



The Analysis Study of Prevalence, Risk Factor, Management of First Trimester Uterine Rupture: A Comprehensive Systematic Review

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ABSTRACT

Background: Most uterine ruptures occur in pregnant women, though it has been reported in non-pregnant women when the uterus is exposed to trauma, infection, or cancer. The aim: The aim of this study to show about prevalence, risk factor, management of first trimester uterine rupture.

Methods: By the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020, this study was able to show that it met all of the requirements. **Result:** Eight publications were found to be directly related to our ongoing systematic examination after a rigorous three-level screening approach. Subsequently, a comprehensive analysis of the complete text was conducted, and additional scrutiny was given to these articles. **Conclusion:**

Uterine rupture in the first trimester of pregnancy is a rare and life-threatening occurrence that can be safely and conservatively treated. The main driving factor behind a scarred uterus is previous caesarean section. Delay in definitive management causes significant fetal morbidity and mortality. For best outcomes, vaginal birth after a previous cesarean section needs close monitoring in appropriately prepared units with the ability to perform immediate cesarean delivery and provide advanced neonatal support.

Keyword: Uterine rupture, prevalence, risk factor, management, first trimester.

INTRODUCTION

Uterine rupture refers to the complete division of all three layers of the uterus: the endometrium (inner epithelial layer), myometrium (smooth muscle layer), and perimetrium (serosal outer surface). Generally speaking, the term uterine rupture implies that a gravid uterus is involved—though ruptures have been reported in nonpregnant uteri. A uterine rupture can allow a part of the fetus, amniotic fluid, or the umbilical cord to enter the peritoneal cavity or broad ligament. A uterine rupture can cause abdominal pain, vaginal bleeding, a change in the contraction pattern, or a nonreassuring fetal heart rate tracing.^{1,2}

Rupture of the uterus is a rare, serious, and potentially fatal complication of pregnancy. A uterine rupture is defined as a disruption of the whole uterine muscle and the visceral peritoneum. This term is often confused with uterine dehiscence, in which the integrity of the visceral peritoneum is retained. Most uterine ruptures occur at the

term of pregnancy and only a limited number of cases occur in the first or second trimester of pregnancy. The main risk factor for uterine rupture is previous surgery with opening of the endometrial cavity. There are however cases of uterine rupture where the cause remains unknown.^{3,4}

The rate of uterine rupture is known to increase in patients with advanced maternal age, overdue pregnancy, macrosomia, a shorter interval of deliveries, single-layer uterine closure, multiple previous caesarean deliveries, and trial of labour after caesarean section as well as laparoscopic or abdominal myomectomy or adeno-myomectomy but it can also occur in women with a native, unscarred uterus. The most common risk factor for uterine rupture is uterine scarring from a previous caesarean section. In one review, 52% had previous caesarean scars. An extremely rare case of uterine rupture in the first pregnancy with no risk factors has also been reported. The risk factors in cases of an unscarred uterus may be associated

with the weakness of the myometrium due to trauma, congenital anomaly, multiple gestations, and the use of uterotonic drugs.⁵⁻⁷

Globally, the incidence of uterine rupture is 0.07%, while in Africa the incidence is 1.3%. The most common risk factor for uterine rupture is a previous cesarean section scar especially when attempting a vaginal birth after a cesarean section. The risk is increased with short interpregnancy interval, a classical uterine scar, and administration of misoprostol. The incidence of rupture in women with a previous cesarean section scar is 0.3% while that of an unscarred uterus is 1 in 5700 to 1 in 20,000 pregnancies. Other risk factors include a previous myomectomy scar and dilation and curettage. Major abdominal trauma occurring during pregnancy such as a motor vehicle accident or a fall can also lead to uterine rupture.^{8,9}

METHODS

Protocol

By following the rules provided by Preferred Reporting Items for Systematic Review and Meta-

Analysis (PRISMA) 2020, the author of this study made certain that it was up to par with the requirements. This is done to ensure that the conclusions drawn from the inquiry are accurate.

Criteria for Eligibility

For the purpose of this literature review, we compare and contrast prevalence, risk factor, management of first trimester uterine rupture. It is possible to accomplish this by researching of the prevalence, risk factor, management of first trimester uterine rupture. As the primary purpose of this piece of writing, demonstrating the relevance of the difficulties that have been identified will take place throughout its entirety.

In order for researchers to take part in the study, it was necessary for them to fulfil the following requirements: 1) The paper needs to be written in English, and it needs to determine about the prevalence, risk factor, management of first trimester uterine rupture. In order for the manuscript to be considered for publication, it needs to meet both of these requirements. 2) The studied papers include several that were published after 2014, but before the

time period that this systematic review deems to be relevant. Examples of studies that are not permitted include editorials, submissions that do not have a DOI, review articles that have already been published, and entries that are essentially identical to journal papers that have already been published.

Search Strategy

We used "Prevalence, risk factor, management of first trimester uterine rupture." as keywords. The search for studies to be included in the systematic review was carried out using the PubMed, SagePub, and Sciencedirect databases.

Data retrieval

After reading the abstract and the title of each study, the writers performed an examination to determine whether or not the study satisfied the inclusion criteria. The writers then decided which previous research they wanted to utilise as sources for their article and selected those studies. After looking at a number of different research, which all seemed to point to the same trend, this conclusion was drawn. All submissions need to be written in

English and cannot have been seen anywhere else.

Only those papers that were able to satisfy all of the inclusion criteria were taken into consideration for the systematic review. This reduces the number of results to only those that are pertinent to the search. We do not take into consideration the conclusions of any study that does not satisfy our requirements. After this, the findings of the research will be analysed in great detail. The following pieces of information were uncovered as a result of the inquiry that was carried out for the purpose of this study: names, authors, publication dates, location, study activities, and parameters.

Quality Assessment and Data Synthesis

Each author did their own study on the research that was included in the publication's title and abstract before making a decision about which publications to explore further. The next step will be to evaluate all of the articles that are suitable for inclusion in the review because they match the criteria set forth for that purpose in the review. After that, we'll determine

which articles to include in the review depending on the findings that we've uncovered. This criteria is utilised in the process of selecting papers for further assessment. in order to simplify the process as much as

feasible when selecting papers to evaluate. Which earlier investigations were carried out, and what elements of those studies made it appropriate to include them in the review, are being discussed here.

Table 1. Search Strategy

Database	Search Strategy	Hits
Pubmed	((<i>"Uterine rupture"</i> [MeSH Subheading] OR <i>"First trimester"</i> [All Fields] OR <i>"Risk factor"</i> [All Fields]) AND (<i>"Prevalence"</i> [All Fields] OR <i>"Epidemiology"</i> [All Fields]) AND (<i>"Management"</i> [All Fields] OR (<i>"Teraphy"</i> [All Fields]))	90
Science Direct	((<i>"Uterine rupture"</i> [MeSH Subheading] OR <i>"First trimester"</i> [All Fields] OR <i>"Risk factor"</i> [All Fields]) AND (<i>"Prevalence"</i> [All Fields] OR <i>"Epidemiology"</i> [All Fields]) AND (<i>"Management"</i> [All Fields] OR (<i>"Teraphy"</i> [All Fields]))	539
Sagepub	((<i>"Uterine rupture"</i> [MeSH Subheading] OR <i>"First trimester"</i> [All Fields] OR <i>"Risk factor"</i> [All Fields]) AND (<i>"Prevalence"</i> [All Fields] OR <i>"Epidemiology"</i> [All Fields]) AND (<i>"Management"</i> [All Fields] OR (<i>"Teraphy"</i> [All Fields]))	451

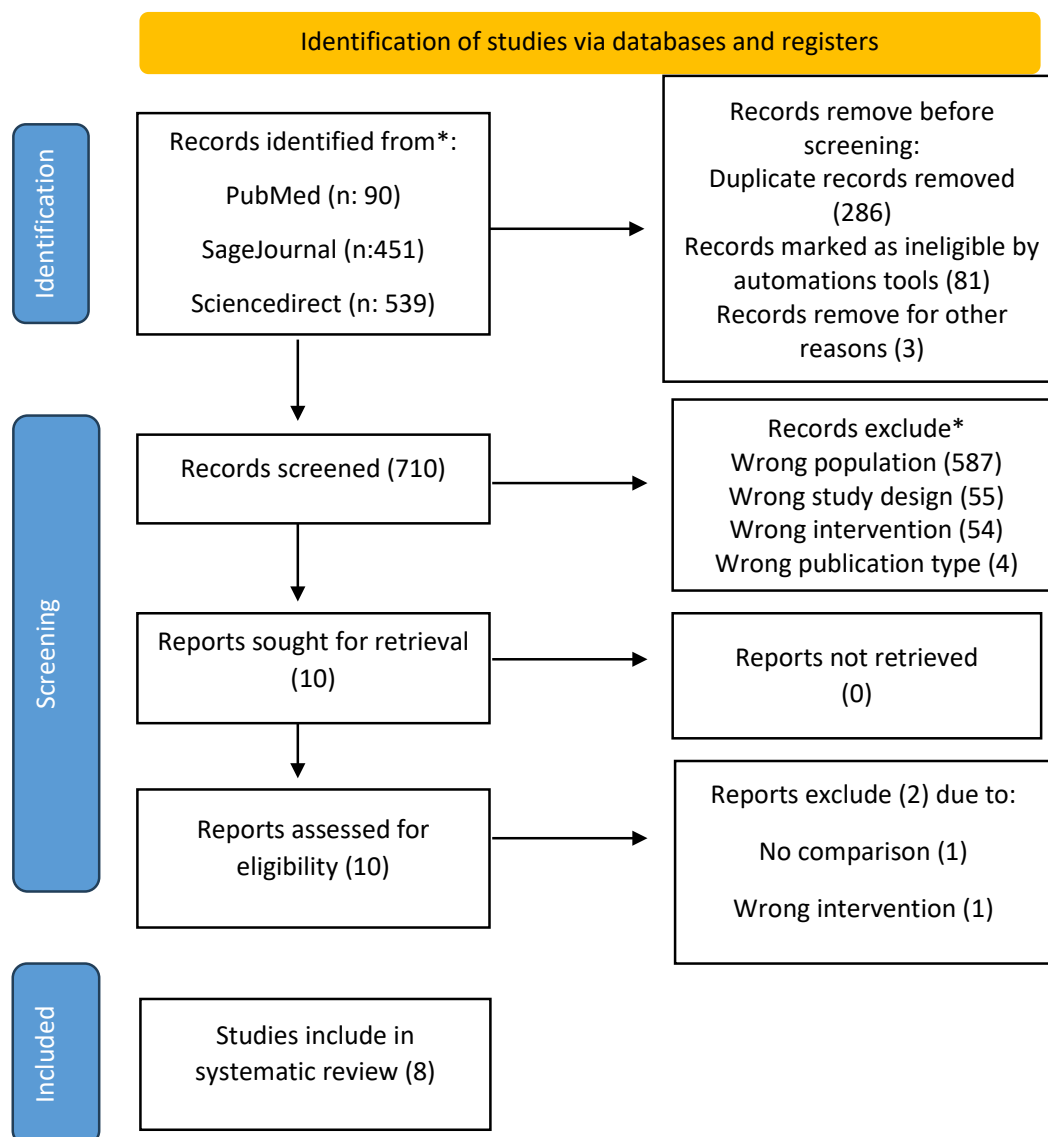


Figure 1. Article search flowchart

Table 2. Critical appraisal of Study

Parameters	(Dimitrova, D et al., 2022)	(Abrar, S et al., 2022)	(Wan, S et al., 2022)	(Meng esha, MB et al., 2020)	(Kitege, JN et al., 2020)	(Ahmed, DM et al., 2018)	(Feleke, G et al., 2023)	(Zhan, W et al., 2021)
1. Bias related to temporal precedence								
Is it clear in the study what is the “cause” and what is the “effect” (ie, there is no confusion about which variable comes first)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Bias related to selection and allocation								
Was there a control group?	No	No	No	Yes	No	No	Yes	No
3. Bias related to confounding factors								
Were participants included in any comparisons similar?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Bias related to administration of intervention/exposure								
Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	No	No	No	No	No	No	No	No
5. Bias related to assessment, detection, and measurement of the outcome								
Were there multiple measurements of the outcome, both pre and post the intervention/exposure?	No	No	No	No	No	No	No	No
Were the outcomes of participants included in any comparisons measured in the same way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were outcomes measured in a reliable way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. Bias related to participant retention								
Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7. Statistical conclusion validity								
Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

RESULT

Using reputable resources like Science Direct, PubMed, and SagePub, our research team first gathered 1080 publications. A thorough three-level screening strategy was used to identify only eight papers as directly relevant to our ongoing systematic evaluation. Next, a thorough study of the entire text and further examination of these articles were selected. Table 3 compiles the literature that was analyzed for this analysis in order to make it easier to view.

Table 3. The literature include in this study

Author	Origin	Method	Sample	Result
Dimitrova, D et al., 2022 ¹⁰	Germany	Between 2005 and 2017 cases with CUR and PUR at Charité University Berlin, Germany were retrospectively identified. Demographic, obstetric and outcome variables were analyzed regarding the type of rupture.	92	92 cases with uterine rupture were identified out of a total of 64,063 births (0.14%). Puerperal complications were more frequent in CUR (67.9 versus 41.1%, $p = 0.021$). Multiparity ≥ 3 was more frequent in CUR (31 versus 10.7%, $p = 0.020$). Factors increasing the risk for CUR were parity ≥ 3 (OR = 3.8, $p = 0.025$), previous vaginal birth (OR = 4.4, $p = 0.011$), TOLAC (OR = 6.5, $p < 0.001$) and the use of oxytocin (OR = 2.9, $p = 0.036$). After multivariate analysis, the only independent risk factor associated with CUR was TOLAC (OR = 7.4, $p = 0.017$).
Abrar, S et al., 2022 ¹¹	Pakistan	It was a retrospective study of 206 women to review data	206	The overall incidence of the ruptured uterus was 1.71%. The important etiological factors were grand multiparity 62

		collected from cases of uterine rupture managed at the WCTH Bannu, Pakistan from October 2016 to October 2018. A structured proforma was designed and used to extract data from operating theatre registers and the hospital medical records.		(35.2%), obstructed/neglected labour 58 (32.9%), injudicious use of Oxytocin 56 (31.8%) and prostaglandins 26 (14.7%), previous cesarean section 35 (19.8%) and previous pelvic surgery (0.5%). Hysterectomy was done in 80.6% of cases, 34 (19.2%) patients underwent uterine repair and 4.5% had bladder repair. The mortality rate was 21%, mainly due to irreversible shock or disseminated intravascular coagulation. Perinatal mortality was 91.4%. Duration of surgery more than two hours and presentation to the hospital at night time was significantly associated with poor maternal outcome (p = 0.00).
Wan, S et al., 2022 ¹²	China	This is a population-based retrospective study. All pregnant women treated for ruptured uterus in one center between 2013 and 2020 were included. Their information	41	A total of 209,112 deliveries were included and 41 cases of uterine rupture were identified. The incidence of uterine rupture was 1.96/10000 births. Among the 41 cases, 16 (39.0%) had maternal and fetal complications. There were no maternal deaths secondary to uterine rupture, while perinatal fatality related to uterine rupture was 7.3%. Among all cases, 38 (92.7%) were scarred

		retrieved from the medical records department were reviewed retrospectively.		uterus and 3 (7.3%) were unscarred uterus. The most common cause of uterine rupture was previous cesarean section, while cases with a history of laparoscopic myomectomy were more likely to have serious adverse outcomes, such as fetal death. 24 (59.0%) of the ruptures occurred in anterior lower uterine segment. Changes in Fetal heart rate monitoring were the most reliable signs for rupture.
Mengesha, MB et al., 2020¹³	Ethiopia	A retrospective hospital-based unmatched case control study design was implemented with 135 cases of women with uterine rupture and 270 controls of women without uterine rupture.	405	Mothers referred from remote health institutions (AOR 7.29 (95% CI: 2.7, 19.68)), mothers who visited once for antenatal care (AOR 2.85 (95% CI: 1.02, 7.94)), those experiencing obstructed labor (AOR 13.33 (95% CI: 4.23, 42.05)), and birth weight of a newborn greater than four kilograms (AOR 5.68 (95% CI: 1.39, 23.2)) were significantly associated with uterine rupture. From 135 mothers who develop uterine rupture, 13 (9.6%) mothers died and 101 (74.8%) fetuses were stillborn. Obstetrical complications like abdominal hysterectomy in 75 (55.6%) of mothers and excessive blood loss in 84 (57.8%) were additional untoward

				outcomes of uterine rupture.
Kitenge, JN et al., 2020¹⁴	Congo	Institution based cross sectional study was conducted from December 1st, 2012 to 31st, 2016 on uterine rupture. During the study selected 158 women were included by using exhaustive sampling method. Data were checked, coded and analyzed into STATA version 12.	186	The overall prevalence of uterine rupture was 0.49%. The average age of the patients was 29.5 ± 6.2 years and 71.52% of them were between 20 and 34 years old; more than 60% had a parity ≥ 4 (average parity: 4.7 ± 2.5). 81.17% of the cases had a fully ruptured uterus and 51.17% of the uterine ruptures were located in the lower segment. Repair of the pregnant ruptured uterus was performed in 93.04% of the cases and hysterectomy in 5.06%. Maternal and perinatal mortalities were 8.86% and 72.04% respectively. Regarding maternal mortality, no parameter showed a significant association with maternal death. As for perinatal mortality, parity ≥ 4 , complete rupture and segmento-corporeal lesion were significantly associated with perinatal death ($p < 0.05$).
Ahmed, DM et al., 2018¹⁵	Ethiopia	This is a cross sectional study with retrospective facility based data collection technique. All pregnant women who	239	We studied 239 cases of uterine rupture in the 5 years period. Mothers without previous cesarean delivery including eight primigravidas took 87% of the cases. From all study participants, 54 of mothers (22.6%) developed undesired outcomes whereas

		were managed for ruptured uterus at Felegehiwot referral hospital from September 11 2012 to August 30 2017 were included.		185(77.4%) discharged without major sequel. More than half (56.9%) arrived in hypovolemic shock. Total abdominal hysterectomy was the commonest procedure accounting for 61.5%. Duration of surgery was less than 2 h in 67.8% of the procedures. Anemia is the commonest complication (80.3%) followed by wound infection and VVF (11.7% each). There were 5 maternal deaths (2.1%). Mothers who had prolonged operation time (> 2 h) (AOR: 2.2, 95% CI: 1.10, 4.63) were significantly associated with undesired maternal outcomes after management of uterine rupture.
Feleke, G et al., 2023¹⁶	Ethiopia	A case-control study was conducted by reviewing data from a total of 582 patient charts which include 194 cases and 388 controls with a case-to-control ratio of 1:2. Then the data was extracted using a pre-tested and	582	There were a total of 22,586 deliveries and 247 confirmed cases of uterine rupture which makes the prevalence 1.09%. Lack of ANC (Ante-natal care) (AOR = 7.5; 95% CI: 1.9–30.3) inadequate ANC (AOR = 2.45; 95% CI: 1.1–5.57), gravidity ≥5 (AOR = 3.3; 95% CI: 1.36–8.12), obstructed labor (AOR = 38.3; 95% CI: 17.8–82.4) and fetal macrosomia (AOR = 8; 95% CI: 17.8–82.4) are variables which increase the odds of developing uterine rupture. Mothers without

		structured data extraction sheet.		additional medical or obstetric conditions are more likely (AOR = 4.2; 95% CI: 2.1–8.65) to develop uterine rupture than mothers with additional medical or obstetric conditions.
Zhan, W et al., 2021¹⁷	China	A multicentre cross-sectional survey conducted in 96 hospitals across China in 2015–2016.	74180	The weighted incidence of uterine rupture was 0.18% (95% CI 0.05% to 0.23%) in our study population during 2015 and 2016. The weighted incidence of uterine rupture in women with scarred and intact uterus was 0.79% (95% CI 0.63% to 0.91%) and 0.05% (95% CI 0.02% to 0.13%), respectively. Younger or older maternal age, prepregnancy diabetes, overweight or obesity, complications during pregnancy (hypertensive disorders in pregnancy and gestational diabetes), low education, repeat caesarean section (≥ 2), multiple abortions (≥ 2), assisted reproductive technology, placenta previa, induce labour, fetal malpresentation, multiple pregnancy, anaemia, high parity and antepartum stillbirth were associated with an increased risk of uterine rupture. The prediction model including eight variables (OR > 1.5) yielded an area under the curve (AUC) of 0.812

				(95% CI 0.793 to 0.836) in predicting uterine rupture in women with scarred uterus with sensitivity and specificity of 77.2% and 69.8%, respectively.
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DISCUSSION

Uterine rupture is a rare catastrophic obstetric complication. It is a complete rupture with direct communication between the uterine cavity and the peritoneum, or a partial rupture in which tearing in the myometrium is covered by the visceral leaf of the peritoneum with no involvement of fetal membranes and without intra-abdominal haemorrhage. Despite the recent advances in modern obstetrics, uterine rupture remained the major cause of fetal and maternal morbidity and mortality in Sub-Saharan Africa (SSA), contributing to about 13% of maternal mortality and perinatal mortality of 74% - 92%.¹⁸

A study conducted by the World Health Organization (WHO) reported that the prevalence of uterine rupture in developing countries was much higher than the developed

world. However, in high-income countries, uterine rupture occurs frequently among women who attempt a trial of labor in the previous caesarean section (CS), which varies from 0.22% to 0.78%. The risk of rupture increased with short birth interval, obstructed labor and poor obstetric care in developing countries. On the other hand, it was reported lower (0.007%) among women in the Netherlands, United Kingdom, and the United States.¹⁸⁻²⁰

Uterine rupture (UR) is a serious complication that directly jeopardizes the life of the mother and the fetus. It refers to the rupture of the uterine body or the lower uterine segment in late pregnancy or during labor, requiring a cesarean section to terminate the pregnancy as soon as the diagnosis is confirmed. The most common risk factors of UR are a history of previous cesarean section (CS), myomectomy, multiparity,

malpresentation, breech extraction, and instrumental deliveries.²¹⁻²³

Evidence suggests that women who have a history of caesarean section may be at increased risk of pregnancy complications, such as placental abruption, placenta previa, placenta percreta, gestational diabetes mellitus and preeclampsia. These pregnancy complications may be partly considered manifestations of dysfunctional placental function. To date, placenta percreta has been reported to be associated with an increased risk of UR. However, there are limited data on the association of other pregnancy complications with UR. A few studies with small sample sizes have analysed the risk of UR with diabetes and hypertension, but these studies have yielded different conclusions. In addition, current guidelines only discuss the impact of vaginal trial delivery after caesarean section on the occurrence of UR, but the effects of pregnancy complications related to previous caesarean deliveries have not been reported. If a link between pregnancy complications and UR is confirmed, it

may provide additional preventive measures.^{24,25}

The strategies for prevention and management, as well as the quality of affordable care for women at risk of or experiencing uterine rupture, are likely to vary across settings depending on their diagnostic capacity, availability of obstetric interventions, and human and facility resources. Therefore, the findings in developed countries may not be generalizable to low-resource countries and settings.²⁶

CONCLUSION

In conclusion, uterine rupture in the first trimester of pregnancy is a rare and life-threatening occurrence that can be safely and conservatively treated. The main driving factor behind a scarred uterus is previous caesarean section. The main factor correlated with first-trimester uterine rupture in unscarred uteri is uterine anomaly, which, if known, deserves particular attention during the whole pregnancy. Signs and symptoms of uterine rupture are nonspecific making diagnosis challenging. Delay in definitive management causes

significant fetal morbidity and mortality. For best outcomes, vaginal birth after a previous cesarean section needs close monitoring in appropriately prepared units with the ability to perform immediate cesarean delivery and provide advanced neonatal support.

DISCLOSURE STATEMENT

Disclosure Statement : The authors have no conflicts of Interest to declare.

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