Journal of Anxiety Disorders 32 (2015) 103–111

Contents lists available at ScienceDirect

Journal of Anxiety Disorders

Posttraumatic stress and other health consequences of catastrophic avalanches: A 16-year follow-up of survivors

Edda Bjork Thordardottir[a,b,*], Unnur Anna Valdimarsdottir[a,c], Ingunn Hansdottir[b], Heidi Resnick[d], Jillian C. Shipherd[e,f], Berglind Gudmundsdottir[a,b,g]

[a] Centre of Public Health Sciences, Faculty of Medicine, School of Health Sciences, University of Iceland, Reykjavik, Iceland
[b] Faculty of Psychology, School of Health Sciences, University of Iceland, Reykjavik, Iceland
[c] Department of Epidemiology, Harvard School of Public Health, Boston, MA, USA
[d] Department of Psychiatry and Behavioral Sciences, Medical University of South Carolina, USA
[e] National Center for PTSD, VA Boston Healthcare System, USA
[f] Department of Psychiatry, Boston University School of Medicine, USA
[g] Mental Health Services, Landspitali – The National University Hospital of Iceland, Iceland

ARTICLE INFO

Article history:
Received 24 September 2014
Received in revised form 19 February 2015
Accepted 9 March 2015
Available online 28 March 2015

Keywords:
Disaster
Avalanche
Posttraumatic stress disorder
Mental health
Physical health

ABSTRACT

To date, no study has investigated the effects of avalanches on survivor's health beyond the first years. The aim of this study was to examine long-term health status 16 years after exposure to avalanches using a matched cohort design. Mental health, sleep quality and somatic symptoms among avalanche survivors ($n = 286$) and non-exposed controls ($n = 357$) were examined. Results showed that 16% of survivors currently experience avalanche-specific PTSD symptoms (PDS score > 14). In addition, survivors presented with increased risk of PTSD hyperarousal symptoms (>85th percentile) (aRR = 1.83; 98.3% CI [1.23–2.74]); sleep-related problems (PSQI score > 5) (aRR = 1.34; 95% CI [1.05–1.70]); PTSD-related sleep disturbances (PSQI-A score ≥ 4) (aRR = 1.86; 95% CI [1.30–2.67]); musculoskeletal and nervous system problems (aRR 1.43; 99% CI 1.06–1.93) and gastrointestinal problems (aRR 2.16; 99% CI 1.21–3.86) compared to the unexposed group. Results highlight the need for treatment for long-term PTSD symptoms and sleep disruption in disaster communities.

Disasters can have a significant effect on survivors' mental and physical health. In a growing body of research on disaster survivors, a majority of studies have found that survivors suffer from psychological disorders and following exposure to disaster (Norris et al., 2002). These findings in general are however limited to the first year following exposure (Norris, Galea, Friedman, & Watson, 2006).

Although limited in number, research on the long-term effect of disasters indicates that survivors may suffer from a range of adverse mental health symptoms, up to decades later such as PTSD (Arnberg, Eriksson, Hultman, & Lundin, 2011; Green et al., 1990), major depression (Zaetta, Santonastaso, & Favaro, 2011), chronic anxiety and sleep-related disturbances (van der Velden, Wong, Boshuizen, & Grievink, 2013). Furthermore, trauma exposure has been shown to be strongly associated with increased physical health problems; such as cardiovascular, gastrointestinal, respiratory and musculoskeletal disorders including chronic pain (Afari et al., 2014; Boscarino, 2004; Green & Kimerling, 2004; McFarlane, 2010; Shipherd, Clum, Suvak, & Resick, 2013; Spitzer et al., 2009; Wachen et al., 2013).

The literature on long-term survivorship after exposure to avalanche is indeed scarce. Two studies have assessed PTSD prevalence in soldiers who survived avalanches in Norway (Herlofsen, 1994; Johnsen, Eid, Lovstad, & Michelsen, 1997), both indicating that survivors suffered from symptoms of PTSD up to four months post-disaster. The other studies, examining two avalanche-exposed communities in small fishing villages in Iceland found that ten weeks post-disaster survivors in one of the communities were twice as likely to meet criteria for psychiatric caseness based on the General Health Questionnaire compared to population controls and further follow-up on both samples showed that ten weeks to 14 months after the two avalanches, approximately 40% of survivors were suffering from PTSD (Asmundsson & Oddsson, 2000; Finnsdottir & Elklit, 2002). These high rates of PTSD merit further investigation and the current study follows up on these samples of avalanche survivors to assess the long-term health of survivors.

* Corresponding author at: Centre of Public Health Sciences, University of Iceland, Stapi v/ Hringbraut, 101 Reykjavik, Iceland. Tel.: +354 525 5486; fax: +354 552 1331.
E-mail address: eddat@hi.is (E.B. Thordardottir).

http://dx.doi.org/10.1016/j.janxdis.2015.03.005
0887-6185/

Compared to unexposed population controls, we hypothesized that those residing in avalanche communities when the disaster occurred would present with higher risks of self-reported mental health symptoms (PTSD, depressive, anxiety, stress and panic symptoms), poorer sleep quality, PTSD-related sleep disturbances and various stress-related medical conditions 16 years post-disaster.

1. Method

1.1. Participants

In 1995, two small towns in the western part of Iceland, Flateyri and Sudavik, were struck by avalanches without warning, destroying in total 48 houses and taking 34 lives (including 13 children). Participants were 286 individuals residing in Sudavik and Flateyri in 1995 when the avalanches occurred, irrespective of whether they were in or out of town at time of the avalanches. Residential records from 1995 with contact information for residents of these towns were obtained from the Icelandic bureau of statistics, Statistics Iceland. With identical means we further identified a comparison group of 357 residents of two towns (Breidalsvik and Raufarhofn) in 1995 with similar living conditions (fishing towns) but not geographically threatened by avalanches. In 2011, we attempted to contact all living residents in these towns, 18 years or older, residing anywhere in Iceland with an active phone number or address (see Appendix A for further detail). Individuals who were currently residing abroad were not included in the study as no information was available about their addresses overseas. Of residents alive in 2011, 16% ($n = 81$) had moved overseas in the exposed group compared to 5% ($n = 23$) in the comparison group. Response rate for the avalanche survivors was 72% (286/399; 50% men, 50% women) and 70% (357/541; 46% men, 54% women) in the comparison group. Response rate was considerably higher when the questionnaire was sent via email than by postal mail in both groups.

1.2. Procedure

Approval for the study was granted by the Icelandic Bioethics Committee (VSNb2009080005/03.7). The Icelandic Data Protection Authority was notified of the study (s4608/2009/LSL/–).

Participants received an introductory letter explaining the objective of the study followed by a phone call a week later inquiring about willingness to participate. Those who verbally agreed to participate received a letter about the study and the questionnaire via email or postal mail. Those who did not have an active phone number received a letter about the study and the questionnaire by postal mail. Participants were informed that answering and returning the questionnaire was viewed as consent to participate in the study. Two weeks after sending the questionnaire, participants received a message via email or postal mail thanking them for their participation and reminding those who had not returned the questionnaire to do so. This was followed by a reminder phone call a week later if the questionnaire had not been returned. Data were collected from January until June in 2011.

1.3. Measures

1.3.1. Background information

Demographic information was gathered for gender, age, education, finances, number of children, current living situation and employment status. In addition, current nicotine use, illegal drug use in the past 12 months, current alcohol consumption, excessive drinking ("how many drinks do you usually have each time you consume alcohol?"; defined as ≥3 drinks for women and ≥5 drinks for men) and medication use was assessed (a yes/no response option was used for each variable). There were no statistically significant differences between the avalanche-exposed and comparison groups with regard to demographic information (see Table 1). Furthermore, the avalanche-exposed group was asked if they were in or out of town when the avalanche fell. A quarter of the exposed group was not in town at the time of the avalanche (see Table 1).

Table 1
Characteristics of survivors of avalanches in 1995 (exposed) and residents of villages not exposed to avalanches (comparison group).*

	Exposed ($n = 286$)	Comparison ($n = 357$)
Gender		
Male	143 (50%)	164 (46%)
Female	143 (50%)	190 (54%)
Age in years		
18–35	108 (38%)	117 (33%)
36–55	109 (39%)	136 (38%)
56–75	47 (17%)	81 (23%)
76–90	16 (6%)	23 (6%)
Education		
University	49 (17%)	44 (13%)
High school or trade school	122 (44%)	145 (41%)
Grade school or less educ.	110 (39%)	163 (46%)
Personal finances		
Very good or good	74 (26%)	106 (30%)
Moderate ends meet	139 (49%)	184 (52%)
Poor or very poor	70 (25%)	62 (18%)
Children (yes)	220 (77%)	266 (75%)
1–2	96 (44%)	126 (48%)
3–4	103 (47%)	114 (43%)
≥5	20 (9%)	25 (9%)
Current living situation		
Married or in relationship	199 (70%)	254 (71%)
Single, divorced or widowed	85 (30%)	103 (29%)
Job		
Working or student	204 (72%)	249 (71%)
Unemployed	25 (9%)	27 (7%)
On disability	20 (7%)	26 (7%)
Parental leave/homemaker	11 (4%)	13 (4%)
Retired	18 (6%)	31 (9%)
Other	6 (2%)	8 (2%)
In town at time of avalanche		
Yes	206 (75%)	–
No	70 (25%)	–
Substance use		
Nicotine use	66 (26%)	70 (21%)
Men	34 (27%)	31 (21%)
Women	32 (24%)	39 (22%)
Illegal drug use past 12 mths.	20 (8%)	29 (9%)
Men	12 (10%)	15 (11%)
Women	8 (6%)	14 (8%)
Alcohol consumer	199 (77%)	261 (77%)
Men	99 (78%)	123 (80%)
Women	100 (76%)	136 (74%)
Excessive drinking		
Men (≥5 drinks)	38 (39%)	44 (37%)
Women (≥3 drinks)	56 (57%)	82 (62%)
Use of medication (yes)	129 (50%)	166 (49%)

* Chi-square analysis revealed no statistically significant differences ($p < 0.05$) between the groups.

1.3.2. The Posttraumatic Diagnostic Scale (PDS; Foa, Cashman, Jaycox, & Perry, 1997)

The PDS was used to assess posttraumatic stress symptoms reflecting PTSD diagnostic criteria items in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM IV; American Psychiatric Association, 2000). Two methods were used to assess the traumatic events experienced. The comparison group answered the standard checklist of 12 traumatic events