Possible Risk Factors for Acute Stress Disorder and Post-Traumatic Stress Disorder After an Industrial Explosion

Endüstriyel Bir Patlama Sonrasında Akut Stres Bozukluğu ve Travma Sonrası Stres Bozukluğu Gelişiminde Olası Risk Faktörleri

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ABSTRACT

Introduction: There have been deaths and injuries after an explosion which happened in an industrial region in Ankara in February 2011. The aim of this study was to determine the prevalence of acute stress disorder (ASD) and posttraumatic stress disorder (PTSD), and to determine the variables which can be the risk factors for PTSD.

Methods: In this study, we included a total of 197 subjects who were present at the factory building and at the four offices nearby when the disaster occurred. All the participants were assessed one month after the explosion and 157 of them were re-assessed six months after the explosion. Socio-demographic information forms were given and the Clinician-Administered PTSD Scale (CAPS) was administered to the participants one month after the explosion. Psychiatric assessments were done using the structured clinical interview for DSM-IV axis-I disorders (SCID-I). The CAPS was re-applied six month after the disaster.

Results: At the first-month assessments, ASD was detected in 37.1% of participants and PTSD in 13.7%, whereas PTSD was observed in 16.6% of subjects at the sixth month of the accident. According to the first month data, having any psychiatric disorder before the incident, physical injury, acquaintances among the dead and the injured people, being involved in the incident and seeing dead people were detected as the risk factors for PTSD. At the sixth month assessment, physical injury, acquaintances among the dead and the injured, being involved in the incident were seen as risk factors for PTSD.

Conclusion: ASD and PTSD can be seen after an explosion. Having a previous psychiatric disorder and being directly affected by trauma and being injured are the risk factors for PTSD. This study implies that preventive mental health care services should include the management of current psychiatric condition and employee safety issues. (*Archives of Neuropsychiatry 2014; 51: 23-29*)

Key words: Post-traumatic stress disorder, acute stress disorder, explosion, risk factors

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ÖZET

Amaç: Şubat 2011'de Ankara'da bir sanayi bölgesinde yaralanma ve can kaybının olduğu bir patlama gerçekleşmiştir. Bu çalışmanın amacı, bu kişiler arasında Akut Stres Bozukluğu (ASB) ve Travma Sonrası Stres Bozukluğunun (TSSB) yaygınlığını tespit etmek ve TSSB için risk faktörü olabilecek değişkenleri saptamaktır.

Yöntem: Felaket gerçekleştiği sırada fabrika binası ve yakınındaki 4 binada bulunanlardan 197 kişi çalışmaya katılmıştır. Tüm katılımcılar patlamadan bir ay sonra değerlendirilmiş ve bu kişilerden 157'si altıncı ayda tekrar değerlendirilmiştir. Katılımcılara patlamadan sonraki birinci ayda sosyodemografik veri formu ve klinisyen tarafından uygulanan travma sonrası stres bozukluğu ölçeği; TSSB-Ö (Clinician-Administered-PTSD Scale; CAPS) uygulanmıştır. Katılımcıların psikiyatrik tanımlarını saptamak için, DSM-IV eksen-I bozuklukları için yapılandırılmış klinik görüşme (SCID-I) uygulanmıştır. Altıncı ayda TSSB-Ö tekrar uygulanmıştır.

Bulgular: Birinci ayda katılımcıların %37,1'inde travmaya bağlı ASB, %13,7'sinde TSSB tespit edilmiştir. Altıncı ayda TSSB %16,6 oranında bulunmuştur. Birinci ayda, öncesinde herhangi bir ruhsal hastalık tanısına sahip olma, travmada fiziksel zarar görme, ölen ve yaralananlar arasında tanıdık olması, olay yerinin merkezinde olma ve ölen kişi görme, TSSB gelişiminde risk faktörü olarak değerlendirilmiştir. Altıncı ayda bireyde, fiziksel hasar görme, ölen veya yaralananlar arasında tanıdık olması ve olay yerinin merkezinde olma TSSB gelişiminde risk faktörü olarak değerlendirilmiştir.

Sonuç: Patlama sonrasında ASB ve TSSB gibi psikopatolojiler yüksek oranda gözlemlenmektedir. Daha önceden bir ruhsal hastalık bulunması yanı sıra patlamadan doğrudan etkilenme ve fiziksel yaralanmanın travma sonrası stres bozukluğu geliştirmede risk faktörü olduğu, koruyucu ruh sağlığı hizmetlerinde mevcut psikiyatrik durumun yönetimi ve çalışan güvenliğinin önemli olabileceği düşünülmüştür. (*Archives of Neuropsychiatry 2014; 51: 23-29*)

Anahtar kelimeler: Travma sonrası stres bozukluğu, akut, stres bozukluğu, patlama, risk faktörleri

Çıkar çatışması: Yazarlar bu makale ile ilgili olarak herhangi bir çıkar çatışması bildirmemişlerdir.

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Introduction

In February 2011, an explosion which involved 9 deaths and 27 injuries according to formal sources occurred in an industrial area in Ankara. As a result of the explosion an earthquake effect was experienced in the workplaces nearby. Although there are many studies related with natural disasters in the literature, limited number of studies have been conducted in relation with industrial disasters.

Traumatic event is defined as experience of a real death or threat of death, a severe injury, experience, witnessing or learning of a threat to physical integrity of self or others and showing reactions including fear, terror and despair to this event. Acute stress disorder (ASD) is an acute stress reaction which is caused by a traumatic event and occurs in one month at most after the event lasting between 2 days and 4 weeks. Dissociative symptoms including difficulty in perception of the events going on around, depersonalization and derealization may occur during the experience of traumatic event or after the event. PTSD is a psychological disorder which occurs after a significant event creating trauma and leads to hypervigilance, avoidance of stimuli which remind of trauma and reexperience of the traumatic event by way of dreams and "flashbacks" lasting for at least one month (1).

Although the prevalence of lifelong experience of trauma ranges between 21.4% and 89.6%, PTSD develops only in 15% of the individuals exposed to trauma (2,3). The lifelong prevalence of PTSD in adults is 7.8% (3).

The risk factors related with occurrence of PTSD include personal factors (gender, age, tendency to stress, coping abilities, presence of other psychiatric diseases), environmental factors (social and cultural characteristics, psychosocial support, economical level) and factors related with explosion (type, severity, physical damage and distance of the individual from the place of disaster) (4). The distance of the individual from the place of event and levels of exposure are very significant risk factors in occurrence of PTSD especially in industrial explosions (5). Presence of psychiatric disorders before the disaster has been reported to be another risk factor.

It is not rare that another psychiatric diagnosis is found together with PTSD. When the other co-diagnosis psychiatric disorders were examined, it was found that at least one other psychiatric disorder accompanied in axis-I with a rate of 79%. The most common of these psychiatric disorders is major depressive disorder (MDD) (30-50%) (6).

In follow-up studies conducted after disasters, the high rates of PTSD were observed to be maintained. Potential risks which cause to these rates have been evaluated in many studies (6). In our previous study related with this explosion, personal beliefs were evaluated in the individuals who had been exposed to explosion at the first month after the explosion directed to potential risks. In this study, evaluation of the individuals who had been exposed to the explosion was made at the first and

sixth months after the trauma and it was aimed to determine the sociodemographic properties which could constitute a risk for PTSD, the differences of exposure to the explosion and other accompanying psychiatric diagnoses.

Methods

The individuals who were present in the factory building and 4 different workplace buildings nearby were included in the study. It was found that 8 (3.27%) of 245 individuals who were found to have been exposed to the explosion did not fill in the data forms appropriately and 40 (16.32%) individuals could not be reached because of some reasons (movement of the workplace, quitting from that workplace, being outside the city). Thus, the data of the first month were evaluated for 197 (80.41%) individuals. At the first month of the study, Clinician-Administered PTSD Scale (CAPS), sociodemographic data form and SCID-I (clinical interview structured for DSM-IV axis disorders in terms of accompanying psychiatric diagnoses) were applied to the participants. At the sixth month of the study, 157 individuals were evaluated, because some workplaces were moved to another place and some employees changed their workplaces. At the sixth month of the study, CAPS was applied to the participants once again. Before the study was initiated, approval form the ethics committee of Etlik İhtisas Education and Research Hospital. Inclusion in the study was based on voluntariness and individuals who were not found to have intellectual and physical ability to participate in the interview were excluded from the study. Informed consent was obtained from the individuals who accepted to participate in the study. The participants were reached by way of workplace and home visits. The data collection tools were applied to the participants by 2 psychiatrists, 3 psychiatry residents and 1 psychologist.

Scales

The Sociodemographic Data Form

This form which was created by the authors of the study was designed as 2 parts. The first part included information related with age, gender, marital status, education level, monthly income, the duration of working at that workplace, presence of previous psychiatric disease and use of psychotropic medication because of this disease. The second part included questions related with the cause for being at the place of event, if the individual saw dead or injured people, if there were acquaintances at the place of event, if any acquaintance lost his/her life, how the individual was exposed to the event and if the individual had any physical damage.

The Clinician-Administered PTSD Scale (CAPS)

This scale was developed by Blake et al. (7). It is a structured interview which evaluates the frequency and intensity of PTSD symptoms and can make a diagnosis of current and lifelong PTSD. It assesses PTSD symptoms with 17 questions and gives the opportunity to evaluate the symptom clusters of reexperi-

ence, avoidance and blunting and hyperalertness separately. The Turkish adaptation, validity and reliability study of this scale which is a likerta type scale was performed by Aker et al. (8).

SCID-I

This is a structured clinical interview form developed by First et al. (9) in order to make DSM-IV axis diagnoses. Its Turkish validity and reliability Fisher's study was performed in 1999 by Özkürkçügil et al. (10).

Statistical analysis

All mdata obtained in the study were analyzed using "Statistical Packages for the Social Science" (SPSS) statistical program. After descriptive statistical analyses were performed (frequency, percentage distribution, mean $\pm$ standard deviation), Pearson chi-square test and Flsher's exact test were used to determine is the groups were different in terms of discrete variables. Shapiro Wilkins test was used to find if the continuous variables were compatible with the normal distribution. In comparison of two groups, Student's T test was used when para-

metric assumptions were met and Mann-Whitney U test was used when parametric assumptions were not met. A p value of $<.05$ was considered statistically significant.

Results

General Sociodemographic Properties

A statistically significant difference was found between the subjects with and without PTSD in terms of education time when the sociodemographic properites of the participants were examined. This difference was also significant in the sample reached at the sixth month ($X^2=11.46$, $p=.022$; $x^2=11.86$, $p=.018$, respectively for the first and sixth months). The sociodemographic data of the participants evaluated at the first month after the explosion are shown in Table 1.

One hundred and ninety-seven individuals could be reached at the first month after the explosion. It was found that 73 individuals (37.1%) experienced trauma-related acute stres disorder at the first month and 27 (13.7%) of these individuals had PTSD.

Table 1. Comparison of the sociodemographis data of the subjects with and without PTSD at the first and sixth month

	1 st month PTSD n, %		1 st month, participants		6 th month PTSD n, %		6 th month participants		
	(+)	(-)	n, %	x^2, p	(+)	(-)	n (%)	x^2	p
Female	8, 29.6%	45, 26.5%	53, 26.9%	0.12, .731	10, 38.5%	35, 26.7%	45, 28.7%	1.46	.226
Male	19, 70.4%	125, 73.5%	144, 73.1%		16, 61.5%	96, 73.3%	112, 71.3%		
Education level									
Primary school	8, 29.6%	18, 10.6%	26, 13.2%	11.46, .022	6, 23.1%	14, 11.1%	20, 12.7%	11.86	.018
Secondary school	9, 33.3%	37, 21.8%	46, 23.4%		11, 42.3%	26, 20.6%	37, 23.5%		
High-school	5, 18.5%	55, 32.4%	60, 30.5%		4, 15.4%	46, 36.5%	50, 31.8%		
University	5, 18.5%	60, 35.3%	65, 33%		5, 19.2%	40, 31.8%	45, 32.0%		
Marital status									
Single	12, 44.4%	66, 38.8%	78, 39.6%	7.19, .066	10, 38.4%	48, 37.8%	58, 37.9%	.819	.845
Married	14, 51.9%	101, 59.4%	115, 58.4%		16, 61.6%	79, 62.2%	95, 62.1%		
Income level									
0-700 TL	13, 48.1%	38, 22.4%	51, 25.9%	11.00, .051	10, 38.4%	31, 23.6%	41, 25.9%	3.33	.649
700-1500 TL	10, 39.9%	86, 50.6%	96, 48.7%		11, 42.3%	65, 49.6%	77, 48.7%		
>1500 TL	4, 14.8%	46, 27.1%	96, 48.7%		5, 19.3%	35, 26.8%	40, 25.4%		
History of previouspsy chiatric disease									
Yes	9, 33.3%	25, 14.7%	34, 17.3%	5.66, .017	8, 30.8%	22, 16.8%	30, 19.1%	2.74	.098
No	18, 66.7%	145, 85.3%	163, 82.7%		18, 69.2%	109, 83.2%	127, 80.9%		
Previous use of psychotropics									
Yes	5, 18.5%	18, 10.6%	23, 11.7%	1.42, .233	5, 19.2%	16, 12.2%	21, 13.3%	.922	.337
No	22, 81.5%	152, 89.4%	174, 88.3%		21, 80.8%	115, 87.8%	136, 86.7%		
Duration of working in the workplace									
0-1 year	10, 37.0%	61, 35.9%	71, 36.0%	1.76, .415	9, 34.6%	46, 35.1%	55, 35.0%	.829	.661
0-2 >1 year	17, 62.9%	109, 64.1%	126, 64.0%		17, 65.4%	85, 64.9%	102, 65.0%		

The p value which is statistically significant is shown bold

At the sixth month after the explosion, 157 of these individuals could be reached and these subjects were evaluated in terms of PTSD: PTSD was found in 26 individuals (16.6%). At the sixth month, a statistically significant difference was found only in the area of education among the sociodemographic data between the individuals with and without PTSD (Table 1).

Presence of previous psychiatric disease

The sociodemographic data form interrogated if the subjects had any previous psychiatric disease before the explosion. The sociodemographic data form did not include detailed questions related with previous diagnoses. 34 individuals (17.3%) stated that they had had a psychiatric disorder previously and 23 individuals (11.7%) stated that they had received psychiatric treatment. Presence of previous psychiatric disease was found to be different between the individuals who did and did not develop PTSD in favor of the ones who developed PTSD ($\chi^2=5.66$; $p=.017$) (Table 1).

Types of exposure to trauma

When the questions related with the levels of physical exposure to trauma were evaluated, it was found that 166 (84.3%) were not damaged physically, 24 (12.2%) were physically damaged to a small extent and 7 (3.6%) were damaged severely. One hundred and seven (54.3%) of the participants stated that they saw injured people and 49 (24.9%) stated that they saw dead people. 131 (66.5%) of 197 individuals who participated in the study were exposed to trauma with the effect of hearing and shake, 38 (18.3%) were exposed to trauma with the effect of

hearing, visual effect and shake and 30 (15.2%) were exposed to trauma by being present in the event. When the subjects who could be reached at the first month were evaluated, it was found that having seen dead people, presence of mild and severe physical damage, presence of acquaintances among dead and injured people and being present in the event showed a statistically significant difference in favour of development of PTSD ($\chi^2=4.22$ $p=.040$; $\chi^2=15.17$, $p=.001$; $\chi^2=7.78$, $p=.005$; $\chi^2=21.14$, $p=.000$). Comparison of the types of exposure to trauma in the groups who did and did not develop PTSD at the first month is shown in Table 2.

When the answers given to the questions (during the assessment at the first month) related with the levels of physical exposure to trauma were evaluated in the subjects who were reached again at the sixth month, it was found that 130 (82.8%) had no physical damage, 21 (13.4%) had mild physical damage and 6 (3.8%) had severe physical damage. It was found that 86 (54.7%) of this group saw injured people and 40 (25.5%) saw dead people. 104 (66.2%) of 157 subjects who were reached again at the sixth month were exposed to trauma with the effect of hearing and shake, 30 (19.1%) were exposed to trauma with the effect of hearing, visual effect and shake and 23 (14.7%) were exposed to trauma by being present in the event. The variables which showed a statistically significant difference in favour of development of PTSD between the subjects who did and did not have PTSD among the subjects who could be reached at the sixth month included presence of mild and se-

Table 2. Comparison of the types of exposure to trauma between the groups who did and did not develop PTSD at the first month

	1 st month PTSD n, %		1 st month, participants		6 th month PTSD n, %		6 th month participants	
	(+)	(-)	n, %	χ^2 -p	(+)	(-)	n, %	χ^2 -p
Having seen injured people								
Yes	18, 66.7%	89, 52.4%	107, 54.3%	1.92-.165	17, 65.3%	69, 52.7%	86, 54.7%	1.41-.234
No	9, 33.3%	81, 47.6%	90, 45.7%	9, 34.7%	62, 47.3%	71, 45.3%		
Having seen dead people								
Yes	11, 40.7%	38, 22.4%	49, 24.9%	4.22-.040	9, 34.7%	31, 23.7%	40, 25.5%	1.37-.242
No	16, 59.3%	132, 77.6%	148, 75.1%	17, 65.3%	100, 76.3%	117, 74.5%		
Physical injury								
None	16, 59.3%	150, 88.2%	166, 84.3%	15.17-.001	15, 57.7%	115, 87.8%	130, 82.8%	14.10-.001
Mild	8, 29.6%	16, 9.4%	24, 12.2%	9, 34.6%	12, 9.2%	21, 13.4%		
Severe	3, 11.1%	4, 2.4%	7, 3.6%		2, 7.7%	4, 3.0%	6, 3.8%	
Acquaintance among dead/injured people								
No	15, 55.6%	136, 80.0%	151, 76.6%	7.78-.005	14, 53.8%	108, 82.4%	122, 77.7%	10.24-.001
Yes	12, 44.4%	34, 20.0%	46, 23.4%	12, 46.2%	23, 17.6%	35, 22.3%		
Type of witnessing								
Hearing/shake	13, 48.1%	118, 69.4%	131, 66.5%	21.14-<.001	10, 38.5%	94, 71.6%	104, 66.2%	24.96-<.001
Hearing, visual, shake	2, 7.4%	34, 20.0%	36, 18.3%	4, 15.4%	26, 19.8%	30, 19.1%		
Being inside the event	12, 44.4%	18, 10.6%	30, 15.2%	12, 46.1%	11, 8.6%	23, 14.7%		

Statistically significant p values are shown bold.

vere physical damage, presence of acquaintances among dead and injured people and being present in the event. ($\chi^2=14.10$, $p=.001$; $\chi^2=10.24$, $p=.001$; $\chi^2=24.96$, $p<.001$) (Table 2).

Accompanying psychiatric disease

Among the subjects who could be reached at the first month, 91 (46.2%) were found to have no psychiatric diagnosis, 55 (27.9%) were found to be diagnosed with a single psychiatric disease, 28 (14.2%) were found to be diagnosed with two psy-

chiatric diseases, 23 (11.7%) were found to be diagnosed with three and more psychiatric diseases (Table 3). These diagnoses were current diagnoses and did not include previous diagnoses.

Among 106 subjects who had a codiagnosis, 40 (20.3%) were found to have major depressive disorder (MDD), 53 (26.9%) were found to have simple phobia, 22 (11.2%) were found to have generalized anxiety disorder (GAD), 17 (8.6%) were found to have obsessive compulsive disorder (OCD) and 18 (9.1%) were found to have social phobia (SP) (Table 3).

The subjects who were diagnosed with acute stress disorder were evaluated in terms of the distribution of all psychiatric diagnoses. Accordingly, a significant correlation was found between PTSD and MDD and GAD, but no significant correlation was found with simple phobia, OCD and SP (Table 4).

At the first month of the study, the subjects who were and were not diagnosed with PTSD were evaluated in terms of the distribution of all psychiatric diagnoses and a significant correlation was found with MDD ($p=.004$), whereas no significant correlation was found with simple phobia, GAD, OCD and SP ($p=.902$; $p=.192$; $p=.218$ and $p=.292$) in the group who were diagnosed with PTSD (Table 4).

When the subjects who were and were not diagnosed with PTSD were evaluated at the sixth month of the study in terms of SCID-I diagnoses at the first month, a statistically significant correlation was found with MDD, whereas no correlation was found with simple phobia, GAD, OCD and SP (Table 4).

Discussion

Advancements in industry increase the risk of disasters in this area. Significant psychosocial impact occurred on the victims of this explosion which occurred in a big industrial region in Ankara.

Table 3. Psychiatric examination and SCID-I results of all participants

	n (197)	Mean (100%)
No psychiatric diagnosis	91	46.2%
A single psychiatric diagnosis	55	27.9%
Simple phobia	28	14.2%
MDD	8	4.1%
OCD	5	2.5%
Social phobia	5	2.5%
Others	9	4.6%
Two psychiatric diagnoses	28	14.2%
MDD+simple phobia	8	4.1%
MDD+GAD	6	3.0%
Social phobia+simple phobia	4	2.0%
MDD+panic disorder	2	1.0%
Others	8	4.1%
Three and more psychiatric diagnoses	23	11.7%

MDD: Major depressive disorder; OCD: Obsessive compulsive disorder; GAD: Generalized anxiety disorder

Table 4. The rates of additional psychiatric diagnoses in all participants in the subjects with PTSD and in the subjects with acute stress disorder at the end of SCID-I

Distribution of psychiatric diagnosis	All participants n/197	%	Subjects with PTSD n/27,%	X ² /p	Subjects with ASD n/73,%	X ² ,p	Subjects with PTSD at the 6 th month n/26	x ² /p
MDD	40/197	20.3%	11/27	8.07	26/73	16,80	11/26	10.85
			40.7%	p=.004	35.6%	p<.001	42.3%	p=.001
Simple phobia	53/197	26.9%	7/27	.02	22/73	.62	8/26	.73
			25.9%	p=.902	30.1%	p=.432	30.7%	p=.392
GAD	22/197	11.2%	5/27	1.70	14/73	7.50	3/26	.00
			18.5%	p=.192	19.2%	p=.006	11.5%	p=.990
OCD	17/197	8.6%	4/27	1.52	7/73	.14	2/26	.01
			14.8%	p=.218	9.6%	p=.713	7.7%	p=.905
Social phobia	18/197	9.1%	1/27	1.11	7/73	.02	4/26	.91
			3.7%	p=.292	9.6%	p=.866	15.4%	p=.338

Statistically significant p values are shown bold.

MDD: Major depressive disorder; OCD: Obsessive compulsive disorder; GAD: Generalized anxiety disorder

In the assessment of the study performed at the first after the explosion, the rate of acute stress disorder was found to be 37.1% and the rate of PTSD was found to be 13.7%. At the sixth month assessment, the rate of PTSD was found to be 16.6%. When the other disasters in the literature related with this subject which can be considered similar were examined, it was found that symptoms of posttraumatic stress disorder were observed with a rate of 73% in the first three months after the event in a disaster of fuel platform and the rate of PTSD was found to be 21% ten years after the event (11). PTSD was found with a rate of 26% in the survivors during the assessment performed 6 months after an airplane accident (12). In many studies, the rate of development of PTSD following disasters has been reported to be 30-60% and the frequency of PTSD has been found to be higher in disasters caused by humans or technological events compared to natural disasters (13). The rates emerging as a result of this disaster appear to be lower compared to the relevant literature. However, this difference seems to be related with the type of exposure to trauma.

When the survivors of the Clapham railway accident were evaluated, symptoms of stress related with the traumatic event was observed with a rate of 40% and a correlation was found between the severity of the traumatic event and traumatic symptom severity (14).

When the types of exposure to trauma were examined, the results suggested that type of exposure had an impact on development of PTSD. When the types of witnessing the event were examined in 27 subjects who developed PTSD in the first month, it was found that 12 (44.4%) were exposed to trauma inside the event and the other 15 subjects (46.6%) were affected by the event by way of hearing the event in the workplaces nearby, exposure to the effect of shake or witnessing the event. By the first month, PTSD developed in 12 (40%) of 30 subjects who were exposed to trauma in the event and in 15 (8.9%) of 167 subjects who witnessed the event near the place of the event (shake, visual and auditory effect). Accordingly, the rate of PTSD was statistically significantly higher in the subjects who were present at the place where the event occurred. Similarly, 12 (46.1%) of 26 subjects who were found to have PTSD at the sixth month were exposed to trauma inside the event. PTSD was found in 12 (52.2%) of 23 subjects who were exposed to trauma and in 11 (8.2%) of 134 subjects who were present in the workplaces nearby among the subjects who could be reached at the sixth month. Conclusively, the difference between the subjects who were in the workplaces where the explosion occurred and the subjects who were present in the workplaces nearby in terms of development of PTSD was also statistically significant at the sixth month. This finding is in parallel with the finding of Hodgins et al. that the only significant risk factor in terms of development of PTSD both at the third and 12th month in police officers exposed to a traumatic event was the severity of trauma (15). In addition, the rate of PTSD was found to be 44.1% in the subjects who were present at the place where the event occurred in the

bombing attack which occurred in the train station of Madrid and 12.3% in the subjects who lived nearby (16). The findings of this study conducted in Madrid are similar to our findings.

In our study, it was found that expression of previous history of psychiatric disease might be a risk factor in terms of development of PTSD in the first month, but was not a risk factor in terms of development of PTSD at the sixth month. Accordingly, being previously diagnosed with a psychiatric disease might be a risk factor in terms of occurrence of stress-related disorders. However, this is statistically insignificant in the long term. In the study of Eşsizoğlu et al. in which the potential risk factors in terms of development of PTSD in individuals exposed to a bombing attack, having a history of psychiatric disorder was considered a significant risk factor in terms of development of PTSD (17). Consideration of the factors which constitute a predisposition seems to be more important compared to presence of specific diagnosis or presence of psychopathology alone to understand the effect of the psychological status before trauma on development of PTSD (18).

According to SCID-I performed at the first month after the explosion, it was thought that only MDD among all the psychiatric disorders found in the subjects might be a risk factor in terms of development of PTSD at the first and sixth months. However, the fact that the DSM-IV time criterion for MDD was two weeks was a limitation. Therefore, it would be a conclusion far from speculation to consider this correlation an association rather than a risk factor. In our study, association of MDD was found in 40.7% of the subjects with PTSD. In large-scale prevalence studies related with this subject, association of major depression and PTSD was found to be 30-50% (3,6). A reason for this association might be the fact that MDD and PTSD overlap phenomenologically. Although the relation between MDD and PTSD is the subject matter of many studies, there is no clear conclusion (18). In addition, it has been found that GAD might be a risk factor for ASD. This shows that individuals who show symptoms of GAD before the event experience stress symptoms related with trauma more intensively in the first one month.

Exposure to physical injury, having seen dead people and having acquaintances among the dead and injured people were found to be the risk factors which might contribute to development of PTSD in the first month in the participants. Presence of physical damage and having acquaintances among the dead and injured people were found to be risk factors in terms of development of PTSD at the sixth month. These factors seem to be directly related with the severity of trauma. In a large population study related with the explosion which occurred in Nairobi in 1998 and caused to the death of 220 people, the factors including witnessing the event, loss of a relative in the event and injury were considered risk factors in terms of development of PTSD (19).

Finally, some limitations of the study will be mentioned. The limitations of the study include lack of more detailed information about the psychological status before the explosion and inadequate statistical power of the sample size in terms of

correlation. In addition, it could not be discriminated if depression among SCID-I current diagnoses was present before the explosion, since two weeks was sufficient for a diagnosis of depression according to DSM-IV. Detailed specification of the psychiatric diagnoses before the event would provide more useful information.

In conclusion, this study is important in terms of being related with development of PTSD after an industrial disaster. The facts that it is a field study conducted in this area, there are very limited number of similar studies and the study evaluated a 6-month follow-up period are important in terms of the study's support to the literature. In our study, the rate of PTSD and the risk factors in terms of development of PTSD are similar to the previous studies. Individuals who are inside the place of disaster or very near to the place of disaster and who have a diagnosis of MDD are a significant group in terms of follow-up and treatment. In addition, these data suggest that the security of employers has a significant role in protecting psychological health as well as physical health. Determining comorbid psychiatric diseases together with PTSD and risk factors is important in treatment of PTSD. Considering the low rate of presentation of individuals affected as a result of this disaster and similar disasters, these patients should be evaluated comprehensively and followed up and treated for long term.

References

1. DSM-IV Amerikan Psikiyatri Birlięi: Mental Bozuklukların Tanısal ve Sayımsal Elkitabı, Dördüncü baskı (DSM-IV), Amerikan Psikiyatri Birlięi, Washington DC, 1994, E, Köroęlu (çev), Hekimler Yayın Birlięi, Ankara, 1995; s.565-577.
2. Perkonig A, Kessler RC, Storz S, Wittchen HU. Traumatic events and post-traumatic stress disorder in the community: Prevalence, risk factors and comorbidity. *Acta Psychiatr Scand* 2000; 101:46-59.
3. Kessler RC, Sonnega A, Bromet E, Hughes M, Nelson CB. Posttraumatic stress disorder in the national comorbidity survey. *Arch Gen Psychiatry* 1995; 52:1048-1060.
4. Ozer EJ, Best SR, Lipsey TL, Weiss DS. Predictors of Posttraumatic Stress Disorder and Symptoms in Adults: A Meta-Analysis. *Psychol Bull* 2003; 129:52-73.
5. Rivière S, Schwoebel V, La Pierre-Duval K, Guinard A, Gardette V, Lang T. Predictors of symptoms of post-traumatic stress disorder after the AZF chemical factory explosion on 21 September 2001, in Toulouse, France. *J Epidemiol Community Health* 2008; 62:455-460.
6. Davidson JR, Hughes D, Blazer DG, George LK. Post-traumatic stress disorder in the community: an epidemiological study. *Psychol Med* 1991; 21:713-21.
7. Blake DD, Weathers FW, Nagy LM, Kaloupek DG, Gusman FD, Charney DS and Keane TM. The development of a Clinician- Administered PTSD Scale. *J Trauma Stress* 1995; 8:75-90.
8. Aker AT, Özeren M, Başıoęlu M, Kaptanoęlu C, Erol A, Buran B. Klinisyen tarafından uygulanan travma sonrası stres bozukluęu ölçeęi: (TSSB-Ö) geçerlilik ve güvenilirlik çalışması. *Türk Psikiyatri Derg* 1999; 10:286-293.
9. First MB, Spitzer RL, Gibbon M, Williams, JBW, Benjamin LS. Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), Clinical Version. Washington DC: American Psychiatric Press. 1997.
10. Özkürkçüoęlu A, Aydemir Ö, Yıldız M. DSM-IV Eksen I Bozuklukları İçin Yapılandırılmış Klinik Görüşmenin Türkçeye Uyarlanması ve Güvenirlik Çalışması. *İlaç Tedavi Dergisi* 1999; 12:233-236.
11. Hull AM, Alexander DA, Klein S. Survivors of the Piper Alpha oil platform disaster: long-term follow-up study. *Br J Psychiatry* 2002; 181:433-8.
12. Carlier IV, Gersons BP. Stress reactions in disaster victims following the Bijlmermeer plane crash. *J Trauma Stress* 1997; 10:329-335.
13. Galea S, Nandi A, Vlahov D. The epidemiology of post-traumatic stress disorder after disasters. *Epidemiol Res* 2005; 27:78-91.
14. Selly C, King E, Peveler R, Osola K, Martin N, Thompson C. Post-traumatic stress disorder symptoms and the Clapham rail accident. *Br J Psychiatry* 1997; 171:478-482.
15. Hodgins GA, Creamer M, Bell R. Risk factors for posttrauma reactions in police officers: A longitudinal study. *J Nerv Ment Dis* 1997; 185:498-506.
16. Gabriel R, Ferrando L, Cortón ES, Mingote C, García-Camba E, Liria AF, Galea S. Psychopathological consequences after a terrorist attack: an epidemiological study among victims, the general population, and police officers. *Eur Psychiatry* 2007; 22:339-346.
17. Eşsizioęlu A, Yaşan A, Bülbül İ, Önal S, Yıldırım EA, Tamer Aker T. Bir terörist saldırı sonrasında travma sonrası stres bozukluęu gelişimini etkileyen risk faktörleri. *Türk Psikiyatri Derg* 2009; 20:118-126.
18. Neria Y, Bromet EJ. Comorbidity of PTSD and Depression: Linked or Separate Incidence. *Biol Psychiatry* 2000;48:878-880.
19. Njenga FG, Nicholls PJ, Nyamai C, Kigamwa P and Davidson JRT. Posttraumatic stress after terrorist attack: psychological reactions following the US embassy bombing in Nairobi. *Br J Psychiatry* 2004; 185:328-333.