



Lifetime history of traumatic events in an American Indian community sample: Heritability and relation to substance dependence, affective disorder, conduct disorder and PTSD

Cindy L. Ehlers^{a,*}, Ian R. Gizer^b, David A. Gilder^a, Rachael Yehuda^c

^a Molecular and Integrative Neurosciences Department, The Scripps Research Institute, 10550 North Torrey Pines Road, SP30-1501, La Jolla, CA 92037, USA

^b Department of Psychological Sciences, University of Missouri, Columbia, MO 65211, USA

^c James J. Peters Veterans Affairs Medical Center and Traumatic Stress Studies Division, Psychiatry Department, Mount Sinai School of Medicine, Bronx, NY 10029-6574, USA

ARTICLE INFO

Article history:

Received 12 June 2012

Received in revised form

22 August 2012

Accepted 2 October 2012

Keywords:

American Indian

PTSD

Trauma

Substance dependence

ABSTRACT

American Indians appear to experience a higher rate of traumatic events than what has been reported in general population surveys. American Indians also suffer higher alcohol related death rates than any other ethnic group in the U.S. population. Therefore efforts to delineate factors which may uniquely contribute to increased likelihood of trauma, post traumatic stress disorder (PTSD), and substance use disorders (SUD) over the lifetime in American Indians are important because of the high burden of morbidity and mortality that they pose to American Indian communities. Participants were American Indians recruited from reservations that were assessed with the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA), family history assessment and the *stressful-life-events scale*. Of the 309 participants, equivalent numbers of men and women (94%) reported experiencing traumas; however, a larger proportion of women received a PTSD diagnosis (38%) than men (29%). Having experienced multiple trauma and sexual abuse were most highly associated with PTSD. Having experienced assaultive trauma and having PTSD symptoms were both found to be moderately heritable (30–50%). Logistic regression revealed that having an anxiety and/or affective disorder and having a substance dependent diagnosis, but not having antisocial personality disorder/conduct disorder, were significantly correlated with having a diagnosis of PTSD. These studies suggest that trauma is highly prevalent in this American Indian community, it is heritable, is associated with PTSD, affective/anxiety disorders and substance dependence. Additionally, trauma, PTSD and substance dependence appear to all co-emerge in early adulthood in this high-risk population.

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1. Introduction

American Indians appear to experience a higher rate of traumatic events (Beals et al., 2005a; Manson et al., 2005; Robin et al., 1997) than what has been reported in general population surveys (Volpicelli et al., 1999). High rates of trauma have also been reported in aboriginal Canadians (Karmali et al., 2005) and in urban American Indian and Alaska Natives (Evans-Campbell et al., 2006; Sugarman and Grossman, 1996). Several studies have also studied PTSD symptoms associated with trauma exposure within specific American Indian communities and in treatment centers (Brinker et al., 2007). The rates of PTSD do not appear to be higher in

American Indian adults or adolescents (Gnanadesikan et al., 2005; Robin et al., 1997); especially, when the level of trauma exposure is accounted for (Beals et al., 2002). Thus, the studies to date indicate that American Indians experience more traumas, but do not appear to experience more PTSD related to that trauma. However, the studies so far completed do not represent enough Indian communities to determine if differences across tribal groups impact the development of PTSD.

The comorbidity of trauma, PTSD and substance use disorders is very high with 52% prevalence rates for men and 28% for women in the general population and as high as 85% in clinical samples (Baker et al., 2009; Kessler et al., 1995, 2005; Mills et al., 2006; Petrakis et al., 2002). However, substance use, trauma and PTSD also have some differences across population groups. For instance, there is no published evidence that holocaust survivors have any increased risk for substance dependence (see Amir et al., 2003; Brodaty et al.,

* Corresponding author. Tel.: +1 858 784 7058; fax: +1 858 784 7409.
E-mail address: cindyeh@scripps.edu (C.L. Ehlers).

2004; Niederland, 1981; Yehuda et al., 1997). However, as pointed out by Szlemko et al. (2006) Native Americans' have uniqueness in terms of history, culture, and societal position that may have resulted in a distinct set of circumstances unlike those found in other groups. For instance, although alcohol use varies among tribes, American Indians suffer higher alcohol related death rates than any other U.S. ethnic group and five times that of the general U.S. population (May, 1982; May and Smith, 1988; Shalala et al., 1999). Therefore efforts to delineate factors which uniquely contribute to increased likelihood of trauma, PTSD, and substance use disorder (SUD) symptoms over the lifetime in Native Americans are important because of the high burden of morbidity and mortality that these pose to some American Indian communities.

Although the comorbidity of alcohol dependence and PTSD has been documented in a number of surveys in the general population (Kessler et al., 1997) and in American Indian Communities (Boyd-Ball et al., 2006), the cause for the co-occurrence is not clearly understood. PTSD in individuals with alcohol dependence may be the result of an independent psychiatric disorder or may be in part caused by the use of alcohol or drugs. For example, PTSD may cause individuals to attempt to self-medicate their symptoms with alcohol and drugs thus leading to substance dependence. In contrast, PTSD may develop in persons with substance dependence given that exposure to multiple traumas is more likely to occur during episodes of heavy drinking and drug usage. A third hypothesis, called the "high risk" hypothesis, posits that exposure to substance abuse and traumatic events are part of a shared trait for vulnerability to engage in high-risk behaviors (Brady et al., 1998; Chilcoat and Breslau, 1998).

One possible common source of variance between PTSD and substance dependence is shared genetic risk. Sartor et al. (2011) recently reported that PTSD and Alcohol Dependence have substantial overlap in genetic influences in an all women's twin sample. Wolf et al. (2010) examined the phenotypic structure of PTSD and a range of other psychiatric disorders in male twin pairs and found that PTSD cross-loaded with both Internalizing and Externalizing disorders (see Green et al., 1990; King et al., 1999; Koenen et al., 2009). A few studies have directly estimated the heritability of trauma exposure and PTSD symptoms. In one study of 4042 male–male veteran twin pairs it was found that genetic factors accounted for about 30% of the variance in PTSD symptoms, and that genetic factors also influenced trauma exposure (Lyons et al., 1993; True et al., 1993). In another study of both male and female twin pairs of non-veteran volunteers PTSD symptoms and exposure to assaultive trauma were both found to have moderate heritability (Stein et al., 2002).

The present report is part of a larger family study exploring risk factors for substance dependence in a community sample of American Indians (see Ehlers et al., 2001a, 2001b, 2001c, 2001d, 2004a, 2008c; Gilder et al., 2004, 2006, 2007, 2009). The lifetime prevalence of substance dependence in this Indian population is high and evidence for heritability and linkage to specific chromosome locations and associations with candidate genes have been demonstrated (see Ehlers and Wilhelmsen, 2005, 2007; Ehlers et al., 2004b, 2006, 2007a, 2007b, 2007c, 2008a, 2008b, 2009, 2010a, 2010b, 2011; Gizer et al., 2011; Wall et al., 2003; Wilhelmsen and Ehlers, 2005). However, descriptions of traumatic events and PTSD have not been reported in this particular Indian population. Therefore, the aims of the present study were: (1) to document the range of traumatic events reported in this American Indian community; (2) to study the relationship of traumatic events to PTSD; (3) to estimate the heritability of PTSD symptoms and trauma exposure and (4) to determine the comorbidity of trauma and PTSD with substance dependence, affective disorder, and conduct disorder.

2. Methods

2.1. Participants

American Indian participants were recruited from eight geographically contiguous reservations with a total population of about 3000 individuals. Participants were recruited using a combination of a venue-based method for sampling hard-to-reach populations (Kalton and Anderson, 1986; Muhib et al., 2001) and a respondent-driven procedure (Heckathorn, 1997) that has been described elsewhere (Gilder et al., 2004). To be included in the study, participants had to be at least 1/16th Native American Heritage (NAH), be between the ages of 18 and 70 years, and be mobile enough to be transported from his or her home to The Scripps Research Institute (TSRI). Given that the present report is part of a larger family study exploring risk factors for substance dependence, study participants are nested within large multigenerational pedigrees. The protocol for the study was approved by the Institutional Review Board (IRB) of TSRI, the Scientific Advisory Committee of the GCRC, and the Indian Health Council, a tribal review group overseeing health issues for the reservations where recruitment was undertaken. Written informed consent was obtained from each participant after the study was fully explained.

2.2. Measures

Potential participants first met individually with research staff to have the study explained and give written informed consent. During a screening period, participants had blood pressure and pulse taken, and completed a questionnaire that was used to gather information on demographics, personal medical history, ethnicity, and drinking history (Schuckit, 1985). Participants were asked to refrain from alcohol and drug usage for 24 h prior to testing. Each participant also completed an interview with the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA) and the family history assessment module (FHAM) (Bucholz et al., 1994), which was used to make substance use disorder and psychiatric disorder diagnoses according to Diagnostic and Statistical Manual (DSM-IV) criteria in the probands and their family members (American Psychiatric Association, 1987). The SSAGA is a semi-structured, poly-diagnostic psychiatric interview that has undergone both reliability and validity testing (Bucholz et al., 1994; Hesselbrock et al., 1999). It has been used in another American Indian sample (Hesselbrock et al., 2000, 2003). A trauma questionnaire was supplemented to the SSAGA to assess quantitative trauma exposure in the participants. The stressful life events and response to stressful-life-events scale was used (Green, 1996).

2.3. Data analysis

Data analyses were based on the four specific aims of this study. The first aim was to document the range of traumatic events reported in this American Indian community. To investigate this aim, the number of participants who experienced any of seven types of trauma (Military combat, sexual abuse, injury or assault, natural disaster with loss, witnessed trauma, experienced crime without injury, unexpected death) as documented by the stressful-life-events scale, were tallied and a Chi Square analysis and Fisher's Exact Test was used to detect gender effects. A weakness of these univariate analyses is that conducting many association tests on small numbers are likely to produce some false positive results.

The second aim was to study the relationship of traumatic events to PTSD. To study this aim, the type of trauma reported by individuals with a diagnosis of PTSD was tallied and a Chi Square analysis and Fisher's Exact Test used to detect gender effects. In

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