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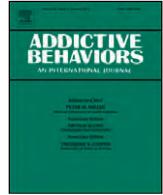
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Co-occurring mental health and alcohol misuse: Dual disorder symptoms in combat injured veterans



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HIGHLIGHTS

- 37.3% of injured veterans with a mental health problem reported alcohol misuse.
- PTSD and depression symptoms were significant correlates of alcohol misuse.
- Higher health complaints in those with dual disorder than mental health alone.

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ABSTRACT

Objective: Service members face difficulties during military deployment potentially resulting in morbidities such as posttraumatic stress disorder (PTSD), depression, and alcohol misuse. The co occurrence of alcohol misuse and mental health disorders is termed dual disorder and has been associated with adverse outcomes. **Methods:** The study included 812 high risk (i.e., endorsing combat exposure with documented combat injury) male U.S. veterans of Operation Iraqi Freedom, injured between October 2004 and November 2007, identified from the Expeditionary Medical Encounter Database.

Results: PTSD and depression symptoms were significant correlates of alcohol misuse. Veterans with dual disorder symptoms reported a significantly higher mean number of health complaints on the Post Deployment Health Reassessment compared with those endorsing only mental health symptoms.

Conclusions: These results highlight how mental health disorders among injured service members increases the odds of problem drinking and those with dual disorder have elevated health complaints.

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1. Introduction

The co occurrence of posttraumatic stress disorder (PTSD) and alcohol misuse is high (Back, Brady, Sonne, & Verduin, 2006; Kessler, Chiu, Demler, & Walters, 2005; Mills, Teesson, Ross, & Peters, 2006), particularly among veteran populations. Rates of self reported alcohol misuse range from 18 to 35% for those returning from an Operation Iraqi or Enduring Freedom (OIF/OEF) deployment (Hoge et al., 2004; Wilk et al., 2010), and prevalence of alcohol misuse among those with PTSD has been shown to be as high as 76% in a treatment seeking Vietnam veteran population (Sierles, Chen, Messing, Besyner, & Taylor, 1986). Additionally, rates of self reported depression and alcohol misuse among veteran infantryman of OIF are not insignificant

and vary from 10 to 15% (Thomas et al., 2010) and are similar to the rates seen in young adult civilian populations (Mason, Hawkins, Kosterman, & Catalano, 2010). In both veteran and civilian populations, the presence of co occurring alcohol misuse and PTSD is associated with poor outcomes across a variety of domains, including greater psychological distress, diminished social functioning, poorer treatment adherence and response, elevated physical health problems, and greater suicidal ideation (Jakupcak et al., 2009; Mills et al., 2006; Ouimette, Ahrens, Moos, & Finney, 1998; Tate, Norman, McQuaid, & Brown, 2007).

A large body of literature links both PTSD and alcohol misuse with an increased risk of symptom complaints and health problems such as difficulty sleeping, muscle aches, and physical pain (Goodwin & Davidson, 2005; Schnurr, Spiro, & Paris, 2000). Elevated rates of health problems among those with PTSD are evident even after controlling for physical illness (Beckham et al., 1998) and injury (McFarlane, Atchison, Rafalowicz, & Papay, 1994). Most of the research evaluating symptom complaints in individuals with alcohol misuse and/or PTSD has used mixed age civilian samples (Norman et al., 2006), or samples of older veterans (Tate et al., 2007). Depression and alcohol misuse comorbidity have been linked to more serious issues. Research among psychiatric

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patients with both alcohol dependence and depression shows that they exhibit greater suicidal ideation and lower self esteem compared to those with depression only (Cornelius et al., 1995).

The aims of the current study were to (1) identify the prevalence and correlates of dual disorder in recently separated veterans, (2) examine the symptoms of PTSD and depression and their association with alcohol misuse, and (3) assess the occurrence of elevated health complaints among veterans with dual disorder. Service members returning from Iraq and Afghanistan, many of whom experienced psychological and physical trauma during their deployment, offer a unique opportunity to examine the occurrence of PTSD/depression, alcohol misuse, and symptom complaints in a young, recently traumatized veteran population. Because whether the onset of increased health complaints occurs soon after the onset of PTSD/depression and alcohol misuse or possibly decades later has not been fully elucidated by the current literature, this research is critical in regard to the assessment and treatment necessary for traumatized individuals who misuse alcohol. In addition, understanding correlates and symptoms of dual disorder among service members is pressing given that alcohol misuse is a significant contributor to morbidity, is especially prevalent following combat deployment, and is a healthcare challenge facing the military, Department of Veteran Affairs, and civilian healthcare (Branchey, Davis, & Lieber, 1984; Hoge et al., 2004; Wilk et al., 2010).

2. Materials and methods

2.1. Patients and methods

The study population included 812 high risk (i.e., endorsing combat exposure and having a documented combat injury) male U.S. veterans of OIF who presented to forward deployed medical treatment facilities (i.e., facilities in the combat zone and nearest to the point of injury) for combat related injury between October 2004 and November 2007. The study population was identified from the Expeditionary Medical Encounter Database (EMED), formerly the Navy Marine Corps Combat Trauma Registry. The EMED is a deployment health database maintained by the Naval Health Research Center, in San Diego, California. The database consists of documented clinical encounters of service members deployed in support of OIF/OEF (Wade, Dye, Mohrle, & Galarneau, 2007). The clinical records are then linked to existing databases including the Post Deployment Health Assessment, Post Deployment Health Reassessment, Defense Manpower Data Center, Standard Inpatient and Ambulatory Data Records to obtain medical, administrative, deployment related, and health assessment data.

2.2. Injury specific, demographic, and deployment data

Injury severity was assessed using the Injury Severity Score (ISS) for each service member (Baker, O'Neill, Haddon, & Long, 1974).

Age, military rank, and service branch at time of injury were extracted from the EMED clinical record. Rank was categorized as junior enlisted (E1 E3), enlisted (E4 E5), or senior enlisted/warrant officer/officer (E6 E9, W1 W4, O1 O6). Deployment and other demographic characteristics, such as marital status, deployment length, level of education, race/ethnicity, and deployment history, were extracted from Defense Manpower Data Center records.

2.3. Mental health diagnosis prior to injury

Inpatient and outpatient mental health diagnoses prior to injury (International Classification of Diseases, 9th Revision, Clinical Modification [ICD 9 CM] codes 290–316) were obtained from medical records managed by the Office of the Secretary of Defense, Health Affairs, TRICARE Management Activity (i.e., Standard Inpatient Data Record and Standard Ambulatory Data Record). Diagnoses were coded by credentialed providers at military treatment facilities and federally reimbursed private clinics using ICD 9 CM codes (Larson, Highfill McRoy, & Booth Kewley, 2008).

2.4. Screening instruments

After returning from deployment, service members complete a Post Deployment Health Assessment (PDHA) and an almost identical follow up questionnaire to the PDHA called the Post Deployment Health Reassessment (PDHRA). Both are self administered questionnaires and are followed by an interview with a health care professional (Hoge, Auchterlonie, & Milliken, 2006). The purpose of these instruments is to evaluate present health status, including mental health, as well as any deployment or post deployment health concerns and to recommend follow up with appropriate health care providers when indicated. Combat exposure was identified from the PDHA through endorsing at least one of three questions; encountering dead bodies, great danger of being killed, or discharging a weapon during combat.

2.5. PTSD, depression and alcohol misuse

The PDHRA contains validated PTSD and depression screening instruments, which are displayed in Table 1. The 4 item PTSD screening instrument in the PDHRA is based on the Primary Care PTSD screen instrument and has been well validated in both soldiers returning from combat and in a patient population from the Veteran's Administration (Bliese et al., 2008; Prins et al., 2003). Based on the results of these validation studies a positive screen for PTSD required Veterans to endorse at least 3 of 4 symptoms from the PTSD screening instrument (Bliese et al., 2008; Prins et al., 2003). The depression screening instrument is derived from the Patient Health Questionnaire (Kroenke, Spitzer, & Williams, 2003). Endorsing either of the 2 questions "more than half

Table 1
Mental health and alcohol-related questions from the Post-Deployment Health Reassessment.

Posttraumatic stress ^a	Depression ^b	Alcohol misuse ^c
Post-Deployment Health Reassessment	Post-Deployment Health Reassessment	Post-Deployment Health Reassessment
Have you had any experience that was so frightening, horrible, or upsetting that, in the past month, you... Have had any nightmares about it or thought about it when you did not want to? (yes/no) Tried hard not to think about it or went out of your way to avoid situations that remind you of it? (yes/no) Were constantly on guard, watchful, or easily startled? (yes/no) Felt numb or detached from others, activities, or your surroundings? (yes/no)	Over the past month, have you been bothered by the following problems? Little interest or pleasure in doing things (not at all/few or several days/more than half the days/nearly every day) Feeling down, depressed, or hopeless (not at all/few or several days/more than half the days/nearly every day)	In the past month, did you use alcohol more than you meant to? (yes/no) In the past month, have you felt that you wanted to or needed to cut down on your drinking? (yes/no)

^a Endorsing 'yes' on any three of the four questions indicates a positive screen for PTSD.

^b Endorsing 'more than half the days' or 'nearly every day' on either question indicates a positive screen for depression.

^c Endorsing 'yes' on either question indicates a positive screen for alcohol misuse.

the days” or “nearly all days” indicated a positive screen (Grieger et al., 2006). Only PTSD and depression were evaluated as these are the only two disorders screened on the PDHRA. Alcohol misuse was assessed through the validated Two Item Conjoint Screening (TICS) instrument (Santiago et al., 2010) on the PDHRA, also shown in Table 1. Participants needed to endorse at least one of two items to be considered a screen positive for alcohol misuse.

2.6. Self rated health

Service members' self rated health was assessed with the following question from the PDHA “Would you say your health in general is...?” The PDHRA assessed self rated health with the following question, “Overall, how would you rate your health during the past month?” Both questions have the same five possible responses: “poor,” “fair,” “good,” “very good,” or “excellent.” Health status was dichotomized by collapsing the poor and fair categories and also the good through excellent ratings. Change in health status was assessed by comparing the difference in individual health ratings between the PDHA and PDHRA. Based on differences, a distinction was made among those with an improvement, decline, or no change in health.

2.7. Outcome

The outcome variable was categorized into 3 levels based on the PDHRA: those reporting no mental health symptoms, only mental health symptoms (PTSD or depression), and those with dual disorder symptoms (PTSD or depression and alcohol misuse). A small number of persons screened positive for alcohol misuse without screening positive for any mental health symptoms ($n = 61$) and were included in the no mental health symptoms group. Symptom complaints were identified from the PDHRA.

2.8. Inclusion/exclusion criteria

In an effort to achieve a homogenous study population, service members with more than 1 injury event and an ISS greater than 8 were excluded. Veterans endorsing combat exposure from the PDHA were included in this study. Additionally, veterans must have completed the PDHA within 365 days of their injury and, subsequently, completed the PDHRA within 365 days of their PDHA. The PDHRA was completed at a median of 185 days after the PDHA in this study population. Veterans with inpatient or outpatient substance related disorders with ICD 9 CM prior to injury were excluded from the study ($n = 29$) to eliminate those with a history of substance abuse. These ICD 9 CM have been previously defined in the literature (Hoge et al., 2002).

2.9. Statistical analysis

Chi square (χ^2) and Fisher's exact tests were used to assess the association of categorical variables with mental health status. An independent sample t test was used to assess the difference in mean number of symptom complaints by mental health outcome. Mann Whitney U tests were used to assess differences among age and injury severity. Binomial logistic regression was used for multivariate analyses to assess correlates of alcohol misuse while adjusting for age, rank, combat exposure and mental health diagnosis prior to injury. The Hosmer Lemeshow test indicated the model was a good fit. Tests were 2 tailed, and a P value of $< .05$ was used to determine statistical significance. All statistical analyses were performed using SAS software, version 9.2 (SAS Institute Inc., Cary, NC).

3. Results

3.1. Demographic characteristics

The median age of the study population was 22.6 years (range of 18–49 years). Table 2 shows the demographic and injury specific characteristics for the 812 male U.S. veterans of OIF classified as dual disorder and only mental health symptoms. Of the 812 veterans, 98 (12.1%) were classified as dual disorder, 165 (20.3%) were classified as only mental health symptoms, and 549 (67.6%) as endorsing no mental health symptoms. Of the 812 veterans, 117 (14.4%) endorsed PTSD symptoms, 48 (5.9%) endorsed depressive symptoms and 98 (12.1%) endorsed PTSD and depressive symptoms. Veterans classified as dual disorder were slightly younger than those with only mental health symptoms ($Z = 2.2$, $p = .139$). Among veterans classified as dual disorder, a higher proportion were junior enlisted ($\chi^2 = 4.4$, $df = 2$, $p = .110$), and were single ($\chi^2 = 3.0$, $df = 1$, $p = .082$) compared with those screening positive for only mental health, however, these were not significantly different. Although veterans with no mental health symptoms were not included in the overall statistical analysis for this table, a lower proportion of this no mental health group reported a decline in health status and diagnosis of a mental health disorder prior to post deployment health assessment compared with those classified as dual disorder or only mental health symptoms. The veterans without mental health symptoms were included in the table in order to provide a baseline for health screening outcomes.

3.2. Relationship of alcohol misuse with PTSD and depression symptoms

Overall 37.3% (95% CI = 31.6%–43.3%) of individuals (98 of 263) with a mental health problem screened positive for alcohol misuse. The pattern of PTSD and depression symptoms for veterans and associated alcohol use is shown in Table 3. After adjusting for age, rank, combat exposure and mental health diagnosis prior to injury, veterans with PTSD symptoms had significantly higher odds of reporting alcohol misuse (adjusted odds ratio [AOR] = 4.05, 95% confidence interval [CI]: 2.74–6.00) compared with those reporting no PTSD symptoms. Similarly, after adjusting for age, rank, combat exposure and mental health diagnosis prior to injury, veterans who endorsed depression symptoms were significantly more likely to have reported alcohol misuse (AOR = 4.22, 95% CI: 2.78–6.40) compared with those reporting no depression symptoms. When control ling for head injury there was no association with alcohol misuse.

3.3. Symptom complaints

A comparison between those classified as dual disorder and only mental health symptoms by frequency of symptom complaints is shown in Table 4. Veterans classified as dual disorder reported a significantly higher mean number of symptoms ($M = 4.7$, $SD = 3.0$ vs. $M = 3.8$, $SD = 3.1$) compared with those screening positive for only mental health ($p = .013$). Similarly, a significantly higher proportion of veterans classified as dual disorder endorsed 5 or more symptoms (55.1% vs. 38.8%; $\chi^2 = 6.6$, $df = 1$, $p = .010$) compared with those having only mental health symptoms. Specific self reported symptoms of significance included feeling tired after sleeping (73.5% vs. 57.6%; $\chi^2 = 6.7$, $df = 1$, $p = .010$), reporting memory problems (60.2% vs. 41.8%; $\chi^2 = 8.3$, $df = 1$, $p = .004$), tinnitus (64.3% vs. 44.9%; $\chi^2 = 9.3$, $df = 1$, $p = .002$), and irritability (61.2% vs. 47.3%; $\chi^2 = 4.8$, $df = 1$, $p = .029$). Although veterans with no mental health symptoms were not included in the overall statistical analysis for this table, they have lower reported symptoms compared with those classified as dual disorder or only mental health symptoms.

Table 2
Demographic and injury-specific characteristics among 812 high-risk U.S. veterans by mental health category.

Characteristics	Dual disorder (N = 98)		Only mental health ^a (N = 165)		p value	No mental health (N = 549)	
	N	(%)	N	(%)		N	(%)
Age, y, median (range)	22.1	(19–49)	23.1	(19–44)	.139	22.5	(18–46)
Rank					.110		
E1–E3	45	(45.9)	57	(34.5)		216	(39.3)
E4–E5	34	(34.7)	75	(45.5)		221	(40.3)
E6-officers	9	(9.2)	21	(12.7)		66	(12.0)
Unknown	10	(10.2)	12	(7.3)		46	(8.4)
Deployment length					.376		
≤ 1 year	83	(84.7)	146	(88.5)		484	(88.2)
> 1 year	15	(15.3)	19	(11.5)		65	(11.8)
ISS, median (range)	2.0	(1–8)	1.0	(1–8)	.963	1.0	(1–6)
Change in health status					.769		
Decline	35	(35.7)	63	(38.2)		52	(9.5)
Improvement	5	(5.1)	11	(6.7)		29	(5.3)
No change	58	(59.2)	91	(55.2)		468	(85.3)
Level of education					.220		
High school graduate or less	87	(88.8)	146	(88.5)		485	(88.3)
At least some college	2	(2.0)	10	(6.1)		44	(8.0)
Unknown	9	(9.2)	9	(5.5)		20	(3.6)
Marital status					.082		
Single	68	(69.4)	98	(59.4)		375	(68.3)
Married	29	(29.6)	67	(40.6)		174	(31.7)
Unknown	1	(1.0)	0	(0.0)		0	(0.0)
Previously deployed					.766		
Yes	28	(28.6)	50	(30.3)		176	(32.1)
No	70	(71.4)	115	(69.7)		373	(67.9)
Problems lingering from injury					.935		
Yes	65	(66.3)	110	(66.7)		229	(41.7)
No	11	(11.2)	18	(10.9)		162	(29.5)
Not sure or no response	22	(22.4)	37	(22.4)		158	(28.8)
Mental health diagnoses prior to injury					.721		
Yes	6	(6.1)	12	(7.3)		19	(3.5)
No	92	(93.9)	153	(92.7)		530	(96.5)

Note. "Unknown" and "Not sure or no response" were excluded from chi-square analyses.
ISS, Injury Severity Score.

^a Mental health refers to screening positive for posttraumatic stress disorder or depression.

4. Discussion

This study provides suggestive evidence that current depression and PTSD symptoms are significant correlates of alcohol misuse in high risk OIF veterans. Veterans with current PTSD or depression symptoms were approximately 4 times more likely to self report alcohol misuse on the PDHRA in comparison with those with no PTSD or depression symptoms, respectively. Additionally, veterans classified as dual disorder had significantly more physical and mental health related symptom complaints (e.g., still feeling tired after sleeping, memory problems, tinnitus, and irritability) compared with those screening positive for only mental health on the PDHRA. Consistent with previous literature, PTSD, depression, and alcohol misuse are often co occurring consequences of deployment (Hien et al., 2010; Jakupcak et al., 2010; Leeies, Pagura, Sareen, & Bolton, 2010; Mills et

Table 3
Assessment of predictors for alcohol misuse based on self-reported mental health disorders among 812 high-risk U.S. veterans.

Symptoms	Proportion of study population (N = 812)		Odds of alcohol misuse (N = 159)	
	N	(%)	AOR	(95% CI)
Model 1				
PTSD	215	(26.5)	4.05	(2.74, 6.00)
Model 2				
Depression	146	(18.0)	4.22	(2.78, 6.40)

CI, confidence interval; AOR, adjusted odds ratio; PTSD, post-traumatic stress disorder.
Note. Model 1 and Model 2 adjusted for age, rank, combat exposure and mental health diagnosis prior to injury.

al., 2006; Shipherd, Stafford, & Tanner, 2005; Tate et al., 2007). This study adds to this knowledge by documenting that these relationships remain evident even in combat injured veterans who may have many additional risk factors for problem drinking outside of mental health symptoms (e.g., physical limitations, pain). Further, a recent investigation has shown that veterans with dual disorder have a higher rate of outpatient mental health services utilization compared with those with substance abuse alone (Brennan, Nichols, & Moos, 2002). Consequently, early and effective screening and intervention for specific mental health symptoms and co occurring alcohol misuse may reduce the amount of future resources required from Department of Veterans Affairs hospitals.

The rate of alcohol misuse among veterans screening for PTSD or depression in the present study is 37.3%, and comparisons with other veteran and civilian populations are difficult because the range of rates reported in the literature is considerable, 15–40% (Leeies et al., 2010; McDevitt Murphy et al., 2010; Mills et al., 2006). The discrepancy in rates of dual disorder likely reflects the different screening instruments used, populations studied, and timing of studies. The rate of alcohol misuse among those with mental health symptoms in the current study was higher than rates reported in previous literature among an OIF veteran population seeking primary care (McDevitt Murphy et al., 2010), and this difference can likely be attributed to the inclusion of only high risk OIF veterans in the current study. This difference may be partially explained by the screening instruments used or by differences between older and younger veterans. The co occurrence of alcohol misuse and mental health disorders has been an ongoing concern within military populations ranging back to Vietnam veterans (Sierles et al., 1986).

Health complaints have previously been examined as a component of patient quality of life (Sumanen, Suominen, Koskenvuo,

Table 4
Frequency of symptom complaints at the Post-Deployment Health Reassessment among 812 high-risk U.S. veterans.

Symptoms	Dual disorder (N = 98)		Only mental health ^a (N = 165)		p value	No mental health (N = 549)	
	N	(%)	N	(%)		N	(%)
Mean number of symptoms (SD)	4.7	(3.0)	3.8	(3.1)	.013	1.2	(1.8)
Endorse 5 or more symptoms	54	(55.1)	64	(38.8)	.010	37	(6.7)
Weakness	10	(10.2)	20	(12.1)	.636	4	(0.7)
Headaches	45	(45.9)	67	(40.6)	.400	70	(12.8)
Swollen, stiff or painful joints	28	(28.6)	36	(21.8)	.217	64	(11.7)
Back pain	51	(52.0)	66	(40.0)	.058	122	(22.2)
Muscle aches	24	(24.5)	43	(26.1)	.777	43	(7.8)
Numbness in hands or feet	26	(26.5)	31	(18.8)	.141	28	(5.1)
Chest pain or pressure	8	(8.2)	12	(7.3)	.792	9	(1.6)
Dizziness or fainting	19	(19.4)	29	(17.6)	.713	14	(2.6)
Still feeling tired after sleeping	72	(73.5)	95	(57.6)	.010	82	(14.9)
Memory problems	59	(60.2)	69	(41.8)	.004	62	(11.3)
Tinnitus	63	(64.3)	74	(44.9)	.002	111	(20.2)
Irritability	60	(61.2)	78	(47.3)	.029	64	(11.7)

^a Mental health refers to screening positive for posttraumatic stress disorder or depression.

Sillanmaki, & Mattila, 2004). Two recent investigations found that patients with PTSD who self medicate through the use of alcohol have worse mental health related quality of life outcomes when compared with those not using alcohol (Leeies et al., 2010; Mills et al., 2006). Likewise, research has found that veterans with dual disorder are more likely to report chronic health problems at multiple follow up periods than those with only substance abuse (Tate et al., 2007). Supporting this established evidence, we found veterans with dual disorder reported significantly more symptom complaints compared with those screening positive for only mental health on the PDHRA. In addition, unlike prior studies with mostly older samples, we found this relationship among a young cohort with relatively recent trauma history, suggesting increased health complaints are an acute risk factor of dual disorder. This finding highlights the need for thorough evaluation and treatment of both mental and physical symptoms among returning veterans to reduce the likelihood that health problems will become chronic and disabling.

Prior investigations have shown comparable findings among those with dual disorder, indicating those with dual disorder are more likely to have elevated physical and mental health concerns in relation to those with PTSD alone or no mental health disorders (Mills et al., 2006). The greater number of symptom complaints found among those with dual disorder compared with those with only substance use disorder (Tate et al., 2007) or only mental health problems (current study) may be explained by the theory of allostatic load, which is defined as the cumulative cost to an organism of going through repeated cycles of adaptation to stress (McEwen & Stellar, 1993). Greater allostatic load is thought to exhaust an organism and thus lead to an increase in susceptibility to illness. With regard to treatment, this model would suggest that reducing the overall burden of stress on an organism would reduce overall physical and mental health symptom complaints. The study by Tate et al. provides support for this theory by showing that veterans with PTSD and substance use disorder had more health problems and health complaints than veterans with substance use disorder and trauma history without PTSD, who also had more health complaints than veterans with substance use disorder and no trauma history (Tate et al., 2007). Based on the findings of this study and the extant literature, the authors recommend that screening for substance misuse and mental health symptoms be conducted comprehensively and as early as possible. For example, as is the case within the VA system, Veterans should be screened at first possible contact, either upon enrollment into a medical setting or at the first medical appointment, and re-screened at regular intervals, at least annually. Screenings should be brief so as not to cause undue burden for Veterans or providers, be psychometrically sound with a follow up plan for more in depth assessment for those who screen positive. Integration of clinical reminders

into the patient electronic record, as is the case in the VA, may make it easier for clinicians to complete regular screenings in a timely fashion.

In regard to treatment, the need for alcohol use interventions in tandem with evidence based mental health treatment in order to resolve problem drinking is an empirical question in need of further investigation. It is possible that chronicity plays a role in whether alcohol treatment is needed. Those in early stages of alcohol misuse may not need addictions treatment if the symptoms that they were self medicating resolve with therapy. On the other hand, if alcohol misuse is longstanding and has become an addiction, addictions treatment is more likely to be needed in tandem with mental health treatment (Norman et al., 2006). While traditionally Veterans Affairs and other settings believed in treating alcohol misuse prior to mental health problems (Ouimette et al. 2003), findings from recent studies (Back et al., 2006; Hien et al., 2010; Mills et al., 2012) suggest that concurrent or primarily mental health focused treatment may be most effective in resolving both problem drinking and mental health concerns.

Although our study adds new data to the current research on dual disorder among OIF veterans, it is not without limitations. A methodological limitation exists with the collection of mental health data through self report due to recall bias. Although we removed veterans with substance abuse related diagnoses prior to injury, undoubtedly, there are those with problem drinking that choose not to seek care and therefore cannot be controlled for in the current analyses. When drawing conclusions from research there is usually a compromise between maintaining specificity to the study sample and achieving generalizability of results to the overall population. Similarly, data for this study population were collected from level I and II Navy Marine Corps military treatment facilities only (casualties treated at forward deployed Army facilities, and those transported directly to Combat Support Hospitals from the point of injury were not included), and therefore our sample may not be representative of all injuries sustained during combat. Screening instruments for PTSD, depression and alcohol misuse on the PDHRA were utilized to define outcome variables but these screen positives do not necessarily reflect the clinical reality of who is diagnosed with these disorders. Further, dual disorder is defined as co occurring mental health and alcohol misuse symptoms and does not represent a clinical diagnosis. That being said, all of the screening instruments used have validity studies supporting their sensitivity and specificity at the cut off levels used to define positive screeners in this study. The four item Primary Care Posttraumatic stress disorder (PC PTSD) screening instrument has a sensitivity and specificity for 3 yes responses ranging between .76-.78 and .87-.88 depending on the population, soldiers versus VA patients (Bliese et al., 2008; Prins et al., 2003). The Patient Health Questionnaire 2 (PHQ 2) which is the two

item depression screener used on the PDHRA has been validated in several different populations, including primary care and alcohol and drug abusers, and found to have sensitivity ranging from 65% to 83% and specificity ranging from 70% to 92%. (Delgadillo et al., 2011; Kroenke et al., 2003; Lowe et al., 2005; Richardson et al., 2010). Lastly, the Conjoint screening (TICS) questions used to identify screen positives for alcohol misuse have been shown to detect current substance use disorders with an 80% sensitivity and specificity in primary care patients who answer yes to one of the two questions and positive responses have been strongly associated with serious alcohol related behaviors such as drinking and driving, riding with a driver who had been drinking, reporting late or missing work because of a hangover, being referred to alcohol rehabilitation and being convicted of driving under the influence in post combat military service members (Brown et al., 2001; Santiago et al., 2010). Screening instruments are designed to identify at risk individuals in an attempt to prevent the full onset or severity of a given disease or disorder and the pre treatment of individuals at risk remains of clinical importance. These validation studies suggest that the instruments and methods to accurately define screen positives are well studied.

Despite these limitations, this study has several strengths. Prior research has often assessed combat exposure from self report methods only (Grieger et al., 2006; Hoge et al., 2006; Jakupcak et al., 2010; Wilk et al., 2010). In contrast, the present study utilized clinical records to ascertain combat related injury along with self reported combat exposure, thus defining a high risk population that is unique to this work. Further, the symptoms evaluated are extensive addressing neurological, physical and mental health complaints.

5. Conclusions

Our study provides new evidence about the increased odds of alcohol misuse associated with depression and PTSD. However, further research is needed to examine the timing of onset for each disorder. Alcohol misuse in conjunction with certain mental health disorders may exacerbate problematic symptoms, and thus highlights the need for early detection and treatment of mental health disorders to reduce the risk of alcohol misuse (Hien et al., 2010; Mills et al., 2006). The findings provide further documentation that may inform and assist clinicians in prioritizing the treatment of PTSD and depression symptoms among veterans, especially those at high risk. Future research should further examine health care utilization and identify long term outcomes to provide feedback and guidance to clinicians for the improvement of treatment based therapy in order to reduce the detrimental impact of dual disorder among OIF veterans.

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None declared.

Contributors

Kevin Heltemes made substantial contributions to study conception, design, data analyses, interpretation, and writing the manuscript. Mary Clouser made substantial contributions to data interpretation and critically revising the manuscript for important intellectual content. Andrew MacGregor made substantial contributions to study conception, design, data analyses, and critically revising the manuscript for important intellectual content. Sonya Norman made substantial contributions to critically revising the manuscript for important intellectual content. Michael Galarneau made substantial contributions in acquisition of study conception and final approval of the version to be published. All authors read and approved the final manuscript.

Conflict of interest

The authors declare that they have no conflicts of interest.

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The views expressed in this article are those of the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, or the U.S. Government. Approved for public release; distribution is unlimited. Human subjects participated in this study after giving their free and informed consent.

This research has been conducted in compliance with all applicable federal regulations governing the protection of human subjects in research (Protocol NHRC.2003.0025).

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14. ABSTRACT Service members face difficulties during military deployment, potentially resulting in morbidities such as posttraumatic stress disorder (PTSD), depression and alcohol misuse. The co-occurrence of alcohol misuse and mental health disorders is termed dual disorder and has been associated with adverse outcomes: psychological distress, diminished social functioning, poorer treatment adherence/response, and physical health problems. Current depression and PTSD symptoms were significant predictors of alcohol misuse. However, those whose symptoms of PTSD had resolved at follow-up were no more likely to misuse alcohol than those without PTSD symptoms. Predictors of dual disorder included sustaining a battle injury, and being junior enlisted and single. Veterans with dual disorder reported a significantly higher mean number of symptom complaints at the follow-up assessment compared with those with only mental health disorders. Our study provides suggestive evidence supporting the self-medication hypothesis, which posits that those with mental health disorders misuse alcohol to alleviate their symptoms. These results highlight the need for early evidence-based mental health treatment among those with dual disorder to reduce rates of veterans suffering from chronic mental health problems, problem drinking, and elevated health complaints.
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