

# Overview of the Prevalence and Contributing Factors for Occupational Noise-Induced Hearing Loss (NIHL) in Malaysia

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## ABSTRACT

**INTRODUCTION:** This manuscript aims to provide a synopsis of the current situation surrounding noise exposure at work and the risk of noise-induced hearing loss (NIHL) in Malaysia. NIHL is an occupational illness that affects most many people and can be prevented in many countries in the world. The production and agriculture businesses and the extraction of natural resources and urban traffic all contribute to ambient noise levels. Working in a noisy environment is the main occupational risk factor for adult-onset hearing loss. In this study, we investigate the prevalence of NIHL across different industries, as well as research publication trends on NIHL. **MATERIAL AND METHODS:** Conducted thorough several online databases, like Science Direct, Web of Science, and Google Scholar, for related research that had already been published. The review phases were carried out according to the recommendations laid out by the preferred reporting items for systematic reviews. A set of criteria was developed for selecting relevant studies. **RESULTS:** The prevalence of NIHL among workers in Malaysia, varies across different industries and has been reported to range from 5.0% to 82.6%. NIHL has multiple contributing factors, including noise intensity, long-term exposure to daily noise, hearing protection devices and age. A review of these studies found varying percentages of individuals affected by each contributing factor. **CONCLUSION:** Occupational NIHL is a preventable health risk for workers across industries. Employers must adopt engineering and administrative controls (education and training) and provide personal hearing protectors to protect workers from noise.

### Keywords

Occupational noise-induced hearing loss, Malaysia, prevalence, contributing and risk factors.

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## INTRODUCTION

Every day, humans are exposed to various noises in our environment, including those produced by televisions and radios, home appliances, and the surrounding environment. These noises are typically not loud enough to damage human ears. Nevertheless, prolonged exposure to loud noises, regardless of duration, can result in damage to delicate auditory structures, resulting in noise-induced hearing loss.<sup>1</sup>

People who suffer from noise-induced hearing loss usually report a decrease in their hearing capabilities in one or both ears, accompanied by a ringing or buzzing sound, known as tinnitus<sup>2</sup>. Physical examination of the ear typically reveals no changes, such as discharge or abnormalities in the ear drum. This type of hearing loss is

sensorineural, meaning that it affects the inner ear, auditory nerve, or higher auditory centres in the brainstem and temporal lobe. NIHL is a permanent condition caused by damage to the nerve cells in the cochlea, a spiral-shaped, fluid-filled tube in the inner ear responsible for converting sound waves into electrical impulses that are sent to the brain. This damage cannot be repaired, and the nerve cells cannot regrow, resulting in permanent hearing loss.<sup>3</sup>

According to the Department of Occupational Safety and Health (DOSH), the most common occupational diseases in Malaysia are related to hearing disorders caused by exposure to noise. Occupational NIHL accounted for 62.3% of all reported cases of occupational illnesses

during the first five months of 2022.<sup>4</sup> The report published by the Department of Statistics Malaysia in 2022, show that occupational noise-related hearing disorder (ONHRD) was the highest-reported occupational disease in 2021 (Figure 1).<sup>5</sup>

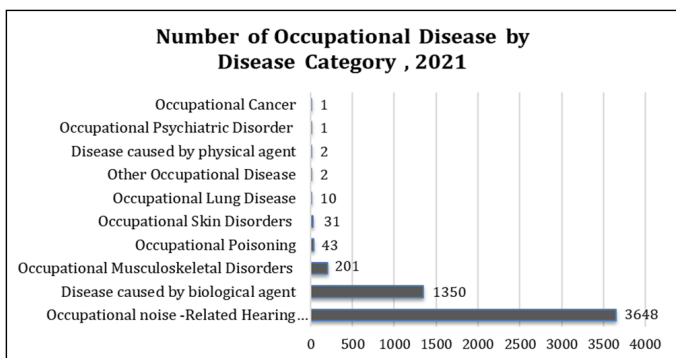


Figure 1: Number of Occupational Diseases by Disease Category 2021.

Preventing NIHL requires a comprehensive understanding of its mechanism and prevalence among affected individuals.<sup>6</sup> Various contribute to the NIHL, such as age, smoking, gender, ethnicity susceptibility, sound pressure level or noise intensity, duration of daily and total exposure, the existence of ear disease, workplace conditions, distance to the noise source, and improper use of hearing protection devices.<sup>7</sup>

In Malaysia, where industrialization and manufacturing are major economic drivers, workers in a variety of industries are at risk of developing NIHL. Consequently, confirming the diagnosis of NIHL is crucial for several reasons. Early detection of NIHL can help stop hearing loss from getting worse and lower the risk of complications. Furthermore, it can safeguard workers' rights, stop further hearing loss, and provide information for public health policies and interventions.<sup>8</sup> Therefore, this systematic review aims to compile information on the risk factors associated with NIHL among workers in Malaysia.

## MATERIALS AND METHODS

In preparing this review, we conducted a thorough search of various online databases, such as Science Direct, Web of Science, and Google Scholar, in pursuit of previously published research that was relevant to the topic. We utilized a combination of the following keywords: "noise-induced hearing loss", "prevalence", "contributing factors" and "Malaysia".

The phases of the review were carried out by the recommendations laid out by the preferred reporting items for systematic reviews and meta-analyses (PRISMA). A set of criteria was developed for selecting relevant studies in Table I.

Table I: Inclusion and exclusion criteria

Criterion	Inclusion	Exclusion
Time	The year 2005 onwards	The year 2004 and below
Article Type	Peer-Review	Non -Peer reviewed
Language Setting	English	Non-English
Exposure Setting	Occupational	Non-occupational
Type of Study	Human Studies	Animal Studies
Hazard Exposure	Occupational Noise	Other Hazard
Participant	Occupational Workers	Non occupational workers
Area	Malaysia	Other than Malaysia countries

## RESULTS

### Description of excluded studies

The Initial search using a keyword identified 61 studies (Figure 2). After excluding duplicate studies (n=11) and applying the inclusion and exclusion criteria specified in Table 1 (n=30), a total of 20 studies were retrieved for further screening. Of these, 9 studies were excluded due to a lack of sufficient data.

The remaining 11 studies were used in this study, and the following data were extracted: the year of reporting, the state, the industrial setting, the population/exposure/sex/age, the prevalence of hearing threshold, the audiological procedure used and the prevalence of hearing threshold and contributing factors to hearing impairment.

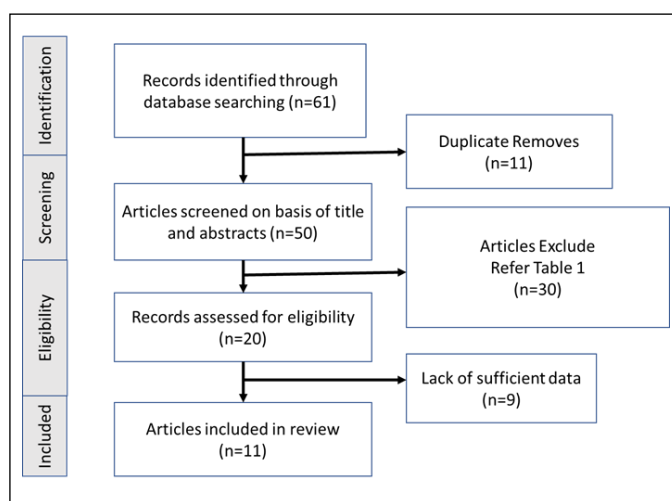


Figure 2: Flow chart of the studies identification and selection process.

## **Description of selected studies**

### **Study Design**

This review comprised 15 studies that were eligible for final evaluation and were carried out in a variety of occupational settings. Among these studies, 11 cross-sectional studies were included in this review.<sup>9-18</sup>

### **Industrial Setting**

The reviewed publications were selected from Fertilizer Factory,<sup>9</sup> Quarries,<sup>19</sup> Palm Oils Mills,<sup>10,12</sup> SME Manufacturing,<sup>13</sup> Traffic Point Duty Personnel,<sup>14</sup> EH-Vector Control,<sup>15,17</sup> Dental Clinic,<sup>16</sup> Grass trimming workers.<sup>11,18</sup>

### **Audiological Procedure**

Pure-tone average (PTA) is used to measure exposure to all substances examined to determine the study's prevalence on the hearing threshold. PTA 0.5-8kHz, n=7; PTA 3,4 and 6kHz, n=1; PTA 0.5-4kHz, n=1; PTA 0.25-8kHz, n=2.

### **Prevalence (hearing threshold)**

Prevalence refers to the proportion of a population at a specific point in time who have a particular health condition or characteristic. In the context of hearing threshold, prevalence refers to the proportion of a population with a particular degree of hearing impairment. An audiogram, a graph that displays a person's hearing sensitivity across a range of frequencies, is used to measure hearing threshold. The audiogram measures the softest sounds a person can hear at different frequencies, and the results are used to categorize hearing loss according to its severity.<sup>20</sup> A 63.6 % with n= 7 have a prevalence of hearing threshold of more than 50%.<sup>9-14,19</sup> The rest of the studies is less than 50%, n= 4.<sup>15-18</sup>

### **Contributing factors**

Occupational hearing impairment can have multiple contributing factors. Hearing loss can be brought on naturally by ageing, and prolonged exposure to occupational noise or chemicals can make age-related hearing loss worse. A 55% with n= 6 contributing factors for hearing impairment because of age.<sup>9-13,19</sup> Contributing

factor of long-term exposure to daily noise is 73% with n=8.<sup>9-11,13-17</sup> Poor practice and total not use of personal hearing protectors (PHP) is 55% with n=6.<sup>9,11,14,16-18</sup> The intensity level of the instrument or machine is 45% with n=5.<sup>9,12,14,16,17</sup>

The highlighted part of findings from the study is presented in Table II, year of reported, state, industrial setting population/exposure/mean age, audiological procedure, prevalence (hearing threshold) and contributing factors of hearing impairment.

## **DISCUSSION**

Occupational noise-induced hearing loss (NIHL) is a common occupational disease that affects workers who are exposed to a high level of noise for a prolonged period. The prevalence of NIHL among workers in Malaysia varies across different industries and has been reported to range from 5.0% to 82.6%. Due to cumulative exposure to loud noises over time, older employees may have a greater risk of developing hearing loss over a longer period. In Malaysia, studies have shown that exposure to high levels of noise in the workplace is a major contributor with more than 80% of NIHL among workers. These results emphasize the significance of reducing noise levels in the workplace and limiting exposure duration to reduce the risk of hearing loss among workers.

This can be accomplished through a variety of means, including the use of engineering controls such as sound barriers, sound-absorbing materials, and noise-reducing machinery, as well as, the provision of hearing protection, and the implementation of policies that restrict the duration of exposure to elevated noise levels.<sup>21</sup> Lack of personal hearing protectors (PHP) can be a significant contributor to NIHL among workers in Malaysia. Workers who are exposed to excessive noise levels without proper hearing protection are at higher risk of developing hearing loss.<sup>22</sup> Under the Occupational Safety and Health (Noise Exposure) Regulations 2019,<sup>23</sup> employers are required to implement engineering and administrative noise control measures to reduce noise exposure below the noise exposure limit (NEL).

However, when these measures are ineffective in reducing noise exposure below the NEL, employers must provide employees with effective PHP.<sup>24</sup> Enforcement of these regulations can be difficult in some industries. Limited resources of awareness about the regulations may make it difficult for the employer to comply. Additionally, workers may not always use hearing protection correctly or consistently, which could contribute to the development of NIHL. To address these issues, it is important to increase awareness about the risk of NIHL and the importance of complying with regulations related to noise exposure and hearing protection. This may involve providing training and education for both employers and workers, as well as making sure that hearing protection is comfortable and appropriate for the specific work environment. Improved enforcement of

regulations and better monitoring of noise levels in the workplace may also be necessary to prevent NIHL in risky industries.

## CONCLUSION

Occupational NIHL is a work-related health risk that can be avoided and has an impact on employees across a variety of industries. Employers are responsible for implementing engineering and administrative controls and providing the necessary personal hearing protectors to safeguard employees from noise exposure. Education and training for workers on the risks of NIHL and how to prevent it are also critical in reducing the incidence of NIHL.

**Table II:** The highlighted part of the finding

Authors	Year	State	Industrial Setting	Population/exposure/ Mean age	Audiological Procedure	Prevalence (hearing threshold)	Contributing factors of hearing impairment
Jeffree et al., 2016 <sup>9</sup>	2016	Sarawak	Fertilizer Factory	Factory Workers (N = 49) Mean age: 44years	PTA 0.5-8kHz	50% (≥ 25 dB)	1)Noise intensity 2) Working period, 3) Usage of HPD 4) Smoking habits 5) Age
Filza Ismail et al., 2013 <sup>19</sup>	2013	north-eastern state	Quarries	Quarries Workers (N = 97) Mean age: 44years	PTA 0.5-8kHz	57% (≥ 25 dB)	1) Age 2) Poor practice score
Rasasoran et al., 2021 <sup>10</sup>	2021	Sabah	Palm Oils Mills	Workers (N = 234) Mean age: 44. 4years	PTA 0.5-8kHz	75% (≥ 25 dB)	1)Age 2) Blue-collar jobs 3) Smoking 4) Works with noisy machinery 5) Longer duration of employment 6) Longer time hours per week
Jaafar et al., 2017 <sup>11</sup>	2017	Kelantan	Grass Trimming Workers	Workers (N = 75) Mean age: 38.9years	PTA 3,4 and 6kHz	82.6 % (≥ 20 dB)	1)Long-term exposure to daily noise 2) Hearing Protection Devices 3) Age
Ammar et al., 2022 <sup>12</sup>	2022	Peninsular Malaysia	Palm Oil Mill Workers	Workers (N = 494) Mean age: 41.08 years	PTA 0.5-8kHz	50.8% (≥ 25 dB)	1)Exposure level 2) Age
Sam et al., 2017 <sup>13</sup>	2014	Selangor	SME Manu- fac-turing	Workers (N = 146) Mean age: 34.9years	PTA 0.5-8kHz	73.3% (≥ 25 dB)	1)Age, 2) Exposure time to high noise
Thomas et al., 2007 <sup>14</sup>	2007	Kuala Lumpur	Traffic Point Duty Personnel	Workers (N = 30) Mean age: 34.9years	PTA 0.5-8kHz	80% (≥ 25 dB)	1)Exposure to longer time 2) Exposure level 3) Hearing protection not provided
Masilamani et al., 2014 <sup>15</sup>	2012	Negeri Sembilan	EH - Vector Control	Workers (N = 181) Mean age: 39.9years	PTA 0.5-8kHz	26.5% (≥ 20 dB)	1)Longer duration of work
Daud et al., 2011 <sup>16</sup>	2011	Malaysia	Dental Clinic	Workers (N = 65) Mean age: 39years	PTA 0.5-4kHz	5% (≥ 20 dB)	1)Duration of exposure 2) Intensity level of dental instruments 3) Long-term exposure
Kamarudin et al., 2022 <sup>17</sup>	2020	Sabah	EH - Vector Control	Workers (N = 8) Mean age: 26.2years	PTA 0.25-8kHz	28% (≥ 25 dB)	1)No hearing protection 2) Intensity of the machine 3) Longer exposure time
Hanidza et al., 2013 <sup>18</sup>	2013	Selangor	Grass trimming Workers	Workers (N = 18) Mean age: 26.2years	PTA 0.25-8kHz	27.7% (≥ 25 dB)	1) No hearing protection, 2) Exposed to excessive noise

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