

## Letter to the Editor



## War and Hearing Impairments: Pay Attention to Silent Victims

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## Article info:

**Received:** 03 Aug 2025**Accepted:** 03 Sep 2025

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In addition to a negative impact on social communications, hearing loss can affect the quality of life and sleep, cause stress and anxiety [1], and exacerbate cognitive and brain disorders, including Alzheimer's disease and dementia [2]. Loud noise is a significant factor in causing hearing loss and its associated consequences. The acoustic conditions during military operations are often dangerous and can lead to long-term hearing impairments among soldiers [3]. The loud sound of air raid sirens and explosions can cause permanent hearing damage [4]. The noise level of military equipment typically exceeds 140–180 dB [5]. The blast of solid materials can create a higher peak pressure level than other sounds, resulting in a blast wave. The blast wave is twice as fast as acoustic noise, and its power is ten times stronger than acoustic noise [6]. Perforation of the eardrum, loss of outer and inner hair cells, loss of cochlear mechanics, rupture of the basilar membrane, abnormal functioning of auditory neurons in different parts of the central auditory system, tinnitus, hearing loss, and loss of speech perception, especially in difficult situations (i.e., in the presence of noise), are the consequences of blast wave [3].

Reports of hearing loss rates among the Iran-Iraq War veterans have indicated that the most common cause of hearing impairment was the shock wave (97.6%), and only 1.4% had direct bullet injuries to the auditory system. Decreased hearing/vertigo was the most common complaint (83%), followed by hearing loss alone (56%) and tinnitus (9.2%). Also, bilateral sensorineural hearing loss was reported in over 86% of people with hearing loss [7]. Studies conducted on Ukrainian refugees have reported significant hearing loss in them, and many refugees have developed sensorineural hearing loss and tinnitus after exposure to explosions and loud noises [8]. There is also a study that



reported a high prevalence of tinnitus and hearing loss caused by repeated gunfire, air raid sirens, and explosions among military and civilians affected by war in Ukraine [9]. In a study on veterans with mild traumatic brain injury, hearing loss was reported in 59.8% and tinnitus in 75.7% of veterans [10]. In a study on 570,332 Iraq and Afghanistan veterans, more than 20% had hearing loss, tinnitus, or both. Comorbid traumatic brain injury, post-traumatic stress disorder, and depression had a significant association with increased rates of hearing loss, tinnitus, or both [11].

In the modern era, with the advancement of military technology, the use of loud equipment such as missiles, drones, and explosive devices has increased. Following the military conflict between Iran and Israel, a significant number of soldiers, civilians, and first responders were exposed to loud noises and explosions. These conditions will lead to an increase in hearing disorders, including hearing loss, tinnitus, etc. Early interventions, the development of comprehensive health policies, and targeted rehabilitation by policymakers and specialists can prevent the consequences of hearing loss, including permanent disabilities, depression, and social isolation.

Here, we provide policy solutions for policymakers in Iran:

- Using the capacity of the media and providing targeted educational materials to promote public knowledge of prevention and management of hearing and balance impairments during wars;
- Providing educational materials separately for people with normal hearing, unilateral hearing loss, hearing aid users, cochlear implant users, children, older people, and their family members, regarding the use of hearing protection devices;
- Holding real maneuvers of using hearing aids by support organizations (the Welfare Organization and the Red Crescent Society) for hearing aid users through simulating a war situation;
- Including topics related to “military audiology” in the curriculum of audiology and occupational health courses, to enhance the ability of graduates to diagnose, prevent, and manage hearing disorders induced by explosive sounds in military environments, and translating and

localizing existing international resources for use by specialists;

- Accurately assessing the intensity of the noise/sound from the launch and explosion of missiles and drones, examining their effects on the peripheral and central auditory systems, and developing effective preventive strategies;
- Use of noise reduction equipment and development of high-performance soundproofing systems to improve the hearing safety of people exposed to explosions;
- Launching a system for recording information on people with hearing disorders for initial assessment and long-term follow-up of military forces and civilians involved in war in order to identify early damage to their hearing system affected by exposure to explosive sounds, prevent functional disabilities, and promote public health.
- Providing mobilized emergency services at the accident area, including counseling in the field of hearing loss and tinnitus for injured people, hearing and balance assessments for injured people, providing batteries and accessories for people using hearing aids and cochlear implants, and, if necessary, adjusting the setting of hearing aids to improve quality of life, communication skills, and preventing secondary injuries.

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