Uterine torsion in pregnancy: a case report and systematic review

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ABSTRACT

Introduction: Uterine torsion in pregnancy is a rare condition but is associated with significant negative outcomes to the pregnant women and their babies. This study is to systematically review the literatures and analyse the clinical presentations, management and complications of uterine torsion in pregnancy.

Materials and Methods: We searched across multiple databases (PubMed, Google Scholar, ScienceDirect, Academia.edu, ResearchGate and Semantic Scholar) and suitable articles from 1993 to 2022 were systematically chosen according to PRISMA guideline. The analysis was performed on the maternal characteristics, signs and symptoms of the uterine torsion, management, complications and outcomes of both the mothers and infants. All case reports or case series reporting uterine torsion in pregnancy from English language journals were included without restriction on the geographical origin.

Results: A total of 149 cases from 146 publications and one from our centre were included for analysis. Most of the cases were seen in the third trimester and presented with acute abdominal symptoms and signs. It presented a challenge in diagnosis and had a myriad of complications to the mothers and infants. The maternal mortality is 2.0% while the perinatal mortality stands at 38.2%.

Conclusion: Uterine torsion in pregnancy is a rarely encountered but serious condition with no specific precipitating factor or diagnostic criteria. It can occur at any gestation, has a wide range of non-specific clinical presentations, and carries a significant risk to the mother and child.

KEYWORDS:
uterine torsion, pregnancy, systematic review

INTRODUCTION

Uterine torsion is a relatively rare condition in humans but commonly encountered in animals, with the bulk of literature being about ungulates such as buffalo, cow, horse and ewe. It had also been reported in smaller animals such as dogs, rabbits and guinea pigs which is explained by the quadruped posture of these animals that allows the uterus to be mobile.[1] The pathology was first described in 1662 by a veterinary surgeon, Hippiaper Columbi, and in humans, the first description was from a postmortem examination by Rudolf Virchow in 1863. In pregnancy, uterine torsion was first reported by Labbe in 1876.[2]

Previously, the terminology torsion was used in cases where the uterine displacement is associated with signs and symptom.[3] Later reports showed that not all torsion has symptoms or signs, hence the alternative definition was chosen. Nowosielski & Henderson suggested that the diagnosis of torsion should be considered when the axial rotation exceeds 30°.[4] Currently, the most accepted definition is that the rotation is 45° or more at the longitudinal axis.[5]

There are several reviews on uterine torsion in pregnancy and one of the largest is by Jensen in 1992, discussing the findings from 212 cases.[6] Since then, there have been one systematic and two literature reviews but the number of publications included were limited due to their restrictive search criteria.[7-9] Here, we present a case managed at our centre and a systematic review of this rare entity with an expansive search across multiple literature databases.

CASE REPORT

A 30-year-old pregnant woman, gravida 3 and parity 2, presented at 36 weeks of gestation with sudden onset abdominal pain, associated with vomiting started five hours earlier. She also reported a reduction in fetal movement, but no vaginal bleeding or fluid loss and was not in labour. Previous pregnancies were uncomplicated, as was the index pregnancy before this acute event. Her vital signs were stable, and the uterus was soft, non-tender and the size corresponded to the gestation. Ultrasound examination showed a single fetus in transverse lie with no fetal heart activity, and placenta was on the anterior uterine wall with an estimated 128 mL of blood clot seen at the placental edge. There was no uterine contraction, nor any cervical changes and all blood investigations were within the normal range. The patient was explained about the intrauterine fetal death with signs of placental abruption and was offered caesarean section as the fetus was in transverse lie.

The surgery was performed under spinal anaesthesia via a transverse suprapubic incision. Large, dilated vessels were seen transversing the lower uterine segment and the vesicouterine fold could not be located. Further examination revealed a 180°, clockwise uterine torsion with an engorged left fallopian tube and ovary located on the right side. Manual internal and external manipulation successfully reverted the torsion, and the fetus was delivered via breech

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extraction through a lower segment transverse hysterotomy as per usual caesarean section. There was a brief episode of uterine atony that responded to intramuscular prostaglandin and oxytocin infusion. The total estimated blood loss was 600 mL with half of it from the abruptio placentae.

The patient had a full recovery before going home two days after the surgery. She was seen again six weeks later where an ultrasound examination, including Doppler study of the uterine vessels, showing normal pelvic anatomy. The antenatal record reviewed before the patient was discharged showed that the placenta was observed on the posterior wall during a midtrimester ultrasound, a sign highly suggestive of uterine torsion but was not realized before the delivery.

MATERIALS AND METHODS

A protocol with explicitly defined objectives, criteria for study selection, search criteria, and statistical methods was developed. We followed the reporting guidelines for meta-analyses and systematic reviews, as outlined by the PRISMA statement.[10]

The primary objective was to investigate the outcomes of uterine torsion in pregnancy, the maternal and perinatal mortality. Other related data such maternal characteristics, presenting signs and symptoms, related surgical procedures, possible precipitating factors, maternal and perinatal morbidity were also extracted and analysed.

Data source and search strategies

The initial search was performed for indexed articles in PubMed. This was later expanded to include other publications in Google Scholar, ScienceDirect, Academia.edu, ResearchGate and Semantic Scholar. The terms used for the search were "uterine torsion", "uterus" AND "torsion" with and without "pregnancy".

A full title and abstract screening were performed independently by two reviewers. Reference lists of the articles collected were later searched for additional relevant articles for inclusion. A full-text screening was then independently undertaken by these reviewers to determine relevance and the final set of articles was reviewed in detail before the data elements were extracted for analysis.

Eligibility and study selection

All case reports or case series, short communications and research letters describing uterine torsion during pregnancy between 1993 and 2022 were included. This time frame was chosen as one of the largest reviews on this pathology was published in 1992, but it included reports from 1800s which discussed cases that had undergone management that are no longer practiced today. There was no limitation on the geographical origin of the publications, but only English language full text articles were chosen for final analyses. We excluded uterine torsion outside the pregnancy including the postpartum period.

Data collection

Articles selected for inclusion were carefully reviewed by the authors, and appropriate data were extracted. Variables included were the parity and gestational age at diagnosis, signs and symptoms related to the torsion, especially abdominal pain, tenderness, rigidity and shock. The surgical techniques were also recorded, such as the type of laparotomy (or laparoscopy), location (anterior or posterior; lower segment or upper segment) and type of hysterotomy (transverse or longitudinal). Also of interest were the other surgeries performed such as hysterectomy, resection of the rudimentary uterine horn, myomectomy and ligaments plication. The timing of diagnosis (before or after the hysterotomy), the detorsion attempt and degree of torsion were also analysed. Associated findings such as the fetal lie at presentation, Müllerian tube abnormality, fibromyomata or adhesion were included in the data collection. Data extraction was finally concluded with maternal and perinatal outcomes.

Risk of bias assessment

The risk of bias was assessed independently by two reviewers, using the Joanna Briggs Institute (JBI) critical appraisal checklist for case reports and case series.[11] Any discrepancy was resolved by discussion and reassessment.

Statistical analysis

Data for categorical variables were directly extracted and presented as numbers and percentages while mean or median, and median interval were calculated for continuous data. Perinatal mortality rate was calculated from pregnancies that had completed 22 weeks of gestation.[12] Data handling and analysis were performed using Statistical Package for Social Science (SPSS) version 27 (SPSS Inc, Chicago, IL, USA) software.

RESULTS

The initial search identified 79 full text articles from PubMed with additional 124 articles from Google Scholar, 89 from Semantic Scholar, 75 from ResearchGate, 19 from Academia.edu, 14 articles from ScienceDirect with 4 additional articles identified from citation tracking. After excluding duplicated papers, non-English and non-retrievable articles, a total of 146 were selected (Fig.1). These publications discussed 149 cases and with a case described from our centre, a total of 150 cases of uterine torsion in pregnancy were included in this review. This search strategy identified 85 publications not included in previous reviews.[13-97]

Risk of bias of the included studies

Overall, the risk of bias, assessed using JBI critical appraisal tool was judged to be low for the description of patient demographic characteristics, history and clinical presentations, diagnostic procedures, and treatment in all cases. Only one case had unclear patient's demographic. Unanticipated events or complications and takeaway lessons were also judged to be of low bias risk except for in three articles. The post-intervention clinical condition: the fetal or neonatal outcome was not available in six cases and was uncertain in one article (Appendix 1).

Uterine torsion characteristics, diagnosis and management

The mean age of the women involved was 30.4 years (range 16 to 43) while the mean gestation at diagnosis was 33.7 weeks (range 7 to 41 weeks). The majority were in the 3rd

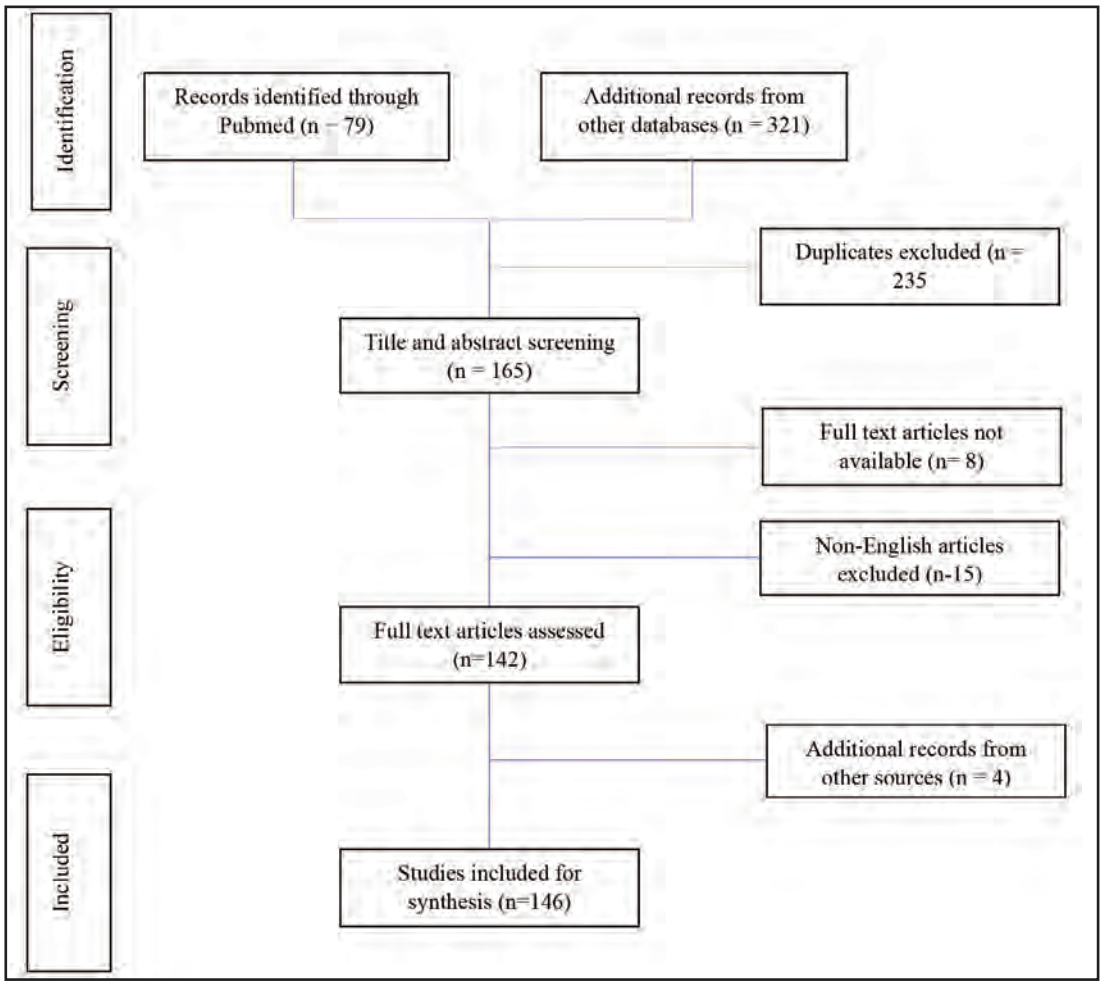

Fig. 1: PRISMA flow diagram of the study selection process

trimester with 84.8% of the incident diagnosed at term. The median gestational age of torsion in cases with no identifiable associated factor is 36 weeks (IQR = 33.2 to 38.0) while torsion in the uterus with fibromyomata(s), the median gestation is 38 weeks (IQR = 36.0 to 39.0). Torsion presented earlier when it is associated with Müllerian tube abnormality; as early as 8 weeks pregnancy with the median gestation at diagnosis of 26.5 weeks (IQR = 21.2 to 32.8). Two women had recurrent uterine torsions in successive pregnancies, all occurring in the third trimester.[89,98]

More than half of the women (59.3%) had at least one symptom at their presentation with the most common complaint being abdominal pain of varying severity. A large majority of the cases (85.3%) had at least one clinical sign and the most encountered were abdominal tenderness and/or rigidity followed by intrauterine fetal demise and shock (Table I). There were no specific signs of uterine torsion in pregnancy but change in placenta locations and extreme deviation of cervix are highly suggestive.[20,34,55,69,90,99-102]

Dextrotorsion was 1.5 times more common compared with the opposite turn and almost 2/3 of the cases had 180° torsion. A significant number of cases were associated with pelvic organ pathology, abnormal fetal lie or external uterine manipulation, with uterine fibroid and Müllerian tube abnormality being the most common (Table I). However, 40% of the torsions were found in normal uterus with a single fetus in the longitudinal lie and with no identifiable precipitating factor.

Two cases were identified before surgery and both were torsion of the rudimentary horns of unicornuate uterus, diagnosed by magnetic resonance imaging (MRI).[35,103] All cases underwent laparotomy except for a woman who had a laparoscopic examination at 8 weeks of pregnancy and another torsion was detected at postmortem examination.[35,104] Despite so, 36.2% (51/141) of the torsions were not diagnosed before hysterotomy and removal of the product of conception (Table II).

Emergency surgeries were performed for various indications in more than 80% of the cases, whereas the rest were planned surgeries. All cases had surgical removal of the product of conception either through hysterotomy, resection of the uterine horn (cornuate uterus) or hysterectomy, except for in two cases where detorsion was performed and the pregnancies were allowed to progressed resulting in livebirths.[105,106] Lower segment and transverse hysterotomy were performed majority of the cases but 2/3 of the incision

Table I: signs and symptoms associated with uterine torsion

	Number	%
1st trimester	3	2.0
2nd trimester	19	12.7
3rd trimester	129	85.3
Nulliparous	40/ 144	27.8
Previous scar	50/145	34.5
fetus lie		
Longitudinal	65/97	67.0
Transverse	27/97	27.1
Oblique	5/97	5.2
Symptoms		
Abdominal pain	79/150	52.7
Nausea/ vomiting	20/150	13.3
Reduced fetal movement	18/150	12.0
Vaginal bleeding	8/150	5.3
Asymptomatic	61/150	40.7
Signs		
Tenderness/ rigidity	48/150	32.0
Intrauterine fetal death†	45/142	31.7
Shock	33/150	22.0
Uterus larger than gestation	13/150	8.7
Fetal distress	19/141	13.5
Absent sign	22/150	14.7
Torsion characteristics		
Right	71/118	60.2
Left	47/118	39.8
Degree of torsion		
<180°	28/140	20.0
180°	99/140	70.7
>180°	13/140	9.3
Associated pathology		
Uterine fibroid	25/150	16.7
Müllerian tube abnormality	20/150	13.3
Twin	8/150	5.3
Adhesion	8/150	4.7
ECV/ massage	5/150	3.3
Ehler Danlos Syndrome	2/150	1.3
None	60/150	40.0

†= pregnancy at 22 completed weeks or more
ECV = external cephalic version

was on the posterior uterine wall. There were cases that required additional surgical procedures other than hysterotomy, mainly to control the haemorrhage, such as uterine compression suture, vascular ligations, hemi or subtotal hysterectomy and total hysterectomy (Table II). There were also two cases of hysterectomy with the fetus in situ because the surgeons judged that hysterotomy could cause excessive hemorrhage.[44,107]

Maternal and perinatal mortality

In this review, three cases of maternal mortality related to uterine torsion were reported. One woman died from shock while awaiting surgery for transverse fetal lie at term and the uterine torsion was diagnosed in the postmortem examination.[104] The other two were postpartum deaths; one was from the complications of massive postpartum haemorrhage secondary to severe placental abruption and uterine atony at 25 weeks of pregnancy.[39] Another maternal death occurred on third postoperative day for suspected massive pulmonary embolism, after a uterine torsion complicated by abruptio placentae at 36 weeks of gestation.[108] In all three cases, the uterus rotated 180° and both postpartum deaths occurred after a stormy perioperative period including subtotal hysterectomies and massive blood losses. With these data, the maternal mortality rate in this review stands at 2.0%.

A total of 141 torsions were diagnosed at 22 weeks gestation or beyond and there were 39 cases of stillbirths and 3 neonatal deaths; hence the perinatal mortality rate was 38.2%. One of the neonatal deaths was due to extreme prematurity, after the delivery at 25 weeks of gestation and two infants had severe intrauterine hypoxia, delivered at 30 and 33 weeks of gestation.[91,101,109] In uterine torsion of < 180°, 180°and >180°, the proportion of perinatal death was 20.0%, 35.9% and 81.8% respectively.

DISCUSSION

Owing to its rarity, it is impossible to describe the best course of action for uterine torsion in pregnancy without conducting a proper literature review. To date, there have been a few major reviews; Robinson and Duval in 1931, Nesbitt & Corner in 1956, Jensen in 1992, Wilson et al in 2006,

Table II: Surgical characteristics, maternal and perinatal outcomes

	Number	%
Emergency surgery	125	83.3
Elective surgery	25	16.7
Diagnosis at surgery		
Diagnosed prior to hysterotomy/ hysterectomy	91/141	64.5
Diagnosis after hysterotomy	50/141	35.5
Detorsion attempt		
Successful	35/129	27.1
Unsuccessful	46/129	35.7
Not attempted	48/129	37.2
Indication for surgery		
Abruptio / uterine rupture	46/145	31.7
fetal distress†	20/145	13.8
Transverse lie	15/145	10.3
Failed IOL/ poor progress	12/145	8.3
Scar dehiscence	5/145	3.4
Position of hysterotomy		
Anterior uterine wall	42/134	31.3
Posterior uterine wall	90/134	67.2
Fundal	2/134	1.5
Location of hysterotomy		
Lower segment	101/118	85.6
Upper segment	17/118	14.4
Type of hysterotomy		
Transverse	99/124	79.8
Vertical	23/124	18.5
J or T incision	2/124	1.6
Additional procedure		
B-lynch brace suture	3/150	2.0
Uterine artery ligation	5/150	3.3
Internal iliac artery ligation	1/150	0.7
Subtotal hysterectomy	9/150	6.0
Hemihysterectomy	3/150	2.0
Total hysterectomy	6/150	4.0
Resection of uterine horn	7/150	4.7
Myomectomy	7/150	4.7
Plication of round / uterosacral ligaments	8/150	5.3
Maternal outcome/ complication		
Abruptio placentae	39/150	26.0
Uterine atony	25/150	16.7
Uterine rupture	3/150	2.0
Maternal death	3/150	2.0
Perinatal Outcome		
Intrauterine fetal death†	39/110	35.5
Neonatal death	3/71	4.2
Perinatal death†	42/110	38.2

† = pregnancy at 22 completed weeks or more
IOL = induction of labour

Ramseyer et al in 2020 and a systematic review by Ferrari et al in 2021.[3,6-9,110] In the 1992 review, 212 cases were discussed and additional 66 cases were later added by other authors up to 2021. By extending the search outside of PubMed, we were able to locate 85 more publications for this review which included 87 cases. The main advantage of this review is the search methodology, which follows the PRISMA guidelines for systematic reviews and includes reports from databases and repositories beyond the PubMed. Expanding the search to also include non-indexed reports allows us to discuss more cases not captured in previous reviews, where 46% of these were located outside PubMed. Even though some of publications were not peer-reviewed, the information from these publications is still helpful, and we performed a risk assessment to ensure the included articles have acceptable bias levels. This review does have its limitations, namely the exclusion of non-English literatures and the nonavailability of some papers. The analysis was also limited in certain aspects since some reports did not include data of our interest especially the perinatal outcomes, which leads to different denominators in some of the parameters.

The assertions made by Barozzi and Robinson that "no tumour, no torsion" and "no uterine abnormalities, no torsion" respectively were based on the long-held belief that uterine torsion is uncommon in normal pelvic anatomy.[110] Nesbitt & Comer, on the other hand, proposed that the association should be "no pelvic pathology, torsion unlikely".[3] In the non-gravid uterine torsion, 84.6% of the cases were linked to either an ovarian tumour or uterine fibroid.[111] These correlations were observed to a lower extent during pregnancy, with only 30.8% of cases were associated with uterine fibroids and Müllerian tube abnormalities. In 63.8% of the cases, no anatomical abnormalities in the pelvis or abdomen were reported. Torsion in pregnancy had been reported as early as 6 weeks, and up to 43 weeks of

pregnancy.[8] In Müllerian tube abnormalities, more than half presented in the 1st and 2nd trimester while in normal or fibromatous uterus, almost 90% of torsion occurred in 3rd trimester. The tendency of the torsion occurring in the later gestations is explained by the weight of the uterus and the softening of the uterine isthmus in advance pregnancy. Of the identifiable associated factors for uterine torsion in pregnancy, the most commonly encountered are the abnormal fetal lie (33%) followed by the uterine fibroid (17.3%) and Müllerian duct abnormalities (13.3%). Few authors proposed that uterine torsion could be caused by fetal transverse lie.[59,72,101] On the other hand, the non-longitudinal lie could in fact be one of the presentations of uterine torsion, where the contracted lower segment prevents the fetal presenting part from descending toward the pelvis. A case describing an immediate change in fetal lie from transverse to longitudinal right after uterine detorsion lends weight to this.[72] With these analyses, 37.8% of the cases had no identifiable predisposing and/or activating factor.

It is anticipated that torsion along the uterine axis will result in venous compression and vascular engorgement, which may trigger ischemia and placental abruption. These could manifest in a wide range of symptoms, the most frequently reported being abdominal pain. Patients could also present with uterine tenderness or rigidity, signs of fetal distress, stillbirths or even hypovolemic shock. Eight women were in shock but had no evidence of placental abruption, which suggests that the origin was neurogenic.[52,66,81,91,104,112-114] Some also presented with a uterine size larger than the gestation and 2/3 were associated with abruptio placentae, while the rest were likely due to the extensive venous congestion.[91,112] Overall, 40% of the cases were asymptomatic and 16.3% had no clinical sign.

Previous authors have described numerous signs said to be diagnostic of uterine torsion such as pulsation in the anterior vaginal fornix, demonstration of spiral vagina, displacement of the urethra, bladder and/ or rectum.[3,110,115] With the exception of a woman with 120° torsion, in which an MRI revealed the twisted upper vagina, none of the cases included in this review had any specific clinical finding as stated above.[99] However, a few cases of extreme cervical displacement had been detected by clinical examination and MRI. Majority of the cases had no cervical changes as most torsion occurred at the cervicouterine junction, and the cervix is kept stable by the Mackenrodt's and the uterosacral ligaments. In Müllerian tube abnormalities, torsion usually involves only a part of the uterus and may not exert enough torque to twist the cervix and the upper vagina.

Making the correct initial diagnosis of uterine torsion when a pregnant woman presents with an acute abdominal incident is not of the upmost importance since surgery will still be carried out. But delaying the surgery in subacute or chronic uterine torsion may put the mother and the unborn child in peril. The diagnosis of uterine torsion in pregnancy has almost always been an intraoperative diagnosis, except in a few instances. A case of 90° torsion in active labour was diagnosed when the round ligament was felt across the thin anterior abdominal wall. The application of manual detorsion and abdominal binder allowed the labour, previously associated with ineffective contraction, to progress.[4] In non-pregnant torsion, computerized tomography (CT) scans and MRI have been used extensively. A review by Matsumoto et al. found that about 70% of the cases had undergone CT scans and/or MRI prior to surgery, and the cervix's "whirl sign" has a 44% sensitivity with 100% positive predictive value for uterine torsion outside the pregnancy.[111] In pregnancy, the use of MRI had reported changes in the cervix and upper vagina, although in most cases, the correlation with uterine torsion was made retrospectively after the laparotomy.[20,34,35,99,103]

In veterinary obstetrics, uterine artery Doppler had been used to diagnose uterine torsion in does and buffaloes.[116,117] Doppler study of the uterine vessels could be incorporated in humans and should be further investigated, such as demonstrating uterine vessels crossing the uterine midline or encircling the isthmus, abnormally dilated vessels or abnormal uterine artery Doppler indices. In fact, engorgement of myometrial vein had been demonstrated in a non-gravid uterine torsion, suggesting that the vascular changes could potentially be a diagnostic parameter in pregnancy.[118] One of the more suggestive signs of gravid uterine torsion is the change in placental locations, seen on ultrasound or MRI. The condition, also called placenta migran, was first reported in 1989 where the ultrasound findings were initially disregarded as documentation error.[119] In few cases including ours, the change in placental locations was not noticed before the caesarean section, hence missing a diagnostic opportunity before the surgery.[47,55,101,120] It is suggested that the change in placental location should be sought in unexplained abdominal pain or suspected abruptio placentae which might indicate uterine torsion. Some authors proposed that placenta location should be determined after every external cephalic version attempt or in case of uterine didelphys.[102,121] This, however, might not be seen in all situations, such as in fundal placenta or in 360° torsion.

The mainstay of the management is relieving the vascular occlusion due to the torsion and delivery of the fetus when necessary. Uterine detorsion not only restores the placental circulation but may also improves the maternal condition. This change was almost immediate with rising blood pressure and a reduction in heart rate after returning the uterus to its normal position.[70] However, only 43.2% of the detorsion attempts were successful. Failure to diagnose or failed detorsion may lead to hysterotomy on the posterior uterine wall, which should be avoided as the scar integrity in the subsequent pregnancy is not known. In most cases where the torsion was not immediately diagnosed at surgery, the uterovesical fold was either not identified or the bladder flap was not seen.[7,38,49,77, 121-124] There were also cases where the bladder flap could not be made, although no further explanation offered by the authors.[63,115,126] Current data suggest that bladder flap may be omitted in lower segment caesarean section which may reduce the operating time.[126] Yet, identifying the vesicouterine reflection is still important as to ensure the proper placement of the hysterotomy incision especially in uterine torsion.

In the 1992 review, 19 cases of maternal death related to uterine torsion were recorded, with only one reported after 1960.[6] From there on, three more cases of maternal deaths related to uterine torsion were reported in 2005, 2013 and 2020 but only one was discussed in previous reviews, as the other two cases were not indexed in PubMed.[7-9] Two of the deaths occurred after the caesarean delivery, related to the complications of massive postpartum haemorrhage in association with placental abruption.[39,108] The other, an antepartum death, was likely due to severe neurogenic shock as the postmortem examination did not show any sign of uterine rupture nor retroplacental hematoma.[104] Despite the current advancement in modern medicine, perinatal mortality in uterine torsion did not show significant improvement. Stillbirths contributed to more than 95% of perinatal deaths and most of them were due to abruptio placentae. The overall mortality rate before 1956 was 30.4% and was reported to be lower at 18% and 22% in 2006 and 2020 reviews respectively.[3,7,8] We found in this review, the perinatal mortality is higher at 38.2%, probably due to our search methodology including publications from various sources.

Based on the available information, we would encourage obstetricians who encounter pregnancies with unexplained abdominal pain, placental abruption with or without fetal effect, to consider uterine torsion as a possible cause of the presenting signs and symptoms. Supporting evidence such as the change in placenta locations on ultrasound and abnormally located or deviated cervix should be sought after. If time permits, Doppler examination of the uterine vessels or MRI should also be performed as predelivery diagnosis could help plan the appropriate course of action for the patient.

CONCLUSION

Uterine torsion, a rare pathological condition in pregnancy, carries significant risk to both the pregnant woman and her fetus. Diagnosing it during pregnancy before laparotomy remains a challenge but evidence suggest some potential methodologies that could be helpful.

CONFLICT OF INTEREST

The authors declare they have no conflicts of interest.

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REFERENCES

1. Sutaria TV, Chaudhari R, Sutaria P. Ultrasonography in uterine torsion: A futuristic tool. Anim Reprod Update 2022; 2(1): 63-71.
2. Shah SH, Nanavati S, Sequeira EJ. Torsion of pregnant horn of uterus bicornis unicollis. J Obstet Gynaecol India 1968; 18: 746.
3. Nesbitt REL, Comer GW. Torsion of the human pregnant uterus. Obstet Gynecol Survey 1956; 11: 311-32.
4. Nowosielski PF, Henderson H. Axial torsion of the pregnant uterus. Report of 3 new cases. Am J Obstet Gynecol 1960; 80: 272-3.
5. Koh KS, Bradford CR. Uterine torsion during pregnancy. Can Med Assoc J 1977; 117(5): 501.
6. Jensen JG. Uterine torsion in pregnancy. Acta Obstetica et Gynecologica Scandinavica 1992; 71: 260-5.
7. Wilson D, Mahalingham A, Ross S. Third trimester uterine torsion: case report. J Obstet Gynaecol Can 2006; 28: 531–5.
8. Ramseyer AM, Whittington JR, Resendez VA, Whitcombe DD, Magann EF. Torsion in the gravid and nongravid uterus: A review of the literature of an uncommon diagnosis. Obstet Gynecol Surv 2020; 75(4): 243-52.
9. Ferrari F, Ferrari FA, Negri B, et al. Uterine torsion and intrauterine growth restriction: Case report and systematic literature review. J Obstet Gynaecol Res 2021; 47(12): 4224-31.
10. Moher D, Liberati A, Tetzlaff J, Altman DG. PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med 2009; 6(7): e1000097.
11. Moola S, Munn Z, Tufanaru C, et al. Chapter 7: Systematic reviews of etiology and risk. In: Aromataris E, Munn Z (Editors). JBI Manual for Evidence Synthesis. JBI, 2020.
12. WHO. Neonatal and perinatal mortality country, regional and global estimates. 2016. https://apps.who.int/iris/bitstream/handle/10665/43444/9241563206_eng.pdf;jsessionid=D8CE1354BB96913AE267C09430D5FF61?sequence=1. Access on 01/02/2023.
13. Mulvey S, Turner MJ. Uterine torsion presenting as fetal distress before labour. J Obstet Gynaecol 1994; 14(1): 24-5.
14. Aviram R, Shtreitzent O, Fejgin M. Posterior wall cesarean section following chronic uterine torsion. Int J Gynaecol Obstet 1995; 51(1): 59-60.
15. Sanusi FA, Simanowitz MD. Acute torsion of the uterus at 38 weeks pregnant. J Obstet Gynaecol 1995; 15(4): 249-50.
16. Ghosh SP, McKenna PJ. Torsion of the gravid uterus induced by change in posture resulting in placental abruption and fetal death. J Obstet Gynaecol. 1996; 16(1): 33-5.
17. Olah KS. Uterine torsion and ischaemia of one horn of a bicornute uterus: a rare cause of failed second trimester termination of pregnancy. BJOG 2002; 109(5): 585-6.
18. Sharma J, Manandhar B, Dangal G. Uterine torsion in pregnancy. Journal of Institute of Medicine 1998; 20 (1 & 2).
19. Masood MJ, Quddusi H, Akhtar MS, Ud-Din N. Uterine torsion in twin pregnancy. Professional Med J 2006; 13(2): 327-9.
20. Picone O, Fubini A, Doumerc S, Frydman R. Cesarean delivery by posterior hysterotomy due to torsion of the pregnant uterus. Obstet Gynecol 2006; 107(2 Pt 2): 533-5.
21. Dalal SJ, Pandit SN, Rao SB. Asymptomatic laevorotation of a gravid uterus. J Obstet Gynaecol India 2007; 57: 59-60.
22. Hariharan C, Shrivastava D, Walia M, Agrawal S. Torsion of gravid uterus near term - a rare complication. J Obstet Gynecol India 2009; 59(5): 455-6.
23. Jahan S, Jalil M, Islam Khan M, Jesmin S, Rumman U. Torsion of the gravid uterus. Ibrahim Med. Coll. J. 2009; 3(2): 78-79.
24. Mihu D, Costin N, Ciorta R, Porumb C, Malutan A. Uterine torsion in the first trimester of pregnancy. Gineco.ro. 2009; 5(2): 126-8.
25. Prabhakar S, Gupta P. Uterine torsion: A case report. Nepal Journal of Obstetrics and Gynaecology 2009; 4 (1): 55-7.
26. Waghmare MS. Interstitial pregnancy near term with uterine torsion. The New Indian Journal of OBGYN 2018; 4(2): 168-70.
27. Kamanu CI, Onwere S, Chigbu B, Aluka C. Torsion of the gravid uterus: case report and review of the literature. JOGECA 2011; 23(1): 30-2.
28. Meharunnissa K, Sahla B, Arshad MM. Torsion of full term pregnant uterus with huge ovarian cyst – a case report. J Obstet Gynecol India 2010; 60(4): 341-2.

29. Ahsan S, Humayun S. Dextro rotation of uterus at term: classical caesarean section through posterior uterine wall. J Fatima Jinnah Med Univ 2011; 5(3): 60-3.
30. Moustafa M, Jones R, Hassan A. Gravid fibroid uterus: torsion, posterior wall caesarean section and myomectomy for red degeneration, a case of obstetrician beware. Gynecol Surg 2011; 8: 455-7.
31. Naik SA, Patel AN, Shah JM, Verma RN. Levotorsion of a unicornuate gravid uterus leading to failed induction. J Obstet Gynecol India 2012; 62: 48-9.
32. Rasquiha SD, Rao SB, Rasquiha VC, Aithal V. A twist in the tale – rare case of uterine torsion. International Journal of Biomedical Research 2012; 3(11): 435-6.
33. Acharya M, Mohapatra PC. Acute axial torsion of gravid Uterus by 360 degrees – A rare case report and an unpredictable. IOSR Journal of Dental and Medical Science 2013; 3(5): 4-6.
34. Bissa U, Shyam KR. Complete Axial torsion of gravid uterus by 720°. IOSR Journal of Dental and Medical Sciences 2013; 7(4): 12-5.
35. Blyth M, Griffiths A, Penketh R. Torsion of a rudimentary horn pregnancy - an unusual case presentation. Gynecol Surg 2013; 10: 91–2.
36. Dragosloveanu C, Maier T, Moisa M, Vladareanu S. Torsion of term gravid uterus in a pregnancy obtained by intrauterine insemination. A case report. Gineco.eu. 2014; 10: 136-8.
37. Jain M, Tripathi R, Jain S, Verma A, Bajpai N. Spontaneous rupture of bicornuate uterus caused by levorotation due to congenital band. Nepal Journal of Obstetrics and Gynaecology 2013; 8(2): 57-9.
38. Krishnaveni R, Saraswathi K. Third trimester uterine torsion. Journal of Reproduction and Infertility 2013; 4(3): 36-9.
39. Qureshi S, Singh U, Bansal B, Singh N. Torsion of preterm gravid uterus: A case report. International Journal of Case Reports and Images 2013; 4(7): 392-5.
40. Tehrani HG, Shahraki AD, Hamoush Z. Sigmoid volvulus and uterine torsion complicating pregnancy. Pak J Med Sci 2013; 29(1) Suppl: 427-8.
41. Tripathi U, Tripathi Y. 180 degrees torsion of the term gravid uterus – a case report of this rare obstetric emergency. Journal of Evolution of Medical and Dental Sciences 2013; 2(23): 4055-7.
42. Boynukalın FK, Aral AI, Güler OT. Uterine torsion in pregnancy. Basic Clin Sci 2014; 3: 15-7.
43. Rathod AT. Torsion of gravid uterus due to uterine asymmetry associated with placental abruption, intrauterine fetal demise, and maternal shock. International Journal of Infertility and Fetal Medicine 2014; 5(2): 64-5.
44. Inderjeet P, Ramona P, Neha S. Torsion of gravid uterus managed by obstetric hysterectomy with the fetus in situ. Indian Journal of Applied Research 2015; 5(4): 520-1.
45. Jayanthi P, Raghava Rao PV. Torsion of gravid uterus. Journal of Evolution of Medical and Dental Sciences 2015; 4(07): 1274-7.
46. Melchor KCB, Dela Concepcion-Co LR. Twisted fate: Successful management of hypovolemic shock due to abruptio placenta secondary to uterine torsion complicated by unilateral absence of adnexa. PJOG 2015; 39(4): 47-53.
47. Varsha S, Prameela Devi G, Bharathi T, Padma Priya V, Sreenivasa Rao S, Israel YN. A twist in the diagnosis … and the uterus! A case report of third trimester uterine torsion. J Clin Sci Res 2015; 4: 240-3.
48. Alhassan MM, Basama F, Elnahas A, Saad RAH, Gubara EB. Asymptomatic torsion of a leiomyomatous gravid uterus at term. Ann Clin Case Rep 2016; 1: 1180.
49. Choi YH, Lee G. Uterine torsion in third trimester pregnancy. Korean J Perinatol 2016; 27(1): 67-9.
50. Chundawat RS, Rastogi R, Tak A. Torsion of gravid horn of bicornuate uterus: a rare case report. Int J Reprod Contracept Obstet Gynecol 2016; 5(7): 2428-30.
51. Feizal MN, Kaur K, Shanmuganathan R, Feizal MR. Torsion of a uterus in a term pregnancy: a case report. Eur J Obstet Gynecol Reprod Biol 2016; 206: E153.
52. Jalvee RG, Kadrekar MR. A rare case of third trimester uterine torsion. IJSR – International Journal of Scientific Research 2016; 5(8): 627-8.
53. Parmar DC, Kadikar GK, Kalathiya BG, Bajaj P. Torsion of pregnant uterus in case of uterus didelphys bicollis. Int J Res Med 2016; 5(1); 137-9.
54. Protrka Z, Arsenijevic P, Jovic N, Zivanovic S, Djuric J, Dimitrijevic A. A case of uterine torsion in term pregnancy associated with placental abruption and intrauterine fetal demise. Clin Exp Obstet Gynecol 2018, 45(2): 287–9.
55. Vijayakumar V, Mushahida S, Prasanthkumar MS, Soundararajan S. An unusual cause for concealed hemorrhagic shock in the second trimester of pregnancy resulting in fetal demise. J Anaesthesiol Clin Pharmacol 2016; 32: 127-8.
56. Anne S, Garg A, Sen D. Asymptomatic levo uterine torsion of 90 degrees during caesarean section. Int J Reprod Contracept Obstet Gynecol 2017; 6: 4700-2.
57. Cetin BA, Bahat PY, Dikmen S, Simsek E, Aydin A. Torsion of term gravid uterus with a large leiomyoma. Int J Reprod Contracept Obstet Gynecol 2017; 6(1): 284-6.
58. Goswami B, Gautam H. Torsion of gravid horn of bicornuate uterus in 3rd trimester – a case report. IOSR Journal of Dental and Medical Sciences 2017; 16(9): 1-4.
59. Abdulaal N, Aldeeb S, Anwar S. Intrauterine fetal death in a torted gravid uterus. Bahrain Med Bull 2018; 40(2): 121-3.
60. Komatsu A, Kawakami K, Hoike H, Nagamatsu T, Osuga Y, Fujii T. Uterine torsion in the second trimester of pregnancy with a large leiomyoma identified in a cesarean section for abruptio placentae: a case report and literature review. Clin Exp Obstet Gynecol 2019; 46(6): 1026-7.
61. Magembe OA. Uterine torsion in pregnancy: case presentation and review of literature. East African Medical Journal. 2018; 95(2): 1270-3.
62. Patra S, Kyal A, Vali F, Choudhary P, Das S, Naskar TK. Torsion (Laevorotation) of gravid uterus at term – a case report. Medical Glory 2018; 2(1): 57-9.
63. Thanappan A. Uterine torsion in pregnancy - A rare case report. University Journal of Medicine and Medical Specialities 2018; 4(3).
64. Dasari P, Ali AM, Chitra T. Uterine torsion associated with previable preterm premature rupture of membranes diagnosed at cesarean section. Int J Infertil Fetal Med 2019; 10(2): 28-30.
65. Ramya S. Anomalous gravid uterus with torsion- a rare case report. University Journal of Surgery and Surgical Specialities 2019; 5(6).
66. Zeng G, Guo F, Gao Q, Liu C, Yang Z, Zhu Y. Acute gravid uterus torsion: A rare and dangerous obstetric emergency. Int J Gynecol Obstet 2018; 147: 414-5.
67. Bagli I, Erdem S. Uterine torsion at term pregnancy associated with a previous pelvic organ prolapse (POP) surgery. J Obstet Gynaecol 2020; 40(4): 569-70.
68. Filippo N, Ilaria G, Edi L, Masoni Stefano M, Veronica T, Sergio A. Uterine torsion diagnosed at the time of laparotomy for a planned cesarean section at term. Journal of Gynecology and Obstetrics 2020; 8(6): 211-3.
69. Gross SJ, Gnade C, Coyne L. Diagnosis of uterine torsion during cesarean section: a case series. Proc Obstet Gynecol 2020; 10(1): 1-6.
70. Ikram ul Haq A, Bashir S, Sadiq N, Waheed N, Ghazanfar S, e Aqsa U. Once in a lifetime diagnosis, uterine torsion. J Soc Obstet Gynaecol Pak 2020; 10(3): 205-8.
71. Kocher M, Hirsig L. A case of uterine incarceration with unrecognized uterine torsion. Radiol Case Rep 2020; 15(10): 1943-7.
72. Mangirish RD, Deepa BK, Ajit AN, Roy MM, Guruprasad PP. Torsion of the gravid uterus: A rare cause of abdominal pain. Indian J Case Reports 2020; 6(9): 526-8.
73. Mayadeo N, Devalla A. Uterine torsion masquerading as abruptio placentae: diagnosed on laparotomy. Journal of Clinical & Diagnostic Research 2020; 14(10): 4-6.

74. Mokhtar H N, Faridz S M, Ismail R, Yaacob N, Ramli R, Uterine torsion in pregnancy, expect the unexpected: case report, Int J Reprod Contracept Obstet Gynecol 2020; 9(8): 3473-6.
75. Narayanan G, Mayagopal, Sabitha O, Jayasekharan SS, Vidyasagar PB, Arockia Singh MS. Torsion of gravid uterus-Once in a life-time emergent situation faced by obstetricians. SSRG International Journal of Medical Science 2020; 7(6): 16-8.
76. Tanouti S, Chakri M, Taheri H, Saadi H, Mimouni A. Uterine torsion of 90 degrees: case report. Int J Reprod Contracept Obstet Gynecol 2020; 9(4): 1743-5.
77. Yin FL, Huang HX, Zhang M, et al. Clinical analysis of uterine torsion and fibroids in full-term pregnancy: A case report and review of the literature. J Int Med Res 2020; 48(6): 300060520920404.
78. Agrawal P, Agrawal R, Chandrakar J. Uterine torsion in a case of previous two caesarean section mimicking uterine rupture: a case report. Int J Reprod Contracept Obstet Gynecol 2021; 10: 1169-71.
79. Benor A, Tetelman E. A case of uterine torsion mimicking pulmonary embolism. International J of Clinical Gynaecology and Obstetrics 2021; 1(1): 1-3.
80. Chau KT, Le MT, Tran DT, Nguyen VQH. Clin. Uterine torsion in a 25-week pregnant female with congenital uterine didelphys and intraoperative complication of uterine atony: a report of a rare clinical case. Exp. Obstet. Gynecol 2021; 48(1): 185-8.
81. Gaboura A, Ibrahim E, Kondaveeti N, Casey C, Abou Salih N. Uterine torsion at term, an unusual cause of abdominal pain in pregnancy. Clinical Case Reports 2021; 4(4): 1-4.
82. Gadappa SN, Sonawane AA, Gaikwad RA, Lohiya NV, Sowjanya SB, Patil SC. Uterine torsion – an obstetrician's nightmare. Paripex-Indian Journal of Research 2021; 10(2): 195-6.
83. Huynh K, Andersen H. Uterine torsion in a full-term pregnancy presenting as prolonged latent phase and fetal intolerance of labor: A case report. Case Rep Women's Health 2021; 32: e00353.
84. Khan K, Elfituri A, Legit C, Doumouchtsis S. Torsion in a complete bicorporeal gravid uterus: A case report. Research Square 2021.
85. Makwe CC, Ugwu AO, Osuji GN, Anumni C, Ekor OE, Asiyanbi GK. Posterior classical caesarean section in a myomatous gravid uterus at term: a case report. Journal of Surgical Case Reports 2021; 9: 1-3.
86. Othman Al-Tarifi AK, Akhtar N, Alamri AA. Uterine torsion, leading to posterior uterine wall incision at cesarean section. JIIMC 2021; 16(3): 200-1.
87. Somani A, Shukla A, Kumari A. Uterine torsion of term pregnant uterus due to anterior fibroid. Indian J Obstet Gynecol Res 2021; 8(2): 285-8.
88. Wan Adnan WF, Shamsudin F, Mohamad Zon E. Uterine torsion in patient with major placenta previa. Eur J Obstet Gynecol Reprod Biol 2021; 258: 467-9.
89. Boogaerts M, Wuyts K, Joos H. Two successive cesarean deliveries through separate posterior and anterior hysterotomy due to asymptomatic uterine torsion. A case report. Case Rep Womens Health 2022; 36: e00435.
90. Bouattour A, Khanfir F, Mnejja A, Ben Aribia E, Derbel M, Chaabane K. Acute abdominal pain during labor: should we think about uterine torsion? Acta Scientific Medical Sciences 2022; 6(5): 18-20.
91. Ghalandarpoor-Attar SN, Ghalandarpoor-Attar SM. Uterine torsion as an elusive obstetrical emergency in pregnancy: is there an association between gravid uterus torsion and Ehlers–Danlos syndrome?: a case report. J Med Case Rep 2022; 16: 210.
92. Hendriks B, van Uitert E, Schoenmakers S, Duvekot JJ, Gommers D, Cornette JMJ, COVPREG Study Group. Gravid uterine torsion after prone positioning in SARS-CoV2 (COVID-19)-related acute respiratory distress syndrome. J Surg Case Rep 2022; 6: 1-3.
93. Mansour M, Alchihan S, AlKhrait S, Alhouda AA, Zrik A, Hussien K. Successful management of a recurrent 180° uterine torsion: a rare case report. Journal of Surgical Case Reports 2022; 8: 1-3.
94. Onyekpa IJ, Odugu BU, Okafor II, et al. Unavoidable posterior lower segment caesarean incision due to a 180-degree uterine torsion resulting from a huge anterior uterine fibroid: a case report. International Journal Of Medical Science And Clinical Research Studies 2022; 2(7): 646-9.
95. Singh A, Sharma S, Siwatch S, Sikka P. Torsion of unscarred gravid horn of a bicornuate uterus with abnormal foetal lie. J Obstet Gynaecol 2022; 42(5): 1558-60.
96. Slaoui A, Lazhar H, Amail N, et al. Acute gravid uterine torsion: case report about an uncommon obstetric emergency. J Androl Gynaecol 2022; 10(1): 3.
97. Vuong ADB, Nguyen PN. Umbilical cord hematoma and uterine torsion: rare pregnancy complications at Tu Du Hospital and review of literature. J Family Reprod Health 2022; 16(3): 220-8.
98. Berger A, Ritter M, Fessler S. Uterine torsion in pregnancy. Archives of Gynecology and Obstetrics 2020; 302: 791-2.
99. Nicholson WK, Coulson CC, McCoy MC, Semelka RC. Pelvic magnetic resonance imaging in the evaluation of uterine torsion. Obstet Gynecol 1995; 85(5 Pt 2): 888-90.
100. Albayrak M, Benian A, Ozdemir I, Demiraran Y, Guralp O. Deliberate posterior low transverse incision at cesarean section of gravid uterus in 180 of torsion: a case report. J Reprod Med 2011; 56: 181–3.
101. Zullino S, Faiola S, Paganelli AM, Ferrazzi E. A Case of Abruptio Placentae due to the Torsion of Gravid Uterus. Case Rep Obstet Gynecol 2014; 2014: 801616.
102. Demaria F, Goffinet F, Jouannic JM, Cabrol D. Preterm torsion of a gravid uterus didelphys horn of a twin pregnancy. Obstet Gynecol 2005; 106(5 Pt 2): 1186-7.
103. Singh P, Gupta R, Das B, Bajaj SK, Misra R. Midtrimester spontaneous torsion of unruptured gravid rudimentary horn: presurgical diagnosis on magnetic resonance imaging. J Obstet Gynaecol Res 2015; 41: 1478-82.
104. Guié P, Adjobi R, N'guessan E, et al. Uterine torsion with maternal death: our experience and literature review. Uterine torsion with maternal death: our experience and literature review. Clin Exp Obstet Gynecol 2005; 32: 245-6.
105. Bukar M, Moruppa JY, Ehalaiye B, Ndonya DN. Uterine torsion in pregnancy. J Obstet Gynaecol 2012; 32(8): 805-6.
106. Kopko J, Stańczak R, Warzecha D, Wielgos M. Uterine torsion in the second trimester of pregnancy. Neuro Endocrinol Lett 2019; 39(6): 423-6.
107. Alpanna G, Meenaxi P. Torsion of gravid uterus managed by obstetric hysterectomy with the fetus in situ. J Obstet Gynaecol India 2013; 63(4): 279-81.
108. Darido J, Grevoul Fesquet J, Diari J, et al. Hemorrhagic shock due to irreducible uterine torsion in a third trimester twin pregnancy: A case report. Clin J Obstet Gynecol 2020; 3: 85-9.
109. LaHood J, You W. Uterine torsion and subsequent rupture in a gravid bicornuate uterus associated with an elevated alpha-fetoprotein. BMJ Case Rep 2018; 2018: bcr2018224388.
110. Robinson AL, Duvall HM. Torsion of the pregnant uterus. BJOG 1931; 38: 55-84.
111. Matsumoto H, Aoyagi Y, Morita T, Nasu K. Uterine torsion in non-gravid women: A case report and review of cases reported in the last 20 years. SAGE Open Med Case Rep. 2021; 9: 2050313X211066649.
112. Fatih FF, Gowri V, Rao K. Uterine torsion in second trimester of pregnancy followed by a successful-term pregnancy. BMJ Case Rep 2012; 2012: bcr2012006359.
113. Arumugham S, Mathew M, Deoskar S, Sharma J. Uterine torsion mimicking supine hypotension syndrome after regional anaesthesia. BMJ Case Rep 2013; 2013: bcr2013010508.
114. Moores KL, Wood MG, Foon RP. A rare obstetric emergency: acute uterine torsion in a 32-week pregnancy. BMJ Case Rep 2014; 2014: bcr2013202974.
115. Duplantier N, Begneaud W, Wood R, Dabezies C. Torsion of a gravid uterus associated with maternal trauma: a case report. J Reprod Med Obstet Gynecol 2002; 47(8): 683-5.

116. Hussein HA. Validation of color Doppler ultrasonography for evaluating the uterine blood flow and perfusion during late normal pregnancy and uterine torsion in buffaloes. Theriogenology 2013; 79(7): 1045-53.
117. Sudha CM, Unnikrishnan MP, Kurien MO, Abhilash RS, Thirupathy V. Doppler ultrasonographic evaluation of uterine torsion in does. J Vet Anim Sci 2019; 50(2): 125-8.
118. Sen A. Engorged myometrial vein sign in uterine torsion. Eur J Obstet Gynecol Reprod Biol 2016; 198: 176-7.
119. Kremer JA, van Dongen PW. Torsion of the pregnant uterus with a change in placental localization on ultrasound; a case report. Eur J Obstet Gynecol Reprod Biol 1989; 31(3): 273-5.
120. Ulu I, Güneş MS, Kiran G, Gülşen MS. A rare cause of placental abruption: uterine torsion. J Clin Diagn Res 2016; 10(1): QD06-7.
121. Salani R, Theiler RN, Lindsay M. Uterine torsion and fetal bradycardia associated with external cephalic version. Obstet Gynecol 2006; 108: 820-2.
122. Basava L, Roy P, Sree GS, Priya VA, Impana S. Complete axial torsion of the gravid uterus by 180 degrees. Int J Reprod Contracept Obstet Gynecol 2015; 4(6): 2074-6.
123. Poulose T, Fox R, Booth A. Unrecognised 180 degree torsion of a pregnant uterus. J Obstet Gynaecol 2006; 26: 70-1.
124. Sparic R, Lazovic B. Inevitable cesarean myomectomy following delivery through posterior hysterotomy in a case of uterine torsion. Med Arh 2013; 67(1): 75-6.
125. Ahmed FU, Ambreen A, Zubair S, Kiran N. Torsion of a term tterus. J Coll Physicians Surg Pak 2016; 26(6 Suppl): S50-1.
126. Dahlke JD, Mendez-Figueroa H, Maggio L, Sperling JD, Chauhan SP, Rouse DJ. The case for standardizing cesarean delivery technique: seeing the forest for the trees. Obstet Gyneco 2020; 136(5): 972-80.
127. Bolaji II, Rafla NM, Mylotte MJ. Classical caesarean section through the posterior uterine wall. Ir J Med Sci 1992; 161: 46-7.
128. Oláh KS. Classical caesarean section through the posterior uterine wall-a complication of complete uterine torsion, J Obstet Gynaecol 1996; 16(1): 32-3.
129. Fait G, Grisaru D, Gull I. Torsion of the pregnant uterus at term. Int J Gynaecol Obstet 1997; 59(1): 41-2.
130. O'Connor RA, Hurley PA. Torsion of the gravid uterus: an unusual cause of transverse fetal lie. J Obstet Gynaecol 1998; 18(6): 589.
131. Pelosi MA 3rd, Pelosi MA. Managing extreme uterine torsion at term. A case report. J Reprod Med 1998; 43(2): 153-7.
132. Achanna S, Monga D, Hassan MS. Case report: torsion of a gravid horn of didelphic uterus. J Obstet Gynaecol Res 1996; 22(2): 107-9.
133. Kovavisarach E, Vanitchanon P. Uterine torsion with shock. Aust N Z J Obstet Gynaecol 1999; 39: 364-5.
134. Mustafa MS, Shakeel F, Sporrong B. Extreme torsion of the pregnant uterus. Aust N Z J Obstet Gynaecol 1999; 39(3): 360-3.
135. Kim SK, Chung JE, Bai SW, et al. Torsion of the pregnant uterus. Yonsei Med J 2001; 42: 267-9.
136. Rich DA, Stokes IM. Uterine torsion due to a fibroid, emergency myomectomy and transverse upper segment caesarean section. BJOG 2002; 109(1): 105-6.
137. Rudloff U, Joels LA. Irreducible uterine torsion at caesarean section: how to deliver? J Obstet Gynaecol 2003; 23: 76-7.
138. El-Taher SS, Hussein IY. Unexpected torsion of the gravid uterus. J Obstet Gynaecol 2004; 24(2): 177.
139. Cook KE, Jenkins SM. Pathologic uterine torsion associated with placental abruption, maternal shock, and intrauterine fetal demise. Am J Obstet Gynecol 2005; 192: 2082-3.
140. Dandawate B, Carpenter T. Asymptomatic torsion of pregnant uterus. J Obstet Gynaecol 2006; 26(4): 375-6.
141. Munro KI, Horne AW, Martin CW, et al. Uterine torsion with placental abruption J Obstet Gynaecol 2006; 26(2): 167-9.
142. Joseph R, Irvine LM, Sanusi FA. Labour dystocia secondary to uterine torsion in twin pregnancy. J Obstet Gynaecol 2008; 28(6): 649.
143. Metz T, Trierweiler M, Arrigo AM, Winn VD. Uterine torsion in delayed diagnosis of abnormal anterior placentation: a report of 2 cases. J Reprod Med 2009; 54: 322-4.
144. De Ioris A, Pezzuto C, Nardelli GB, Modena AB. Caesarean delivery through deliberate posterior hysterotomy in irreducible uterine torsion: case report. Acta Biomed 2010; 81(2): 141-3.
145. Deshpande G, Kaul R, P M. A case of torsion of gravid uterus caused by leiomyoma. Case Rep Obstet Gynecol 2011; 2011: 206418.
146. Wang B, Zhou JH, Jin HM. Torsion of a rudimentary uterine horn at 22 weeks of gestation. J Obstet Gynaecol Res 2011; 37: 919-20.
147. Zhang EG, Wimalasundera R. Uterine torsion in a monochorionic diamniotic (MCDA) twins pregnancy. Prenat Diagn 2011; 31(6): 614-5.
148. Erdogdu E, Arısoy R, Tugrul S, Pekin O. Third trimester uterine torsion. Arch Gynecol Obstet 2012; 286(5): 1333-4.
149. Homam H, Moukhah S, Alizadeh M. Asymptomatic torsion of a gravid uterus. Taiwan J Obstet Gynecol 2013; 52: 599-601.
150. Farhadifar F, Bahram N, Shahgheibi S, Soofizadeh N, Rezaie M. Asymptomatic uterine torsion in a pregnant woman. Indian J Surg 2014; 76: 321-2.
151. Rood K, Markham KB. Torsion of a term gravid uterus: a possible cause of intrauterine growth restriction and abnormal umbilical artery Doppler findings. J Ultrasound Med 2014; 33: 1873-5.
152. Sachan R, Patel ML, Sachan P, Arora A. Complete axial torsion of pregnant uterus with leiomyoma. BMJ Case Rep 2014; 2014: bcr2014205558.
153. Vavrinkova B, Binder T. Uterine torsion in pregnancy. Case report. Neuro Endocrinol Lett 2015; 36: 241-2.
154. Nash K, Oji VC, Mitra S. Uterine torsion, a rare cause of acute abdominal pain in the third trimester of pregnancy: a case report. J Obstet Gynaecol 2016; 36: 668-9.
155. Karavani G, Picard R, Elami-Suzin M, Mankuta D. Complete uterine torsion diagnosed during an elective caesarean section following failed external cephalic version: a case report. J Obstet Gynaecol 2017; 37: 673-4.
156. Carrier M, Korb D, Morin C, Sibony O. Asymptomatic uterine torsion diagnosed after two uneventful pregnancies. J Gynecol Obstet Human Reprod 2018; 47: 583-5.
157. Hoffmann S, Jayaratnam S. Uterine torsion - a case report and literature review. Glob J Reprod Med 2018; 5(3): 59-61.
158. Kilicci C, Sanverdi I, Bostanci E, Abide CY, Eser SK. Uterine torsion of 720 degrees in third trimester of pregnancy and accompanying bladder torsion: a case report. Pan Afr Med J 2018; 29: 175.
159. Kumar N, Das V, Pandey A. Torsion and rupture of a non-communicating rudimentary horn in a 17-week gestation in a 16-year-old girl: lessons learnt. BMJ Case Rep 2018; 2018: bcr2017222073.
160. Gupta N, Dwivedi D, Gupta RR. A rare case of asymptomatic axial rotation of the gravid term uterus by 180 degrees. Indian J Case Reports 2019; 5(5): 416-8.
161. Toshniwal R. Uterine torsion in 20 weeks of pregnancy: A Rare Case Report. J Obstet Gynaecol India 2019; 69(Suppl 1): 28-30.

Appendix 1

JBI Critical Appraisal Check list for Case Reports[11]

Ref	Authors	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
7	Wilson et al	yes	yes	yes	yes	yes	yes	yes	yes
9	Ferrari et al	yes	yes	yes	yes	yes	yes	yes	yes
13	Mulvey & Turner	yes	yes	yes	yes	yes	yes	yes	yes
14	Aviram et al	yes	yes	yes	yes	yes	yes	yes	yes
15	Sanusi & Simanowitz	yes	yes	yes	yes	yes	yes	yes	yes
16	Ghosh & McKenna	yes	yes	yes	yes	yes	no	no	no
17	Olah	yes	yes	yes	yes	yes	yes	yes	yes
18	Sharma et al	yes	yes	yes	yes	yes	yes	yes	yes
19	Masood et al	yes	yes	yes	yes	yes	yes	yes	yes
20	Picone et al	yes	yes	yes	yes	yes	yes	yes	yes
21	Dalal et al	yes	yes	yes	yes	yes	yes	yes	yes
22	Hariharan et al	yes	yes	yes	yes	yes	yes	yes	yes
23	Jahan et al	yes	yes	yes	yes	yes	yes	yes	yes
24	Mihu et al	yes	yes	yes	yes	yes	yes	yes	yes
25	Prabhakar & Gupta	yes	yes	yes	yes	yes	yes	yes	yes
26	Waghmare	yes	yes	yes	yes	yes	yes	yes	yes
27	Kamanu et al	yes	yes	yes	yes	yes	yes	yes	yes
28	Meharunnissa et al	yes	yes	yes	yes	yes	no	yes	yes
29	Ahsan & Humayun	yes	yes	yes	yes	yes	yes	yes	yes
30	Moustafa et al	yes	yes	yes	yes	yes	no	yes	yes
31	Naik et al	yes	yes	yes	yes	yes	yes	yes	yes
32	Rasquiha et al	yes	yes	yes	yes	yes	no	yes	yes
33	Acharya & Mohapatra	yes	yes	unclear	yes	yes	yes	yes	yes
34	Bissa & Shyam	yes	yes	yes	yes	yes	yes	yes	yes
35	Blyth	yes	yes	yes	yes	yes	yes	yes	yes
36	Dragosloveanu	yes	yes	yes	yes	yes	yes	yes	yes
37	Jain et al	yes	yes	yes	yes	yes	yes	yes	yes
38	Krishnaveni & Saraswathi	yes	yes	yes	yes	yes	yes	yes	yes
39	Qureshi et al	yes	yes	yes	yes	yes	yes	yes	yes
40	Tehrani et al	yes	yes	yes	yes	yes	yes	yes	yes
41	Tripathi & Tripathi	yes	yes	yes	yes	yes	yes	yes	yes
42	Boynukalin et al	yes	yes	yes	yes	yes	no	yes	yes
43	Rathod	yes	yes	yes	yes	yes	yes	yes	yes
44	Inderjeet et al	yes	yes	yes	yes	yes	yes	yes	yes
45	Jayanthi & Rao	yes	yes	yes	yes	yes	yes	yes	yes
46	Melchor& Dela Concepcion-Co	yes	yes	yes	yes	yes	yes	yes	yes
47	Varsha et al	yes	yes	yes	yes	yes	yes	yes	yes
48	Alhassan et al	yes	yes	yes	yes	yes	yes	yes	yes
49	Choi & Lee	yes	yes	yes	yes	yes	yes	yes	yes
50	Chundawat et al	yes	yes	yes	yes	yes	yes	yes	yes
51	Feizal et al	yes	yes	yes	yes	yes	yes	yes	yes
52	Jalvee & Kadrekar	yes	yes	yes	yes	yes	yes	yes	yes
53	Parmar et al	yes	yes	yes	yes	yes	yes	yes	yes
54	Protrka et al	yes	yes	yes	yes	yes	yes	yes	yes
55	Vijayakumar et al	yes	yes	yes	yes	yes	yes	yes	yes
56	Anne et al	yes	yes	yes	yes	yes	yes	yes	yes
57	Cetin et al	yes	yes	yes	yes	yes	yes	yes	yes
58	Goswami & Gautam	yes	yes	yes	yes	yes	yes	yes	yes
59	Abdulaal et al	yes	yes	yes	yes	yes	yes	yes	yes
60	Komatsu et al	yes	yes	yes	yes	yes	unclear	yes	yes
61	Magembe	yes	yes	yes	yes	yes	yes	yes	yes
62	Patra et al	yes	yes	yes	yes	yes	yes	yes	yes
63	Thanappan	yes	yes	yes	yes	yes	yes	yes	yes
64	Dasari et al	yes	yes	yes	yes	yes	yes	yes	yes
65	Ramya	yes	yes	yes	yes	yes	yes	yes	yes
66	Zeng et al	yes	yes	yes	yes	yes	yes	yes	no
67	Bagli & Erdem	yes	yes	yes	yes	yes	yes	yes	yes
68	Filippo et al	yes	yes	yes	yes	yes	yes	yes	yes
69	Gross et al	yes	yes	yes	yes	yes	yes	yes	yes
70	Ikram ul Haq	yes	yes	yes	yes	yes	yes	yes	yes
71	Kocher & Hirsig	yes	yes	yes	yes	yes	yes	yes	yes
72	Mangirish et al	yes	yes	yes	yes	yes	yes	yes	yes
73	Mayadeo Mayadeo & Devalla	yes	yes	yes	yes	yes	yes	yes	yes
74	Mokhtar et al	yes	yes	yes	yes	yes	yes	yes	yes
75	Narayanan et al	yes	yes	yes	yes	yes	yes	yes	yes
76	Tanouti et al	yes	yes	yes	yes	yes	yes	yes	yes

Ref	Authors	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
77	Yin et al	yes	yes	yes	yes	yes	yes	yes	yes
78	Agrawal et al	yes	yes	yes	yes	yes	yes	yes	yes
79	Benor & Tetelman	yes	yes	yes	yes	yes	yes	yes	yes
80	Chau et al	yes	yes	yes	yes	yes	yes	yes	yes
81	Gaboura et al	yes	yes	yes	yes	yes	yes	yes	yes
82	Gadappa et al	yes	yes	yes	yes	yes	no	yes	yes
83	Huynh & Anderson	yes	yes	yes	yes	yes	yes	yes	yes
84	Khan et al	yes	yes	yes	yes	yes	yes	yes	yes
85	Makwe et al	yes	yes	yes	yes	yes	yes	yes	yes
86	Othman Al Tarifi et al	yes	yes	yes	yes	yes	yes	yes	yes
87	Somani et al	yes	yes	yes	yes	yes	yes	yes	yes
88	Wan Adnan et al	yes	yes	yes	yes	yes	yes	yes	yes
89	Boogaerts et al	yes	yes	yes	yes	yes	yes	yes	yes
90	Bouattour et al	yes	yes	yes	yes	yes	yes	yes	yes
91	Ghalandarpoor-Attar & Ghalandarpoor-Attar	yes	yes	yes	yes	yes	yes	yes	yes
92	Hendriks et al	yes	yes	yes	yes	yes	yes	yes	yes
93	Mansour et al	yes	yes	yes	yes	yes	yes	yes	yes
94	Onyekpa et al	yes	yes	yes	yes	yes	yes	yes	yes
95	Singh et al	yes	yes	yes	yes	yes	no	yes	yes
96	Slaoui et al	yes	yes	yes	yes	yes	yes	yes	yes
97	Vuong & Nguyen	yes	yes	yes	yes	yes	yes	yes	yes
98	Berger et al	yes	yes	yes	yes	no	no	no	no
99	Nicholson et al	yes	yes	yes	yes	yes	yes	yes	yes
100	Albayrak et al	yes	yes	yes	yes	yes	yes	yes	yes
101	Zullino et al	yes	yes	yes	yes	yes	yes	yes	yes
102	Demaria et al	yes	yes	yes	yes	yes	yes	yes	yes
103	Singh et al	yes	yes	yes	yes	yes	yes	yes	yes
104	Guie et al	yes	yes	yes	yes	yes	yes	yes	yes
105	Bukar et al	yes	yes	yes	yes	yes	yes	yes	yes
106	Kopko et al	yes	yes	yes	yes	yes	yes	yes	yes
107	Alpana & Meenaxi	yes	yes	yes	yes	yes	yes	yes	yes
108	Darido et al	yes	yes	yes	yes	yes	yes	yes	yes
109	LaHood & You	yes	yes	yes	yes	yes	yes	yes	yes
112	Fatih et al	yes	yes	yes	yes	yes	yes	yes	yes
113	Arumugham et al	yes	yes	yes	yes	yes	yes	yes	yes
114	Moores et al	yes	yes	yes	yes	yes	no	yes	yes
115	Duplantier et al	yes	yes	yes	yes	yes	yes	yes	yes
120	Ulu et al	yes	yes	yes	yes	yes	yes	yes	yes
121	Salani et al	yes	yes	yes	yes	yes	yes	yes	yes
122	Basava et al	yes	yes	yes	yes	yes	yes	yes	yes
123	Poulose et al	yes	yes	yes	yes	yes	yes	yes	yes
124	Sapric & Lazoric	yes	yes	yes	yes	yes	yes	yes	yes
125	Ahmed et al	unclear	yes	yes	yes	yes	yes	yes	yes
127	Bolaji et al	yes	yes	yes	yes	yes	yes	yes	no
128	Olah	yes	yes	yes	yes	yes	yes	yes	yes
129	Fait et al	yes	yes	yes	yes	yes	yes	yes	yes
131	O'Connor & Hurley	yes	yes	yes	yes	yes	yes	yes	yes
132	Pelosi III & Pelosi	yes	yes	yes	yes	yes	yes	yes	yes
133	Achanna et al	yes	yes	yes	yes	yes	yes	yes	yes
134	Kovavisarach & Vanitchanon	yes	yes	yes	yes	yes	yes	yes	yes
135	Mustafa et al	yes	yes	yes	yes	yes	yes	yes	yes
136	Kim et al	yes	yes	yes	yes	yes	yes	yes	yes
137	Rich & Stokes	yes	yes	yes	yes	yes	yes	yes	yes
138	Rudloff & Joels	yes	yes	yes	yes	yes	yes	yes	yes
139	El-Taher & Hussein	yes	yes	yes	yes	yes	yes	yes	yes
140	Cook & Jenkins	yes	yes	yes	yes	yes	yes	yes	yes
141	Dandawate & Carpenter	yes	yes	yes	yes	yes	yes	yes	yes
142	Munro et al	yes	yes	yes	yes	yes	yes	yes	yes
143	Joseph et al	yes	yes	yes	yes	yes	yes	yes	yes
144	Metz et al	yes	yes	yes	yes	yes	yes	yes	yes
145	De Ioris et al	yes	yes	yes	yes	yes	yes	yes	yes
146	Deshpande et al	yes	yes	yes	yes	yes	yes	yes	yes
146	Wang et al	yes	yes	yes	yes	yes	yes	yes	yes
147	Zhang & Wimalasundera	yes	yes	yes	yes	yes	yes	yes	yes
148	Erdogdu et al	yes	yes	yes	yes	yes	yes	yes	yes
149	Homam et al	yes	yes	yes	yes	yes	yes	yes	yes
150	Farhadifar et al	yes	yes	yes	yes	yes	no	yes	yes
151	Rood & Markham	yes	yes	yes	yes	yes	yes	yes	yes

Ref	Authors	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
152	Sachan et al	yes	yes	yes	yes	yes	yes	yes	yes
153	Vavrinkova & BInder	yes	yes	yes	yes	yes	yes	yes	yes
154	Nash et al	yes	yes	yes	yes	yes	no	yes	yes
155	Karavani et al	yes	yes	yes	yes	yes	yes	yes	yes
156	Carrier et al	yes	yes	yes	yes	yes	yes	yes	yes
157	Hoffman & Jayaratnam	yes	yes	yes	yes	yes	no	yes	yes
158	Kilicci et al	yes	yes	yes	yes	yes	yes	yes	yes
159	Kumar et al	yes	yes	yes	yes	yes	yes	yes	yes
160	Gupta et al	yes	yes	yes	yes	yes	yes	yes	yes
161	Toshniwal	yes	yes	yes	yes	yes	yes	yes	yes