

Alcohol Abuse in Subjects Developing or not Developing Posttraumatic Stress Disorder after Trauma Exposure

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Abstract

Background and Objectives: The complex relation between trauma and alcohol abuse is still far to be recognized. Traumatic experiences can prompt and facilitate an excessive use of alcohol. On the other hand, alcohol use may increase the possibility to be involved in traumatic events or reduce post-trauma resilience. This study aimed to explore alcohol use and abuse in a sample of traumatized participants, with or without posttraumatic stress disorder (PTSD). **Methods:** Thirty-five outpatients with a Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR) diagnosis of PTSD and 35 outpatients with trauma exposure who did not develop PTSD were recruited. The clinical assessment of the participants comprised the following scales: The Structured Clinical Interview for DSM-IV, the Clinician-Administered PTSD Scale, and the Alcohol Use Disorders Identification Test (AUDIT). **Results:** Correlation analysis conducted on all participants showed a significant positive correlation between the AUDIT score and trauma load. When considering the two groups separately, the same correlation reached statistical significance in the PTSD group only. Analysis of beta-coefficients of regressions confirmed a significant influence of trauma load on the AUDIT score. **Conclusion:** A greater use of alcohol significantly correlated with trauma load only in the PTSD group. This data indicates that trauma itself is not sufficient to determine drinking problems, whereas PTSD symptoms may lead to alcohol use. A circular relation, rather than a linear one, can therefore be considered when traumatic experiences and alcohol use are taken into account. Specifically, traumatic experiences could cause the PTSD development, which could, in turn, lead to alcohol use or abuse as a self-medication. Such outcome could develop in alcohol use disorder that, circularly, enhances the risk of traumatic experiences. Hence, in the clinical evaluation of PTSD patients, a deep investigation of drinking patterns is highly recommended.

Keywords: Alcohol, Alcohol Use Disorders Identification Test, posttraumatic stress disorder, trauma

INTRODUCTION

Posttraumatic stress disorder (PTSD) is a composed syndrome, whose symptoms originate from a punctual traumatic event exposure. Clinical presentation includes intrusive re-living of traumatic event, avoidance of thoughts/memories/feelings, emotional numbing, and hyperarousal.^[1,2] Nightmares, flashbacks, anxiety, and global insomnia are some of the clinical presentations of PTSD. Amnesia for the traumatic event and exaggerated response can be PTSD debut symptoms too.^[3] Moreover, higher impulsivity levels have been related to hyperarousal symptoms in PTSD.^[4]

Although PTSD symptoms are clinically recognized and the syndrome is categorically framed, its exact pathophysiology is still unclear. It is also unclear if neural modifications known in PTSD patients are related to PTSD diagnosis or trauma

exposure only.^[5] More studies on the issue are therefore needed. Fear circuitry, central nervous system dysfunction, dissociation, stress response system, and synaptic plasticity modulators are some of the areas under investigation to clarify PTSD pathophysiology.

Traumatic experiences are indeed overwhelming with respect to ordinary life events, and they activate fear circuitry. PTSD claims fear as one of its distinctive feature:^[6] the past trauma is widely re-lived, negative stimuli trigger exaggerated responses,

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and innocuous stimuli are perceived as threatening. Amygdala, a key NCS region in emotional handling, results hyperactivated by neutral stimuli in PTSD patients.^[7,8] Other dysfunctional circuitries have been associated to PTSD: hippocampus, cingulate, and medial and dorsolateral prefrontal cortex.^[8-11] The clinical severity of this syndrome may also be related to compromised functional connectivity.^[12]

Scientific research is now developing a growing interest in lifetime exposure to different kind of traumatic events: it has been seen that cumulative trauma exposure predicts PTSD development in both general population and a prisoner sample, apparently relating this syndrome to multiple lifetime interpersonal trauma exposure, rather than to a single traumatic event.^[13] More studies are of course needed to validate this result.

Trauma exposure and PTSD are often presenting with related problems: alcohol abuse could be considered one of them.^[14-16] Indeed, scientific literature from 1980 to 2013 links substance misuse to higher rates of trauma-exposition. Alcohol disorders have also been related to psychiatric diagnoses, suicide rates, medical conditions, and higher mortality rates.^[17] These results encourage a specific investigation on the relation between trauma exposure, PTSD development, and alcohol consumption.

Alcohol abuse ranges from excessive alcohol consumption to actual alcohol disorder.^[18-20] The highest prevalence of alcohol use problems is recorded among young male adults. Epidemiologic data suggest that 67% of participants with a lifetime history of alcohol dependence met alcohol dependence criteria before 25 years of age.^[21] A higher prevalence of alcohol-related disorders is presented by men rather than by women among veterans. Substance misuse in this last group is associated with increased occurrence of homelessness, injuries, partner violence, sexual assaults,^[12] depression comorbidity,^[22,23] PTSD,^[17,22,23] and suicidal behavior.^[5]

Alcohol Use Disorders Identification Test (AUDIT) is a 10-item screening test evaluating alcohol abuse in the previous 12 months: it screens alcohol abuse without being a diagnostic tool.

The complex relation between trauma and alcohol abuse is still far to be recognized. Traumatic experience and stressful life events can prompt and facilitate an excessive use of alcohol, fostering the development of alcohol use disorders. On the other hand, alcohol *per se* may represent a risk factor able to influence the possibility to be involved in traumatic events or to reduce the capacity of being resilient in the posttrauma.

The aim of the present study is to explore alcohol use and abuse in a sample of traumatized participants, with or without PTSD. The secondary objective is to investigate the association between alcohol abuse and lifetime trauma events.

METHODS

Participants and assessment

This study was developed and realized at the Department of Neuroscience, Imaging and Clinical Sciences, University “G. D’Annunzio”, Chieti. All traumatized outpatients consecutively

visited by the “PTSD Unit, Chair of Psychiatry, University “G. D’Annunzio”–Chieti, from May 2013 to May 2014 were asked to participate in the study. Exclusion criteria were the following: current or lifetime diagnosis of organic mental disorder and uncontrolled or severe medical conditions. Inclusion criteria were: age ≥ 18 years, at least a traumatic event during lifetime, written informed consent to participate in the study. We consider traumas all those situations related to a life-threatening danger, namely, if they expose one’s life to actual or threatened death, serious injury, or sexual violence.

Seventy participant meeting our inclusion/exclusion criteria were recruited and divided into two study groups were recruited: Thirty-five outpatients with a Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR)^[1] diagnosis of PTSD and 35 outpatients with trauma exposure who did not develop PTSD as a control group.

The Local Ethics Committee approved all recruitment and assessment procedures. All participants provided written informed consent, after receiving a complete description of the study, and having had the opportunity to ask questions.

Tools

Clinical assessment of patients and controls was carried out by trained psychiatrists and comprised the following scales: the Structured Clinical Interview for DSM-IV Axis-I disorders/Patient Version (SCID-I/P),^[24] the Clinician-Administered PTSD Scale (CAPS),^[25] and the AUDIT.^[26]

The structured clinical interview for Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition Axis-I disorders

The Structured Clinical Interview for DSM-IV Axis-I disorders (SCID-I) is a semi-structured interview for use with patients suffering from psychiatric disorder (SCID-I/P: Patient Edition) or with nonpatient community participants (SCID-I/NP: Non-Patient Edition) who are undergoing evaluation for psychopathology. The SCID-I is the most simple to use of the clinician-administered interviews and makes diagnoses according to the DSM-IV Axis-I disorders. It is composed of nine diagnostic modules, mood episodes, and mood disorders differential included. The interviewer may choose to focus only on areas of the greatest diagnostic interest, eliminating one or more modules. The interview supplies required probe questions and suggested follow-up questions. “Skip out” directions or liberal use are utilized when a participant fails to meet a critical criterion required for a specific disorder. Diagnoses are made by the interviewer during the course of the interview; no separate scoring algorithm or program is required. The SCID-I had a reusable administration booklet with required questions, suggested follow-up questions, and diagnostic criteria. The ideal SCID-I interviewer is someone with sufficient clinical experience of psychopathology and psychiatric diagnosis to perform a diagnostic interview without an interview guide.^[24]

The clinician-administered posttraumatic stress disorder scale

The CAPS is a 30-item structured interview for evaluating core and related associated symptoms of PTSD. It values the frequency and intensity of each symptom using standard rapid questions and explicit, behaviorally anchored rating scales. The CAPS provide both continuous and dichotomous scores for current and lifetime PTSD symptoms. Designed for use by clinicians with sufficient experience of psychopathology and psychiatric diagnosis, it also can be administered by appropriately trained paraprofessionals. Data from a large-scale psychometric study of the CAPS have provided impressive evidence of its reliability and validity as a PTSD interview.^[25]

The alcohol use disorders identification test

The AUDIT is a 10-item screening test evaluating alcohol abuse in the previous 12 months: It screens alcohol abuse without being a diagnostic tool. Scientific data consider AUDIT as superior to biochemical markers. Screening patients presenting depression symptom with the complete AUDIT form is recommended.^[27] Moreover, higher scores in AUDIT-C, “Consumption-C” form of AUDIT—a shorter form of AUDIT test consisting of three questions investigating current frequency and quantity of drinking, as long as frequency of drinking six or more drinks in the past years have been related to worse outcome in medical adherence to treatment, gastrointestinal illness, all-cause mortality, and risk of meeting future trauma in traumatized participants, namely, the US veterans.^[28] The AUDIT is a widely used screening measure that assesses the presence and severity of problematic drinking or alcohol use disorder.^[29] Total scores range from 0 to 40. Questions investigate a variety of issues regarding drinking behavior: harmful use, hazardous use, and dependence tendencies. Through AUDIT scores, five categories of drinkers may be identified: nondrinker (score: 0), low-risk drinker (scores: 1–7), harmful drinker (scores: 8–15), hazardous drinker (scores: 16–19), or likely dependent on alcohol (scores: 20).^[30] A cutoff of 8 is therefore usually used to discriminate between low-risk and high-risk drinkers.^[27]

Statistical analysis

Chi-square test was used to compare categorical demographic and clinical data, applying Yates or Fisher corrections when required. Analysis of variance (ANOVA) was used to analyze between-group differences in continuous variables. In case of nonhomogenous variances, revealed by Brown–Forsythe test and nonparametrical Kruskal–Wallis ANOVA by Ranks was performed to confirm the ANOVA results. Correlations between AUDIT total score and clinical and demographic variables were measured using Pearson’s correlation coefficient in the sample as a whole and in each group separately. Statistical significance was set at $P < 0.05$, corrected for multiple comparisons using a Bonferroni’s correction.

A multiple regression analysis was also conducted in the whole sample with AUDIT scores as the dependent variable and

those variables showing between-group differences/trends or statistical significant correlations (uncorrected threshold) with AUDIT score as independent variables. Statistical analysis was performed using TIBCO Statistica 13.3: Tibco Software inc (2017), 3307 Hillview Avenue Palo Alto, CA 94304, USA.^[31]

RESULTS

PTSD patients and controls with traumatic experiences did not significantly differ in age, sex, education, comorbid conditions, pharmacological treatments, type of trauma, number of traumatic life events (trauma load), and temporal distance from trauma exposure [Table 1]. ANOVA revealed that CAPS total score was significantly higher in PTSD patients compared to traumatized controls ($F = 69.8$; $df = 1, 68$; $P = 0.000001$).

The AUDIT total score was similar between groups and only a few participants (3 PTSD and 2 controls) were above the cutoff for at-risk drinking. Correlation analysis conducted on all participants showed a significant positive correlation (Bonferroni’s corrected $P = 0.01$) between the AUDIT score and trauma load (Pearson’s coefficient $r = 0.44$, $P = 0.0002$). When considering the two groups separately, the same correlation reached statistical significance in the PTSD group ($r = 0.46$, $P = 0.007$), whereas it did not reach the corrected threshold statistical significance ($r = 0.39$, $P = 0.02$). After correcting for multiple comparisons, also correlations between the AUDIT score and age, education, and temporal distance from trauma did not survive [Table 2 for correlation results summary].

We conducted a general regression analysis model, entering the AUDIT score as the dependent variable and those variables showing between-group effects/trends or significant correlation with the AUDIT score as independent predictors (namely, diagnostic group, trauma load, temporal distance from trauma exposure, CAPS total score, and current pharmacological treatment). Results of the General Regression Model (GRM) are depicted in Table 3. As a result, GRM was significant ($F = 2.95$, $df = 8.59$, $P = 0.008$) and explained about 28% of the variance. Analysis of beta-coefficients of regressions revealed a significant influence of trauma load on the AUDIT score: $\beta = 0.42$, $P = 0.001$ (confidence interval = 0.19; 0.65), thus confirming the correlation results.

DISCUSSION

In this study, we investigated alcohol use/abuse in a sample of traumatized participants, with or without PTSD. In particular, we explored the association between alcohol abuse and number of traumatic life events.

Our data highlighted that patients and traumatized controls did not significantly differ for age, sex, education, trauma load, and temporal distance from trauma exposure. Correlation analyses conducted on all participants demonstrated a significant positive correlation (corrected for multiple comparisons) between the AUDIT score and trauma load. In particular,

Table 1: Summarizes the characteristics of the two study groups

Variable	PTSD group (n=35)	Control group (n=35)	P
Females, n (%)	16 (45.7)	16 (45.7)	(NS) ^a
Mean age in years (SD)	39.3 (11.2)	37.5 (10.6)	0.47 ^b
Mean school education in years (SD)	12.6 (3.2)	13.7 (4.7)	0.29 ^b
Temporal distance from trauma exposure in years (SD)	7.8 (9.8)	5 (5.3)	0.16 ^b
Trauma load - mean number of traumatic events (SD)	1.3 (0.6)	1.2 (0.6)	0.43 ^b
CAPS PTSD symptom score, mean (SD)	54.5* (21.5)	16.3* (16.4)	<0.0001 ^b
AUDIT score, mean (SD)	2.5 (3.2)	1.9 (2.2)	0.39 ^b
AUDIT score ≥8: High-risk drinkers, n (%)	3 (8.6)	2 (5.7)	NS ^d
Trauma type n (%)			
Car crash/air crash/shipwreck	10 (28.6)	13 (37.1)	0.61 ^c
Assault/sexual or physical violence	9 (25.7)	7 (20)	0.78 ^c
Life-threatening illness	1 (2.9)	1 (2.9)	NS ^d
Natural disaster	4 (11.4)	6 (17.1)	0.74 ^c
War trauma	1 (2.9)	1 (2.9)	NS ^d
Sudden violent death of a loved one	8 (22.9)	2 (5.7)	0.08 ^d
Industrial accident	2 (5.7)	5 (14.3)	0.43 ^d
Comorbid psychiatric conditions	13 (37.1)	10 (28.6)	0.61 ^c
Anxiety disorders	3 (8.6)	4 (11.4)	NS ^d
Bipolar disorders	4 (11.4)	1 (2.9)	0.36 ^d
Depressive disorders	6 (17.1)	5 (14.3)	NS ^c
Substance use disorders	5 (14.3)	1 (2.9)	0.20 ^d
Cannabis	1 (2.9)	0	NS ^d
Benzodiazepines	4 (11.4)	1 (2.9)	0.36 ^d
Psychopharmacologic treatments	6 (17.1)	1 (2.9)	0.11 ^d
Antidepressants	3 (8.6)	1 (2.9)	0.61 ^d
Mood stabilizers	1 (2.9)	1 (2.9)	NS ^d
Benzodiazepines	3 (8.6)	0	0.24 ^d

^aNS: Not significant, ^bIndependent *t*-test, ^cChi-square test, ^dFisher's exact test. SD: Standard deviation, AUDIT: Alcohol use disorders identification test, PTSD: Posttraumatic stress disorder, CAPS: Clinician-administered PTSD scale

Table 2: Correlation between the alcohol use disorders identification test score and demographic, clinical and psychometric variables

Variable	All subjects (n=70)		PTSD (n=35)		Controls (n=35)	
	r	P	r	P	r	P
Age	-0.23	0.06	-0.17	0.33	-0.35	0.04 ^a
Education	0.12	0.32	-0.07	0.69	0.37	0.03 ^a
Temporal distance from trauma exposure in years	-0.03	0.84	-0.22	0.21	0.41	0.014 ^a
Trauma load	0.44	0.0002*	0.46	0.007*	0.39	0.02 ^a
CAPS total score	-0.07	0.55	-0.22	0.22	-0.27	0.12

Sample size: PTSD group (n=35); Controls (n=35), All subjects (n=70). Trauma load - Average of number of traumatic life events, *Significant after Bonferroni's correction for multiple comparisons (*P* corrected=0.05/5=0.01), ^aNot significant (*P*>0.010) after Bonferroni's correction. PTSD: Posttraumatic stress disorder, CAPS: Clinician-administered PTSD scale

if the two groups are considered separately, the correlation was statistically significant in the PTSD group, whereas it did not survive the Bonferroni's correction and was therefore considered not significant in the traumatized control group.

Interestingly, analysis of beta-coefficients of regressions denoted a significant influence of trauma load on the AUDIT score, thus confirming the correlation results.

Noteworthy, the present results indicated a greater use of alcohol correlated with trauma load, but only in the PTSD

group, the correlation remained significant after correcting for multiple comparisons. This data indicates that trauma itself is not sufficient to determine alcohol abuse, whereas the development of the cluster of symptoms typically observed in PTSD may lead to alcohol use. Our data are consistent with scientific literature, as high rates of comorbid PTSD and at-risk alcohol behavior are reported. People with more traumatic episodes have an increased risk of alcohol dependence, especially if the traumatic experience has occurred in an early phase of the development.^[32,33] PTSD seems to act as

Table 3: General regression model results

Parameters estimate	β	t	P	Adjusted R^2
Age	-0.153	-1.158	0.251	0.189
Education (years)	0.116	0.899	0.372	
Temporal distance from trauma exposure (years)	-0.001	-0.008	0.994	
Trauma load*	0.416	3.628	0.001	
CAPS total score	-0.187	-1.089	0.280	
Diagnosis (PTSD, controls)	0.110	0.392	0.696	
Psychopharmacological treatments (yes/no)	-0.144	-0.978	0.332	
Diagnosis psychopharmacological treatments	0.115	0.451	0.65	

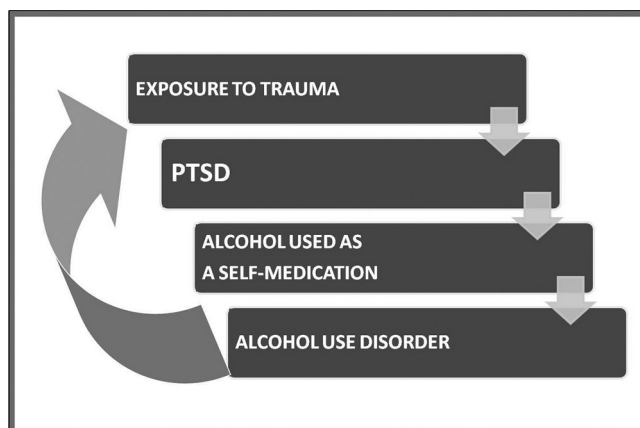
* $P < 0.05$. Trauma load - average of number of traumatic life events, In bold: Statistically significant results. PTSD: Posttraumatic stress disorder, CAPS: Clinician-administered PTSD scale

the link between trauma experience and substance/alcohol dependence,^[34] at least in most of the cases.

However, if AUD develops as a coping mechanism to manage PTSD symptoms or if it represents a vulnerability factor for PTSD is still to be clarified.

It can be argued that patients turn to the use of alcohol to self-medicate and alleviate symptoms related to PTSD.^[35] The previous study highlighted that the key mediator in the PTSD symptoms-alcohol use relationship is the provision of alcohol's tension-reducing features. Most studies showed the connection between lifetime trauma exposure and substance use disorders (SUDs), denoting that lifetime exposure to traumatic occurrences raises probability for substance abuse. PTSD, in particular, has been linked with SUDs.^[36] Alcohol may support dealing with social disablements connected with PTSD symptoms, whereas for women risk, aggression, and sexuality expectations interceded the relation between PTSD symptoms and alcohol use severity, for men sociability expectations mediated the consequences of PTSD symptoms on alcohol use gravity.^[37] Therefore, an alcohol use disorder may represent the third step of a cascade, where the trauma can determine the onset of posttraumatic symptoms, and the use of alcohol may be used as a self-medication [Figure 1]. With respect to this, resilience plays a relevant role and may represent the factor that can prevent the development of a posttraumatic syndrome, or in a later stage, of an alcohol use disorder. In a recent paper, it has been emphasized a part of the significant vulnerabilities that may increase drinking risk in students with posttraumatic stress. These involve minor self-efficacy for rejecting alcohol when in a negative mood, lower emotional control, maladaptive coping, minor protective behaviors, and higher expectations for alcohol self-medicating effects.^[38]

Although this hypothesis is the leading one, another hypothesis should be taken into account: participants with alcohol use disorder may be predisposed to be involved in traumatic experiences or to show a higher susceptibility to develop PTSD. It was demonstrated that men with serious alcohol abuse (AUDIT-C 9–12) have an increased risk of trauma.

**Figure 1: Complex relation between trauma and alcohol use**

Men ≥ 65 showed a greater risk for trauma at all levels of alcohol abuse (AUDIT-C 5–8 and 9–12).^[7] Furthermore, alcohol is implicated in up to 50% of inpatients admitted due to trauma, and in approximately 50% of all traffic crash deaths, suicides, and homicides.^[39] However, our study did not show a high prevalence of AUD in the sample of participants with traumatic experiences, regardless of the presence of PTSD. This data may limit the relevance of the hypothesis of alcohol use as a direct risk factor for traumatic experience. Conversely, the possibility of a higher susceptibility of alcohol abusers to the development of PTSD, due to a lower resilience, cannot be ruled out.

A third thesis asserts independent developmental pathways originating from a shared etiology, as well as the trauma exposition itself.^[40] Furthermore, PTSD and alcohol abuse have been connected with emotional dysregulation with deficit of emotional clearness, hard engaging in the goal-directed behavior, and in impulse control.^[41] In another study,^[28] the number of traumatic experience and stressful life events resulted to be associated with a higher risk of relapse in alcohol-dependent participants, only if the stressful event had a specific correlation with the use of alcohol itself (like a car accident or an episode of aggression after the use of alcohol). This data confirm that traumatic experiences may be a risk factor for alcohol abuse, as proposed in the first hypothesis, but on the other hand, it emphasizes the role of alcohol as confounding factor *per se* in the development of traumatic experiences. Specifically, traumatic experiences could cause PTSD development, which could, in turn, lead to alcohol use or abuse as self-medication. Such outcome could develop in an alcohol use disorder that, circularly, enhances the risk of traumatic experiences. The main finding of the present study is the significant positive correlation between the score of alcohol-related disorders, and the number of experienced traumatic events in the PTSD group compared to the traumatized control group.

CONCLUSION

In line with our results and those from scientific literature, it can be speculated that there is a strong correlation between

PTSD and alcohol consumption, with the self-medication hypothesis as the leading one. A circular relation, rather than a linear one, can therefore be considered when traumatic experiences and alcohol use are taken into account. In the clinical evaluation of PTSD patients, a deep investigation of drinking patterns is therefore highly recommended, to reduce the risk of maladaptive alcohol use in the long-term course of the illness. Prospective studies in at-risk population are needed, as long as studies aiming at defining the role of resilience in alcohol use disorders.

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Conflicts of interest

There are no conflicts of interest.

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