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Original Research

Alcohol consumption in the aftermath of a natural disaster: a longitudinal study

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ABSTRACT

Objectives: In this study, we examined changes in alcohol consumption in the aftermath of a natural disaster, as well as possible predictors of both increased and decreased drinking.
Study design: Observational longitudinal study.
Methods: Repatriated Norwegian adults who resided in areas affected by the 2004 Southeast Asia tsunami completed a questionnaire at 6 and 24 months postdisaster (N = 649).
Results: Weekly alcohol consumption and frequency of intoxication did not change significantly from 6 to 24 months postdisaster at the population level: 18.3% (n = 116) increased their alcohol consumption while 21.1% (n = 125) showed a reduction. Increased drinking was not predicted by severity of disaster exposure, post-traumatic stress, or measures of psychological functioning. Reduced alcohol consumption was predicted by younger age and social withdrawal, but not by any of the other study variables.
Conclusion: Our findings indicate that the tsunami experience had only minor effects on alcohol consumption, in contrast to some studies suggesting a relationship between trauma exposure and increased alcohol consumption.

Introduction

The bulk of studies on the relationship between disaster exposure and alcohol use have concluded that disaster exposure or subsequent post-traumatic stress is associated with increased alcohol consumption.[1–6] Also, psychopathology such as depression, anxiety disorders, and somatization disorders have generally been found to be associated with a high level of alcohol use,[7–10] as well as with trauma exposure.[11–13]

Previous research in this field has several limitations, however. First, a large proportion of the studies indicating an association of disaster exposure and increased drinking have relied on retrospective data.[4–6,14] In some of these studies, participants were asked directly whether they had changed their drinking habits after the traumatic event. Other studies assessed such changes by posing questions about current

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alcohol use and alcohol use prior to the traumatic event. Previous analyses of the same dataset on which the present study is based suggested that such data may not necessarily capture actual changes in drinking patterns but rather reflect attribution and recall bias.[15] Another limitation of the research literature in question is that few studies have included a relevant reference group of non-exposed individuals as controls.[3,15,16] By its very nature, the cross-sectional design of these studies also limits the possibility of establishing the probability of a cause–effect relationship.

The body of longitudinal research in this field is meager, and the findings are mixed. Some of these studies indicate that trauma exposure is related to increased drinking, but that other stressors significantly interact with this relationship.[17,18] Evidence suggesting that this relationship is independent of other factors has also been reported.[16] Finally, one longitudinal study found no association between trauma exposure and a trajectory of increased alcohol consumption.[19]

If trauma exposure is, in fact, associated with a risk of more extensive drinking, such a link might have important implications with respect to treatment and follow-up of trauma-exposed individuals. In relation to this, it would also be important to assess factors that may increase the risk. Additional longitudinal studies that address this issue are thus needed.

Most longitudinal studies in this field have investigated the effects of terrorist events while only a few have assessed potential consequences of natural disasters. Furthermore, few studies have involved European populations. The present report is based on data from a sample of Norwegians who survived the 2004 Southeast Asia tsunami, implying that the participants had been exposed to a well-defined, sudden-onset, short-duration disastrous event. Moreover, they were all repatriated shortly after the disaster. Therefore, the dataset offers a unique opportunity to identify potential effects of the primary trauma exposure.

The purpose of this study was to investigate long-term changes in alcohol consumption among individuals exposed to a natural disaster. More specifically, we aimed to examine whether alcohol consumption changed from 6 to 24 months postdisaster and whether an increase or decrease in alcohol consumption was related to severity of disaster exposure, post-traumatic stress, psychological functioning, and demographic variables.

Methods

Participants

All Norwegian nationals who had been in Southeast Asia during the 2004 tsunami were registered by the police as they returned to Norway. The Norwegian Centre for Violence and Traumatic Stress Studies got permission to use this registry for scientific purposes by the Regional Committee for Medical Research Ethics and the Norwegian Social Science Data Services. All registered adults (aged 18 years and older) were requested by mail to complete a questionnaire at 6 and 24 months postdisaster. A total of 899 individuals (36.4%) returned a questionnaire at 6 months, 1179 (47.8%) responded at 24 months, and 674 (27.3%) responded at both assessments. Because of missing data on alcohol consumption at the first and/or second assessment(s), our analyses were confined to 649 individuals. The respondents were of similar age and had a similar sex distribution compared to non-responders.[20] Attrition was negatively associated with exposure to the tsunami and the severity of post-traumatic stress symptoms.[20] Our study sample consisted of 53% women. At the time of the disaster, the mean age was 44.1 years (sd = 12.9), 61% had more than 12 years of education, 75% were employed, and 70% were married or cohabiting. The employment and marital status of participants was similar to the age- and sex-adjusted Norwegian population.[13]

Measures

Disaster exposure

At the first assessment, participants were asked in detail about their exposure to stressful aspects of the tsunami[21] and classified into three groups according to exposure severity: not exposed, non-danger exposed, and danger exposed.[13,15,22] The 'not exposed' group included individuals who reported no contact with the waves or flood, no physical injuries to themselves or a close relative, no loss of a relative, no fear for the safety of relatives, and no witnessing of death or suffering of others. This group was used as the reference population in this study. The 'non-danger exposed' group included individuals who experienced some disaster-related exposure but no life-threatening situations. The 'danger exposed' group included individuals who had life-threatening experiences, such as having been caught, touched, or chased by the waves or flood.

Post-traumatic stress symptoms

At both assessments, the Impact of Event Scale-revised (IES-R)[23] was applied. It comprises 22 items measuring symptoms of intrusion, avoidance, and arousal during the previous week. The participants responded to each item on a five-point Likert scale, with regard to their experience with the tsunami. The mean IES-R score was calculated as a measure of the severity of post-traumatic stress symptoms. Previous research has demonstrated a high scale–construct validity and test–retest reliability of this inventory,[24] and a high internal consistency was revealed in the present study (Cronbach alpha = 0.96 at both assessments).

General psychopathology

The 28-item General Health Questionnaire (GHQ-28)[25] was used as a measure of general psychopathology during the last weeks at the first assessment. We used GHQ-28 total and subscale (somatization, anxiety, social dysfunction, depression) mean scores, derived from participant responses on a four-point Likert scale. The GHQ-28 has high sensitivity and specificity for the identification of clinical diagnostic cases,[25] and a high internal consistency was revealed in the present study (Cronbach alpha: total = 0.95, somatization = 0.87, anxiety = 0.89, social dysfunction = 0.90, depression = 0.92).

Social support and social withdrawal

At the first assessment, the Crisis Support Scale[26] was applied. Participants responded to the items on a 7-point Likert scale,

and the mean score of the four first items of the scale was calculated as a measure of positive social support.[27] We also used the withdrawal item from the Posttraumatic Symptom Scale,[28] applied at the first assessment, as a measure of social withdrawal during the previous 2 weeks. The participants responded to the item on a 7-point Likert scale, with respect to their experience with the tsunami.

Alcohol consumption

Weekly alcohol consumption was measured at both assessments by asking the participants how many alcoholic drinks they consumed in a typical week (a 'drink' was specified as a glass of wine, a beer, or a mixed drink, i.e., similar to a standard unit of alcohol).[15] Response categories were 'I do not drink alcohol', '1 drink', '2–5 drinks', '6–10 drinks', '11–20 drinks', and '>20 drinks'. We also applied a dichotomous measure on heavier drinking, in which respondents who consumed more than ten drinks in a typical week were singled out. In addition, we assessed the frequency of heavy episodic drinking at both assessments by asking the participants how many times during the last month they had consumed so much alcohol that they felt clearly intoxicated.[15] Response categories were 'no times', 'once', '2–3 times', '4–10 times', and '>10 times'.

Analysis of data

First, we analysed data on the respondents' weekly alcohol consumption. Subsequently, we examined whether the pattern of findings was echoed in analyses of the frequency of heavy episodic drinking. We used the Marginal Homogeneity test to analyse the change in alcohol consumption from 6 to 24 months postdisaster, both for the whole sample and for each of the allocated exposure groups. We calculated the proportions with increased and reduced alcohol consumption using Blaker's 95% confidence intervals (CIs).[29] Exact chi-square tests were used to compare the proportions in the three exposure groups reporting increased and reduced alcohol consumption. We applied bivariate logistic regression models to investigate possible predictors of increased and reduced alcohol consumption from 6 to 24 months, using increased drinking (versus not increased) and decreased drinking (versus not decreased) as dependent variables. Participants who belonged to the highest consumption category at the first assessment (and therefore could not possibly report a higher alcohol consumption at the second assessment) were excluded from the analysis of increased alcohol consumption. Likewise, participants who reported drinking no alcohol in a typical week at the first assessment (and therefore could not have reported lower alcohol consumption at the second assessment) were excluded from the analysis of reduced alcohol consumption. When calculating IES-R, GHQ-28, and positive social support mean scores, individuals with 30% or more unanswered items were assigned a missing value. Otherwise the scale scores were computed as the mean of the valid items.

To study adjusted effects on increased and reduced alcohol consumption, we applied a multivariate logistic regression model. In addition to disaster exposure, we added age and sex, then mean IES-R score at 6 months and GHQ-28 total mean score, and then positive social support and social withdrawal as predictor variables. We performed exact chi-square tests, using Monte Carlo with 100,000 sampled tables, to compare alcohol consumption at 6 and 24 months postdisaster in groups with different degrees of disaster exposure. The Spearman correlation coefficient was used to study the relationship between post-traumatic stress symptoms and alcohol consumption at 6 and 24 months postdisaster. Significance was set as $P < 0.05$. Statistical analyses were performed using the software package SPSS version 19.0.

Results

Weekly alcohol consumption

Table 1 shows a cross-tabulation of the weekly alcohol consumption among participants at 6 and 24 months postdisaster. There was no significant change in weekly alcohol consumption from 6 to 24 months at the population level. Among the 634 participants who potentially could have reported a higher alcohol consumption at the second assessment compared with the first, 116 (18.3%) did so. Among the 593 participants who potentially could have reduced their alcohol consumption, 125 (21.1%) did report a lower level of drinking.

Sub-group analyses of the three allocated exposure groups gave similar results; there was no significant change in alcohol consumption in either of the exposure groups (not exposed, $P = 0.887$; non-danger exposed, $P = 0.415$; danger exposed, $P = 0.615$). Also, the proportion that increased and the proportion that reduced their alcohol consumption did not vary significantly across groups with different severity of disaster exposure (Table 2).

In cross-sectional analyses, we found no association between post-traumatic stress and weekly alcohol consumption, at either 6 months ($r = -0.23$, $P = 0.558$) or 24 months ($r = -0.14$, $P = 0.720$). In addition, weekly alcohol consumption did not differ among the three allocated exposure groups at 6 months ($\chi^2 = 16.49$, $P = 0.085$) or at 24 months ($\chi^2 = 5.86$, $P = 0.831$). Also, the proportion reporting relatively heavy drinking (consumption of >10 units weekly, n = 55) 24 months post-disaster did not differ between the three allocated exposure groups ($\chi^2 = 3.54$, $P = 0.179$).

Predictors of increased and decreased weekly alcohol consumption

Table 3 provides an overview of bivariate logistic regression analyses conducted to identify possible predictors of increased or decreased alcohol consumption from 6 to 24 months post-disaster. Increased alcohol consumption was not significantly predicted by disaster exposure, post-traumatic stress symptoms, general psychopathology, social support, social withdrawal, or demographic variables, when unadjusted for other variables. Reduced alcohol consumption was significantly predicted by younger age and social withdrawal while none of the other study variables had any statistically significant effect. When adjusted for other variables in a multivariate logistic regression model, age (odds ratio

Table 1 – Alcohol consumption at 6 and 24 months (number of units consumed in a typical week).[a]

6 months post-disaster, n	24 months Post-disaster, n						
	None	1 unit	2–5 units	6–10 units	11–20 units	>20 units	Total
None	**41**	10	3	2	0	0	56
1 unit	16	**100**	38	1	0	0	155
2–5 units	7	42	**170**	34	3	1	257
6–10 units	1	3	36	**74**	20	0	134
11–20 units	0	1	4	8	**15**	4	32
>20 units	1	0	0	2	4	**8**	15
Total	66	156	251	121	42	13	649

$P = 0.327$, marginal homogeneity test.

[a] Numbers to the left of the bold figures indicate participants who reported lower levels of alcohol consumption at 24 months compared with 6 months (total 125 participants). Numbers to the right of the bold figures indicate participants who reported higher levels of alcohol consumption at 24 months compared with 6 months (total 116 participants).

(OR): 0.77, 95% CI: 0.65–0.92) and social withdrawal (OR: 1.30, 95% CI: 1.09–1.55) remained significantly associated with reduced alcohol consumption, while none of the other study variables had any statistically significant effect.

Heavy episodic drinking

In line with the findings reported above, we found no significant change in the frequency of heavy episodic drinking from 6 to 24 months ($P = 0.267$). Sub-group analyses of the three allocated exposure groups gave similar results; there was no significant change in frequency of intoxication in either of the exposure groups (not exposed, $P = 1.000$; non-danger exposed, $P = 0.356$; danger exposed, $P = 0.456$). Further, cross-sectional analyses revealed no significant association between post-traumatic stress and frequency of intoxication at 6 months ($r = 0.036$, $P = 0.364$) or at 24 months ($r = 0.049$, $P = 0.236$). The frequency of intoxication also did not differ among the three allocated exposure groups at 6 months ($\chi^2 = 8.46$, $P = 0.390$) or at 24 months ($\chi^2 = 12.07$, $P = 0.146$).

Discussion

In this study of Norwegian tsunami survivors, we found no aggregate-level changes in either weekly alcohol consumption or frequency of intoxication from 6 to 24 months post-disaster. Furthermore, individuals who increased their alcohol consumption did not differ from those who did not with respect to disaster exposure, post-traumatic stress symptoms, measures of psychological functioning, or demographic variables. Reduced alcohol consumption, on the other hand, was associated with younger age and social withdrawal but not with any of the other study variables.

It may be argued that any changes in alcohol use may have occurred before 6 months, i.e., before our first period of data collection. Thus, we emphasize that alcohol consumption did not differ between the reference group and two groups with different levels of disaster exposure, indicating no disaster-related systematic change in alcohol consumption at the population level prior to the 6-month assessment.

Our findings counter those of most previous studies investigating alcohol consumption in the aftermath of disasters.[1,2,16] These studies have typically used retrospective reports of self-perceived changes in drinking behaviour,[4–6,30,31] and such data may, as noted, be unreliable because of attribution and recall bias.[15] Memory can be affected by the perceived significance of a traumatic event,[32] and one may assume that individuals struggling with post-traumatic stress reactions may be more likely to interpret and perceive their behaviour in the context of the disaster event. This tendency might be an important source of bias in studies using retrospective reports of self-perceived changes in alcohol consumption. This is exemplified by previous findings from the same study population the present study is based on.[15] More precisely, cross-sectional analyses revealed a discrepancy between retrospective reports of self-perceived changes in alcohol consumption and corresponding reports of drinking pattern in different exposure groups. The current study indicated that disaster exposure had only minor effects on alcohol consumption in the long run, which further queries the validity of the retrospective reports. Moreover, our

Table 2 – Number of participants with increased or decreased alcohol consumption in three allocated exposure groups.

	Total (N = 649)	Not exposed, reference (n = 87)	Non-danger exposed (n = 324)	Danger exposed (n = 229)	
Increased consumption	116	19	55	42	$\chi^2 = 1.09$,
	(18.3)	(22.4)	(17.4)	(18.7)	$P = 0.575$
	[15.4–21.5]	[14.4–32.2]	[13.5–21.9]	[13.9–24.3]	
Reduced consumption	125	18	61	44	$\chi^2 = 0.28$,
	(21.1)	(22.0)	(20.2)	(22.0)	$P = 0.858$
	[17.9–24.6]	[13.6–32.1]	[16.0–25.1]	[16.6–28.2]	

Results are given as N, and (%) with [95% CI] within group.

Table 3 – Bivariate associations between increase or decrease in alcohol consumption from 6 to 24 months post-disaster and demographic variables, disaster exposure, and psychological functioning.

	Increased alcohol consumption (N = 634)			Reduced alcohol consumption (N = 593)		
	Total (N)	N (%) or mean	OR (95% CI)	Total (N)	N (%) or mean	OR (95% CI)
Age[a,b]	634	43.6 vs. 44.3	0.96 (0.82–1.12)	593	41.0 vs. 44.9	0.78* (0.66–0.91)
Sex						
Female	341	57 (16.7)	–	309	63 (20.4)	–
Male	293	59 (20.1)	1.26 (0.84–1.88)	284	62 (21.8)	1.09 (0.74–1.62)
Education						
>12 years	364	59 (16.2)	–	345	75 (21.7)	–
≤12 years	228	48 (21.1)	1.38 (0.90–2.11)	211	43 (20.4)	0.92 (0.61–1.40)
Married or cohabiting[a]						
Yes	431	77 (17.9)	–	400	82 (20.5)	–
No	178	34 (19.1)	1.09 (0.69–1.70)	171	38 (22.2)	1.11 (0.72–1.71)
Employed[a]						
Yes	476	85 (17.9)	–	453	96 (21.2)	–
No	158	31 (19.6)	1.12 (0.71–1.77)	140	29 (20.7)	0.97 (0.61–1.55)
Disaster exposure						
Not exposed	85	19 (22.4)	–	82	18 (22.0)	–
Non-danger exposed	316	55 (17.4)	0.73 (0.41–1.32)	302	61 (20.2)	0.90 (0.50–1.63)
Danger exposed	225	42 (18.7)	0.80 (0.43–1.47)	200	44 (22.0)	1.00 (0.54–1.87)
IES-R[c,e]	624	1.06 vs. 1.12	0.92 (0.72–1.18)	584	1.15 vs. 1.09	1.10 (0.86–1.40)
GHQ-28[d,e]	625	0.97 vs. 0.93	1.17 (0.78–1.73)	583	0.93 vs. 0.93	1.01 (0.67–1.52)
GHQ-28[d] **subscale**[e]						
Somatization	619	1.08 vs. 1.03	1.13 (0.81–1.57)	579	0.99 vs. 1.05	0.83 (0.59–1.17)
Anxiety	625	1.12 vs. 1.08	1.08 (0.80–1.47)	583	1.09 vs. 1.09	1.01 (0.75–1.37)
Social dysfunction	626	1.25 vs. 1.20	1.27 (0.83–1.93)	584	1.23 vs. 1.20	1.15 (0.74–1.78)
Depression	622	0.42 vs. 0.39	1.09 (0.76–1.56)	583	0.41 vs. 0.39	1.09 (0.76–1.57)
Positive social support[e]	607	4.94 vs. 5.15	0.91 (0.79–1.04)	569	5.15 vs. 5.13	1.01 (0.88–1.17)
Social withdrawal	629	2.53 vs. 2.25	1.09 (0.98–1.21)	589	2.60 vs. 2.17	1.15* (1.03–1.28)

*p value < 0.05.
[a] At the time of the disaster.
[b] OR per 10 years.
[c] Impact of event scale-revised.
[d] General health questionnaire.
[e] Mean score.

findings converge with a longitudinal study of New York residents after the 9/11 terrorist attack, which found that exposure to the attack was unrelated to a trajectory of increased alcohol consumption in the 4 years following the event.[19]

Our study differs from most previous studies of alcohol consumption in the aftermath of disasters in one important aspect: the participants were exposed to a well-defined, sudden-onset, short-duration event and quickly repatriated back to their homes in Norway. The participants were therefore to a large extent shielded from secondary disaster stressors, such as economic loss, relocation, and disruption of normal life. In most studies of disaster victims, the participants have continued to live in the disaster-stricken area. Longitudinal studies have shown that secondary disaster stressors and other past and current life stressors might be more important than exposure to a point-in-time mass traumatic event for predicting increased alcohol consumption from a long-term perspective.[17–19]

Cross-national differences in both standard of living and drinking culture should also be taken into account when interpreting results from different studies. Our study was based on a sample from a high-income European society with an established welfare system, and a large proportion (61%) of the participants were highly educated. Furthermore, in Norway, alcohol use predominantly occurs on weekends and holidays and in party settings, and solitary drinking is generally not considered socially acceptable.[33,34] Social withdrawal may be a common outcome of trauma exposure.[13,35] Thus, our finding that reduced alcohol consumption was associated with social withdrawal, which to our knowledge has not previously been documented, should be interpreted in the context of the cultural norms and traditions that shape drinking behaviour in Norway.

The association between reduced alcohol consumption and younger age in the aftermath of the tsunami might reflect factors independent from the trauma exposure itself. In Norway, as in other western countries, a substantial reduction in the consumption of alcohol typically occurs in the third decade of life.[33] This, in turn, might explain why the younger individuals in our study were more likely than others to reduce their alcohol consumption from the first to the second period of data collection.

Several caveats should be noted related to these findings. Due to the relatively small sample size, there is a risk that the present study failed to detect differences and associations of potential significance. Hence, the results should be interpreted with caution. Moreover, when measuring weekly alcohol consumption, no time frame was specified. The item

did, however, appear in the context of other questions referring to incidents and events during the previous month. It may also be noted that there is no golden standard of assessing drinking behaviour, and that our measures of alcohol consumption have not previously been validated. Because all Norwegian adults who were in Southeast Asia during the tsunami were asked to participate in the study, sample selection bias can be assumed to be low. However, the response rate was moderate, and attrition was inversely related to disaster exposure and post-traumatic stress symptoms.[20] Whether there was also an association between non-participation and alcohol use is unknown, and previous investigations of such associations have yielded mixed findings.[36] Caution should also be shown when generalizing our results to populations with a different alcohol consumption pattern compared to the Norwegian one, which is characterized by relatively infrequent drinking and a high level of consumption when drinking occurs.[33]

Summing up, our study indicates that the extent of exposure to a natural disaster itself does not necessarily correlate with a change in drinking behaviour in the aftermath. Although disaster exposure affects individual psychological functioning,[37] alcohol consumption does not seem to be affected in the same way. However, many studies have previously documented increased alcohol consumption in populations exposed to traumatic events but, as discussed, several methodological limitations are related to this research. Furthermore, possible changes in drinking behaviour may be more dependent on factors secondary to the trauma itself, such as economic loss, relocation, and disruption of normal life. More research is needed to determine the relative impact of these factors on alcohol consumption in the aftermath of disasters.

Author statements

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Ethical approval

The study was approved by the Regional Committee for Medical Research Ethics and Norwegian Social Science Data Services.

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Competing interests

None declared.

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