



Predictive Factors for Acute Stress Disorder and Posttraumatic Stress Disorder after Motor Vehicle Accidents

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Key Words

Motor vehicle accidents · Acute stress disorder ·
Posttraumatic stress disorder · Predictive factors

ASD, limitations in work and social life, and lower social support scores. In developing countries like Turkey, long-term PTSD is commonly seen after traffic accidents.

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Abstract

Background: Since traffic accidents are more common in developing countries than in developed countries, we aimed to investigate the association of several factors with the development and persistence of posttraumatic stress disorder (PTSD) after traffic accidents. **Sampling and Methods:** In the study, 95 participants with injuries from traffic accidents were evaluated at 4 different times: in the beginning, and after 3, 6 and 12 months. **Results:** During the first evaluation, 41.1% (39) of our participants had acute stress disorder (ASD). It was found that lower perceived social support (OR = 0.0908, 95% CI = 0.034–0.243, p = 0.027) and higher peritraumatic dissociative experience scores (OR = 1.332, 95% CI = 1.170–1.516, p < 0.001) were significant predictors of ASD. In the evaluations after 3, 6 and 12 months after the accident, we found PTSD affected 29.8, 23.1 and 17.9% of the participants, respectively. Although limitations at work and in social life after a traffic accident were not related to PTSD at 3 months (OR = 1.2243, 95% CI = 0.529–76.059, p = 0.999) or at 6 months (OR = 63.438, 95% CI = 0.529–76.059, p = 0.089), limitations at work and in social life were predictors of PTSD at 12 months (OR = 155.514, 95% CI = 2.321–104.22, p = 0.019). **Conclusions:** The persistence of PTSD at the 12-month evaluation is related to

Introduction

Globally, traffic accidents are a major cause of death and injury among the adult population. For example, over 2 million deaths have been reported worldwide [1], and every year 1.5 million people are injured from vehicle accidents in the USA [2]. The injuries from traffic accidents cause serious social and economic problems, and are a threat to public health [3]. The health problems related to traffic accidents are not only physical injuries, but also comprise psychological problems, particularly posttraumatic stress disorder (PTSD). The frequency of PTSD following a traffic accident ranges between 10 and 46% [4, 5], and this rate varies in relation to the time elapsed after the accident. In previous studies, the reported prevalence of acute stress disorder (ASD) is 18–42% [5, 6–8], whereas the prevalence of PTSD is 23.1–25.2, 16.5–18.2 and 10–32% after 3 months [6, 10], 6 months [5, 9, 10] and 12 months [5, 11, 12], respectively.

The following conditions have been found to be associated with an increased risk of developing PTSD after a traffic accident: psychological problems prior to the trauma

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ma [4], the presence of dissociative reactions after the accident [5, 9], the development of ASD [6], avoidance behavior during coping [13], female gender [14, 15] and the severity of the trauma [10, 16]. Posttraumatic factors, such as stigma and social support systems, also affect the PTSD rates [17]. Although risk factors for PTSD after traffic accidents have been reported in previous studies, precise conclusions have not been reached. For example, female gender has been stated as a risk factor in vehicle accidents, yet some studies have not found such a relationship [18]. Although 88% of traffic accidents and related problems occur in developing countries [19], most of the studies are carried out in the developed countries. It has been reported that in Turkey around 400,000 traffic accidents occur every year, about 100,000 people get injured and 3,000 people are fatally injured [20]. The long-term follow-up studies from developing countries like Turkey not only provide an insight into the nature of PTSD and related factors, but can also shed light on variables like sociocultural differences between developing and developed countries that influence PTSD in traffic accidents. For this purpose, in the present study, we aimed to investigate the association of related factors with the development and persistence of PTSD after traffic accidents at 4 different times.

Material and Method

Subject Selection

Participants with injuries from traffic accidents, who attended the Emergency Department of Dicle University Hospital between January 2006 and June 2006, were included. Inclusion criteria were as follows: aged older than 18 years; absence of any traumatic symptoms, like cerebral edema confirmed by a neurosurgical consultation; absence of losses of consciousness or neurological deficits upon examination; no pathological findings on cerebral CT; absence of any physical or psychiatric condition that could impair communication; willingness to give consent to participation in the study. All injuries without organ loss (e.g. upper extremity amputation, eye loss) and not requiring an operation under general anesthesia were included. A total of 108 subjects were recruited and 95 of them agreed to participate and gave written consent, whereas the remaining 13 patients were excluded from the study.

Study Methods

A screening interview was carried out with patients who were going to be observed for at least 24 h; then, eligible patients, who were willing to participate, underwent their first evaluation in a suitable room prior to discharge. First evaluations were performed 3.897 ± 0.883 days after the accident in an appropriate setting with a face-to-face interview with a psychiatrist. Sociodemographic factors were noted and the following evaluation materials were employed: the Peritraumatic Dissociative Experiences

Questionnaire (PDEQ) [21], the Multidimensional Scale of Perceived Social Support (MSPSS) [22], and the related Structured Clinical Interview for DSM Disorders (SCID) for ASD according to DSM-IV [23, 22]; patients fulfilling the criteria of PTSD other than duration and disability were considered to have ASD. The second evaluation was performed 3 months later in 84 subjects who attended the follow-up visit. This time the Clinician-Administered PTSD Scale (CAPS) and a questionnaire regarding work and social life changes after the accident were administered. In the third evaluation performed 6 months after the accident, CAPS and the questionnaire regarding work and social life changes were administered to 78 subjects who were invited to the hospital. The last evaluation was performed after 1 year in 67 subjects, in which CAPS, the Multidimensional Scale of Perceived Social Support, and the questionnaire regarding work and social life changes were administered. All interviews and questionnaires were conducted by the same psychiatrist that had done the initial screening interview.

Study Material

1. Clinician-Administered PTSD Scale

CAPS usage was in accordance with DSM, and 3 fields specific for the diagnosis of PTSD were used [25]. CAPS was used to evaluate both the symptoms of PTSD and the effectiveness of the therapy. The scale scores range between 0 and 4, and represent the severity and frequency of each field. The total scale score is found by adding up the symptom frequency and severity points; thus, the range is between 0 and 136. A Turkish translation of the CAPS form is available, and its effectiveness and reliability have been confirmed [24]. In addition, its compatibility with the SCID has been reported. Validity analysis of the Turkish version of CAPS revealed a κ value of 0.84 for the compatibility between CAPS and SCID. For the overall scale, Cronbach's α coefficient was 0.91, the inter-observer reliability coefficient was between 0.82 and 0.99, and κ values were between 0.71 and 0.99. In the present study, for total points of the scale, the last month was evaluated.

2. Multidimensional Scale of Perceived Social Support

The MSSS is a scale with 12 items that are filled in by the subject [26]. There are 3 subgroups of interest relating to the source of the social support: family, friends and a special person; each of these has 4 related questions. By adding up the points of every 4 questions in the subgroups, and then adding up the points of the subgroups, the total points are found. Higher scale points indicate a higher level of support. The effectiveness and reliability of the scale in our country have been confirmed by Eker and Arkar [27]. In the present study, total points were used.

3. Peritraumatic Dissociative Experiences Questionnaire

This is a questionnaire consisting of 10 questions that are filled in by the subject. It investigates the presence of dissociative symptoms, like derealization, depersonalization and dissociative amnesia, which the subject might have experienced during or right after the trauma [27]. Total points range between 10 and 50, and the Turkish translation has been made by Geyran [28]. In the present study, total points were used.

4. Patient Evaluation Form

This form was prepared by the study team, and assessed demographic data such as: age, gender, marital status, monthly in-

Table 1. The demographic characteristics of the participants (n = 95)

Demographic characteristics	n	%
Gender		
Women	28	29.5
Men	67	70.5
Marital status		
Single	31	32.6
Married	64	67.4
Education		
None or primary school	52	54.7
Secondary school and upwards	43	45.3
Alcohol/drug abuse		
Yes	2	2.1
No	93	97.8
Psychiatric illness prior to the trauma		
Yes	9	9.5
No	86	90.5
Religion		
None/partial	55	57.9
Religious	40	42.1
Work state		
None/housewife	46	48.42
Working	49	51.58
Previous traffic accident		
Yes	11	11.6
No	84	88.4
Mean age, years	33.93 ± 19.78	
Mean income, USD	475.26 ± 314.43	
Mean MSPSS score	67.54 ± 17.79	

come, religious status (religious: trying to perform all the daily requirements of the religion, partially religious: has religious beliefs but does not perform daily religious duties, not religious: has religious beliefs but does not obey any rules), presence of psychiatric illness prior to the trauma, work status and alcohol/drug abuse.

Statistical Evaluation

All analyses employed the SPSS program (version 15.0). Analyses included descriptive statistics and logistic regression. The associations of risk factors and the conditional risk of ASD and PTSD were estimated using odds ratios (OR) and 95% confidence intervals (CI). Logistic regressions were used to identify independent predictors of ASD and PTSD after 3, 6 and 12 months.

Results

In the present study, 30.1% of the subjects were female and 69.9% were male (mean age: 33.93 ± 19.78 years). The mean monthly income per family was USD 375.26 ± 214.43. During the first evaluation, the multi-dimension-

Table 2. Logistic regression model for predictors of ASD

Independent variables	ASD		
	OR	95% CI	p
Gender	1.094	0.139–8.592	0.932
Marital status	1.151	0.228–5.815	0.865
Education	1.114	0.225–5.519	0.895
Previous psychiatric illness	0.403	0.032–5.005	0.479
Religion	0.564	0.113–2.822	0.486
Work state	0.634	0.111–3.617	0.608
Previous traffic accident	0.464	0.045–4.797	0.519
Age	1.037	0.969–1.109	0.294
Income	1.000	0.997–1.004	0.887
MSPSS score	0.908	0.834–0.989	0.027*
PDEQ score	1.332	1.170–1.516	<0.001*

* p < 0.05.

ally perceived social support score was 67.54 ± 17.79. The demographic characteristics of the subjects are given in table 1.

According to the first evaluation, 39 (41.1%) of the participants had ASD. The independent predictors of ASD in subjects who experienced the accident were examined, where ASD development was the dependent variable. The model building process with ASD as the dependent variable demonstrated that a lower MSPSS score (OR: 0.0908, 95% CI: 0.834–0.989, p = 0.027) and a higher PDEQ score (OR: 1.332, 95% CI: 1.170–1.516, p < 0.001) were significant predictors of ASD. The results of the logistic regression model for predictors of ASD are given in table 2.

In the evaluations 3, 6 and 12 months after the accident, we found PTSD in 29.8% (25), 23.1% (18) and 17.9% (12) of the participants, respectively. To identify the predictors, factors were included in logistic regression from after 3, 6 and 12 months of PTSD. The dependent variable was the development of PTSD after 3, 6 and 12 months. Limitations at work and social life after a traffic accident were not related to the presence of PTSD at 3 months (OR = 122.43, 95% CI = 0.000, p = 0.999) or at 6 months (OR = 63.438, 95% CI = 0.529–76.059, p = 0.089); however, they were a significant predictor of PTSD at 12 months (OR = 155.514, 95% CI = 2.321–104.22, p = 0.019). Although the PDEQ score was associated with the presence of PTSD only at 3 months (OR = 1.161, 95% CI = 1.031–1.308, p = 0.014), lower MSPSS scores were associated with the presence of PTSD at 3, 6 and 12 months (OR = 0.847, 95% CI = 0.764–0.983, p = 0.002; OR = 0.807, 95% CI = 0.711–0.917, p = 0.001; OR = 0.760, 95% CI =

Table 3. Logistic regression model for predictors of PTSD after 3, 6 and 12 months

Independent variable	PTSD at 3 months			PTSD at 6 months			PTSD at 12 months		
	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Gender	0.325	0.032–3.246	0.338	3.779	0.418–34.14	0.236	155.510	2.321–146.35	0.033*
Education	0.551	0.096–1.006	0.504	1.449	0.211–9.954	0.706	1.438	0.066–31.222	0.817
Work state	0.326	0.040–2.638	0.326	0.660	0.056–7.835	0.742	41.852	0.645–27.46	0.079
ASD	17.682	2.153–145.4	0.008	356.024	1.698–7.466	0.031	9.083	1.615–12.426	0.46*
Limitations at work and in social life after traffic accident	122.43	0.000	0.999	63.438	0.529–	0.089	155.514	2.321–104.22	0.019*
Income	1.001	0.996–1.006	0.826	1.001	0.997–	0.807	0.997	0.986–1.008	0.626
MSDSS	0.847	0.764–0.983	0.002**	0.807	0.711–0.917	0.019*	0.760	0.609–0.949	0.015*
PDEQ	1.161	1.031–1.308	0.014*	1.026	0.211–9.954	0.730	0.975	0.817–1.164	0.781

* $p < 0.05$; ** $p < 0.01$.

0.609–0.949, $p = 0.015$, respectively). The results of the logistic regression model for predictors of PTSD after 3, 6 and 12 months are given in table 3.

Discussion

Of the 95 subjects who participated in the present study, only 67 (70.5%) were available for the last evaluation. Although the number of participants completing the study is low, it is similar to the numbers in other follow-up studies after traffic accidents [6, 12, 29]. Difficulties in the completion of follow-up studies after traffic accidents are quite common. In the present study, some participants failed to complete the study due to following reasons: residency in another town, economic issues, feeling better and not needing further visits. In the present study, the male to female ratio was about 2.5. In most studies, this ratio is close to 1 [29–31], although several studies have reported ratios up to 2 [12]. The relatively high male to female ratio in the present study may be attributed to the social culture of the region, where women are much more home-oriented compared to men who adopt a more extrovert lifestyle.

According to the first evaluation, there was ASD in over 40% of the participants. This is a quite high ratio in comparison with some studies that reported 13–18% [5, 6, 8]. This high rate of ASD in the present study may be attributed to the use of PTSD diagnostic criteria (fulfilling the criteria of PTSD other than duration and disability were considered as ASD) in the initial evaluation. Likewise, several studies using similar methods have reported similar results [9, 15]. This high ASD rate may also be caused by the highly traumatic lifestyle in the region.

In the evaluations 3, 6 and 12 months after the accident, we found PTSD rates of 29.8, 23.1 and 17.9%, respectively. This finding is similar to the results of other studies [5, 9–11, 15].

In the present study, higher dissociation scores were found to be a significant predictor of ASD and PTSD at 3 months, but the same was not true for the presence of PTSD at 6 and 12 months. There are conflicting findings concerning the extent to which acute dissociative symptoms predict PTSD. In many studies, peritraumatic dissociation was a powerful predictor of subsequent PTSD [5, 9, 32, 33]. However, Murray et al. [33] found that although peritraumatic dissociation measured within 24 h to 1 week of the trauma predicted PTSD 6 months after a motor vehicle accident, persistent dissociation at 4 weeks was a more powerful predictor. The lack of a relation between dissociation and PTSD at 6 and 12 months may be attributed to the administration of the dissociation scale around the third day after the trauma in the present study. Further studies may clarify whether differences in the populations studied or methodological differences have contributed to these different results.

Our findings suggest that ASD remains as a predictor of PTSD after 3, 6 and 12 months. ASD was the most influential factor in the development of PTSD [6, 33, 34]. However, a review found that the positive predictive power of the ASD diagnosis was low [35]. According to this study, marked methodological variability across studies seems to contribute to the different findings regarding the relation between ASD and PTSD. ASD differs from PTSD in 2 critical ways. First, the disturbance must last for a minimum of 2 days and a maximum of 4 weeks (after which time a diagnosis of PTSD could be made). Second, the ASD criteria emphasize dissociative reactions.

In the present study, a lower perceived social support score was predictive of ASD and PTSD at all time points. Previous studies have reported relationships between PTSD and social support [5, 9, 17]. Insufficiency of social support following trauma may precipitate a negative cycle, i.e. increasing the severity of mental discomfort leading to ASD which in turn may unfavorably affect social support systems by impairing social interactions and lead to isolation. In addition, indifference, anger, despair and depression that develop following trauma may lead to impaired perception of the support [5].

Although limitations at work and in social life experienced after a traffic accident were not related to the presence of PTSD at 3 and 6 months, they were associated with PTSD at 12 months. There are scarce data on the mechanism of the relation between social/occupational limitations and PTSD. However, these problems may be an indicator of the trauma severity, and they may represent chronic stressors unfavorably affecting the coping mechanisms of the patient. Thus, they may pose a difficulty for the patient in coping with the mental consequences of the trauma. Additional stressful events and losses have been shown to be risk factors for the development of PTSD following a traumatic event [7, 10].

In our study, female gender was not associated with ASD, PTSD at 3 months and PTSD at 6 months. On the other hand, following a traffic accident, women had a greater chance of suffering from PTSD at 12 months

compared to men. Many studies have shown that female gender is a risk factor for PTSD after traffic accidents [9, 10, 14, 15], although some studies have not found any relationship [18]. Women could communicate their symptoms easily, they were more vulnerable and found accidents more terrifying; all of these factors have been suggested as explanations of the higher incidence of PTSD [10].

Several limitations of our study are as follows: lack of knowledge of traumatic experiences prior to the traffic accident, low study completion rate (70% of participants failed to complete the study) and small sample size.

In conclusion, our findings suggest that the development of PTSD at 3 months after a traffic accident is predicted by the development of ASD, peritraumatic dissociative scores and social support scores. Limitations in social/occupational life, ASD and social support scores are associated with the persistence of PTSD at 12 months. In developing countries like Turkey, long-term PTSD is commonly seen after traffic accidents. Early intervention and rehabilitation are needed for the risk groups that have been determined. Also, we found a relatively high male to female ratio in the present study. Investigations into sociocultural differences, like the gender difference, are needed to assess their influence on PTSD after traffic accidents, especially between developing and developed countries.

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