

Factors Affecting the Diagnosis of Post-Traumatic Stress Disorder After a Terrorist Attack

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Abstract

Objective: On 3 January 2008 explosives placed in an automobile on a thoroughfare in Diyarbakir, southeastern Turkey exploded in a terrorist attack. The aim of this study was to determine the risk factors for the diagnosis of and the rate of post-traumatic stress disorder (PTSD) among individuals who were eye- or earwitnesses to the explosion 1 and 3 months after the explosion. **Methods:** Among the residents and workers in close proximity to the explosion site, 216 individuals who were eye- or earwitnesses to the explosion were included in the study. A sociodemographic data form and a traumatic stress symptom scale were administered to the participants 1 and 3 months following the explosion.

Results: In all, 12.5% of the participants were diagnosed with PTSD 1 month post-explosion versus 9.6% 3 months post-explosion. While history of psychiatric disorder and physical injury were risk factors for PTSD 1 month post-explosion, risk factors 3 months post-explosion was history of psychiatric disorder. **Conclusions:** PTSD occurs at high rates in individuals exposed to terrorist attacks. More studies following such events are required in Turkey. In light of these results it is advised that individuals at risk of PTSD receive therapeutic and preventive interventions provided by mental health professionals.

Keywords: Terrorist Attack, Post-traumatic Stress Disorder, Risk Factor.

INTRODUCTION

On 3 January 2008 explosives placed in an automobile on a thoroughfare in Diyarbakir, southeastern Turkey exploded in a terrorist attack. According to government reports, 6 people died and 67 were injured. Terrorism is a type of warfare designed to have maximum psychological impact on a population (Everly and Mitchell, 2001). Post-traumatic stress disorder (PTSD) is one of the most frequent psychological disorders observed after disasters (Galea et al., 2002). Many studies report that high rates of PTSD are observed among those that directly witness a terrorist attack (Norris et al., 2002). The development of PTSD following terrorist attacks has been reported in Ireland, Israel, France, the USA (North et al., 1999), Tanzania (Gidron, 2002), Kenya (Frank et al., 2004), and Spain (Gabriel et al., 2004). Some of these stud-

ies investigated the risk factors associated with PTSD in individuals exposed to trauma. Frank et al. (2004) conducted a study following a terrorist bomb attack in Kenya on 7 August 1998. It was determined that being female, single, and poorly educated, being in the area of the attack at the time of the explosion, being an eyewitness to the explosion, being injured, having an attack-related injury that has not totally healed, mourning a deceased victim of the explosion, experiencing economic difficulty after the explosion, and being unable to work due to an attack-related injury, were associated with the development of PTSD.

Although Turkey is a country that has experienced terrorist attacks in its recent past, studies assessing the psychological effects of these attacks are lacking. The aim of the present study was to determine the risk fac-

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tors for the diagnosis of and the rate of post-traumatic stress disorder (PTSD) 1 and 3 months after the terrorist attack that occurred in Diyarbakir on 3 January 2008 among individuals who were eye- or earwitnesses to the explosion.

METHOD

Among the population living or working within 7 apartment blocks that had a frontage on street and were in close proximity to the explosion site, those aged 16 years or older who were an eye- or earwitnesses to the explosion and gave consent (for those between 16 and 18 years of age, consent was obtained from parents) were included in this study. There were approximately 200 flats within these 7 apartment blocks. Among 443 individuals that were contacted 1 month after the explosion, 92 (20.8%) declined to participate in the study; however, their reasons were not recorded. Forty-four of the participants (9.9%) did not properly complete the study forms. Among the 307 subjects whose data forms were evaluated, 216 had witnessed the explosion visually or aurally. Three months following the attack, 22 of the 216 subjects (10.8%) declined to participate in the study, 30 could not be reached for various reasons (moved away, out of town, etc.), and 18 (8.3%) did not provide adequate information on the data forms. Thus, data collected from 146 eye- or ear-witnesses 3 months post-explosion were evaluated. The data forms presented below were administered to each participant 1 and 3 months after the attack. The data forms were delivered to the subjects' residences or workplaces by 2 psychiatric specialists and 2 psychiatric assistants. The forms were collected by returning to the residences and workplaces to which the forms were delivered 2 times within 3 days. The investigators helped illiterate participants complete the forms. As the investigators knew the Kurdish and Zazaki languages, which are widely used in Diyarbakir, interpreters were not needed. The participants were given a psychiatric interview.

Data Forms

1. Sociodemographic Data Form.

This form prepared by the researchers was designed to collect the following data: name (optional), age, gender, marital status, level of education, employment status (housewives were considered unemployed), whether the participant lived alone or not, history of psychiatric disorder (yes or no), proximity to the explosion site, physical damage to the home/workplace due to the explosion,

observation of deceased and/or injured people, participation in aid tasks, physical injury to self or acquaintances, deceased acquaintances, and level of fear, terror, and despair in response to the explosion. The subjects were not questioned about their ethnic origin, as such a question might have lowered the participation rate.

2. Screening Instrument for Traumatic Stress

This scale was developed by Başoğlu et al. (2001), and its reliability and validity has been verified. This 4-point Likert-type scale consists of 23 items that provide a self-evaluation of the previous month. Each item is scored between 0 and 3, and the total scale score is obtained by summing the scores of all items. The first 17 items evaluate PTSD symptoms (according to DSM-IV criteria) and the last 6 items evaluate the symptoms of depression. A total score ≥ 25 on the first 17 items indicates possible PTSD. Başoğlu et al. (2001), reported that the sensitivity and specificity of the scale are both 81%.

Statistical Analysis

SPSS v.15 was used to analyze the data. Those that developed or did not develop PTSD after the explosion according to the Screening Instrument for Traumatic Stress were compared in terms of sociodemographic characteristics using the chi-square test, or Student's *t* test, if data were normally distributed. In these analyses, the level of significance level was set at $P < 0.05$. Logistic regression and linear regression analyses were used to evaluate risk factors for the development of PTSD. The variables that were significantly different based on the analysis of data collected 1 month post-explosion (significance level $P \leq 0.10$) were entered into the logistic regression model (Rothman and Greenland, 1998). In addition, when possible PTSD presence at the end of the 1st month was added on the 3rd month regression analysis, whether the significance levels of variables differed or not was also evaluated. Answers to the question, "how much fear, terror, or despair did you experience as a result of the explosion" (despite a significant difference 1 month post-explosion) were not included in the logistic regression analysis, because this question is already diagnostic for PTSD. Furthermore, answers to the same question in the 3rd month analysis were classified as "present" and "absent" (the answer "not at all" was considered "absent" and the answers "a little – moderate" and "severe" were considered "present"), since a statistical comparison is not possible when classified as, "not at all", "a little – moderate" and "severe".

TABLE 1. Comparison of the sociodemographic characteristics of participants with and without PTSD 1 month post-explosion.

	PTSD (+)		PTSD (-)		PTSD		Total	
	n/mean	%/SD	n/mean	%/SD	X ² /t	p	n/mean	%/SD
Gender								
Female	14	51.9	94	49.7	0.042	0.837	108	50.0
Male	13	48.1	95	50.3			108	50.0
Marital Status								
Married	16	59.3	112	59.3	0.000	1.000	128	59.3
Single	11	40.7	77	40.7			88	40.7
Education								
Primary and below	7	25.9	34	18.0	3.069	0.216	41	19.0
Secondary	15	55.6	89	47.1			104	48.1
University	5	18.5	66	34.9			71	32.9
Working Status								
Employed	19	70.4	135	71.4	0.013	0.909	154	71.3
Unemployed/housewife	8	19.6	54	28.6			62	28.7
History of Psychiatric Disorder								
Present	7	25.9	9	4.8	15.429	<0.001	16	7.4
Absent	20	74.1	180	95.2			200	92.6
Age	31.33	12.12	34.02	11.35	1.142	0.255	33.68	11.45
Monthly income	1549.71	1679.24	1810.83	1620.19	0.728	0.468	1773.75	1626.17

PTSD: Post-traumatic stress disorder, Monthly income= Turkish Lira.

RESULTS

Among the participants analyzed 1 month post-explosion, 50% (108) were male and 50% (108) were female. Mean age was 33.68 ± 11.45 years (range: 16-70 years) and mean monthly income was 1773.75 ± 1626.17 TL. In all, 59.3% (128) of the participants were married, 32.9% (71) were university graduates, none lived alone, and 71.3% (154) were currently employed. Among the 216 participants evaluated 1 month post-explosion, 27 (12.5%) were diagnosed with PTSD according to the Screening Instrument for Traumatic Stress. When the participants with and without PTSD were compared, significantly more participants with PTSD were observed to have had a history of psychiatric disorder (25.9% and 4.8%, respectively; $X^2 = 15.429$ and $P < 0.001$). The sociodemographic characteristics of the participants analyzed 1 month post-explosion and their comparison between patients with and without PTSD are presented in Table 1.

Among the 216 participants, 19.4% (42) reported that they saw the explosion, 80.6% (174) reported that they heard the explosion and felt the ground shake, 58.3%

(126) reported that they had observed deceased or injured people, and 8.3% (18) reported that they had been physically injured (all minor injuries that did not require hospitalization). Compared to those that did not develop PTSD, significantly more of the participants with PTSD saw the explosion (37.0% vs. 16.9%; $X^2 = 6.097$ and $P = 0.014$), saw dead or injured people (81.5% vs. 55.0%; $X^2 = 6.803$ and $P = 0.009$), were physically injured due to the explosion (29.6% vs. 5.3%; $X^2 = 18.320$ and $P < 0.001$), lost a friend or relative in the explosion (18.5% vs. 6.9%; $X^2 = 4.190$ and $P = 0.041$), and friend or relative were physically injured (37.0% vs. 15.9%; $X^2 = 7.013$ and $P = 0.008$). A comparison of the reactions to the explosion between those with and without PTSD 1 month post-explosion, and the respective consequences are presented in Table 2.

Among 146 subjects analyzed 3 months post-explosion, 14 (9.6%) were diagnosed with PTSD according to the Screening Instrument for Traumatic Stress. More participants with PTSD had a history of psychiatric disorder than those that did not have PTSD (42.9% vs. 6.1%; $X^2 = 19.768$ and $P < 0.001$). Sociodemographic characteristics and their comparison between subjects

TABLE 2. Comparison of the consequences of the explosion and reactions to it between participants with and without PTSD 1 month post-explosion.

	PTSD (+)		PTSD (-)		X ²	p	Total	
	N:27	%	N:189	%			N:216	%
Proximity to explosion								
Eyewitness	10	37.0	32	16.9	6.097	0.014	42	19.4
Ear-witness	17	63.0	157	83.1			174	80.6
Observed casualties								
Present	22	81.5	104	55.0	6.803	0.009	126	58.3
Absent	5	18.5	85	45.0			90	41.7
Physical damage at home/workplace								
Present	26	96.3	158	83.6	3.019	0.082	184	85.2
Absent	1	3.7	31	16.4			32	14.8
Fear, terror, despair								
Not at all	0	0.0	14	7.4	10.800	0.005	14	6.5
A little-moderate	0	0.0	42	22.2			42	19.4
Severe	27	100.0	133	70.4			160	74.1
Physically injured								
Present	8	29.6	10	5.3	18.320	<0.001	18	8.3
Absent	19	70.4	179	94.7			198	91.7
A deceased relative/acquaintance								
Present	5	18.5	13	6.9	4.190	0.041	18	8.3
Absent	22	81.5	176	93.1			198	91.7
An injured relative/acquaintance								
Present	10	37.0	30	15.9	7.013	0.008	40	18.5
Absent	17	63.0	159	84.1			176	81.5

PTSD: Post-traumatic stress disorder.

with and without PTSD 3 months post-explosion are presented in Table 3.

More participants that developed PTSD than those that did not had a friend or relative that was injured in the explosion (42.9% vs. 12.9%; $X^2 = 8.571$ and $P = 0.003$). A comparison of reactions to the explosion and their respective consequences experienced by those that developed PTSD and those that did not 3 months post-explosion are presented in Table 4.

In an effort to identify the risk factors associated with the development of PTSD 1 and 3 months after the explosion, variables that were significantly different between the 2 analysis points (significance level was $P \leq 0.10$), namely a history of psychiatric disorder

($P < 0.001$), proximity to the explosion ($P = 0.014$), observing deceased or injured people ($P = 0.009$), physical damage at home/workplace ($P = 0.082$), being physi-

cally injured, and having a deceased ($P = 0.041$) or injured ($P = 0.008$) relative/acquaintance, were entered into logistic regression analysis. Thus, 1 month post-explosion a history of psychiatric disorder ($OR = 10.764$) and being physically injured by the explosion ($OR = 5.782$), and 3 months post-explosion a history of psychiatric disorder ($OR = 10.637$) were determined to be risk factors for the development of PTSD. Nonetheless, a history of psychiatric disorder was not determined to be a risk factor for PTSD 3 months post-explosion if the possible presence of PTSD 1 month post-explosion was considered as a variable for the development of PTSD 3 months post-explosion. Yet, the possible presence of PTSD 1 month post-explosion was determined to be a risk factor for the development of PTSD 3 months post-explosion ($OR = 27.744$). There was no significant difference in terms of the other variables. Risk factors that affected the development of PTSD according to logistic

TABLE 3. Comparison of the sociodemographic characteristics of participants with and without PTSD 3 months post-explosion.

	PTSD (+)		PTSD (-)		χ^2/t	p	Total	
	N/Ortalama	%/sd	N/Ortalama	%/sd			N/Ortalama	%/sd
Gender								
Female	10	71.4	67	50.8	2.170	0.141	77	52.7
Male	4	28.6	65	49.2			69	47.3
Marital Status								
Married	8	57.1	75	56.8	0.001	0.981	83	56.8
Single	6	42.9	57	43.2			63	43.2
Education								
Primary and below	3	21.4	26	19.7	0.412	0.814	29	19.9
Secondary	6	42.9	68	51.5			74	50.7
University	5	35.7	38	28.8			43	29.4
Working Status								
Employed	10	71.4	94	71.2	0.000	0.986	104	71.2
Unemployed	4	28.6	38	28.8			42	28.8
History of Psychiatric Disorder								
Present	6	42.9	8	6.1	19.768	<0.001	14	9.6
Absent	8	57.1	124	93.9			132	90.4
Age	36.00	14.69	32.81	10.89	-1.003	0.318	33.12	11.28
Monthly income	2602.09	2344.38	1617.68	1587.78	-1.859	0.066	1712.67	1687.38

PTSD: Post-traumatic stress disorder. Monthly income= Turkish Lira.

regression analysis 1 and 3 months post-explosion are presented in Table 5.

Linear regression analysis of the participants' total scores on the first 17 items of the Screening Instrument for Traumatic Stress and using the same independent variables 1 and 3 months post-explosion, a history of psychiatric disorder 1 month post-explosion ($t = 4.523$, $P < 0.001$), and being physically injured during the explosion ($t = 2.155$, $P = 0.032$) significantly affected Screening Instrument for Traumatic Stress total score. Yet, proximity to the explosion ($t = -1.108$), observing deceased or injured people ($t = 1.558$), having a deceased relative/acquaintance ($t = 1.220$), physical damage at home/workplace ($t = 1.059$), and having an injured relative/acquaintance ($t = 1.706$) did not significantly affect Screening Instrument for Traumatic Stress total score ($P > 0.05$). At 3 months post-explosion, while a history of psychiatric disorder ($t = 2.946$, $P = 0.004$) had a significant effect on Screening Instrument for Traumatic Stress total score, proximity to the explosion ($t = -1.362$), observing deceased or injured people ($t = 0.899$), having a deceased relative/acquaintance ($t = 1.331$), and having an injured relative/acquaintance ($t = 1.025$) did not (P

> 0.05). When the possible presence of PTSD 1 month post-explosion was considered a variable for the development of PTSD, linear regression analysis of the data collected 3 months post-explosion, similar to the results of the logistic regression analysis, it was determined that having a history of psychiatric disorder did not affect Screening Instrument for Traumatic Stress total score. The possible presence of PTSD 1 month post-explosion significantly affected Screening Instrument for Traumatic Stress total score 3 months post-explosion ($t = 6.506$, $P < 0.001$).

DISCUSSION

In all, 12.5% of the participants had PTSD at the end of the 1st post-explosion month, versus 9.6% 3 months post-explosion. Studies carried out following terrorist attacks have reported rates of PTSD ranging from 7% to 35% (Galea et al., 2002; Schlenger et al., 2002; Frank et al., 2004; Gabriel et al., 2007; Abenhaim et al., 1992). Characteristics of the samples studied may have caused the differences in the reported rates of PTSD. For instance, Gabriel et al. (2007) reported a PTSD rate of 44.1% among those physically injured after the bomb-

TABLE 4. Comparison of the consequences of explosion and reactions to it between participants with and without PTSD 3 months post-explosion.

	PTSD (+)		PTSD (-)		X ²	p	Total	
	N: 14	%	N:132	%			N: 146	%
Proximity to the explosion								
Eyewitness	3	21.4	24	18.2	0.089	0.766	27	18.5
Ear-witness	11	78.6	108	81.8			119	81.5
Observed casualties								
Present	10	71.4	75	56.8	1.111	0.292	85	58.2
Absent	4	28.6	57	43.2			61	41.8
Physical damage at home/workplace								
Present	14	100.0	110	83.3	2.747	0.097	124	84.9
Absent	0	0.0	22	16.7			22	15.1
Fear, terror, despair								
Present	14	100.0	122	92.4	1.139	0.286	136	93.2
Absent	0	0.0	10	7.6			10	6.8
Physically Injured								
Present	1	7.1	11	8.3	0.024	0.877	12	8.2
Absent	13	92.9	121	91.7			134	91.8
Loss of a relative/acquaintance								
Present	2	14.3	10	7.6	0.755	0.385	12	8.2
Absent	12	85.7	122	92.4			134	91.8
An injured relative/acquaintance								
Present	6	42.9	17	12.9	8.571	0.003	23	15.8
Absent	8	57.1	115	87.1			123	84.2

PTSD: Post-traumatic stress disorder.

ing attack that took place in Madrid on 11 March 2004, versus 12.3% among those that lived in a home adjacent to the explosion; however, it is difficult to explain this variation as solely due to methodological differences. Many factors, such as the level of devastation and loss of life due to traumatic events, or the timing of the study can affect the observed prevalence of PTSD (Başoğlu et al., 2002).

Logistic regression analysis results of the present study show that a history of psychiatric disorder constituted a risk factor for the development of PTSD development 1 and 3 months post-explosion. Concurrence or history of psychiatric disorders increase the risk of PTSD and PTSD increases the risk of other psychiatric disorders (Perkonigg et al., 2000). Several authors report that a history of psychiatric disorder is a significant risk factor for PTSD (Blanchard et al., 1995; Breslau et al., 1995; Brewin et al., 2000; Hapke et al., 2006) however, in the present study it was observed that the possible presence

of PTSD 1 month post-explosion was a risk factor for the development of PTSD development 3 months post-explosion month, while a history of psychiatric disorder history was not. Verger et al. (2004) used a statistical method similar to that used in the present study to study subjects that were exposed to terrorist bombing attacks between 1995 and 1996, and reported that the development of a psychiatric disorder due to the explosion was a risk factor for PTSD, although approximately 2.6 years after the explosion. They also determined that a history of psychiatric disorder was not a risk factor for PTSD.

Another risk factor identified in our analysis of the data collected 1 month post-explosion was physical injury. In studies performed after terrorist bomb attacks it was reported that physical injury was a risk factor for PTSD (Frank et al., 2004; Verger et al., 2004). When the 3rd post-explosion month data in the present study were evaluated it was observed that physical injury due to explosion was not a risk factor for the development of

TABLE 5. Risk factors for the development of PTSD according to logistic regression analysis 1 and 3 months post-explosion.

	1st month			3rd month		
	OR	%95 GA	p	OR	%95 GA	p
History of psychiatric disorder						
Absent	1			1		
Present	10.764	3.206-36.176	0.000	10.637	2.578-44.702	0.001
Proximity to the explosion						
Eyewitness	1			1		
Ear-witness	0.522	0.191-1.426	0.205	0.766	0.162-3.620	0.736
Observed casualties						
Absent	1			1		
Present	2.248	0.726-6.955	0.160	1.042	0.245-4.423	0.810
Physical damage at home/workplace						
Absent	1			1		
Present	2.017	0.230-17.657	0.526	Olgu yok		
Physically injured						
Absent	1			1		
Present	5.782	1.732-19.297	0.004	0.285	0.016-5.144	0.395
A deceased relative/acquaintance						
Absent	1			1		
Present	2.070	0.543-7.893	0.331	5.816	0.661-51.162	0.113
An injured relative/acquaintance						
Absent	1			1		
Present	1.589	0.572-4.416	0.374	3.353	0.784-14.335	0.103

OR: Odds ratio; CI: confidence interval.

PTSD. This might have been due to the fact that physical injury due to the explosion in our study population was minor (recovered with ambulatory care, caused no morbidity, and able to return to work and social activities). In a study performed 1 and 3 months following a terrorist attack, Frank et al. (2004) reported that rather than physical injury itself, an injury not recovered from was indeed a risk factor.

Even though significantly more of the participants with PTSD in the present study ($P \leq 0.10$) were eyewitnesses to the explosion, observed deceased or injured people, had a deceased or injured relative/acquaintance, and had a home/workplace damaged, none of these variables were risk factors for PTSD. Studies of terrorist attacks have reported that visually witnessing the explosion (Galea et al., 2002; Frank et al., 2004) and loss of a relative or acquaintance in the event (Frank et al., 2004; Gabriel et al., 2007) were associated with the development of PTSD. Similar to other reports in the literature, the terrorist attack that led to the present study was small

scale in terms of death and injury; therefore, the rate of PTSD among our study population was low. This might have precluded us from identifying certain factors previously reported as significantly related to PTSD.

Comparing the 2 groups based on data collected 1 and 3 months post-explosion, no differences were observed in terms of gender, marital status, or level of education. Previous studies have reported that PTSD developed at a higher rate among females than males (Frank et al., 2004; Verger et al., 2004; Solomon et al., 2005), among the unemployed than the employed (Verger et al., 2004), and among bachelor (single) individuals than married individuals (Frank et al., 2004; Verger et al., 2004). In our study, the fact that significantly more males than females were eyewitnesses to the explosion ($P = 0.006$) and observed dead or injured people ($P = 0.013$) might have been the reason why there were no differences between genders. Low-level social support after trauma may increase the possibility of psychiatric disorders (Ozaltun et al., 2004). The studies in which mari-

tal status was reported as an important factor for PTSD development associated this factor with the level of social support, especially during the post-traumatic period (Brewin et al., 2000). None of the participants in the present study were living alone at the time of the explosion. Considering that people in the study area still live as a collectivist society, it can be anticipated that marital status would not affect the development of PTSD. The present study's finding that level of educational did not affect the development of PTSD is consistent with the results of other studies (Frank et al., 2004; Verger et al., 2004; Gabriel et al., 2007).

The present study has several limitations; namely, the study sample had a higher average monthly income and level of education compared to the rest of the city and the country as a whole, and the decrease in the number of participants between the 1st and 3rd post-explosion months, which led to difficulty performing statistical analysis (for instance, 3 months post-explosion the

homes/workplaces of all our participants had been physically damaged and, therefore, this variable could not be introduced into the logistic regression analysis).

Although similar events have occurred in the past, this is the first study that was conducted after a terrorist bomb attack in Turkey. Turkey is at risk of experiencing more such attacks in the future due to its special conditions, such as geopolitic etc. The results of our study support previous results suggesting that PTSD occurs at high rates among individuals exposed to terrorist attacks. Kiliç (2008) reported that among individuals that experienced trauma, most with psychiatric symptoms did not seek treatment. Defining the characteristics of individuals at risk prior to a traumatic event could contribute to adequate preventive and therapeutic health care measures. Additionally, long-term studies of the psychological consequences of such attacks with larger samples are required.

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