Audiologic characteristics in a sample of recently-separated military Veterans: The Noise Outcomes in Servicemembers Epidemiology Study (NOISE Study)


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ABSTRACT

Military Service Members are often exposed to high levels of occupational noise, solvents, and other exposures that can be damaging to the auditory system. Little is known about hearing loss and how it progresses in Veterans following military service. This epidemiology study is designed to evaluate and monitor a cohort of Veterans for 20 years or more to determine how hearing loss changes over time and how those changes are related to noise exposure and other ototoxic exposures encountered during military service. Data reported here are from baseline assessments of the first 100 study participants (84 males; 16 females; mean age 33.5 years; SD 8.8; range 21–58). Each participant was asked to complete a comprehensive audiologic examination and self-report questionnaires regarding sociodemographic characteristics, noise and solvent exposures, health conditions common among post-deployment Veterans, and the social and emotional consequences of hearing loss. For this relatively young cohort, 29% exhibited hearing loss, defined as average hearing threshold >20 dB HL in the conventional audiometric range. Forty-two percent exhibited hearing loss in the extended-high-frequency audiometric range using the same criterion (average hearing threshold >20 dB HL). Certain factors were found to be associated with poorer hearing in both conventional and extended-high-frequency ranges, including age, type of military branch, years of military service, number of military deployments, noise exposure, tinnitus, and a positive screen for post-traumatic stress disorder. Although the majority of participants had hearing within normal limits, 27% reported a self-perceived mild/moderate hearing handicap and 14% reported a significant handicap. Further research is needed to identify a cause for this discrepancy in audiologic results versus self-report. The information obtained from this longitudinal study could be used in future resource planning with the goal of preventing, as much as possible, the development of hearing loss during military service, and the exacerbation of prevalent hearing loss after military service and over Veterans’ lifetimes.

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1. Introduction

It is well known that hearing loss can severely compromise the performance of military personnel and their ability to keep themselves and their teams safe (Yankaskas, 2013; Yong and Wang, 2015). In spite of this awareness and increased efforts to use hearing protection in the field, a substantial number of military personnel still experience hearing loss. Hearing loss due to loud noise is non-reversible and may lead to a lifetime of clinical care to ameliorate the symptoms.

According to the Veterans Benefits Administration (VBA), hearing loss has been the second most common service-connected disability awarded through the Department of Veterans Affairs (VA) since fiscal year (FY) 2007 (tinnitus has been the most prevalent). The VBA reported 1,015,305 Veterans were service-connected for hearing loss in FY 2015, up from 933,182 reported the previous year (VBA Annual Benefits Report, FY 2015). The VA expends considerable resources to address hearing loss over Veterans’ lifetimes. To illustrate, 1253 VA-employed clinical audiologists at 491 sites of care completed 2,018,302 patient encounters in the second quarter of FY 2015, which comprises 10% of the 6.6 million Veterans’ lifetimes. To further address the hearing loss, the VA spent $298M on hearing aids, batteries, and repairs during FY 2015.

The present VA demands for care, services, and claims related to hearing loss create backlogs that require services to be outsourced, and in some cases the employment of per diem staff in order to keep up with clinical demands (Beck et al., 2016). The wars in and around Iraq and Afghanistan have greatly increased the numbers of Veterans enrolling in and receiving VA health care. It was reported that 1,189,709 Veterans that served in Operations Enduring Freedom, Iraqi Freedom, and New Dawn (collectively referred to as OEF/OIF/OND) accessed VA health care between FY 2002 and the second quarter of FY 2015, which comprises 10% of the 6.6 million Veterans who received VA health care services during FY 2014 (Department of Veterans Affairs, 2015). Audiatory complaints are highly prevalent in these recent Veterans returning from service (Theodoroff et al., 2015).

In order to provide Veterans with the best hearing health care and prevention of auditory injury, it is imperative to obtain as complete an understanding as possible of the epidemiology and pathophysiology of hearing loss and how it progresses following military service (Humes et al., 2006). This requires determining if Veterans’ auditory problems result only from prior military service or whether they are due to a variety of other causes such as occupational and/or recreational noise exposures, head trauma(s), and chemical and ototoxic exposures experienced in their daily lives outside of military service — or some combination of these factors. Potential benefits of obtaining this information include: identification of categories of individuals having the greatest susceptibility to auditory injury, promotion of effective hearing conservation and auditory injury measures, and development of advanced treatments addressing the underlying causes of hearing loss.

In a review of the literature, it was found that Helfer et al. (2005) conducted a review of medical evaluations on 141,856 Army Active Duty, Reserve, and Army National Guard members who were seen in Military Health System audiology clinics from April 2003 through March 2014. Noise-induced hearing loss injury prevalence rates were found to be higher for post-deployment related diagnoses (68.6%) versus non-deployment related diagnoses (4.0%). Military post-deployment related diagnoses also showed higher rates among the following conditions: acoustic trauma, permanent threshold shift, tinnitus, eardrum perforation, and H-3 or H-4 hearing profiles.

In a current longitudinal study (Karch et al., 2016), electronic medical chart reviews of 456 military personnel with TBI diagnosis of either blast-exposed or non-blast injury revealed 64% overall developed a significant threshold shift (STS; 67% blast-exposed; 58% non-blast). They also found that TBI patients with blast exposure developed hearing loss at a rate 24% greater than those without blast exposure. The authors also acknowledged the lack of epidemiologic studies on hearing loss and/or tinnitus resulting from military service in the active duty and the Veteran populations.

The majority of data on noise-induced hearing loss have been collected on Veterans seeking medical care. In a systematic review of 14 studies conducted by Theodoroff et al. (2015), all the studies involved Veterans and military personnel seeking treatment for various co-morbidities (TBI/blast exposure; concussions; mental health issues; etc.). The high prevalence of hearing difficulties found may not be generalizable to the majority of those in the military.

This present study is necessary because the majority of research on hearing loss in Veterans pertains to those who have suffered traumatic brain injury (TBI), those with blast exposure, or Veterans who are seeking medical care. The high prevalence of hearing difficulties found may not be representative of all Veterans. More research is needed to determine the true effects of military noise and ototoxic chemical exposures on Service Members at the population level. Longitudinal data are needed to inform researchers and clinicians, as well as individuals responsible for making/implementing new policies in the Military. This longitudinal research can result in the added benefit of better prevention methods and treatment regimens for Service Members in the Military.

The present research, referred to as the Noise Outcomes in Servicemembers Epidemiology Study (NOISE Study), is a joint effort between research investigators at the VA and the Department of Defense (DoD). This study provides for the evaluation of hearing loss and documentation of military noise exposure in Veterans within 2.5 years of discharge, and then continues to document over time the non-military and ototoxic exposures they receive as well as the impact of these exposures on their daily function. Such a study would help to elucidate the relationship between noise and auditory injury and to determine if there is a delay in the onset of noise-induced hearing loss related to military service. This is a unique study in that it is designed to capture Service Members soon after discharge and follow them over their lifetimes. Such a timeline will allow accurate detection of if and when changes occur. Longitudinal studies are needed because the effects of hearing loss and tinnitus on Veterans are not well known (Theodoroff et al., 2015).

The Committee on Accessible and Affordable Hearing Health Care for Adults recently published their recommendations titled, “Hearing Health Care for Adults: Priorities for Improving Access and Affordability” (Blazer et al., 2016). The present study also directly addresses the recommendations set forth by this committee for “understanding the extent and impact of hearing loss,” which include: “Support and conduct studies, including longitudinal studies in diverse populations to better understand: (1) the risk and natural history of hearing loss; (2) risk factors and co-morbidities of hearing loss; (3) hearing health care needs; and (4) the impact of hearing loss and its treatment on health function, economic productivity, and quality of life.” (pp. 3–4).

The NOISE Study will longitudinally (20 + years) evaluate a cohort of Military Service Members and Veterans to determine how hearing loss might change over time and how those changes might be related to noise exposure and other ototoxic exposures encountered during military service as well as from experiences outside of military service. The purpose of this report is to present baseline hearing characteristics of the first 100 participants in the
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