

Are Veterans at Risk of Hearing Loss?

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ABSTRACT

Many military servicemen and veterans who had been working in high-intensity blast waves experience traumatic brain injury (TBI), resulting in chronic auditory deficits despite normal hearing sensitivity. The specific noise level that can cause noise-induced hearing loss generally depends on duration of the exposure, the type of noise, and the frequency content of the noise, as well as the susceptibility of the exposed individual. It is very crucial that hearing conservation among military personnel and veterans should be taken into consideration. This paper has highlighted the rationale for the development of Hearing Loss Prevention Program focused at the need of continuation of hearing loss among veterans associated with social, recreational, and non-military occupational noise exposure.

Keywords: Veterans; Brain injury; Risk; Hearing

INTRODUCTION

Hearing loss is a hidden impairment which doesn't come into picture until it effects our daily life. There are various causes that leads to hearing loss. One of the common cause can be due to aging or hereditary factor. It can be triggered by sudden exposure to loud noise, viral infections, effects of toxins or by injury. In general, veterans face many health related issues, once they return from work especially those who have served extensively in combat zones. Among them, the common and serious condition is hearing loss [1]. Currently, ranking among the most prevalent health issues for the recent and former army members. The most important concern to the Congress of Veterans Administration is sudden noise exposure among military population that resulted in a contract with the Institute of Medicine National Academies [2] with an aim to conduct a review on noise exposure in the military from the existing data comprising from World War II to the present. The report investigated the extent to which hearing impairment could be effected among the armed forces employees, it also assessed the different sources of hazardous noise during military service, and estimated the levels of noise exposure leading to hearing loss [2]. The report highlighted the concerns of Congress as a concluding statement that exposure to any kind of hazardous noise in the military should be considered as a serious health threatening condition [1]. According to the U.S. Department of Veterans Affairs [3], more than 933,000 veterans have been provided with necessary

compensation for hearing loss and more than 1.3 million veterans are receiving disability benefits for tinnitus. Apart from hearing loss and tinnitus, Auditory Processing Disorder (APD) is a rising health condition that affects a huge number of veterans who were exposed to sudden noise exposure. APD is a condition the has an impact on the brain's ability to comprehend speech despite the individual being able to process the sounds normally [4]. Other than injuries to the ear or brain which may cause physical damage, an improper communication with a listener may be one of the most triggering reason of hearing loss.

RISK FACTORS

Militants face environmental factors that can be harmful to hearing irrespective of wherever they are been trained or posted. According to a report being published by BioMed Central's Military Medical Researchers [5], which focused on the possible varying sources of loudest noise that can be a biggest threat to noise-induced hearing loss. Usually sources of noise exposure in the military is often associated with work in industrial based environments such as ship-building yards and aircraft maintenance. As research indicates that the level of noise exposure during combat are extremely hazardous and difficult to control because the sources are not always predictable. Military exposure of noise sources and their levels are been published by the Army hearing program and also in the study conducted by Berger et al. [6], wherein they have mentioned few predominant

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sources of noise exposures like the cockpit of Chinook and Black Hawk helicopters whose sound levels reach 102.5 and 106 dB, respectively. They suggested that the impact of noise on hearing mechanism among the members of the military depends upon the branches of service. Although the army servicemen (soldier, sailor, airman or marine) can be exposed to very high levels of noise from either weapons like shotguns, rifles, pistols, grenades and anti-tank weapons, armoured vehicles, carrier decks of navy vessels, helicopters, fighter planes, transport aircraft and various jets. Usually in some jet propulsion fuel a single explosion can exceed the noise level of 140 dB that can cause an irreparable damage instantly. On the other hand machine guns and pistols have peak noise levels greater than 150 dBHL. This sort of sudden exposure to any loud noise can result in permanent hearing loss [7]. Chronic exposure to high sound level noise can contribute to ear damage which may lead to sensorineural hearing loss that leads to problematic situation gradually. During excessive noise exposure the ear is injured in a very critical manner which can be explained as follows:

1. High-level and noise exposures of short duration exposures exceeding the sound level of 140 dB can have an severe impact on the delicate inner hair cells which results in loose of elasticity [8]. The consequence of such noise exposure is acoustic trauma which occurs instantly and results in an immediate hearing loss which becomes permanent in nature gradually.
2. The organ of Corti loses its properties and gets detached from the basilar membrane, which is replaced by scar tissue. As the ear is damaged significantly due to exposure to impulsive sounds, the maximum sound pressure level (SPL) plays a major role than the duration of the exposure [8].

Environmental noises resulting in acoustic trauma usually come from explosive events, such as shotgun, high-powered rifle, or pistol shot (160-170 dB SPL), firecracker detonating near the head (170 dB SPL). Some research studies have revealed that noise exposure between 90 and 140 dB severely damages the cochlea mechanically and metabolically which depends on the level and duration of exposure. Permanent noise-induced hearing loss, in contrast to acoustic trauma, develops slowly over years, and is caused by any exposure which exceeds a daily average of 90 dBHL in which the hair cells within the cochlea are damaged which do not regenerate; they are replaced by scar tissue [8,9]. With continuous exposure, the loss spreads to the lower frequencies which is necessary for understanding speech. Henceforth permanent hearing loss if remains untreated can lead to poor speech comprehension affecting quality of life among the individuals [9].

NEW RESEARCH ON VETERANS AND HEARING LOSS

A study was conducted by Papesh et al., [4] which revealed that around 380,000 army militants had been diagnosed with traumatic brain injury (TBI) resulting in brain-related deficiencies [4]. The participants diagnosed with TBI reported that hearing impairment is among the most common symptom. Studies have indicated that individuals with mild TBI also exhibit clinical symptoms associated to cognitive, physical, or behavioural domains [10]. TBI Individuals also show associated characteristics like anxiety, depression, apathy, and stress [11] In

relation with the increase in mild TBI, injuries related to blast results in auditory and vestibular issues. Numerous studies have examined the association between TBI and hearing impairment, in which mild TBI population has not been studied widely yet. A longitudinal study was conducted on 36 American adults who had a significant medical history of mild TBI and the values were compared with the normative values. Results revealed that individuals performed poorer on the Dichotic Word Listening Task [12].

One of the most core challenge(s) that this study focused was the concept of "sensory gate impairment" which refers to the ability of the brain to filter out superfluous information so it can concentrate on the relevant matter. Result of this study indicated that veterans who had been exposed to extremely high noise blasts resulted in TBIs and were more likely to have sensory gate impairment [4]. Similar studies also mention that hearing problems often exist in spite of normal hearing acuity in pure-tone audiometry which reflects dysfunction at central auditory system rather than peripheral locus [8-11].

This assumption is further being correlated in various other recent research work which shows that around 40% of veterans who are been exposed to high-intensity blasts leads to poor performance in audiological behavioural and electrophysiological standard tests exclusively for central auditory system [13].

INTERVENTION OPTIONS FOR VETERANS

Early diagnosis leads to better intervention. There are hearing aids available which can be recommended based on the audiometry test results. Hearing aids come in various colours and styles so that the professionals can match up the best one for the personnel. Apart from hearing aids, in western countries almost all the branches of the military have been recommended to use Hearing Conservation Program as a mandatory device which existed since 1948 when the Air Force first issued its hearing conservation guidelines. After the implementation these programs have improved gradually and better monitored. Institute of Medicine of the National Academies Report (2006) conducted a survey which was to examine the extent to which the ear protection devices aim to control the noise, use and effectiveness of hearing protection programs, evaluation of program effectiveness of personnel, and audiometric monitoring [2]. It was found that the Navy was effectively using Hearing Protection Devices to reduce noise levels on submarines by up to 30 dB. In a combat zone, the military is reliant on use of Ear protection devices. Based on the level of noise exposure, today's technology Ear protection devices permits approximately up to 50 dB of attenuation when worn in the form of ear plugs in combination with ear muffs, and sometimes even more at frequencies above 2 kHz [2,3]. Thus, early intervention measures can lead a better life for the militants who suffer from any kind of hearing related issue [14-17].

CONCLUSION

Exposure to high sudden blasts of noise during military service is a major and serious problem that might result in considerable financial and clinical burden to the respective administration. In

a developing country like India there is lack of awareness regarding the hazardous impact of noise on hearing mechanism. Henceforth, more awareness should be created among these kind of services. Development of a Hearing Conservation Program specifically targeting the veteran population can be a very precious tool for educating veterans about the hazards and negative impact of noise and for changing their thoughts and actual concepts toward use of Ear protection devices during civilian life.

CONFLICTS OF INTEREST

No

AUTHOR DISCLOSURE STATEMENT

No competing financial interests exist

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