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Ten-Year Follow-Up of Earthquake Survivors:
Long-Term Study on the Course of PTSD Following a Natural Disaster

Oguz K. Karamustafalıoğlu, MD[a,‡]; Leah Fostick, PhD[b,‡,*]; Mehmet Çevik, MD[c]; Gil Zukerman, PhD[b]; Onur Tankaya, MD[c]; Mustafa Güveli, MD[c]; Banadir Bakım, MD[c]; Nesrin Karamustafalıoğlu, MD[d]; and Joseph Zohar, MD[e,f]

ABSTRACT

Objective: Few earthquake survivor studies extend follow-up beyond 2 years, leaving the long-term course of earthquake-related posttraumatic stress disorder (PTSD) unknown. This 10-year survey re-assessed the 1999 İzmit, Turkey, earthquake survivors.

Methods: İzmit earthquake survivors (N = 198), previously assessed for PTSD/partial PTSD at 1–3 months and 18–20 months post-earthquake, were evaluated 10 years post-event from January 2009 through December 2010. A PTSD self-test (Turkish translation) used *DSM-IV* criteria to characterize full PTSD, "stringent partial PTSD," "lenient partial PTSD," or non-PTSD based on symptom type/amount.

Results: Full PTSD prevalence decreased from 37% at 1–3 months post-earthquake to 15% at 18–20 months ($P < .001$), remaining relatively stable (12%) at 10 years ($P = .38$). Stringent and lenient partial PTSD decreased between 1–3 months and 18–20 months (from 9% to 3% and from 24% to 12%, respectively; $P < .001$), remaining stable at 10 years (5% and 9%, respectively; $P = .43$ and $P = .89$). PTSD was more prevalent at 1–3 months among those who had a close acquaintance harmed, had been evacuated for long periods (> 1 week), or had more children; this was not observed at 10 years ($P = .007$–$.017$). Avoidance symptoms 1–3 months post-earthquake were the best predictor for full PTSD at 10 years ($P < .001$). Delayed-onset PTSD was observed in only 2% of participants.

Conclusions: Full and partial PTSD decreased over the first 2 years post-trauma, but remained stable at 10 years, suggesting PTSD symptoms at around 2 years remain stable at 10 years. Background characteristics did not predict PTSD long-term course, but avoidance level did. Delayed-onset PTSD was relatively rare.

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[a]Istanbul University Forensic Sciences Institute, Istanbul, Turkey
[b]Department of Communication Disorders, Ariel University, Ariel, Israel
[c]Şişli Etfal Teaching and Research Hospital, Istanbul, Turkey
[d]Health Sciences University Istanbul, Istanbul, Turkey
[e]Sackler Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel
[f]Post-Trauma Center, Research Foundation, Sheba Medical Center, Ramat Gan, Israel
‡These authors contributed equally to this work.
**Corresponding author:* Joseph Zohar, MD, Chaim Sheba Medical Center, Tel Hashomer, Israel 52621 (Jzohar@post.tau.ac.il).

Many studies have examined the association between natural disasters and posttraumatic stress disorder (PTSD).[1–21] The majority of these studies suggest that survivors of disasters are likely to exhibit posttraumatic stress symptoms following the event. In a review of 225 studies,[12] 166 reported that natural disasters were associated with a risk of PTSD or related symptoms.

The İzmit earthquake, registering 7.4 on the Richter scale, struck northwestern Turkey on August 17, 1999. It lasted 45 seconds, killed around 17,000 people, and left approximately half a million homeless. The earthquake was heavily felt in the densely populated urban area and caused considerable damage in Istanbul, about 70 km (43 miles) from the earthquake's epicenter.

In 2006, we published the results of 3 PTSD self-assessment surveys conducted among survivors of the İzmit earthquake over the 20 months following the event.[8] In that study, the prevalence of PTSD was 30.2% at baseline (1–3 months post-earthquake), 26.9% at 6–10 months, and 10.6% at 18–20 months. Since the 2006 study, additional data emerged regarding earthquake-related PTSD, expanding knowledge of the mental state of earthquake survivors. Figure 1 presents earthquake-related PTSD prevalence from our 2006 study, along with earlier and later studies. Most studies reported PTSD occurring within the first year after earthquakes; few studies measured its prevalence 2 years later,[2,5,8] and only one measured it after 3 years.[13] Time since exposure to trauma has an important effect on the clinical course of PTSD; its initial diagnosis depends on time (symptoms should last more than 1 month), and its chronicity certainly depends on time (more than 3 months[22]). While 1 and 3 months are relatively short-term, the long-term course of PTSD also affects its clinical picture and shows that PTSD prevalence is time-dependent; a reduction in PTSD prevalence is reported as time passes in the first 3 years since exposure to trauma.[23] However, whether the reduction in PTSD prevalence continues more than 3 years post-trauma or whether it gets to an asymptote is not clear. Also unclear is the nature of late-onset PTSD and whether it has a time limit for development. Thus, knowledge regarding the long-term course of earthquake-related PTSD is needed.

When studying the long-term course of PTSD, we must consider how to conceptualize the presence of symptoms and, more significantly, the definition of remission. Clearly, if *DSM* criteria are met, one is considered to have PTSD, but when they are no longer met, or fewer symptoms are

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Clinical Points

- Time since exposure to trauma has an important effect on the clinical course of posttraumatic stress disorder (PTSD). However, most long-term follow-ups on PTSD are 2 to 3 years, and knowledge regarding the long-term course of earthquake-related PTSD is lacking.
- Full and partial PTSD decreased over the first 2 years post-trauma, but remained stable at 10 years, suggesting PTSD symptoms at around 2 years remain stable at 10 years.
- Avoidance symptoms, but not background characteristics, place risk for the persistence of full PTSD diagnosis. Delayed-onset PTSD was relatively rare.

present, is one considered in remission? Indeed, binary classification of "yes/no PTSD" can obfuscate identifying a substantial portion of trauma-exposed persons who experience some level of posttraumatic stress symptoms.[23–25] Indeed, some of the participants diagnosed with late-onset PTSD were reported to develop PTSD symptoms immediately after trauma exposure, but these symptoms did not reach full diagnosis until some time later,[23,26] creating an underestimation of PTSD prevalence post-trauma and overestimation of delayed-onset PTSD. On the same line, the occurrence of remission might also be overestimated, defining participants who overcame a few symptoms that push them under the binary diagnostic criteria of PTSD as not having PTSD while still suffering from many other symptoms. Also, those with partial or subthreshold PTSD are at higher risk for comorbid disorders and functional impairment,[26] showing that PTSD also negatively affects those who did not reach a full diagnosis. In an attempt to overcome these limitations, classifications of partial, subthreshold, or subclinical PTSD have been suggested, some implementing a stricter, others a more lenient, definition of "partial PTSD."[26] For example, Dickstein et al[26] suggested two definitions of "partial PTSD." The "stringent partial PTSD," although it does not expect the full symptomatology of "full PTSD," still requires most of the criteria, with only two criterion C symptoms instead of three. The "lenient partial PTSD" is more flexible, requiring only one criterion B symptom and criterion C or criterion D symptoms. These two definitions represent the specificity and sensitivity debate in medical diagnosis. It shows the need to stay close to the full PTSD diagnosis, versus the aspiration to detect those who were not diagnosed with PTSD but are affected by the exposure to trauma.

A high-resolution inspection of PTSD symptomatology enables a more delicate examination of its variability over the years. Therefore, it is essential in a long-term follow-up of the course of PTSD. Nevertheless, most long-term studies of PTSD employed only a categorical "yes/no" definition of PTSD, usually considering "yes PTSD" for those who fully meet *DSM* criteria for PTSD. In contrast, all others are considered "no PTSD," without differentiating between the number of symptoms experienced.

Aims of the Study

The current study addresses the need for long-term research on earthquake survivors by reporting the findings of a 10-year follow-up of a group of survivors from whom data were originally collected 1–3 months after the earthquake. We employ a broader outlook on how PTSD manifests; even if only partial criteria for PTSD are met, survivors can still have chronic, debilitating symptoms that interfere with daily activity. Accordingly, in this study, we adopted the definition of Dickstein et al[26] for partial PTSD

Figure 1. Study-by-Study Comparison of Prevalence of Earthquake-Related Posttraumatic Stress Disorder (PTSD)

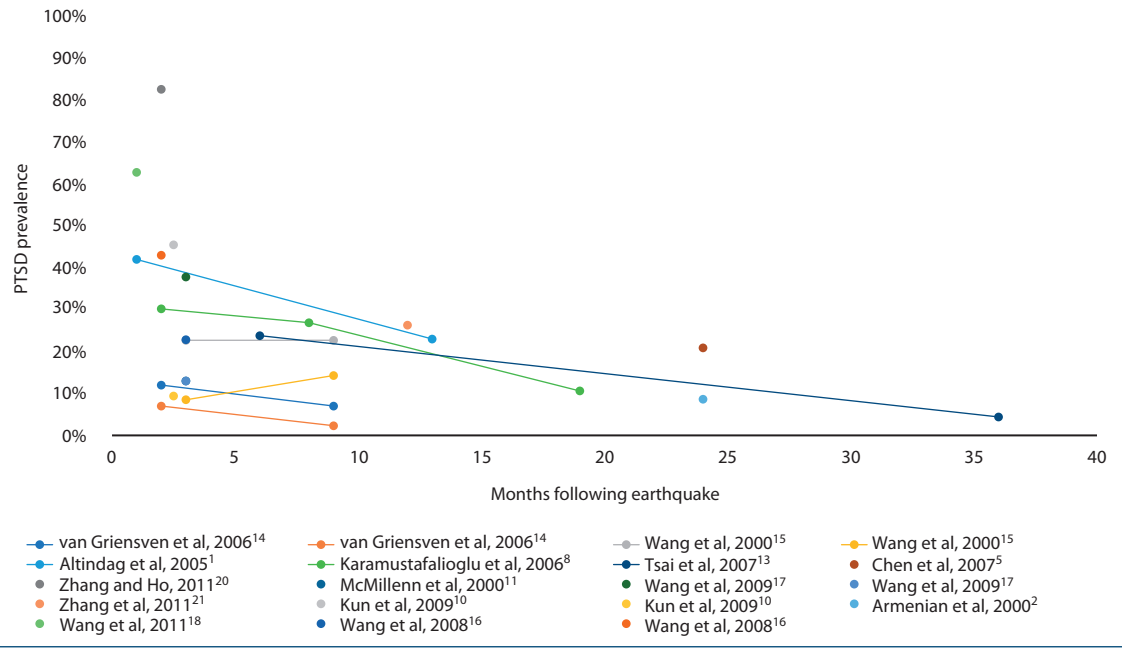

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Table 1. Demographic Characteristics of the Study Participants at 10-Year Survey[a]

Characteristic	Whole Sample (N = 198)	PTSD at 10 Years (n = 24)	No PTSD at 10 Years (n = 174)	Statistical Comparison
Age, mean (SD), y	44.2 (14.4)	46.1 (13.5)	44.0 (14.6)	$F_{1,197} = 0.465$, $P = .496$
Gender				$\chi^2_1 = 0.009$, $P = .926$
Male	48 (24)	6 (25)	42 (24)	
Female	150 (76)	18 (75)	132 (76)	
Married	108 (55)	17 (71)	91 (52)	$\chi^2_3 = 1.7$, $P = .633$
No. of children, mean (SD)	2.6 (1.2)	2.5 (1.2)	2.6 (1.2)	$F_{1,197} = 0.005$, $P = .946$
Education				$\chi^2_4 = 3.075$, $P = .545$
Illiterate	7 (4)	2 (8)	5 (3)	
Elementary school	58 (29)	8 (33)	50 (29)	
Junior high	27 (14)	4 (17)	23 (13)	
Senior high	41 (21)	6 (25)	35 (20)	
College	11 (6)	0 (0)	11 (6)	
Did not answer	54 (27)	4 (17)	50 (29)	
Occupation				$\chi^2_5 = 2.378$, $P = .795$
Unemployed	7 (4)	1 (4)	6 (3)	
Labor	13 (7)	1 (4)	12 (7)	
Officer	4 (2)	0 (0)	4 (2)	
Self-employed	15 (8)	3 (13)	12 (7)	
Housewife	87 (44)	13 (54)	74 (43)	
Student	25 (13)	2 (8)	23 (13)	
Did not answer	47 (24)	4 (17)	43 (25)	

[a]Values are shown as n (%) unless otherwise noted.
Abbreviation: PTSD = posttraumatic stress disorder.

when analyzing the long-term effect of earthquake trauma on PTSD symptomatology.

METHOD

Participants

The cohort included 198 survivors of the 1999 earthquake in Turkey who participated in an original survey administered 1 to 3 months post-earthquake (see Survey 1[8]) and were available for the 10-year follow-up assessment. This represents 43% of the 464 participants reported in our previous study.[8] All participants were residents of Avcilar, a suburb of Istanbul severely affected by the earthquake, causing death and damage. Demographic data are presented in Table 1.

Measures

Demographics. Demographic data collected included gender, age, marital status, number of children, education, and occupation.

Traumatic experience. The traumatic experience, referring to the 1999 earthquake and representing diagnostic criterion A, was well-documented from the prior survey conducted 1 to 3 months post-earthquake, including level of earthquake exposure, type(s) of loss experienced, receipt of rescue services, length of time evacuated from home, and expectation of, and preparation for, future earthquakes.

PTSD assessment. Following Karamustafalıoğlu et al,[8] we used a Turkish translation of the Anxiety Disorders Association of America (ADAA) PTSD self-test.[27] This checklist of 17 yes/no questions is categorized into 3 *DSM-IV* diagnostic criteria clusters (re-experiencing, avoidance, hyperarousal). The validity of the scale, using the Cronbach α coefficient, is α = .89 for the full scale and α = .73, α = .79, and α = .76 for the re-experiencing, avoidance, and arousal subscales, respectively. Construct validity with the Clinician-Administered PTSD Scale showed 86% concordance, with 3% false-positive and 11% false-negative diagnoses.[8]

Based on the number of "yes" responses, "full PTSD" was defined as having 1 criterion B symptom (re-experiencing), 3 criterion C symptoms (avoidance, numbing), and 2 criterion D symptoms (hyperarousal). In addition, following Dickstein et al,[26] two definitions of "partial PTSD" were adopted: "stringent partial PTSD" was defined as a minimum of 1 criterion B symptom, 2 criterion C symptoms (instead of 3), and 2 criterion D symptoms, while "lenient partial PTSD" was defined as a minimum of 1 criterion B symptom and 3 criterion C symptoms or 2 criterion D symptoms.

Procedure

The Turkish Şişli Eftal Teaching and Research Hospital Institutional Review Board approved the study. Verbal consent to participate was given following an explanation of the study. No compensation was provided for participation.

The new survey followed the same procedure as Karamustafalıoğlu et al[8] and was performed from January 2009 through December 2010 in Avcilar, an Istanbul suburb severely affected by the earthquake. As in the original survey,[8] the survey distributors were primary care nurses working in the district and well known to the original cohort from ongoing health care contact. The first author trained the nurses to explain and carry out the questionnaires. The survey forms were distributed to all those who participated in the previous survey. The nurses collected the forms the next day, and if they were not filled, the nurses read the questions to the participants and recorded their responses.

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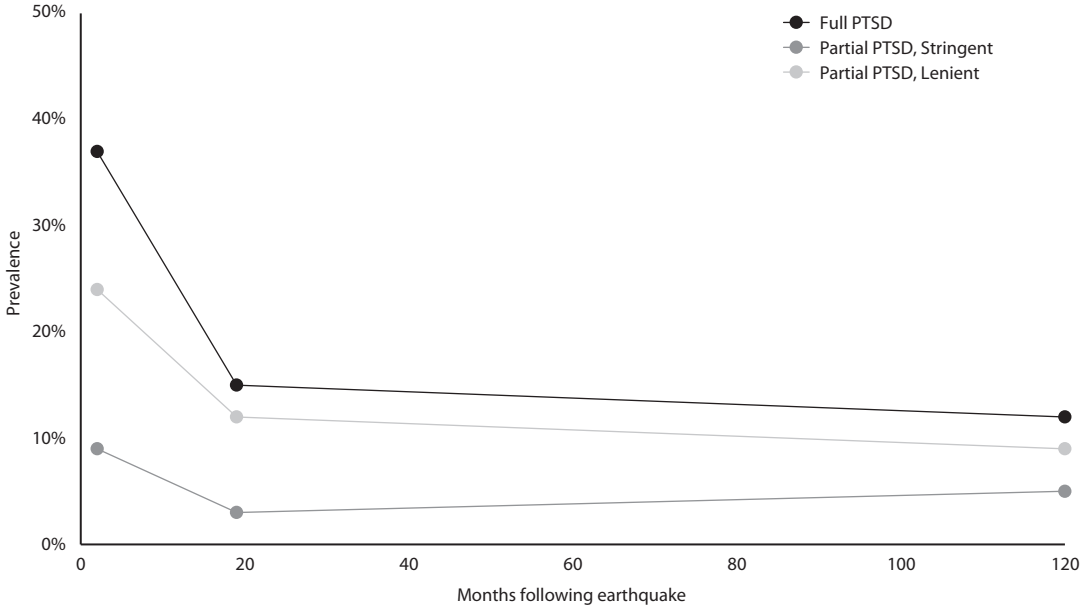
Figure 2. Prevalence of Full, Stringent Partial, and Lenient Partial Posttraumatic Stress Disorder (PTSD) After Earthquake



Statistical Analysis

Comparison of PTSD prevalence of different PTSD categories (full, stringent, lenient) and demographics was tested using χ^2. Other demographics (age, number of children) were analyzed using 1-way analysis of variance. Finally, logistic regressions were performed to predict PTSD diagnoses (based on the presence of the diagnostic criterion) at the 10-year follow-up from each PTSD diagnostic criterion in the survey administered at 1–3 months.

RESULTS

Demographic and Traumatic Experience Data

Table 1 presents demographic data for the participants who participated in the present study, for the whole sample (N = 198) and separately for those who had PTSD at 10 years (n = 24) and those who had no PTSD at 10 years (n = 174). Of the 198 participants, 151 (76%) were in the affected area during the earthquake, 136 (69%) had to evacuate their homes, and 133 (67%) had expectations of future earthquakes. A close acquaintance had been harmed for 46 participants (23%), and 10 (5%) were recipients of a rescue operation.

More participants with full PTSD at 10-year follow-up had relatives hurt or who died ($\chi^2_1 = 8.124$, $P = .017$), were evacuated for more than a week ($\chi^2_1 = 14.105$, $P = .007$), and had more than 3 children ($\chi^2_1 = 9.575$, $P = .008$) compared to those not meeting full PTSD criteria. More participants with stringent partial PTSD also had relatives hurt or who died ($\chi^2_1 = 9.575$, $P = .008$) than those who did not meet this criterion. There was no difference in any other background or demographic characteristics between those who had PTSD or no PTSD.

PTSD Prevalence

Full and partial PTSD prevalence was calculated at two timepoints: post-earthquake (1–3 months) and follow-up (10 years), as well as at an additional intermediate assessment timepoint (18–20 months) (Figure 2). Full PTSD decreased from 37% (n = 74) post-earthquake to 15% (n = 30) at the intermediate assessment to 12%

Table 2. Change in Posttraumatic Stress Disorder (PTSD) Diagnoses From Post-Earthquake to 10-Year Follow-Up

Post-Earthquake (1–3 mo)	Follow-Up (10 y)	n (%)
Binary PTSD Diagnosis		
PTSD[a] (n = 74)	PTSD	12 (16)
	No PTSD	62 (84)
No PTSD (n = 124)	PTSD	12 (10)
	No PTSD	112 (90)
Full and Partial PTSD Diagnosis		
PTSD[a] (n = 74)	PTSD	12 (16)
	Stringent partial PTSD	6 (8)
	Lenient partial PTSD	9 (12)
	No PTSD (full or partial)	47 (64)
Stringent partial PTSD[b] (n = 17)	PTSD	1 (6)
	Stringent partial PTSD	1 (6)
	Lenient partial PTSD	2 (12)
	No full or partial PTSD	13 (76)
Lenient partial PTSD[c] (n = 48)	PTSD	7 (15)
	Stringent partial PTSD	1 (2)
	Lenient partial PTSD	5 (10)
	No full or partial PTSD	35 (73)
No PTSD[d] (n = 59)	PTSD	4 (7)
	Stringent partial PTSD	2 (3)
	Lenient partial PTSD	2 (3)
	No full or partial PTSD	51 (86)

[a]Full *DSM-IV* criteria.
[b]At least 1 criterion B, 2 criterion C, and 2 criterion D symptoms.
[c]At least 1 criterion B, 3 criterion C, or 2 criterion D symptoms.
[d]Did not meet criteria for full, stringent partial, or lenient partial PTSD.

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Table 3. Logistic Regression for Predicting Posttraumatic Stress Disorder (PTSD) Diagnoses at Follow-Up by the 3 Diagnostic Criteria Assessed Post-Earthquake

Variable	R^2	B	SE β	Wald χ^2	95% CI
PTSD (follow-up), n = 24	.07				
Re-experiencing (post-earthquake)		–0.188	0.385	0.240	0.39–1.76
Avoidance (post-earthquake)		0.363	0.174	4.357*	1.02–2.02
Hyperarousal (post-earthquake)		0.278	0.275	1.024	0.77–2.26
Stringent Partial PTSD (follow-up), n = 10	.02				
Re-experiencing (post-earthquake)		0.103	0.238	0.186	0.69–1.76
Avoidance (post-earthquake)		0.122	0.107	1.303	0.91–1.39
Hyperarousal (post-earthquake)		0.227	0.160	2.012	0.91–1.71
Lenient Partial PTSD (follow-up), n = 18	.03				
Re-experiencing (post-earthquake)		0.228	0.195	1.366	0.87–1.84
Avoidance (post-earthquake)		0.045	0.089	0.259	0.87–1.24
Hyperarousal (post-earthquake)		0.222	0.130	2.929	0.96–1.61

*$P < .001$.

(n = 24) at follow-up. PTSD prevalence post-earthquake was significantly higher than at the intermediate and follow-up assessments ($\chi^2 = 27.26$, $P < .001$ and $\chi^2 = 36.18$, $P < .001$, respectively), but no difference in PTSD prevalence was found between the intermediate and 10-year follow-up assessments ($\chi^2 = 0.77$, $P = .38$). Stringent and lenient partial PTSD prevalence also decreased from post-earthquake (9% and 24%, respectively) to the intermediate assessment (3% and 12%, respectively) and remained stable at follow-up (5% and 9%, respectively). Lenient and stringent partial PTSD prevalence was significantly higher post-earthquake than at the intermediate ($\chi^2 = 36.50$, $P < .001$ and $\chi^2 = 64.64$, $P < .001$, respectively) and follow-up ($\chi^2 = 37.98$, $P < .001$ and $\chi^2 = 76.56$, $P < .001$) assessments, but no difference was found between intermediate and 10-year follow-up assessments ($\chi^2 = 0.01$, $P = .89$ and $\chi^2 = 0.61$, $P = .43$, respectively).

Table 2 presents the change in PTSD diagnoses across the study's two main timepoints: 1–3 months post-earthquake and 10-year follow-up both for binary diagnosis and for full and partial PTSD. The binary diagnosis comparison shows that 84% recovered from PTSD at 10-year follow-up, while the partial diagnosis comparison shows that 20% without full PTSD still had symptoms. Also, the binary diagnosis shows a delayed-onset rate of 10%, while the partial PTSD diagnosis shows that most participants had partial PTSD prior to the full diagnosis. Of those diagnosed with full PTSD at the post-earthquake assessment, 36% still met the criteria for either full or partial PTSD at follow-up 10 years later. Twelve participants had full PTSD at both post-earthquake and follow-up assessments, resulting in 6% for chronic (10-year-long) PTSD in our total sample; these 12 participants amount to 67% of all participants with full PTSD at follow-up.

Around a quarter of those who met the criteria for either type of partial PTSD (24%–27%) at the post-earthquake assessment met the criteria for full or partial PTSD at follow-up. Of those diagnosed with neither full nor partial PTSD post-earthquake, 13% met the criteria for either full or partial PTSD at the 10-year follow-up; indeed, 4 participants of the 198 in the sample met the criteria for full PTSD at follow-up while diagnosed with no PTSD at 1–3 months, evidencing a rate of 2% for delayed-onset PTSD following the earthquake that occurred 10 years before.

Prediction of Long-Term PTSD Diagnoses

To test whether long-term PTSD symptom prevalence could be predicted soon after the traumatic event occurred, logistic regression analyses were performed on 3 PTSD diagnostic criteria (re-experiencing, avoidance, hyperarousal) post-earthquake to predict meeting full PTSD (n = 24), stringent partial PTSD (n = 10), and lenient partial PTSD (n = 18) criteria at follow-up (Table 3). A significant model was observed only for full PTSD at follow-up (global fitness of model[28]: $\chi^2_8 = 19.58$, $P = .012$). This model showed that avoidance symptoms at 1–3 months post-trauma predicted full PTSD after 10 years.

DISCUSSION

This 10-year follow-up of a cohort of survivors from the 1999 Turkish İzmit earthquake is one of the longest follow-ups in the PTSD literature following natural disasters and the only one assessing partial PTSD after 10 years. It included 198 participants diagnosed with either full or partial PTSD 1–3 months post-earthquake, at an intermediate assessment 8–20 months post-earthquake, and at a 10-year follow-up. The study revealed a robust decline in full and partial PTSD rates during the first 18–20 months post-event and symptom stabilization from 20 months to 10 years following the earthquake. The data also showed a low rate of delayed-onset PTSD (2%) and a specific role of avoidance symptomatology/behavior post-earthquake as a predictor of less favorable outcomes (ie, meeting criteria for full PTSD diagnosis 10 years later).

Different prevalence rates of PTSD across studies may be attributed to different earthquake natures/severities, affected population characteristics, assessment methodologies and instruments, and psychiatric assessment timing.[12] In this cohort, PTSD prevalence immediately post-earthquake was in line with previous studies of PTSD following earthquakes that reported prevalence rates ranging from 22.7% to 45.5%.[1,10,15] The present study demonstrated that 15% of

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the cohort had full PTSD almost 2 years post-earthquake, in line with some studies' prevalence rates,[2,8] but not others[5,13] (see Figure 1). The study's main contribution to understanding the natural course of PTSD is the finding of symptom stability observed between 18–20 months and 10 years post-trauma. This finding is in line with those of Kessler et al,[29] who reported that the main decrease in PTSD symptomatology occurs during the first 12 months after the trauma and remains relatively stable up to 10 years later.

In recent years, the importance of identifying not only those who meet full PTSD criteria but also those who meet partial PTSD criteria has been acknowledged.[24] Among our sample, at 18–20 months and 10 years post-trauma, almost 10% of the participants met the criteria for at least two diagnostic clusters associated with PTSD (intrusiveness and either avoidance or arousal). This finding suggests that some individuals still suffer from significant symptomatology as long as 10 years after exposure to a major traumatic event such as a natural disaster. Such individuals may be identified as early as around 2 years post-disaster, and, according to the current study, their symptoms may remain stable for at least the next 8 years. Indeed, Cukor et al[30] examined full and partial PTSD among workers dispatched to the World Trade Center site 1 and 2 years following 9/11 (September 11, 2001), finding a substantial proportion of their cohort had partial PTSD at 1 year (29%) and 2 years (13.9%) following the event. This finding suggests that the clinical implications of traumatic event exposure, including partial PTSD, may be robust and enduring. Such findings underscore the importance of detection and intervention of this subpopulation of individuals, even a decade after trauma exposure. While the rates of partial PTSD in the Cukor et al[30] study were much higher than in the current study, they also demonstrate a significant decline in the diagnostic rate from post-disaster to 2 years; should their follow-up continue to 10 years as well, it would be interesting to compare findings.

Full PTSD diagnosis at follow-up was shown among 2% who were initially assessed as having neither partial nor full PTSD. This can be considered delayed-onset PTSD, the prevalence of which is still under debate in the literature. The low percent of delayed-onset PTSD evidenced in the present study is in line with Bryant and Harvey,[31] who found delayed-onset PTSD among 5 of 103 victims of motor vehicle accidents 2 years post-event (of note, Bryant and Harvey[31] also found that, similar to the current study's findings, all those with delayed-onset PTSD were female). However, other studies found higher rates; in a meta-analysis of 24 prospective studies, Smid et al[32] reported a prevalence rate of 25% in delayed-onset PTSD among studies with at least two assessment points: one within the first 6 months after the traumatic event and the second 12 to 60 months since the event. Andrews et al,[33] who also reported very low rates of delayed-onset PTSD among civilians (0%–1%), explained the discrepancy in the rates of delayed onset by suggesting that "the majority of the relevant studies did not adhere to *DSM* criteria in the assessment and diagnosis of delayed-onset PTSD."(p1324) Moreover, changing the criteria from *DSM-IV* to *DSM-5* is expected to result in lower rates of PTSD,[34] which might result in even lower rates of delayed-onset PTSD.

Re-experiencing, avoidance of stimuli associated with the trauma, and increased arousal are the core symptoms of PTSD.[22] In our study, avoidance appeared to be the single criterion predicting the long-term course of PTSD, but only in its full form (not for any partial PTSD). This finding suggests that although re-experiencing and hyperarousal are the most prominent symptoms immediately after exposure to trauma, they have lower sensitivity than avoidance to the long-term outcomes of PTSD.

The importance of avoidance to the diagnosis of PTSD was reported previously,[11,35,36] showing its pivotal role in PTSD development and its tenacity over time. Although re-experiencing and hyperarousal symptoms were reported to be expected, they do not seem to define the course of PTSD,[36] while avoidance symptoms do.[35] Hence, it appears that the use of avoidance as a coping strategy is a significant negative predictor of the course of PTSD even 10 years after the event. Identification of avoidance as a predictor for a less favorable PTSD course carries important significance, giving clinicians a tool for recognizing who is at greater risk for a less favorable course of PTSD and, therefore, for whom intervention focusing on the avoidance is even more essential.

The main limitation of the current study is the use of self-report rating scales rather than clinician-administered tools. The shortcomings of self-rating scales are well-described and include (among other issues) how accurately the participants understand what they are being asked and the relatively large variance of subjective scores given in response to the questions. Nevertheless, the instrument used (Turkish translation of the PTSD self-test of the ADAA) is built around *DSM* criteria (in this case, *DSM-IV*). It is much more practical to use when assessing a large number of participants (eg, 9,422 in the original study), especially when resources are limited. Moreover, the *DSM-5* denotes a broader scope of criteria for PTSD diagnosis that includes negative alterations in cognitions and mood (*DSM-5*[22]), increasing the number of symptom groups from 3 to 4 and the number of symptoms from 17 to 20. These symptoms were not captured in either the original study[8] or follow-up studies based on the *DSM-IV* criteria available at that time. Thus, it is possible that using the current constellation of *DSM-5* criteria would result in somewhat different (possibly higher) rates of full or partial PTSD.

Other limitations are related to the naturalistic and uncontrolled nature of the study; any treatment effect (if there was treatment) was not assessed. Hence, the issue of the effect of treatment on the trajectory of PTSD was not included. This poses a major limitation to the study; nevertheless, in the present cohort, being in a rural suburb of Istanbul with no frequent access to medical care, the treatment possibilities were limited, and no systematic or long-term treatment was provided. Also, the study sample was relatively small, and with a majority of women; psychiatric

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comorbidities were not investigated, and no other traumatic events were investigated during the follow-up period.

CONCLUSIONS

Following earthquake survivors for 10 years has yielded 4 main conclusions: (1) Full and partial PTSD decrease during the first 2 years following trauma exposure but after that remain relatively stable up until 10 years later, suggesting transition into a chronic disorder; (2) background variables that predict the development of PTSD do not necessarily predict its long-term course; (3) avoidance is a significant risk factor for chronic full PTSD; and (4) delayed-onset PTSD seems to be relatively rare.

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***Additional information*:** The original data set is available from Karamustafalıoğlu et al.[8]

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