Epidemiology and Prevention of Combat-Related Post-Traumatic Stress in OEF/OIF/OND Service Members

Barbara A. Hermann, PhD; Brian Shiner, MD, MPH; Matthew J. Friedman, MD, PhD

ABSTRACT This article summarizes information about the prevalence of post-traumatic stress disorder (PTSD) in military personnel and Veterans who have served in the Iraq and Afghanistan conflicts as well as the disorder's impact and efforts to prevent it in this population. We examine prevalence in light of epidemiologic methods and discuss associated outcomes, etiology, and factors affecting risk for PTSD. Prevention strategies are presented both in terms of individual-level interventions and operational strategies designed to mitigate the development of PTSD. Our findings indicate that while research into the prevalence and consequences of PTSD in the Iraq and Afghanistan cohort has been significant, relatively little is known about the effectiveness of approaches designed to prevent it.

INTRODUCTION

Between 2001 and 2011, the first 10 years of the Iraq and Afghanistan conflicts (Operation Enduring Freedom[OEF]; Operation Iraqi Freedom [OIF]; Operation New Dawn [OND]), approximately 2.3 million U.S. troops have served in OEF/OIF/OND.[1] Many experienced combat and are at risk for postdeployment problems, including mental disorders, stress reactions, and readjustment difficulties. Among the most impairing disorders is post-traumatic stress disorder (PTSD), a psychiatric condition that can follow a traumatic event or events. Symptoms of PTSD include re-experiencing of the event, avoidance of reminders of the event, emotional numbing, and physiological hyperarousal.[2] Understanding who develops PTSD and the determinants that increase risk is critical for informing policy decisions, resource allocation, and any efforts aimed at prevention and treatment.

Effective treatments for PTSD have been developed and disseminated throughout the Department of Veterans Affairs (VA) and Defense Department clinical facilities, whereas efforts at prevention are less advanced. Determining who is at risk for PTSD and developing prevention strategies for service members is complicated by an inadequate scientific understanding of resilience and a lack of evidence-based interventions for PTSD prevention. This article aims to present current knowledge of the epidemiology and prevention of PTSD within the OEF, OIF, and OND cohort. The discussion is contextualized with studies of civilians and of Vietnam and Gulf War service members.

PREVALENCE ESTIMATES OF PTSD IN OEF, OIF, AND OND

Prevalence is the proportion of people in a population that have a given disorder at a given time. Methods employed in epidemiologic studies of PTSD prevalence among service members of the Afghanistan and Iraq conflicts have varied in assessment instruments, the time period since deployment of the assessment, and the demographic, service-related, or other characteristics of the samples examined. Understanding the meaning of and variation among the widely varying estimates requires seeing them through the lens of these factors.[3] We highlight three studies relevant to understanding the prevalence of PTSD, both during the process of returning from combat and during the transition from military to civilian life.

The postdeployment health assessment (PDHA) and postdeployment health reassessment (PDHRA), both of which contain a four-item primary care PTSD screen,[4] have provided information about the prevalence of PTSD during the process of returning from combat. The PDHA is intended to be administered either in theater at the end of a tour of duty or within 1 to 2 weeks of returning from deployment. The PDHRA is intended to be administered 3 to 6 months after returning from deployment. Two studies examined only Army and Marine personnel. One used data from only the PDHA on those returning from deployment in 2003 and 2004 and found the prevalence of PTSD in OIF service members (4.8%) to be twice that of OEF service members (2.2%).[5] The other study used both PDHA and PDHRA data from 2005 and 2006 so was able to monitor PTSD prevalence over the 3- to 6-month period. Prevalence from the PDHA was comparable for active duty (6.2%) and reservists (6.6%). Although both cohorts exhibited increased prevalence on the PDHRA, prevalence was significantly higher for reservists (14.3%) than for active duty personnel (9.1%).[6] It is important to understand that PDHA and PDHRA estimates, based on the brief screening questionnaire, are higher than one would expect from a full diagnostic evaluation.

To investigate the effect of time since deployment, the RAND Corporation conducted a telephone survey targeting large and geographically diverse areas of the United States likely to contain OEF/OIF/OND personnel who had previously been deployed.[7] Using the PTSD Checklist,[8] which assesses all 17 symptoms of PTSD found within the DSM criteria,[2] the overall prevalence of probable PTSD was 13.8%. Interestingly, the number of months since return was

National Center for PTSD, VA Medical Center (116D), 215 North Main Street, White River Junction, VT 05009.

not significantly associated with the development of PTSD. However, the prevalence of PTSD was almost twice as high in those who had separated or retired from the military as in current active duty service members. The study validated other findings and assumptions from the PDHA- and PDHRA-based studies. National Guardsmen and reservists had twice the risk of PTSD as active duty service members. Compared to soldiers, sailors had less than half the risk of PTSD and airmen had less than one-tenth of the risk, whereas Marines had an equivalent risk. To summarize, prevalence estimates for PTSD in OEF/OIF/OND service members ranged widely (2.2%–17.3%). Factors such as time since deployment, service branch and component, and the relative sensitivity and specificity of different assessment instruments employed in these studies account for some of the discrepancies in prevalence estimates.

IMPACT OF PTSD

At the individual level, PTSD negatively impacts quality of life,[9] as well as physical and psychological health functioning.[10] Adding to the burden are comorbid disorders. Data from the RAND study indicate that PTSD is frequently comorbid with depression or traumatic brain injury (TBI).[7] One analysis of VA treatment records suggests that among OEF/OIF/OND VA users newly diagnosed with PTSD, nearly half also carried a diagnosis of dysthymic disorder or minor depressive disorder, 21.4% also had major depressive disorder, 18.5% also had an alcohol use disorder, and 12.5% also had a nonalcohol substance use disorder.[11] Although the specific effect of PTSD on military attrition has not been examined, the development of mental health problems has been found to increase the likelihood of attrition from the military.[5] Studies of health care utilization among OEF/OIF/OND VA users indicate that those with PTSD consume nearly twice the general health care of those without a psychological health diagnosis.[12] The 2-year social costs of PTSD and depression in Veterans of OEF/OIF/OND has been estimated at $3,525 per veteran, with almost two-thirds of the cost because of lost productivity.[13]

ETIOLOGY OF PTSD

Pavlovian fear conditioning has served as a central model for the development of PTSD.[14] Laboratory models in which animals are exposed to inescapable and unpredictable stress have informed human research on PTSD and psychological interventions. The presumed psychobiological circuitry underlying PTSD focuses on excessive activation of the amygdala by stimuli perceived to be threatening.[15] Such activation can be considered the ignition switch that produces outputs to a number of brain areas that mediate memory of emotional events, autonomic and fear reactions, and approach or avoidance behavior. In PTSD, the normal checks and balances by the medial prefrontal cortex on amygdala activation may be impaired.[16] Disinhibition of the amygdala produces a vicious spiral of recurrent fear conditioning in which ambiguous stimuli are more likely to be appraised as threatening, sensitizing key limbic areas, and lowering the threshold for fearful reactivity.[17] In the classical conditioning model of PTSD, re-experiencing and arousal symptoms are viewed as conditioned emotional responses in which the traumatic event is the unconditioned stimulus, and associated environmental reminders serve as conditioned stimuli. This model has been elaborated as emotional processing theory.[18] Such a model predicts that improvement can be achieved through extinction of conditioned fear reactions thus reducing trauma-related anxiety and correcting erroneous beliefs associated with the conditioned fear. With extinction of such fears, PTSD escape and avoidance behavior resolves, as well.[19]

RISK AND RESILIENCE FACTORS FOR PTSD IN OEF, OIF, AND OND

Although exposure to traumatic events is a necessary prerequisite for the development of PTSD, it is not in itself sufficient. Various factors related to vulnerability versus resilience have been identified, with the OEF/OIF/ OND conflicts providing an opportunity for several prospective studies.[20,21] A comprehensive review of resilience is not possible in the present article. Interested readers are referred to a recent book on resilience, which considers the entire spectrum of factors affecting resilience, from genetic and molecular to social and cultural influences.[22]

Predeployment Factors

A number of individual characteristics are modestly associated with the development of PTSD in trauma-exposed individuals. Research specific to service members and Veterans of OEF/OIF/OND suggest that risk of PTSD is heightened by female gender, divorce, exposure to family psychiatric illness, domestic violence, abuse, or violence before military induction, enlisted status, and diminished psychological or physical health before combat.[10,23–26] Investigations of the genetic factors involved in PTSD have been scarce. The few existing family studies of PTSD, focusing on refugees, physical injury in children and Holocaust survivors, suggest an elevated risk of PTSD among relatives with the disorder but cannot say whether this association is as a result of genetics or environment.[27] Twin studies, including the Vietnam era twin registry, compare the degree of similarity within identical or monozygotic (MZ) pairs with the degree of similarity within fraternal or dizygotic (DZ) pairs and indicate that genetic influences account for about one-third of the variance in PTSD risk.[28,29]

An important current research area is identifying genes that might increase (or reduce) vulnerability to PTSD following exposure to traumatic events (e.g., gene times environment interactions). As might be expected, the current list of candidate genes includes genes involved in the human stress response. These include polymorphisms that modulate

the dopaminergic and serotonergic systems, the hypothalamic–pituitary–adrenocortical axis, corticotropin-releasing factor, neuropeptide Y, and brain-derived neurotrophic factor.[30–32]

Deployment-Related Factors

Service Experiences

Greater combat exposure, length or number of deployments, or perceived threat of personal danger has been associated with PTSD risk in prospective studies with OEF/OIF/OND service members.[25,26] In addition, deployment-related physical injuries have been found to prospectively increase the odds of PTSD symptoms postdeployment in the millennium cohort study.[26] Interestingly, perceptions of threat have been found to partially or fully mediate the association of combat severity with PTSD in British Veterans of the Iraq and Afghanistan conflicts as well as U.S. combat Veterans from other cohorts.[33,34] Perceived combat preparedness at predeployment has, in turn, been found to moderate the link between combat and perceived threat[35] and predict new-onset PTSD prospectively even after accounting for combat exposure.[20] Like sense of preparedness, social support may serve a protective function. Specifically, unit member cohesion has been associated with lower odds of developing PTSD in service members serving in OEF/OIF/OND.[36]

Acute Symptoms

The development of early stress symptoms, particularly those characterized as high arousal, following combat exposure may increase risk of subsequent PTSD.[37] A meta-analysis of studies identifying predictors of PTSD found strong evidence for the role of peritraumatic dissociation in determining who develops PTSD in the aftermath of trauma exposure, with an average weighted effect size of $r = 0.35$.[38] More recent evidence, from mostly civilian samples, suggests that the persistence of dissociation is a better predictor than its presence.[39]

Postservice Factors: Life Stressors, Social Support, and Resilience

Postdeployment life stressors, such as economic difficulties, unemployment, and family discord, appear to play a role in PTSD for service members of OIF.[20,21] Coping with such difficulties may relate to the quality of social supports. A lack of social support after deployment has been associated with worse mental health adjustment in Gulf War veterans[40] and in National Guard service members of OIF.[20] Cross-sectional studies indicate that social support relates to psychological resilience, the capacity to successfully adapt in the face of challenge, in veterans of OEF/OIF/OND.[36] The construct of resilience itself has been linked to lower rates of PTSD[36] and particularly for those service members who experience high combat exposure.[41] Thus, social resources during and postdeployment may buffer against poor adjustment and may enhance resilience.

PREVENTION STRATEGIES

Early Intervention

Pharmacological

Based on evidence that excessive noradrenergic activity is associated with PTSD, the beta-adrenergic antagonist propranolol has been examined as a prophylactic agent. In the only randomized trial, the medication resulted in some suppression of adrenergic arousal, in comparison with a nontreated group when administered to emergency room accident victims within 6 to 12 hours of the event. However, there was no significant reduction in PTSD symptoms 1 and 3 months later.[42] Based on findings of low cortisol levels among individuals with PTSD, hydrocortisone administered acutely in intensive care or cardiac care hospital wards yielded promising results, but trials are needed in emergency room or combat settings.[43] The most exciting field-based finding is that acute (usually within 1–3 hours) administration of narcotic agents to U.S. Navy and Marine service members wounded in Iraq appeared to result in significantly lower rates of PTSD several months later than compared with nonadministration.[44] However, the trial was not randomized and did not determine whether the effect was as a result of rapid pain reduction, antagonism of noradrenergic activity, or both.

Psychological

Psychological debriefing (PD), in its most common form of critical incident stress debriefing (CISD), was developed for rescue workers in the acute aftermath of potentially traumatic events. PD typically involves a single session of open sharing and discussion within a unit after a potentially traumatic event. Past reviews of the literature concluded that PD does not prevent subsequent psychopathology.[45] A recent trial with 1,004 U.S. Army soldiers randomly assigned by platoon to CISD, a stress management class, or no intervention during the final phase of a 6-month peacekeeping mission to Kosovo yielded no clear advantages for CISD.[46] Although not focused on military samples or combat-related trauma, several randomized controlled trials indicate that brief Cognitive Behavioral Therapy (CBT) may ameliorate Acute Stress Disorder (ASD) and lessen the subsequent development of PTSD.[47,48,49] Furthermore, a randomized controlled trial of patients admitted to an emergency room suggests that CBT, initiated within a mean of 30 days after the trauma, may prevent chronic PTSD. Specifically, prolonged exposure and cognitive therapy each significantly and similarly reduced the odds of PTSD at 5 and 9 months postintervention, relative to a selective serotonin reuptake inhibitor, a placebo, or wait-list.

Operational Approaches

The U.S. Army established the Comprehensive Soldier Fitness program in 2008, based in part of concepts of sport and positive psychology and with the aim to increase resilience of soldiers and their families both during and after deployment

through enhanced physical, emotional, social, spiritual, and family skills. Confidential online assessment is coupled with self-paced online training modules. Organizationally, Army career schools have been infused with resilience awareness training, and master resilience trainers serve as mentors to Army leaders in order to promote resilience within units. To date, the efficacy of this approach has not been evaluated systematically.

Another U.S. Army strength-based program is the Battlemind stress management training (now also known as Military Resilience Training). The term Battlemind is used as an acronym for 10 combat-related skills that may cause problems postdeployment if not reframed in the context of civilian life.[50] A preliminary evaluation of the effectiveness of predeployment Battlemind training was conducted by the Army's fifth Mental Health Advisory Teams in 2008. The evaluation used a convenience sample of 2,195 Army soldiers deployed to Iraq and found that, after adjusting for rank, gender, months deployed, and levels of combat exposure, 12.0% of the soldiers who reported receiving the training screened positive for PTSD, depression, and anxiety versus 20.5% of soldiers who denied undergoing the training.[51] The authors noted that significant differences existed between the groups that may influence these outcomes, but they did not specify these variables or analyze their effects.

The Battlemind training has been modified and now includes a postdeployment intervention, Battlemind Debriefing. This is a single session form of PD administered within 2 weeks of returning from deployment and aimed at providing education, normalizing transition challenges, and encouraging social support. Battlemind Debriefing was evaluated in one group-randomized trial of 2,297 soldiers returning from a year-long deployment in Iraq. It was associated with modest improvements at 4-month follow-up on PTSD, depression, and sleep (d = 0.21, 0.26, and 0.50, respectively) when compared to a stress education class, but only for soldiers who scored in the top third for combat exposure.[50] The active components within the Battlemind approach driving these effects have not yet been determined.

Prevention interventions within the Marine Corps and Navy have been guided by the Stress Continuum Model, which organizes all possible stress states into one of four color-coded stress zones.[52] This model forms the foundation for the Navy and Marines Combat and Operational Stress Control doctrine, which is a set of five core leader functions aimed at promoting psychological health and preventing stress disorders. Several career schools and deployment-cycle training modules have been developed for service members, leaders, and families based on these functions. Line operational leaders use the framework and tools to better recognize when units may be at increased risk for problems in order to target preventative strategies at service members with preclinical symptoms. Specific procedures to promote recovery are described in a toolkit called Combat and Operational Stress First Aid. This approach is based on the evidence-informed Psychological First Aid, a modular approach for assisting people in the immediate aftermath of disaster and terrorism developed jointly by the VA National Center for PTSD and the National Child Traumatic Stress Network. The aim of Psychological First Aid is to reduce initial distress and to foster short- and long-term adaptive functioning following exposure to potentially traumatic events, such as natural disasters. Combat and Operational Stress First Aid encompasses seven steps that serve to assess difficulties, coordinate safety and care, reduce arousal, encourage family and peer support, and restore self-confidence and competence. Combat and Operational Stress First Aid and its tools have not yet undergone empirical evaluation, but studies are reportedly underway.[53]

CONCLUSIONS

It is clear that deployment to combat zones in Iraq and Afghanistan is associated with the development of stress reactions and PTSD. There is evidence that individual differences in risk and protective factors influence the development of PTSD. To enhance understanding of the etiological pathways of PTSD, additional research that identifies modifiable risk factors involved in PTSD development and moderators of their effects is needed.

Although there are evidence-based psychotherapies and pharmacotherapies for PTSD, the major challenge is to prevent PTSD by increasing resilience and preparation as well as the provision of effective early interventions for traumatized service members in the military theater. Extrapolating from civilian and disaster research, the best candidates to date are cognitive behavioral interventions in the immediate weeks after trauma exposure and approaches, such as Psychological First Aid, that are evidence-informed but require rigorous evaluation. Additional preventative and early intervention strategies have been proposed and are in various stages of implementation and evaluation.

The costs of PTSD for the individual, military, and society are significant. The OEF/OIF/OND cohort has offered an unprecedented opportunity to study the epidemiology and risk and resilience factors related to combat PTSD. It is imperative that this knowledge is translated into novel preventative strategies and that work to evaluate existing prevention efforts continues.

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