SYSTEMATIC REVIEW

Prevention and Management Intervention (PMI) of Occupational Ototoxic Exposure in Industrial Perspective Globally: A Systematic Review

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ABSTRACT

Introduction: The World Health Organisation (WHO) has estimated an increasing number of occupational hearing loss. In Malaysia, there is high pervasiveness of hearing loss and hearing impairment among manufacturing workers. Ototoxicity Prevention and Management Intervention (PMI) is not yet established in the majority of countries, including Malaysia. This work aims to investigate the ototoxicity PMI from international guidelines and global reports. **Method:** Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 flow diagram was adopted for item selection. Two large data sets were used: (1) published, peer-reviewed articles obtained through two search strategies (PubMed and Web of Science); and (2) grey literature. **Results**: Sixteen items were identified and were categorised into a triad of approaches; exposure-based, knowledge-based, and clinical-based approaches. **Conclusion**: The way forward rises from this study suggested that an effective ototoxicity PMI is needed in occupational settings where ototoxic chemical (ototoxicants) exposure occurs. Therefore, more efforts should be geared toward ototoxicity PMI especially in developing countries.
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INTRODUCTION

Hearing loss is the world's fourth leading cause of disability, costing nearly 750 billion dollars yearly. The World Health Organisation (WHO) further estimated an increase occupational hearing loss, despite the successful enforcement of noise control in industries. More specifically, WHO has projected that nearly 2.5 billion individuals will suffer from hearing loss by 2050 (1). WHO (1) also stated that work-related ototoxic chemicals are one of the factors that lead to hearing loss. These chemicals are referred to as ototoxicants, characterised as "any substance, including drugs or industrial chemicals, that is toxic to the auditory system". This disease has become a universal concern but it is highly preventable.

As ototoxicants change the membrane structure of Corti, it may become more brittle and susceptible to noise (2). The immediate effect of ototoxicants on the cells of Corti is that it causes their membranous structures to be disrupted, resulting in an acute damage mechanism. Meanwhile, the chronic ototoxic consequences may be attributable to the development of chemically and physiologically reactive intermediates. The ototoxicants are damaging to both the peripheral and central auditory systems. Toluene, for example, has been found to increase inhibitory synaptic responses and block the middle-ear acoustic reflex as a central nervous system (CNS) depressant (cholinergic efferent system) (3).

According to the National Institute for Occupational Safety and Health (NIOSH) Bulletin (4), these ototoxicants could enter the body through inhalation of fumes, ingestion, and skin absorption. There are five classes of ototoxicants: [1] pharmaceuticals; [2] solvents (trichloroethylene, n-propylbenzene, toluene, carbon disulfide, methyl styrene, n-hexane, ethylbenzene, p-xylene, styrene); [3] asphyxiants (tobacco smoke, carbon monoxide, hydrogen cyanide and its salts); [4] nitriles (cis-crotononitrile; 3,3'-iminodipropionitrile;