The prevalence of uterine rupture and associated factors in Ethiopia: A systematic review and Meta – analysis

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Abstract

Background

Globally, maternal morbidity and mortality a major public health challenge. Uterine rupture is a life-threatening obstetrical emergency with serious undesired complications for both the mother and her infant. Uterine rupture is the leading cause of maternal and fetal death in developing countries. Therefore, the aim of this systematic review and meta-analysis was to assess the prevalence of uterine rupture and its associated factors in Ethiopia.

Method:

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline was followed. The databases used were; PubMed, Google scholar, Cochrane Library, African Journals Online, Ethiopian's university research repository online library, and manual searching. The search was further limited to studies conducted in Ethiopia and reported in English. Two authors independently extracted all necessary data using a standardized data extraction format. STATA 11 software was used to analyze the data. The Cochrane Q and I² test were used to assess the heterogeneity of studies. The pooled estimate prevalence and the odds ratios with 95% confidence intervals were computed by a random effect model.

Result:

A total of 16 studies were included in this meta-analysis with a sample size of 10,550. The national pooled prevalence of uterine rupture was 14.74%. The pooled adjusted odds ratio (AOR) of uterine rupture for prolonged labour (>24hours) was 4.3 (95% CI=2.57,7.19), not having antenatal care during pregnancy was 3.71(95%CI=2.26,6.08),grand multiparity was 1.99(95%CI=1.04,3.81),rural residency was 4.17 (95%CI=1.72,10.12),having cesarean section scar was 8.52 (95%CI: 4.98,14.59),not using partograph during labour was 3.43(1.62,7.29), and obstructed labour was 8.78(95%CI:3.38,22.8).

Conclusion:

This systematic review and meta-analysis showed that uterine rupture was high in Ethiopia. Being from the rural residence, prolonged labour (>24hours), not having ante natal care, grand multiparity, having cesarean section scar, not using partograph during labour, and obstructed labour increased the risk of uterine rupture.

Background

Uterine rupture is a life-threatening tearing of the uterus either partially or completely during pregnancy or delivery. This usually results in extrusion of the product of conception into the abdominal cavity, extensive damage to the uterus, and deadly bleeding in the mother and death of the baby [1, 2].
Worldwide, maternal mortality remains a major challenge to health care systems. Globally, around 303,000 to half a million women die per annum due to complications of pregnancy and childbirth. The global Maternal Mortality Rate is 216 per 100,000 live births. The majority of these, 99% (302,000) maternal mortality concentrated in Sub-Saharan African and South Asian countries: Sub-Sahara Africa alone bears over 90% of the burden of maternal death. Among these uterine rupture accounts for about 8% of all maternal deaths [3].

Ethiopia is one of the Sub-Saharan African countries where maternal and perinatal mortality rates are still very high, with a maternal mortality ratio of 412 maternal deaths per 100,000 live births [4]. In less and least developed countries uterine rupture is a standing and horrific challenge and it is an important cause of maternal mortality and morbidity, with the overall incidence of around 74 in 10,000 [5, 6].

Uterine rupture is one of the tragic obstetric complications with a higher potential of resulting maternal and neonatal morbidity, and mortality with the case fatality rate as high as 30.4% [12]. Maternal consequences are hemorrhage, hypovolemic shock, bladder injury, anemia, need for transfusion, obstetric fistula, psychological trauma, wound infection, sepsis, serious morbidities, loss of fertility from hysterectomy and maternal death. Fetal consequences are admitting to the neonatal intensive care unit, fetal hypoxia or anoxia, and neonatal death [7-10].

Uterine rupture was one of the top four major causes that contributed to 36% of maternal deaths besides hemorrhage (22%), hypertensive disorders of pregnancy (19%), and sepsis (13%) [11, 12].

In developing counties the prevalence of uterine rupture is significantly high due to different factors. A major factor is obstructed labour secondary to contracted pelvis [13], Other risk factors for uterine rupture includes previous cesarean section [10, 14-16], maternal education, lack of infrastructure, poor health literacy [16, 17], short inter-pregnancy interval, unmet need for family planning [5, 18], multi-gravidity, not utilizing antenatal care, distance from health care facility, congenital uterine anomalies, fetal macrosomia, breech extraction, feto-pelvic disproportion, neglected labor and uterine instrumentation, home delivery [13, 18-20]. Moreover, high parity, mal-presentation and unsafe obstetric practices such as inappropriate use of oxytocine, prostaglandin drugs for induction/augmentation of labor, and fundal pressure in prolonged second stage [10, 13, 14, 21] also associated with uterine rupture.

The Ethiopian government is the first in Africa, rich in publicly stated commitments to reduce maternal mortality with ready access to obstetric care, prenatal care, awareness creation, obstetric training and free service for laboring mothers. Regardless of those active measures, uterine rupture is still a major and deadly public health problem in Ethiopia.

In Ethiopia, obstructed labor and uterine rupture cause 36% of maternal death [50]. There are studies on the prevalence and factors for uterine rupture in Ethiopia [2, 8, 22-36]. The majority of the studies are inconsistent and showed variations from 4.4% [37] to 25% [8] over time and across geographical areas. Therefore, this systematic review and meta-analysis aimed to provide a pooled national estimate of uterine rupture and its associated factors in Ethiopia.
Methods

Study design and setting

A systematic review and meta-analysis, which aimed to estimate the overall prevalence of uterine rupture and associated factors was conducted in Ethiopia. Ethiopia is located in the eastern part of Africa bordered by Kenya to the south, Eritrea to the north, Djibouti and Somalia to the east, and Sudan and South Sudan to the west. In Ethiopia, nearly 78% of the population live in rural areas, and 48% of reproductive age (15–49) women also have no education [50].

The result is reported in accordance with the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P) checklist, and the PRISMA extension statement for reporting of systematic reviews incorporating network meta-analyses of healthcare interventions (see checklist in Additional file 2).

Inclusion and exclusion criteria

The studies were included if they met the following inclusion criteria: (1) studies conducted in Ethiopia; (2) observational studies, including cross-sectional, case-control and cohort studies; (3) studies that reported prevalence and/or risk factors; (4) the outcome uterine rupture (4) both published and unpublished studies at any time were included. Additionally, we excluded editorials, commentaries, reviews, studies conducted non-English language were excluded.

Searching for studies

A comprehensive search strategy was done by three (AAA, AAN, and BFZ) authors. We searched PubMed, Cochrane Library, Google scholar, and African Journals Online databases for all available studies using the following search terms: “incidence”, “prevalence” “outcome”, “determinants”, ‘prolonged labour”, “obstructed labour” “classical cesarean section”, “factors”, “no ante natal care”, “home deliver”, “uterine rupture”, “ruptured uterus”, “vaginal birth after cesarean/caesarean section”, “trial of labour”, “obstetrical extraction”, “age”, “grand multiparty”, “rural residents”, “factors”, “determinants”, “vaginal birth”, “outcome”, AND Ethiopia.

These keywords were used in combination and separately using "AND" and "OR" Boolean operators. An example of the search details for PubMed illustrated in (Additional file 1: Table 1).

We looked at Google Scholar by using Combination of search items: Incidence OR prevalence OR outcome OR determinants OR factors) AND uterine rupture) OR (vaginal birth after cesarean/caesarean OR trial of labor/labour OR trial of scar OR labor/labour OR delivery OR vaginal birth OR vaginal delivery OR cesarean/caesarean OR home childbirth OR natural childbirth OR obstetrical extraction) AND Ethiopia.

Additionally, we looked at Cochrane Library, African Journals Online using database specific subject headings associated with the above keywords used in PubMed.
For unpublished studies, master's thesis and PhD dissertation, the official website of Ethiopian's University research repository online library (University of Gondar and Addis Ababa University) was searched. Moreover, we searched from the reference lists of all the included studies (snowball technique) to identify any other studies that may have been missed by our search strategy. Finally, all studies were imported into reference management (Mendeley Desktop) software.

Outcome of interest

The primary outcome of this review was uterine rupture, which is tearing of the uterine wall either completely or partially during pregnancy or delivery. Ruptured uterus leads to extrusion of product of conception in to the abdominal cavity and massive hemorrhage especially when the rupture is of unscarred uterus: uterine rupture contributes significantly to both fetal and maternal mortality, serous morbidities and loss of fertility from hysterectomy.

The secondary outcomes were: the determinants of uterine rupture such as obstructed labour, contracted pelvis, previous cesarean section, maternal education, short inter-pregnancy interval, unmet need for family planning, multi-gravidity, not utilizing antenatal care, distance from health care facility, congenital uterine anomalies, fetal macrosomia, breech extraction, feto-pelvic disproportion, neglected labor and uterine instrumentation, home delivery, high parity, mal-presentation and unsafe obstetric practices such as inappropriate use of oxytocine, prostaglandins drugs for induction/augmentation of labor, fundal pressure in prolonged second stage, lack of infrastructure like transportation, electricity, poor knowledge of danger sign of pregnancy, and lack of birth preparedness and complication readiness plan.

Data extraction and quality Assessment

All essential data from the included studies were independently extracted by three (AAA, AAN, and BFZ) authors using a predesigned data abstraction form. Any disagreement was handled by the third reviewer (AAN) and repeated reading of the articles independently. Finally, consensus was reached through discussion between authors.

A prespecified form which was designed to extract data of methodological and scientific quality was used. As recommended by PRISMA (44), the following data were extracted from each study: first authors name, study setting, study period, study design, method of data collection, sample size, response rate, odds ratio (OR), and the possible associated factors of uterine rupture. The quality of each article was evaluated using Joanna Briggs Institute (JBI) quality appraisal criteria adapted for studies reporting prevalence data, cross-sectional, cohort and case-control studies [38]. The following items were used to appraise cross-sectional studies: (1) inclusion criteria; (2) valid and reliable measurement of exposure; (3) description of study subject and setting; (4) objective and standard criteria used; (5) strategies to handle confounder; (6) identification of confounder; (7) appropriate statistical analysis; and (8) outcome measurement. The following items were used for appraising cohort studies: (1) similarity of groups; (2) similarity of exposure measurement; (3) identification of confounder; (4) validity and reliability of measurement; (5) strategies to deal with confounder; (6) sufficiency of follow up time; (7);
appropriateness of groups/participants at the start of the study; validity and reliability of outcome measured (8) completeness of follow-up or descriptions of reason to loss to follow-up; (9) strategies to address incomplete follow-up; and (10) appropriateness of statistical analysis. The following items were used for appraising case-control study: (1) comparable groups; (2) appropriateness of cases and controls; (3) standard measurement of exposure; (4) criteria to identify cases and controls; (5) handling of confounder; (6) similarity in measurement of exposure for cases and controls; (7) strategies to handle confounder; (8) appropriateness of duration for exposure; (9) appropriateness of statistical analysis; and (10) standard assessment of outcome. During quality assessment checklist criteria's, studies considered low risk whenever fitted to 50% and or above.

Statistical analysis

A weighted inverse variance random-effects model [39] was used to estimate the overall pooled prevalence. The pooled AOR of prolonged labour (>24 hours), not having antenatal care, grand multiparity, rural residency, having cesarean section scar, not using partograph during labour, and obstructed labour was computed. Subgroup analysis was done by study region and year of study to adjust the variations in the pooled estimate of the prevalence. The heterogeneity of studies was assessed by using I2 test statistics. The heterogeneity of studies declared as as low, moderate, and high at the values of 25%, 50%, and 75% respectively [40]. Publication bias across studies was checked using funnel plot and Egger regression [41] were used to declare publication bias. STATA version 11 statistical software was used for all statistical analyses.

Results

Studies included in the meta-analysis

The search strategy identified 250 articles from PubMed, 200 articles from Google Scholar, 110 articles from Cochrane Library, 102 articles from African Journals Online, 30 articles from Ethiopian's University research repository online library, and 10 articles through manual search. Of which, 242 were excluded due to duplication, 424 through review of titles and abstracts. Additionally 40 full-text articles were excluded for not reporting the outcome variable and other reasons. Finally, 16 studies were included (Fig. 1).

Characteristics of included studies

In this review, 16 relevant studies were included with a sample size of 10,5530. Among sixteen studies, eleven cross sectional(2,8,22-24,28-33), four case-control (37,50,51,52) and one cohort ([26]) studies were found. Regarding the geographical area, seven studies were conducted in Amhara region (2,8,24,28,29,31,50), four in Oromia (23,27,33,32), three in Southern Nation Nationalities and People (SNNPR) (29,31,52) and two in Tigray (22,30) (Table 1).

Quality of the included studies
Four study was assessed using JBI checklist for case-control studies [37, 50, 51, 52], eleven studies [2,8,22-24,28-33] using JBI checklist for cross sectional studies, and one study [27] using the JBI checklist for case control studies. None of the studies were excluded based on the quality assessment criteria (Table 1).

Prevalence of uterine rupture

Primarily, among sixteen studies, four case-control studies were not considered in the prevalence estimation. Consequently, twelve studies [2,8,22-24,27-33] were included in the final meta-analysis to estimate the prevalence of uterine rupture.

The overall pooled of the prevalence of was 14.74 % (95%CI:10.64, 18.83). The heterogeneity among the studies used to estimate the pooled Prevalence of uterine rupture was marked ($I^2 = 96.1\%$ and $P \leq 0.001$) (Fig. 2). Subgroup analysis was done by study area and year of study. Thus, the pooled prevalence of uterine rupture was high in the Tigray region (21 % (95%CI:18.99, 23)), and the least occurrence was in Amhara (14 % (95% CI:7.22, 20.08)). Similarly, the subgroup analysis by year of study showed that uterine rupture was 13.19% (95%CI:9.01, 17.37) in studies conducted after 2017, Studies conducted from 2014-2015 showed a prevalence of uterine rupture was 17.16 % (95%CI:5.37, 28.94), and studies conducted before 2014 showed the prevalence of uterine rupture was 25% (95%CI: 22.17, 27.83).

Publication bias

Funnel plot was assessed for asymmetry distribution of prevalence of uterine rupture among pregnant women by visual inspection (Fig.3). Egger's regression test showed with a p-value of 0.87 indicated the evidence for no publication bias.

Sensitivity analysis

This systematic review and meta-analysis showed that the point estimate of its omitted analysis lies within the confidence interval of the combined analysis (Fig.4). Therefore, trim and fill Analysis is no further computed.

Risk factors for uterine rupture

In this systematic review and Meta-analysis; prolonged labour (>24hours), not having antenatal care during pregnancy, grand multi parity, rural residents, having cesarean section scar ,not using partograph during childbirth , and obstructed labour were the factors for uterine rupture.

Rural residency and uterine rupture

A total of seven articles were included to identify the association between rural residency and uterine rupture. Women who lived in rural area were 4 times more likely to have uterine rupture urban residents (OR: 4.17; 95% CI: 1.72, 10.12)(Fig. 5).
Grand multiparity and uterine rupture

Six studies [2, 23,25,28,30,31] showed a significant association between grand multiparity and uterine rupture. Women who were grand multipara were 2 times more likely to develop uterine rupture (OR: 1.99: 95% CI: 1.04, 3.81). Egger’s regression test was showed a p-value of 0.08(fig.6).

Not having antenatal care during pregnancy and uterine rupture

Eight articles were included in this analysis [2, 23, 27,28,31,30,50,52]. There was a higher prevalence of uterine rupture among participants who did not have antenatal care during pregnancy. Women who don’t have antenatal care during pregnancy were four times more likely to develop uterine rupture (OR: 3.7: 95% CI: 2.26, 6.08)( Fig.7)

Previous cesarean section scar and uterine rupture

Three studies [23, 25, 32] showed a significant association between Previous cesarean section scar and uterine rupture. Women who had previous cesarean section scar were 9 times more likely to develop uterine rupture (OR: 8.5: 95% CI: 4.98, 14.59). Egger’s regression test was showed a p-value of 0.26(Fig.8).

Prolonged labour and uterine rupture

Six articles with were included in this analysis [25,27,31,32,50,52]. There was a higher prevalence of uterine rupture among women who had prolonged labour. Women who had prolonged labour were four times more likely to develop uterine rupture (OR=4.3, 95% CI:2.57, 7.19)(Fig.9). Egger’s regression test was showed a p-value of 0.02.

Obstructed labour and uterine rupture

Four studies [23, 3, 32,52] showed a significant association between obstructed labour and uterine rupture. Women who had obstructed labour were 9 times more likely to develop uterine rupture (OR:8.8: 95% CI: 3.38, 22.80)(Fig.10).

No parthograh utilization during labour and uterine rupture

Three studies [2,23,52] showed a significant association between Not utilizing parthograh during labour and uterine rupture. Not using parthograh during active phase of labour increase the probability of uterine rupture by 3 times (OR:3.4:95% CI:1.62,7.29)(Fig.11). Egger’s regression test was showed a p-value of 0.05.

Discussion

Our meta-analysis aimed to estimate the pooled prevalence of uterine rupture and its associated factors in Ethiopia. In this meta-analysis, the overall pooled prevalence rate of uterine rupture was 14.74%. In addition, Prolonged labour(>24hours), not having antenatal care during pregnancy, grand multiparity, rural
residents, having cesarean section scar, not using partograph during labour, and obstructed labour were significant predictors for uterine rupture.

The prevalence of uterine rupture in the current study was higher than a study done in United Nation[42] and Turkey[43]. Low antenatal care utilization, extensive home delivery, malnutrition, stunting, obstructed labour, inconsistent availability of infrastructures like roads, transportation, uterine trauma, short inter pregnancy interval, high unmet need for family planning, fetal anomalies, trial of vaginal birth at home, and maternal demographic characteristics like rural residency might cause the higher rate of uterine rupture in Ethiopia. Women who lived in rural area might have lower level of knowledge and awareness of mothers about birth preparedness and complication readiness plan which in turn attribute to high prevalence of uterine rupture in Ethiopia [44].

The subgroup analysis revealed that there was a significant variation among regions. Women from Amhara region had lower rates of uterine rupture as compared to Tigray and Oromia regions. This discrepancy might be due to the fact that there might be the difference in antenatal service utilization, level of awareness about birth preparedness and complication readiness plan, family planning service utilization, level of partograph utilization, and home delivery status.

According to this study, women from the rural residence were four times more likely to develop uterine rupture. This could be due to living in rural area of Ethiopia, low knowledge to antenatal care, birth preparedness and complication readiness plan, high home delivery, high unmet need for family planning, short inter pregnancy interval, high proportion of mothers unaware of danger sign of pregnancy, lack of infrastructure, lower level of education and women empowerment.

In this study, women who had prolonged labour(>24hours) were nearly four times more likely to get uterine rupture compared to women who gave birth within normal time. This finding was in agreement with a study conducted in Angola[45]. This could be due to prolonged labour causes increase the use of oxytocine, increases the risk of obstructed labour, instrumental delivery, and increase cesarean section rate which in turn increase uterine rupture.

This study also showed that women who did not have antenatal care follow up during pregnancy were nearly four times more likely to develop uterine rupture. This finding was in line with a study conducted in Nepal[46]. This might be the fact that not having antenatal care during pregnancy decrease women health status likes multiple pregnancy, gestational diabitus, uterine and fetal anomalies, and other risk factors for uterine rupture. Moreover, women who don't have antenatal care are prone to home delivery, poor awareness about birth preparedness and complication readiness plan, danger sign of pregnancy which in turn increase the risk of rupture.

Having cesarean section scar also identified as a key predictor of high rate of uterine rupture; women who had cesarean section scar were nearly nine times more likely to develop uterine rupture compared to those who did not have cesarean section scar. This finding agreed with studies in Turkey [43] and Nigeria[47]. This might be due to the fact that during labor, pressure builds as the baby moves through
the mother's birth canal. This pressure can cause the mother's uterus to tear. Most of these women live where there is lack of facilities with comprehensive obstetric care, poor referral system and the transport facilities are poorly developed that even when they are referred, there is a poor chance of their reaching the hospital. Moreover, scared uterus is highly susceptible to rupture if combined with oxytocine use, trial of vaginal birth, multiple pregnancy and other obstetric manipulations.

Additionally, this study identified grand multiparity as a key predictor of high rate of uterine rupture; women who were grand multipara were nearly two times more likely to develop uterine rupture. This finding was supported by study in Nigeria [48]. The reason for this could be because grand multi parity increase the risk of gestational diabetes, macrosomia, abnormal fetal presentation, fetal anomalies, and Precipitous labor and delivery which in turn increase the risk of uterine rupture.

This review showed that women who had obstructed labour were nearly nine times more likely to develop uterine rupture. This finding was similar to studies conducted in Uganda [49] and USA[1]. The reason for this could be because during obstructed labour there is an impossible barrier (obstruction) preventing its descent despite strong uterine contractions, which increase risk of uterine rupture.

This study identified not using partograph during labour was as an important predictor of uterine rupture. Women who did not followed by partograph during labour were nearly three times more likely to develop uterine rupture as compared to women who were followed by partograph.

Adequate emphasis has not been given on this life threatening complication which might lead to increased maternal mortality and morbidity, hemorrhage, obstetric fistula, psychological trauma, bladder injury, wound infection, sepsis, serous morbidities, loss of fertility from hysterectomy and fetal consequences are admitting to the neonatal intensive care unit, fetal hypoxia or anoxia, and neonatal death.

It could be reduced if all women delivered at health institutions, proper utilization of partograph, improve family planning service utilization, improve antenatal care follow up and improve birth preparedness and complication readiness plan, and health literacy about sexual and reproductive health, women's health and pregnancy. To achieve the WHO’s reducing maternal mortality strategy, Ethiopia is rich in publicly stated commitments and policies aimed at reduction of maternal mortality by 2030, and implementing the health policy that focused on maternal health. However, the burden of maternal mortality and uterine rupture remains high in the Ethiopian population. Thus, the finding of this study would be important to develop further interventions and may have a significant impact on health service resource utilization. It will have direct or indirect importance in providing information to the joint United Nations Program on maternal mortality, Sustainable Development Goal: to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by 2030 and WHO declaration of no country should have an maternal mortality ratio greater than 140/100,000 live births.

Conclusion
The prevalence of uterine rupture was high in Ethiopia. Prolonged labour (>24 hours), not having antenatal care during pregnancy, grand multiparity, rural residency, having cesarean section scar, not using partograph during labour, and obstructed labour were significant predictors for uterine rupture. A high index of suspicion and quick referral to a well-equipped center may reduce the incidence of this condition. All patients with a history of cesarean section should deliver in hospitals with facilities for surgery and blood transfusion. Regular antenatal care and meticulous screening of high-risk patients are very important for effective prevention. Family-planning advice to reduce grand multiparity, improved access to maternal care, decentralization of obstetric services into peripheral units to prevent home deliveries and good supervision during labor can reduce the incidence of uterine rupture.

Strength and limitation

This review used a predefined search strategy for both published and unpublished articles to reduce reviewer's bias and conducting data extraction and quality evaluation by two independent reviewers to minimize the possible reviewer bias. We also performed sensitivity and subgroup analysis based on the years of the study and study area. Besides, the effects of five key predictors of uterine rupture were estimated. On the other hand, included articles were restricted to English language only; this is a limitation of the study as it missed studies published in other Ethiopian languages.

Abbreviations

AA: Addis Ababa
CI: Confidence Interval
OR: Odds Ratio
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SNNP: Southern Nation Nationality and Peoples
USA: United State of America
WHO: World Health Organization

Declarations

Ethics approval and consent to participate
Not applicable

Consent to publish
Not applicable
Availability of data and material

The data sets generated during the current study are available from corresponding author on reasonable request.

Competing interests

All authors declare that they have no competing interests.

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Authors' Contributions

All authors (AAA, AAT, FYB, SK, AAN, and BFZ) contributed to the data analysis and read and approved the final manuscript.

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References

1. Hofmeyr, G.J., L. Say, and A.M. Gülmezoglu, WHO systematic review of maternal mortality and morbidity: the prevalence of uterine rupture. Bjog, 2005. 112(9): p. 1221-8.

2. Aliyu SA, Y.T., Lemma TB, Prevalence and Associated Factors of Uterine Rupture During Labor among Women Who Delivered in Debre Markos Hospital North West Ethiopia. Intern Med 2016. 6(22).
3. WHO, U., UNFPA WBG and UNPD Trends in Maternal Mortality: 1990 to 2015: Estimates Developed by WHO, UNICEF, UNFPA, The World Bank and the United Nations Population Divisions. 2015. 32: p. 1-55.

4. Central Statistical Agency - CSA/Ethiopia and ICF, Ethiopia Demographic and Health Survey 2016, 2017, CSA and ICF: Addis Ababa, Ethiopia.

5. Guise, J.-M., et al., Systematic review of the incidence and consequences of uterine rupture in women with previous caesarean section. Bmj, 2004. 329(7456): p. 19.

6. Khan, K.S., et al., WHO analysis of causes of maternal death: a systematic review. The lancet, 2006. 367(9516): p. 1066-1074.

7. Dhaifalah, I., J. Santavy, and H. Fingerova, Uterine rupture during pregnancy and delivery among women attending the Al-Tthawra Hospital in Sana’a City Yemen Republic. Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub, 2006. 150(2): p. 279-283.

8. Admassu, A., Analysis of ruptured uterus in Debre Markos hospital, Ethiopia. East African medical journal, 2004. 81(1): p. 52-55.

9. Khooharo, Y., et al., Incidence and management of rupture uterus in obstructed labour. Journal of Ayub Medical College Abbottabad, 2013. 25(1-2): p. 149-151.

10. Berhan, Y. and A. Berhan, Causes of maternal mortality in Ethiopia: a significant decline in abortion related death. Ethiopian journal of health sciences, 2014. 24: p. 15-28.

11. Aziz, N. and S. Yousfani, Analysis of uterine rupture at university teaching hospital Pakistan. Pakistan journal of medical sciences, 2015. 31(4): p. 920.

12. Igwegbe, A.O., G.U. Eleje, and O.I. Udegbonam, Risk factors and perinatal outcome of uterine rupture in a low-resource setting. Nigerian medical journal: journal of the Nigeria Medical Association, 2013. 54(6): p. 415.

13. Guise, J.M., et al., Systematic review of the incidence and consequences of uterine rupture in women with previous caesarean section. BMJ, 2004. 329(7456): p. 19-25.

14. Mishra, S.K., N. Morris, and D.K. Uprety, Uterine rupture: preventable obstetric tragedies? Australian and New Zealand journal of obstetrics and gynaecology, 2006. 46(6): p. 541-545.

15. Rizwan, N., R.M. Abbasi, and S.F. Uddin, Uterine rupture, frequency of cases and fetomaternal outcome. JPMA-Journal of the Pakistan Medical Association, 2011. 61(4): p. 322.

16. Mukasa, P.K., et al., Uterine rupture in a teaching hospital in Mbarara, western Uganda, unmatched case-control study. Reproductive health, 2013. 10(1): p. 29.

17. Lieng, M., O. Istre, and A. Langebrekke, Uterine rupture after laparoscopic myomectomy. The Journal of the American Association of Gynecologic Laparoscopists, 2004. 11(1): p. 92-93.

18. Padhye, S., Rupture of the pregnant uterus: a 20 year review. Kathmandu Univ Med J, 2005. 3(3): p. 234-8.

19. Ashimi, A.O., et al., A prospective surveillance of ruptured uterus in a rural tertiary health facility in Northwest Nigeria. The Journal of Maternal-Fetal & Neonatal Medicine, 2014. 27(16): p. 1684-1687.
20. Dattijo, L., N. Umar, and B. Yusuf, *Ruptured uterus in Azare, north eastern Nigeria*. Jos Journal of Medicine, 2011. 5(2): p. 17-20.

21. Justus Hofmeyr, G., L. Say, and A. Metin Gülmezoglu, *Systematic review: WHO systematic review of maternal mortality and morbidity: the prevalence of uterine rupture*. BJOG: An International Journal of Obstetrics & Gynaecology, 2005. 112(9): p. 1221-1228.

22. Abebe, F., et al., *Determinants of uterine rupture among cases of Adama city public and private hospitals, Oromia, Ethiopia: a case control study*. Reproductive Health, 2018. 15(1): p. 161.

23. Ahmed, D.M., T.S. Mengistu, and A.G. Endalamaw, *Incidence and factors associated with outcomes of uterine rupture among women delivered at Felegehiwot referral hospital, Bahir Dar, Ethiopia: cross sectional study*. BMC Pregnancy and Childbirth, 2018. 18(1): p. 447.

24. Getahun, W.T., et al., *Uterine rupture among mothers admitted for obstetrics care and associated factors in referral hospitals of Amhara regional state, institution-based cross-sectional study, Northern Ethiopia, 2013-2017*. PLoS One, 2018. 13(12): p. e0208470.

25. Marie Bereka, T., A. Mulat, and T. Eshete, *Associated Factors and Outcome of Uterine Rupture at Suhl General Hospital, Shire Town, North West Tigray, Ethiopia 2016: A Case-Control Study*. Obstetrics and Gynecology International, 2017. 2017: p. 1-7.

26. Eshete, A., *PREVALENCE AND FACTORS ASSOCIATED WITH RUPTURE OF GRAVID UTERUS AND FETO-MATERNAL OUTCOME: A ONE-YEAR RETROSPECTIVE COHORT STUDY*. 2018.

27. Astatikie, G., M. Limenih, and M. Kebede, *Maternal and fetal outcomes of uterine rupture and factors associated with maternal death secondary to uterine rupture*. BMC Pregnancy and Childbirth, 2017. 17: p. 1-9.

28. Yemane Y, G.W., *Assessment of the Associated Factors, Management and Complications of Uterine Rupture at Mizan-Tepi University Teaching Hospital, Mizan-Aman Town, Bench-Maji Zone, Snnprs, South West Ethiopia*. Health Sci J 2017. 11(3).

29. Admassu, A., *Analysis of ruptured uterus in Debre Markos Hospital, Ethiopia*. East Afr Med J, 2004. 81(1): p. 52-5.

30. Gessessew, A. and M. Melese, *Ruptured uterus-eight year retrospective analysis of causes and management outcome in Adigrat Hospital, Tigray Region, Ethiopia*. Ethiopian Journal of Health Development, 2002. 16.

31. Getahun, W., et al., *Uterine rupture among mothers admitted for obstetrics care and associated factors in referral hospitals of Amhara regional state, institution-based cross-sectional study, Northern Ethiopia, 2013-2017*. PLOS ONE, 2018. 13: p. e0208470.

32. Mengistie H, A.D., Hiko D, et al., *Maternal and perinatal outcomes of uterine rupture patients among mothers who delivered at mizan aman general hospital, SNNPR, south west Ethiopia; a five year retrospective hospital based study*. Womens Health. 2016. 2(1): p. 13-23.

33. Berhe, Y., H. Gidey, and L.L. Wall, *Uterine rupture in Mekelle, northern Ethiopia, between 2009 and 2013*. Int J Gynaecol Obstet, 2015. 130(2): p. 153-6.
34. Chamiso, B., *Rupture of pregnant uterus in Shashemene General Hospital, south Shoa, Ethiopia (a three year study of 57 cases).* Ethiop Med J, 1995. 33(4): p. 251-7.

35. Marie Bereka, T., A. Mulat Aweke, and T. Esthetie Wondie, *Associated Factors and Outcome of Uterine Rupture at Suhul General Hospital, Shire Town, North West Tigray, Ethiopia 2016: A Case-Control Study.* Obstet Gynecol Int, 2017. 2017: p. 827286.

36. Zelelow, Y., H. Gidey, and L. Wall, *Uterine rupture in Mekelle, northern Ethiopia, between 2009 and 2013.* International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics, 2015. 130.

37. Astatikie, G., M.A. Limenih, and M. Kebede, *Maternal and fetal outcomes of uterine rupture and factors associated with maternal death secondary to uterine rupture.* BMC Pregnancy and Childbirth, 2017. 17(1): p. 117.

38. Institute, J.B., *Critical Appraisal Tools-JBI [Internet].*

39. DerSimonian, R. and R. Kacker, *Random-effects model for meta-analysis of clinical trials: an update.* Contemporary clinical trials, 2007. 28(2): p. 105-114.

40. Higgins, J.P., et al., *Measuring inconsistency in meta-analyses.* Bmj, 2003. 327(7414): p. 557-560.

41. Peters, J.L., et al., *Comparison of two methods to detect publication bias in meta-analysis.* Jama, 2006. 295(6): p. 676-680.

42. Guise JM, M.M., Osterweil P, Nygren P, Chan BK, Helfand M. , *Systematic review of the incidence and consequences of uterine rupture in women with previous caesarean section. BMJ.* 2004;329(7456):19-25. doi:10.1136/bmj.329.7456.19.

43. Turgut, A., et al., *Uterine rupture revisited: Predisposing factors, clinical features, management and outcomes from a tertiary care center in Turkey.* Pak J Med Sci, 2013. 29(3): p. 753-7.

44. Berhe, A.K., Muche, A.A., Fekadu, G.A. et al. , *Birth preparedness and complication readiness among pregnant women in Ethiopia: a systematic review and Meta-analysis.* Reprod Health 15, 182 (2018). https://doi.org/10.1186/s12978-018-0624-2.

45. Strand RT, T.P., Niekowal J, Bergström S, *Audit of cases with uterine rupture: a process indicator of quality of obstetric care.* 2010.

46. 2006;32:574-9., C.N.A.o.u.r.i.a.t.c.i.e.N.L.f.O.c.J.O.G.R.

47. Mbamara, S., N. Obiechina, and G. Eleje, *An analysis of uterine rupture at the Nnamdi Azikiwe University Teaching Hospital Nnewi, Southeast Nigeria.* Nigerian Journal of Clinical Practice, 2012. 15(4): p. 448-452.

48. Olagbuji, B.N., F. Okonofua, and A.B. Ande, *Uterine rupture and risk factors for caesarean delivery following induced labour in women with one previous lower segment caesarean section.* The Journal of Maternal-Fetal & Neonatal Medicine, 2012. 25(10): p. 1970-1974.

49. Kadowa, I., *Ruptured uterus in rural Uganda: prevalence, predisposing factors and outcomes.* Singapore medical journal, 2010. 51(1): p. 35.
50. Central Statistical Agency (CSA) [Ethiopia] and ICF. 2016. Ethiopia Demographic and Health Survey 2016. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF.

Table

Table 1: Descriptive summary of included studies on uterine rupture based on year of study, study design, sample size, region of study, response rate, and prevalence \((n=16)\).
| Author (year)                  | study design(setting) | Sample size | Response rate | Study area | P(%) | Quality |
|-------------------------------|-----------------------|-------------|---------------|------------|------|---------|
| Dawud A.et al(2017)           | Cross-sectional       | 376         | 91            | Amhara     | 9    | Low risk|
| Fikru A.et al(2017)           | Cross-sectional       | 432         | 100           | Oromia     | 10   | Low risk|
| Worku T.et al(2017)           | cross sectional       | 750         | 99            | Amhara     | 16.68| Low risk|
| Akine Eshete .et al(2017)     | Cohort                | 498         | 97.4          | Oromia     | 17.1 | Low risk|
| Tefera M.et al(2015)          | case control          | 336         | 89            | Tigray     | N/A  | Low risk|
| Tegene L.et al(2016)          | Cross-sectional       | 363         | 98            | SNNP       | 12.44| Low risk|
| Geremew A.et al(2014)         | Cross-sectional       | 254         | 95            | Amhara     | 4.4  | Low risk|
| Temesgen T. et al(2015)       | Cross sectional       | 172         | 98            | Oromia     | 9    | Low risk|
| Amare W.et al(2017)           | case control          | 210         | 97.8          | Amhara     | N/A  | Low risk|
| Yayehyirad Y.et al (2016)     | case control          | 352         |               | SNNP       | N/A  | Low risk|
| A. ADMASSU. et al(2004)       | cross-sectional       | 1200        | 99            | Amhara     | 25   | Low risk|
| Samuel A.et al(2016)          | Cross-sectional       | 880         | 97.2          | Amhara     | 9.5  | Low risk|
| Alemtseyay W.et al(2018)      | Case control          | 321         | 96.4          | Amhara     | N/A  | Low risk|
| Chamiso B.et al(1995)         | Cross-sectional       | 2185        | 94.7          | Oromia     | 26   | Low risk|
| Amanuel G.et al(2001)         | cross sectional       | 2000        | 96            | Tigray     | 21   | Low risk|
| Author          | Study Type   | N  | Prevalence | Region   | Risk Level |
|-----------------|--------------|----|------------|----------|------------|
| Habtamu M.et al (2015) | Cross-sectional | 221 | 91.7       | SNNP     | 10.4       | Low risk  |

**Figures**
Figure 1

PRISMA 2009 Flow diagram for identification and selection of articles for inclusion in the review.
Figure 2
Prevalence of uterine rupture in Ethiopia, 1995-2018
Figure 3

Funnel plot with 95% confidence limits of the pooled prevalence of uterine rupture in Ethiopia
### Table: Sensitivity Analysis

| Study             | ID | ES (95% CI)       | Weight |
|-------------------|----|-------------------|--------|
| Fikru A.et al     |    | 6.29 (3.36, 11.78)| 15.37  |
| Worku T.et al     |    | 2.44 (1.14, 5.24) | 14.82  |
| Akine Eshete .et al|   | 14.60 (7.07, 30.15)| 14.98  |
| Tegene L.et al    |    | 3.99 (2.01, 7.92) | 15.14  |
| Amare W.et al     |    | 5.00 (0.81, 30.94)| 9.77   |
| Samuel A.et al    |    | 5.26 (1.79, 15.46)| 13.36  |
| Alemtsehay W.et al|    | 1.15 (0.98, 1.35) | 16.56  |
| **Overall**       |    | 4.17 (1.72, 10.12)| 100.00 |

**NOTE:** Weights are from random effects analysis.

### Figure 4

Sensitivity analysis of the pooled prevalence of uterine rupture in Ethiopia.
Figure 5

The pooled effects of rural residency on uterine rupture in Ethiopia.
Figure 6

The pooled effects of grand multiparity on uterine rupture in Ethiopia.
Figure 7

The pooled effects of not having antenatal care during pregnancy on uterine rupture in Ethiopia.
### Figure 8

The pooled effects of previous cesarean section scar on uterine rupture in Ethiopia.

| Study            | ES (95% CI)       | Weight |
|------------------|-------------------|--------|
| Fikru A.et al    | 9.94 (5.36, 18.43)| 47.23  |
| Worku T.et al    | 4.90 (2.13, 11.27)| 31.29  |
| Amare W.et al    | 13.60 (4.73, 39.08)| 21.48  |
| Overall (I-squared = 25.6%, p = 0.261) | 8.52 (4.98, 14.59) | 100.00 |

NOTE: Weights are from random effects analysis

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Figure 8

The pooled effects of previous cesarean section scar on uterine rupture in Ethiopia.
| Study                  | ES (95% CI)        | Weight |
|-----------------------|--------------------|--------|
| Worku T.et al         | 3.44 (1.49, 7.93)  | 16.51  |
| Akine Eshete .et al   | 6.50 (1.51, 27.90) | 8.76   |
| Tefera M.et al        | 24.39 (7.97, 74.67)| 12.28  |
| Amare W.et al         | 3.79 (2.49, 5.77)  | 24.42  |
| Yayehyirad Y.et al e  | 2.71 (1.25, 5.86)  | 17.65  |
| Alemtsehay W.et al    | 2.62 (1.40, 4.90)  | 20.38  |
| Overall (I-squared = 62.3%, p = 0.021) | 4.30 (2.57, 7.19) | 100.00 |

NOTE: Weights are from random effects analysis

**Figure 9**

The pooled effects of Prolonged labour on uterine rupture in Ethiopia.
### Figure 10

The pooled effects of obstructed labour on uterine rupture in Ethiopia.
Figure 11

The pooled effects of no parthograph utilization during labour on uterine rupture in Ethiopia.

Supplementary Files

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