

ORIGINAL ARTICLE

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Trauma during pregnancy: Assessment of cases from a forensic medical aspect**● Ozlem Ozgur Gursay¹, ● Tugrul Kiliboz², ● Beycan Dogan², ● Kenan Karbeyaz²**¹Eskisehir Acibadem Hospital, Department of Gynecology and Obstetrics, Eskisehir, Turkey²Eskisehir Osmangazi University Faculty of Medicine Department of Forensic Medicine, Turkey

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Abstract

Evaluation of trauma during pregnancy puts forth a difference from other traumas in forensic medicine. The purpose of this study is to investigate forensic cases of trauma happened in pregnancy, share the findings with the literature and to scrutinize the legal procedures during this period. Applied trauma cases between 1st January 2010 and 31st December 2019 were evaluated retrospectively by forensic medicine clinic of Eskişehir Osmangazi University Medical Faculty. Of these cases, pregnant women were included to the study. Data including age, pregnancy week, origin of the event, physical findings of the trauma, effects of the trauma to the pregnancy outcome and whether radiologic examination could be done, were interpreted. 174 trauma cases were perused in this scope of the study. Of these, 61 (35.1%) were subjected to violence, 113 traumas (64.9%) were due to accident. 6 (3.4%) pregnant women had lethal injury, 45 cases (25.9%) needed stationary treatment and 3 had pregnancy loss due to trauma. Our findings were concordant with the literature. Effects of trauma on fetus should be determined by the clinical evaluation of the documents recorded during obstetric follow-up in the hospital. Forensically, estimation of the effects of trauma on the pregnancy outcome should be determined by studying collaboratively with the other medical sciences especially obstetrics and gynecology.

Keywords: Pregnancy, forensic medicine, trauma**Introduction**

In our country's law system, pregnancy is accounted of a special condition in the course of intentional injury and relevant regulations were done for the penalty. According to the Turkish Penal Code (TPC) preterm labor or abortion due to violence or assault of a pregnant woman is regarded as a major crime [1]. Health status of mother and fetus with the effects of trauma on them should be reported in detail while writing up a forensic report in pregnancy period.

Trauma is one of the major cause of death of mother and fetus during pregnancy, besides obstetric reasons [2-4]. Pregnant women are more vulnerable to traumas than non-pregnant ones. Physiologic changes in circulation and lung capacity are the best known factors that increase the effects of trauma in pregnant. Most common traumas stated during pregnancy are motor vehicle accidents followed by falling and assault [2-6].

Examination methods, diagnostic tests and treatment can be different in each traumatized pregnant. Physiological changes seen in pregnancy can obscure the findings of trauma [2]. Restricted usage of radiologic methods could make it difficult for diagnose and decision making of treatment [7-8]. Correlation between trauma and effects on fetus should be well-established from the forensic medical approach. For this, pregnancy follow-up should be evaluated and status of fetus before trauma should be identified. Then findings of trauma and possible effects on fetus should be determined and described in detail. Studies involving forensic medical evaluation of pregnancy traumas were not common in our country. The purpose of our study is to investigate forensic cases of trauma happened in pregnancy, share the findings with literature and to scrutinize the legal procedures during this period in Eskişehir province.

Material and Methods

Applied trauma cases between 1st January 2010 and 31st December 2019 were evaluated retrospectively by forensic medicine clinic of Eskişehir Osmangazi University Medical Faculty. Of these cases in a decade, pregnant women were included to the study. In a ten-year period, 4205 (21.2%) women out of 19.864 trauma cases were examined by the forensic medicine clinic and of these women, 174

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(4.1%) were pregnant during the incident. Data including age, pregnancy week, origin of the event, physical findings of the trauma, effects of the trauma to the pregnancy outcome and whether radiologic examination could be done were interpreted. For this, hospital records including forensic reports, medical history, findings and test results were reviewed. Decision of termination of pregnancies due to trauma were implemented by the help of records of obstetric follow-up including antenatal examination before injury and findings recorded by the obstetricians after injury. All data were analyzed statistically by using SPSS 22 programme.

Results

174 cases evaluated within the scope of the study, 61 (35.1%) were reported as subjected to violence, 113 (64.9%) traumas were due to accident. There was no significant difference in the number of cases over the years. The mean age of female victims was 24 ± 7.1 (19-41) years. 98 (86.7%) of accidents occurred as a result of motor vehicle crash whereas 15 (13.3%) cases due to falls. Indoor falls as home accident like downstairs fall or fall from chair reported in 8 (53.3%) cases and outdoor falls from high, like from tree, rock or wall reported in 7 (46.7%) of them. No cases were reported as occupational accident. In all traumas, only blunt force injuries were seen, no sharp injury or firearm injury was reported.

47(77%) out of 61 pregnant women were subjected to violence by their husbands, other 12 (19.7%) were abused by a known assailant like neighbour or co-worker, only 2 (3.3%) women were strucked by a stranger.

98 (56.3%) of 174 pregnant women were injured in their first trimester, 57 (32.7%) in the second trimester, 19 (10.9%) of them were in the third trimester. The origin of events distributed according to the pregnancy weeks are shown in Table-1. Correlation between the origin of events and the week of pregnancy was found to be statistically insignificant ($P>0.05$). In all trimesters approximately 1/3 of cases subjected to violence, 2/3 of them were reported to be accident.

Table 1. Distribution of the origin of events according to the pregnancy weeks

Pregnancy term	Origin of event				Total	
	Violence (assault)		Accident			
	n	%	n	%	n	%
1 st trimester	33	33.7	65	66.3	98	100.0
2 nd trimester	22	38.6	35	61.4	57	100.0
3 rd trimester	6	31.6	13	68.4	19	100.0
Total	61	35.1	113	64.9	174	100.0
$\chi^2=0.497$ P>0.05 df=2						

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For diagnosis, magnetic resonance imaging (MRI) was used in 12 cases, direct radiograph in 21 of them. 6 of the 12 cases visualized with MRI applied due to assault, other 6 due to motor vehicle accident. Of these, intracranial hemorrhage was diagnosed in 4 of assault cases, 2 of crashes. Before MRI, written informed consent was taken in all cases. In contrast, 21 women were unaware of their pregnancy when they applied to the hospital so direct radiograph was used for diagnosis. All 21 of them were in their first trimester; 5 were assaulted, 16 were hit by motor vehicle. They were questioned about pregnancy and after signed an informed consent about the unoccurrence of pregnancy, direct radiographic

imaging was done. 7 cases of bone fractures were diagnosed: 3 cases of cranial bones, 2 cases of nasal bone, 1 fracture of ulna and 1 of tibia. During their obstetric follow-up, no negative outcome on pregnancy was recorded because of radiologic imaging. Obstetric follow-up including antenatal screening and ultrasound examination after injury were done in all cases.

Contents of forensic reports are shown in Table-2. 6 (3.4%) women had lethal injury, 45 (25.9%) women were injured that could not be healed by simple medical intervention. The correlation between the origin of events and the reports' contents were statistically nonsignificant ($P>0.05$).

Decision of termination of pregnancies due to trauma were implemented by the help of records of obstetric follow-up including antenatal examination before injury and findings recorded by the obstetricians after injury. 3 (1.7%) pregnancies terminated prematurely, 2 caused by accident, 1 pregnant was assaulted. Of these preterm births, 2 of them had cesarean section, 1 was delivered vaginally. 2 pregnancies were recorded to be in their second trimester, 1 was in her third trimester. All 3 pregnancies terminated due to incident happened in 3 days following the day of the trauma. Assailant was identified to be the husband of the pregnant in which case, fetal loss resulted.

Table 2. Distribution of the origin of events according to the contents of forensic reports

Site Reports						
Origin of Event	Lethal Injury				Total	
	Existence		Nonexistence			
	n	%	n	%	n	%
Violence (assault)	4	6.6	57	93.4	61	100.0
Accident	2	1.8	111	98.2	113	100.0
Total	6	3.4	168	96.6	174	100.0

Pearson χ^2 $P>0.05$ $df=1$

Origin of Event	Simple Medical Intervention				Total	
	Not enough		Enough			
	n	%	n	%	n	%
Violence (assault)	17	27.9	44	72.1	61	100.0
Accident	28	24.8	85	75.2	113	100.0
Total	45	25.9	129	74.1	174	100.0

Pearson χ^2 $P>0.05$ $df=1$

Origin of Event	Termination of Pregnancy				Total	
	Happened		Not happened			
	n	%	n	%	n	%
Violence (assault)	1	1.6	60	98.4	61	100.0
Accident	2	1.8	111	98.2	113	100.0
Total	3	1.7	171	98.3	174	100.0

Pearson χ^2 $P>0.05$ $df=1$

Discussion

When a traumatized pregnant applies to a health institution, diagnostic tests and treatment can be different from other traumatized non-pregnant women. Visualization methods during pregnancy are limited to fetus sensitivity to irradiation. In all clinics, especially in emergency services, all women at fertile age should be questioned about the probability of pregnancy and informed consent should be taken. [2,9,10]. 21 cases presented in

this study were visualised by direct radiograph. These 21 women were determined to be unaware of their pregnancy when they applied to the hospital. All 21 of them were diagnosed to be in their first trimester. 5 of these cases were applied due to assault, 16 were hit by motor vehicle. When hospital records were reviewed, it was seen that these women had signed an informed consent about the unoccurrence of pregnancy, so direct radiographic imaging had been done. During their obstetric follow-up, no negative outcome on pregnancy was recorded because of radiologic imaging. This situation puts forth the importance of the questioning the traumatized women about the probability of pregnancy before radiologic imaging, taking informed consent and necessity of doing pregnancy test after approval of the patient. If no consent was taken on pregnancy status, there could be legal charge for the doctors in consequence of the incomplete hospital records of the studied cases. In the cases we evaluated, the absence of a problem in pregnancy follow-up in X-rayed cases may be due to the low number of cases and does not mean that a problem will not be encountered.

Trauma during pregnancy could be lethal to the mother and fetus [2,3,11]. According to the literature, most common types of traumas seen during pregnancy are motor vehicle crashes followed by falls and assaults [2-6]. Muench et al., claimed that 2% of pregnant women were hit by a car [12]. Poole et al., reported that 43.4% of traumatized pregnant women were injured because of traffic accidents [13]. In this study, it is determined that 113 (64.9%) cases of traumas were due to accident and 98 (86.7%) of them occurred as a result of motor vehicle crash. Approximately 1500-5000 fetal losses are reported annually as a result of car crash in the United States of America (USA) [14]. In our study, 3 pregnancies were lost due to trauma and 2 of them occurred as a result of traffic accidents.

Violence against women is the most important public health problem seen in our country and worldwide. Literature declared that violence against women did not end up during pregnancy [15-20]. A multicenter multinational analysis including 19 countries, stated that physical violence against women during pregnancy changed between 2% to 31.5% [21]. A study in America, analyzed that 22% of pregnant women applied with trauma history were injured due to assault [4]. According to the literature, pregnant women exposed to violence nearly all assaulted by their partners [4,15-21]. A review of woman homicides in the last 25 year – period in Eskişehir put forth that 12 (8.1%) of 148 murdered victims were found to be pregnant at the time of murder and all were killed by their husbands [22]. In this study, 61 (35.1%) cases were reported to be assault. 47 (77%) out of 61 pregnant women were subjected to violence by their husbands. In the Article 87 of TPC, it is declared that preterm labor or abortion due to violence or assault of a pregnant woman increases the penalty charged to the assailant [1].

In one case of our study, the fetus was dead in utero because of the trauma itself. Assailant was the pregnant's husband. There was no defined obstetric problem during follow-ups before the incident. Trauma related lesions were identified at the head, neck, chest and abdomen of the patient. Also fracture of cranial bones associated with the intracranial hemorrhage visualized at the mother. In utero mort fetus was delivered by cesarean section.

Data about pregnancy week at the time of incident is quite variable

in the literature [2-6,23]. Cultural and regional effects are estimated to play role in these differences. In this study, 98 (56.3%) pregnant women were injured in their first trimester, 57 (32.7%) in the second trimester, 19 (10.9%) of them were in the third trimester. Occurrence of less injury in the last trimester claimed to be the result of less socialization at the last terms of pregnancy in our country.

Forensic report of cases were arranged in accordance with the related articles of TCP. It was recorded that 6 (3.4%) women had lethal injury and 45 (25.9%) women were injured that could not be healed by simple medical intervention. Our results were found to be consistent with the literature. Trauma during pregnancy differentiates from other traumas from the first examination till the forensic reporting. Informed consent should be taken from all referred traumatized women at fertile age before doing diagnostic tests. Pregnancy should exactly be excluded before radiologic examination. To determine the effects of trauma on the fetus, hospital records of obstetric follow-up should be investigated. Forensically, estimation of the effects of trauma on the pregnancy outcome should be cleared out by studying collaboratively with the other medical sciences especially obstetrics and gynecology.

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

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Ethical approval

The study was approved by the Non-Interventional Clinical Studies Ethics Committee of Eskişehir Osmangazi University (Protocol number: 2020/296).

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