

# Pregnancy and trauma: analysis of 139 cases

## *Gebelik ve Travma:139 Olgunun Analizi*

Sevdegül Karadaş<sup>1</sup>, Hayriye Gönüllü<sup>1</sup>, Mehmet Reşit Öncü<sup>2</sup>, Zehra Kurdoğlu<sup>3</sup>, Yasin Canbaz<sup>4</sup>

<sup>1</sup>Department of Emergency Medicine, Faculty of Medicine, Yüzüncü Yıl University, Van, Turkey

<sup>2</sup>Clinic of Emergency Service, Van Training and Research Hospital, Van, Turkey

<sup>3</sup>Department of Gynecology and Obstetrics, Faculty of Medicine, Yüzüncü Yıl University, Van, Turkey

<sup>4</sup>Department of Plastic and Reconstructive Surgery, Faculty of Medicine, Yüzüncü Yıl University, Van, Turkey

### Abstract

**Objective:** The aim of this study was to examine the diagnoses and treatment methods and demographical and clinical characteristics of pregnant women who were exposed to trauma and in addition, review of the literature was carried out in this regard.

**Material and Methods:** One hundred thirty-nine pregnant women who presented at the Yüzüncü Yıl University between January 2006 and September 2009 with local or general body trauma complaints were analysed retrospectively.

**Results:** The average age of the cases was 26.72±6.29 years and the age group ranging from 21-34 composed the majority. When they were studied according to their etiologies, falls during daily activities formed 43.9%. When they were analyzed in terms of their gestational weeks, 64.46% were in the 3<sup>rd</sup> trimester. Pregnant cases with trauma resulted in maternal (3 cases) and fetal (9 cases) loss. It was found that 19 cases who had imaging techniques involving radiation and whose gestation was continuing had a problem-free gestation period and healthy children.

**Conclusion:** It is mandatory to evaluate both mother and fetus together when trauma exposure is in question, the general well-being of the fetus should be provided and the mother should be informed about the presence of advanced trauma life support.

(J Turkish-German Gynecol Assoc 2012; 13: 118-22)

**Key words:** Pregnancy, trauma, emergency department, radiation, etiology

**Received:** 31 January, 2012

**Accepted:** 23 April, 2012

### Özet

**Amaç:** Bu çalışmanın amacı travmaya maruz kalan gebe olguların demografik, klinik özelliklerini, tetkik ve tedavi yöntemlerini incelemek ve literatürü gözden geçirmektir.

**Gereç ve Yöntemler:** Ocak 2006-Eylül 2009 tarihleri arasında Yüzüncü Yıl Üniversitesi Acil servis' ine lokal veya genel vücut travması nedeniyle başvuran ve gebeliği olan 139 olgu geriye dönük olarak incelendi.

**Bulgular:** Olguların yaş ortalaması 26.72±6.29 yıl olup, çoğunluğunu 21-34 yaş arası grup oluşturmaktaydı. Etiyolojilerine göre incelendiğinde %43.9'u günlük aktiviteler sırasında düşme olup, trimestera göre değerlendirildiğinde %64.46'sı 3. trimester idi. Travmalı gebe olguların 3'ü maternal, 9'u fetal kayıpla sonuçlandı. Radyasyon içeren görüntüleme yöntemi kullanılan ve gebeliği devam eden 20 olgunun gebeliklerini sorunsuz sürdürdükleri ve çocuklarının sağlıklı olduğu öğrenildi.

**Sonuç:** Travmaya maruz kalan tüm gebelerde, anne ile birlikte fetusun değerlendirilmesi gerekli olup, fetusun iyilik halinin sağlanması, annenin ileri travma yaşam desteğine uyulmasına bağlıdır.

(J Turkish-German Gynecol Assoc 2012; 13: 118-22)

**Anahtar kelimeler:** Gebelik, travma, acil servis, radyasyon, etiyoloji

**Geliş Tarihi:** 31 Ocak 2012

**Kabul Tarihi:** 23 Nisan 2012

### Introduction

The incidence of trauma during pregnancy is 5% and it is known to cause 6-7% of maternal deaths due to non-obstetric reasons. Although fetal mortality and morbidity increase in parallel with the severity of maternal injury, sometimes severe fetal injury may occur even with mild traumas, and trauma may lead to intrauterine fetal demise, abortions, pre-term delivery or ablatio placentae (1-4).

The approach to pregnant trauma patients is still a problem for health care providers due to the physiologic and anatomic

changes in pregnancy, drugs that are considered to negatively affect the fetus and anxiety about radiologic tests (4, 5).

This study aimed to retrospectively evaluate the pregnant trauma patients which were significant for both the mother and the fetus and require a multidisciplinary approach, and to obtain epidemiologic data in the light of the literature.

### Material and Method

A total of 139 pregnant subjects who were admitted to the Emergency Department (ED) of Yüzüncü Yıl University

Medical Faculty due to local or multiple trauma (2 or/and other system injuries) between January 2006 and September 2009 were retrospectively screened using the ED registry. Age of the patients, gestational week, season of admission, etiology of the trauma, organ injuries, diagnostic methods like X-ray, computed tomography (CT), magnetic resonance imaging (MRI) and ultrasonography (USG), treatments, data about hospitalization, and maternal and fetal complications were evaluated. Contrast liquid for radiological evaluation was not used.

The analyses of treatments, surgical interventions, supportive therapies (fluids, blood and blood product replacements, tetanus prophylaxis, analgesics, steroids, antibiotic therapy, ice application, wound care, monitorization) were also performed. All patients were examined by the obstetric and gynecology department.

**Statistical Analysis**

Data analysis was performed using SPSS (Statistical Package for Social Science) 13.0 package program. Descriptive statistics for constant variables were defined as mean±standard deviation (SD), minimum and maximum values, and categorical variables were defined as number (n) and percent (%). Qui-square test was used to determine whether there was a statistically significant difference between groups in terms of categorical variables and student’s t test was used to compare the mean values of constant variables.

**Results**

The mean age of the pregnant women exposed to trauma was 26.72±6.29 years (range 15-45 years) and the majority of the patients were between 21-34 years. Distribution of the cases according to age groups and gestational weeks is shown in Figures 1 and 2, while distribution according to etiology of trauma is presented in Table 1.

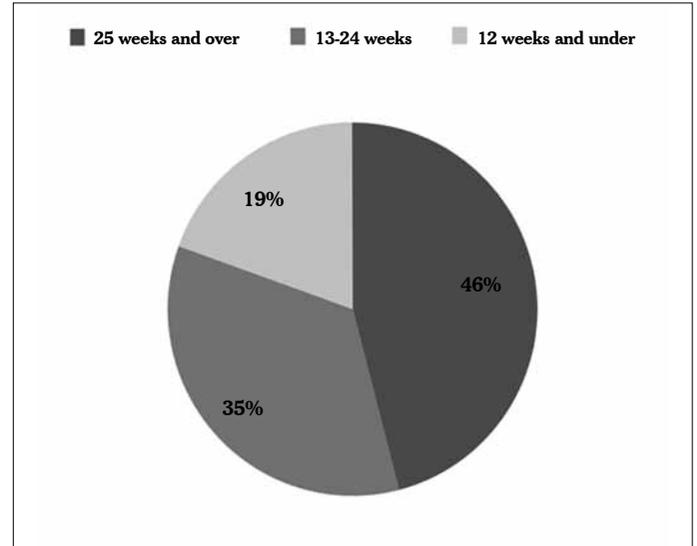
The kind of trauma was classified as “local and multiple trauma”. While 9 (6.4%) cases were multiple trauma, 130 (93.6%) cases were local.

When the cases were analyzed according to the season they applied to the hospital, it was seen that hospital admissions were most frequent in the summer (33.1%) (n=46) followed by spring (28.8%) (n=40), winter (23%) (n=32) and autumn (15.1%) (n=21). There was no statistically significant difference between the groups (p>0.05).

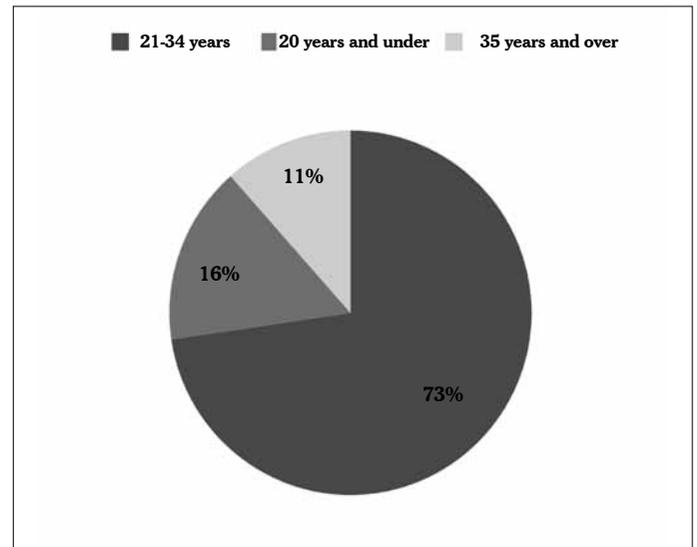
When the subjects were evaluated according to the tests, it was seen that, while radiologic tests were not used for 110 (79.1%) subjects, radiologic tests for chest, pelvis, skull, vertebra and extremity, CT (cerebral, maxillofacial, lumbal, pelvis) and cerebral MRI were performed for 29 (20.9%) patients (Table 2). Radiation doses and postpartum outcomes of the subjects who had radiologic tests and whose pregnancies continued are shown in Table 3.

Consultations for all subjects were carried out in the Gynecology and Obstetrics Clinic and the fetus was evaluated with obstetric USG. While fetal or maternal complications were not detected in 133 (95.7%) cases, intrauterine fetal demise was detected in 6 cases.

Organ injuries and treatments are presented in Table 4. Of the followed up pregnant subjects, 3 (2.2%) resulted in maternal and 9 resulted in fetal losses. While the etiology of trauma was a traffic accident in 5 of the fetal loss cases, falls



**Figure 1. Distribution of the cases according to age groups**



**Figure 2. Distribution of the cases according to gestational weeks**

**Table 1. Distribution of the cases according to etiology**

Etiology	n	%
Falls during daily activities	61	43.9
Motor vehicle accident	29	20.8
Falls off	17	12.2
Electrical shock	12	8.6
Pounding	9	6.5
Other	11	8
Total	139	100

were detected in 2, falls off were detected in 1 and burn in the genital area coexisting with spontaneous abortion was detected in 1 case. Causes of fetal exitus were direct fetal injury in 2, fetal hypoxia in 2, abortion in 3 and therapeutic abortion in 2. While the etiology of maternal deaths was traffic accident-related multi-organ injury and hemorrhagic shock in 2, cerebral edema due to cerebral trauma in the course of seizure in 1. While 2 of maternal deaths were 21-34 years group, 1 case was in the 20 years and under group. All three maternal death cases occurred in the third trimester of pregnancy. One of the cases resulting in maternal mortality passed away due to hemorrhagic shock while her operation was being planned and another died during the operation. The third case died owing to respiratory and circulatory failure during the patient's intensive care. There were no fetal heart beats determined in the course of first evaluation of all three cases ending in maternal mortality.

**Table 2. Radiological tests**

	n	%
USG	139	100
X-Ray	25	17.9
CT	6	4.3
MRI	2	1.4

**Table 3. Fetal outcome of patients with radiation exposure during the trauma evaluation**

Radiation dose cGy/Rad	Healthy delivery	Therapeutic abortion	Fetal complication
0.001-0.1	14		-
0.1-0.5	6		-
0.5-5		2	

**Table 4. Affected organs and therapeutic approaches**

Organ injuries	n (%)	Treatments
None	78 (56.1)	-
Soft tissue trauma	43 (30.9)	*
Vaginal bleeding and skin incision	3 (2.1)	*, Suture
Maxillofacial trauma	4 (2.7)	*, close reduction of mandible fracture (in 1 case)
Femur fracture	3 (2.1)	*, close reduction
Clavicle fracture	2 (1.4)	*, 8 bandage
Fracture of the tibiae and fibulae	2 (1.4)	*, close reduction
Fracture of pelvis and femur	1 (0.71)	*, pelvipedal splint, close IMN**
Pelvis Fracture	1 (0.71)	*, skeletal traction
1-2° burns	1 (0.71)	*
Cut wound of the hand	1 (0.71)	Suture
Vertebral fracture	1 (0.71)	*

\* Analgesic, antibiotic, steroid treatment, tetanus prophylaxis, ice application, fluid and erythrocyte suspension replacement according to the indications, \*\* Intra-medullary nailing

When the cases were evaluated according to the Glasgow Coma Scale (GSK) scoring, the GSK in 134 cases was found to be 15 and between 9-14 in 5 cases.

When the cases were analyzed according to the clinics where they were followed up, it was seen that follow up and treatment of 117 (84.1%) were completed in the ED. One patient (0.7%) was referred to another hospital. Seven (5.1%) patients rejected follow up. Six (4.3%) patients were followed up in the Gynecology and Obstetrics Clinic, 8 (5.8%) patients were followed up in the other wards.

Mean duration of hospital stay was 24 hours.

## Discussion

The incidence of trauma during pregnancy is increasing due to active participation in working life (6). However, trauma management in the gravida has been a continuous problem for centuries (2).

Trauma is reported to be seen in 3-7% of all pregnancies and 0.4% of these are reported to need hospitalization (2, 3).

El-Kady et al. (7) reported that motor vehicle accidents, falls and pounding were included in the etiology of trauma and more than half occurred during the last trimester, Tinker et al. (1) reported that the most common causes for trauma were falls (51.6%) followed by motor vehicle accidents, traumas most commonly occurred in the 2<sup>nd</sup> trimester and falls were more frequent during the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters. Connolly et al. (8) and Nannini et al. (9) reported that the most frequent causes were motor vehicle accidents, falls, pounding and burns, respectively and especially falls were most frequent during the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters.

The most common causes of trauma were reported as motor vehicle accidents (55%), falls (23%), assaults (21%) and burns (1%) (10, 11). The period when trauma is seen most frequently was the 3<sup>rd</sup> trimester in this study also, as in that of El-Kady et al. Trauma etiologies were detected as falls during daily activities

(43.9%) and motor vehicle accidents (20.8%) similarly to that of Tinker et al. (1). The main cause of frequent falls in the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters may be the displacing of the center of gravity due to weight gain and enlargement of the uterus.

While Chang et al. (12) reported that the major causes of fatal traumas were motor vehicle accidents, homicide and suicide, Harper et al. (13) reported homicide, motor vehicle accidents, pounding and assaults (gunshot wounds, stab wounds, drownings), falls and suicide attempts as the major causes of fatal cases. Tinker et al. (1) reported that maternal and fetal deaths were most commonly caused by motor vehicles. In our study, all maternal deaths occurred during the 3<sup>rd</sup> trimester and the most common etiologic factor was motor vehicle accidents. The mortality in motor vehicle accidents is high as they lead to high energy trauma.

Weiss et al. (14) and McFarlane et al. (15) reported known risk factors for trauma during pregnancy as young maternal age, drug and alcohol use and domestic violence. Tinker et al. (1) reported risk factors as young maternal age, smoking and alcohol use, seizures, obesity and women's participation in working life. In this study, the mean age of the subjects was  $26.72 \pm 6.29$  and alcohol and drug use were not detected. One of the dying subjects had a history of seizures. Absence of alcohol and drug use may be explained by the sociocultural properties of the region in which the study was conducted.

Risk factors for fetal deaths due to maternal trauma have been reported as high ISS (injury severity score), falling out of the motor vehicle, maternal pelvic fracture, crash, maternal alcohol use and smoking, young maternal age and motorbike accidents (7, 16). In the study presented here, the etiology of fetal losses was traffic accidents in 55.5% of the cases and complications like direct fetal injury, fetal hypoxia and therapeutic abortion related to traffic accident.

The ratio of trauma-related fetal mortality is 65%. While the most common cause of fetal losses had been accepted as maternal death in previous years, at present it is accepted as the result of developments in the approach to the trauma, the most common cause of fetal losses has been reported as fetal hypoxemia developing secondary to maternal shock (4, 17). Other causes of fetal losses have been reported as maternal hypotension, abruptio placentae, rupture of the uterus, direct uterine trauma and disseminated intravascular coagulation (DIC) in various studies (18-21). Ali et al. (18) hold DIC developing due to circulating placental products responsible for fetal losses. In our study, the ratio of fetal losses is 6.5% and is caused by spontaneous abortion (3 cases), fetal hypoxia (2 cases), direct fetal injury (2 cases) and therapeutic abortion (2 cases). Stafford (22) and Baed et al. (3) reported that the degree of maternal injury was not an important factor for permanent fetal injury and the ratio of trauma-related fetal losses was higher than the ratio of maternal deaths. Shah et al. (23) reported the maternal death rate as 3.5%, Esposito et al. (10) reported fetal death rate as at least 5%. In this study, while the ratio of fetal losses was 6.5%, maternal death rate was 2.2% and fetal losses were more than maternal deaths.

The ratio of hospitalization in pregnant trauma patients has been reported as 5-24% (24). In the United States, indications for

hospitalization due to trauma during pregnancy not resulting in delivery are fractures, dislocations, sprains and hurts (6). In our study, consistent with literature, the most common indication for hospitalization was bone fractures and the ratio of hospitalization was 10.8%.

Despite the absence of specific literature concerning pregnant trauma patients, obstetrics consultation is recommended. In clinical studies, the patients with normal examination and monitoring findings are recommended to be followed up for at least 2-6 hours (2). Level 2 studies indicate that fetal heart monitoring should be carried out for at least 6 hours in a pregnant woman with a gestational age of over 20 weeks. Monitoring should be continued in cases of uterine contractions, vaginal bleeding, abnormal fetal heart rate pattern, uterine tenderness, severe maternal injury and rupture of amniotic membranes (2). Level 3 studies indicate that the fetus should be evaluated in the early period and optimum resuscitation of the mother according to advanced trauma life support should be obtained (2). Oxygenation should certainly be provided due to the harmful effects of hypoxemia on the fetus, even when there is no need for maternal intubation (6). Also in this study, all cases were consulted at the Gynecology and Obstetrics Clinic and the fetus was evaluated with urgent obstetric ultrasonography. Consistent with the literature, fetal cardiac monitoring was performed for evaluation of pregnant women in the 2<sup>nd</sup> and 3<sup>rd</sup> trimesters and adequate oxygenation of the mother was provided. All pregnant women were monitored for possible obstetric complications such as premature delivery, ablatio placentae. 84.1% of the cases were monitored in the ED for at least 2-6 hours and discharged thereafter. The mean duration of hospital stay was found to be 24 hours.

X-ray, tomography and nuclear imaging methods are a significant cause of anxiety for the patient herself, her family and physician (25). Serum  $\beta$ -hCG levels should be obtained for all females in the reproductive age who were exposed to trauma, and protected X-rays should be obtained as possible (26). The effects of ionizing radiation on an embryo and fetus can include: pregnancy loss, malformations, neurobehavioral abnormalities, fetal growth retardation, and cancer. However, there is no defined threshold and the amount of radiation does not predict the severity of the disease (27).

The American College of Obstetrics and Gynecology (ACOG) reported that 5 rad radiation does not lead to fetal loss, still birth, birth defects or childhood leukemia (2). Nevertheless, Groen et al. (27) stated that a low dose of radiation causes increased risk in childhood leukemia. On the other hand, the nature and extent of determining effects of radiation on pregnancy depend on the radiation dose and trimester of the pregnancy. Animal studies show that, during the first 2 weeks after conception, a dose as small as 10-20 rad can be lethal for an embryo. The threshold for fetal death increases throughout gestation as the fetus develops (27). Despite this, anxiety regarding the harmful effects of radiation is not a drawback for X-ray imaging necessary for making a diagnosis (28). In this study, various imaging methods have been used by preserving the abdomen when there was any indication. Except for 2 women who were exposed to trauma and survived, radiation dose was

below 0.5 rads. Two subjects who were subjected to 5 rads of radiation underwent therapeutic abortion and 20 subjects who were given radiologic tests and whose pregnancies continued were seen to experience no problems in their pregnancies and their babies had no pathologies.

In order to save the baby, caesarean section should be considered in pregnant women whose gestational age is above 24 weeks and who are about to die. Delivery of the baby in 4-20 min following maternal death is of great importance in terms of neurologic outcomes (29). In this study, urgent caesarean section was not considered as fetal heart sounds could not be heard in the initial evaluation of the subjects who died.

In conclusion, appropriate circulation and oxygenization should be obtained in all pregnant women exposed to trauma, required tests should be performed by taking advantages and disadvantages into account and patients should be monitored closely with a multidisciplinary approach. It should be kept in mind that securing the well being of the baby depends on optimum maternal respiratory and circulatory support and complying with recommendations for advanced trauma life support. The patient should be examined in the Obstetrics and Gynecology Clinic for evaluation of the well being of the baby. The pregnant women and relatives should be informed that maternal alcohol and cigarette use, and the presence of diseases like seizures would increase susceptibility to trauma and lead to poor post-traumatic fetal and maternal outcomes.

#### Conflict of interest

No conflict of interest was declared by the authors.

#### References

1. Tinker SC, Reefhuis J, Dellinger AM, Jamieson DJ; National Birth Defects Prevention Study. Epidemiology of maternal injuries during pregnancy in a population-based study, 1997-2005. *J Womens Health (Larchmt)* 2010; 19: 2211-8. [\[CrossRef\]](#)
2. Barraco RD, Chiu WC, Clancy TV, Como JJ, Ebert JB, Hess LW, et al. Practice management guidelines for the diagnosis and management of injury in the pregnant patient: The EAST practice management guidelines work group. *J Trauma* 2010; 69: 211-4. [\[CrossRef\]](#)
3. Bard MR, Shaikh S, Pestaner J, Newell MA, Rotondo MF. Direct fetal injury due to airbag deployment and three-point restraint. *J Trauma* 2009; 67: 98-101. [\[CrossRef\]](#)
4. Al B, Baştürk M, Tekbaş G, Evsen MS, Sancicek V, Yücel Y, et al. Trauma management in pregnancy. *JEAM* 2010; 2: 93-102.
5. Mattox KL, Goetzl L. Trauma in pregnancy. *Crit Care Med* 2005; 33(10 Suppl): S385-9. [\[CrossRef\]](#)
6. Brown HL. Trauma in pregnancy. *Obstet Gynecol* 2009; 114: 147-60.
7. El-Kady D, Gilbert WM, Anderson J, Danielsen B, Towner D, Smith LH. Trauma during pregnancy: an analysis of maternal and fetal outcomes in a large population. *Am J Obstet Gynecol* 2004; 190: 1661-8. [\[CrossRef\]](#)
8. Connolly AM, Katz VL, Bash KL, McMahon MJ, Hansen WF. Trauma and pregnancy. *Am J Perinatol* 1997; 14: 331-6. [\[CrossRef\]](#)
9. Nannini A, Lazar J, Berg C, Tomashak A, Cabral H, Barger M, et al. Injury: a major cause of pregnancy-associated morbidity in Massachusetts. *J Midwifery Womens Health* 2008; 53: 3-10. [\[CrossRef\]](#)
10. Esposito TJ. Trauma during pregnancy. *Emerg Med Clin North Am* 1994; 12: 167-99.
11. Muench MV, Canterino JC. Trauma in pregnancy. *Obstet Gynecol Clin North Am* 2007; 34: 555-83. [\[CrossRef\]](#)
12. Chang J, Berg C, Saltzman L, Herndon J. Homicide: a leading cause of injury deaths among pregnant and postpartum women in the United States, 1991-1999. *Am J Public Health* 2005; 95: 471-7. [\[CrossRef\]](#)
13. Harper M, Parsons L. Maternal deaths due to homicide and other injuries in North Carolina: 1992-1994. *Obstet Gynecol* 1997; 90: 920-3. [\[CrossRef\]](#)
14. Weiss HB. Pregnancy-associated injury hospitalizations in Pennsylvania, 1995. *Ann Emerg Med* 1999; 34: 626-36. [\[CrossRef\]](#)
15. McFarlane J, Parker B, Soeken K, Bullock L. Assessing for abuse during pregnancy severity and frequency of injuries and associated entry into prenatal care. *JAMA* 1992; 267: 3194-5. [\[CrossRef\]](#)
16. Grossman NB. Blunt Trauma in Pregnancy. *Am Fam Physician* 2004;70: 1303-10.
17. Pearlman MD, Tintinalli JE. Evaluation and treatment of the gravida and fetus following trauma during pregnancy. *Obstet and Gynecol Clin North Am* 1991; 18: 371-81.
18. Ali J, Yeo A, Gana TJ, McLellan BA. Predictors of fetal mortality in pregnant trauma patients. *J Trauma* 1997; 42: 782-5. [\[CrossRef\]](#)
19. Weiss HB, Songer TJ, Fabio A. Fetal deaths related to maternal injury. *JAMA* 2001; 286: 1863-8. [\[CrossRef\]](#)
20. Ikossi DG, Lazar AA, Morabito D, Fildes J, Knudson MM. Profile of mothers at risk: an analysis of injury and pregnancy loss in 1,195 trauma patients. *J Am Coll Surg* 2005; 200: 49-56. [\[CrossRef\]](#)
21. Aboutanos SZ, Aboutanos MB, Dompkowski D, et al. Predictors of fetal outcome in pregnant trauma patients: a five-year institutional review. *Am Surg* 2007;73: 824-7.
22. Stafford P, Biddinger P, Zumwalt R. Lethal intrauterine fetal trauma. *Am J Obstet Gynecol* 1988; 159: 485-9.
23. Shah KH, Simons RK, Holbrook T, Fortlage D, Winchell RJ, Hoyt DB. Trauma in pregnancy: maternal and fetal outcomes. *Mayo Clin Proc* 2000; 75: 1243-8.
24. Oxford CM, Ludmir J. Trauma in pregnancy. *Clin Obstet Gynecol* 2009; 52: 611-29. [\[CrossRef\]](#)
25. Lowe SA. Diagnostic radiography in pregnancy: risks and reality. *Aust N Z J Obstet Gynaecol* 2004; 44: 191-6. [\[CrossRef\]](#)
26. Patel SJ, Reede DL, Katz DS, Subramaniam R, Amorosa JK. Imaging the pregnant patient for nonobstetric conditions: algorithms and radiation dose considerations. *Radiographics* 2007; 27: 1705-22. [\[CrossRef\]](#)
27. Groen RS, Bae JY, Lim KJ. Fear of the unknown: ionizing radiation exposure during pregnancy. *Am J Obstet Gynecol* 2011 Dec 11. [Epub ahead of print]
28. ACOG Committee on Obstetric Practice. ACOG Committee Opinion. Number 299, September 2004 (replaces No. 158, September 1995). Guidelines for diagnostic imaging during pregnancy. *Obstet Gynecol* 2004; 104: 647-51.
29. Morris JA Jr, Rosenbower TJ, Jurkovich GJ, Hoyt DB, Harviel JD, Knudson MM, et al. Infant survival after cesarean section for trauma. *Ann Surg* 1996; 223: 481-91. [\[CrossRef\]](#)