

# Perceptions of Occupational Noise, Hearing Protection, and Risk Among Airport Workers: A Preliminary Study from Kuantan, Malaysia.

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## ABSTRACT

**Background:** Occupational noise exposure remains a significant health concern in high-risk environments such as airports. High noise produced by an aircraft or its components, whether on the ground while parked, during take-off, or during landing, can cause problems for workers and nearby communities. Despite regulatory efforts, the use of hearing protection devices (HPDs) and awareness of noise-induced hearing loss (NIHL) vary across settings, particularly in regional airports.

**Objective:** This preliminary study aimed to explore airport workers' perceptions of occupational noise, identify perceived barriers to hearing protection, and examine readiness for noise-reduction behaviours among staff at Kuantan Airport, in Kuantan, Pahang, Malaysia.

**Methods:** A total of 29 Malaysia Airports Holdings Berhad (MAHB) employees participated, representing approximately 64% of the airport's workforce. Participants completed a self-administered questionnaire assessing attitudes toward noise, perceived susceptibility to NIHL, self-efficacy, perceived benefits of noise reduction, and perceived barriers to hearing protection. Hearing screening was also conducted using pure tone audiometry and tympanometry.

**Results:** Findings revealed high mean scores in the attitude, susceptibility, and barriers domains. Participants recognized the risks of occupational noise and expressed openness to protective behaviours. While discomfort and communication challenges were reported as barriers to HPD use, participants indicated that these challenges could be addressed through targeted interventions.

**Conclusion:** The results highlight a strong foundation for implementing effective hearing conservation programs in regional airports. Improving HPD design, delivering tailored education, and fostering workplace engagement can enhance protective behaviours and support long-term hearing health. Future studies with larger, more diverse samples are recommended to validate and extend these findings. These preliminary findings contribute to understanding NIHL risk perception and support the design of tailored conservation strategies in underserved aviation sectors.

## Keywords:

occupational noise, hearing protection, airport workers, noise-induced hearing loss, Malaysia, hearing conservation programs

## INTRODUCTION

Occupational noise remains a major health and safety concern across various industries, with airport environments posing particularly high risks due to constant exposure to elevated noise levels from aircraft and ground operations (Bertsch & Sescu, 2022; Civil Aviation Authority, 2024; Nair & Kashyap, 2009; Jockel et al., 2019). Prolonged exposure to high noise has been associated with noise-induced hearing loss (NIHL), tinnitus, stress, sleep disturbances, and cardiovascular conditions (Abbasi et al., 2024; Chada et al., 2022; Hassan, 2024; Sivakumaran et al., 2022). According to Hailu et al. (2024), a 10 dB increase in aircraft noise exposure is linked to a 7% to 17% higher risk of cardiovascular disease.

Noise across various areas of an aircraft and airport can present significant hazards to workers' hearing, with exposure levels varying by role and location (Lindgren et al., 2009). Studies have recorded airport noise ranging from 70–91 dB(A), with peaks reaching approximately 119 dB(A) (Aziz et al., 2017; Civil Aviation Authority, 2024; Smedje et al., 2011). Cockpit noise typically ranges from 70–90 dB(A) (Zevitas et al., 2018), rising even higher during take-off and landing, potentially exceeding 140 dB(A) (Lee et al., 2022; Xu, 2025). Ground staff, maintenance crews, and baggage handlers are especially vulnerable, often exposed to levels exceeding occupational limits (Athirah & Shahida, 2019; Aziz et al., 2017; Hong & Kim, 2001; International Civil Aviation Organization [ICAO], 2013).

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Based on a study by Ozcan and Nemlioglu (2006), ground crews near taxiing aircraft were exposed to noise levels exceeding 140 dB(A), maintenance personnel near engines to 100–120 dB(A), and cabin staff to approximately 80–85 dB(A) during flights. The primary sources of these elevated levels are airframe and engine noise, supplemented by hydraulic, air conditioning, and communication systems (Xu, 2025). These findings highlight the urgent need for robust hearing conservation measures to protect the long-term occupational health of aviation personnel (Ivosšević et al., 2018; Orikpete et al., 2024).

While the physical hazards associated with occupational noise are well established, workers' perceptions of noise exposure remain a critical yet underexplored area. Despite the high risk of exposure, there is a notable lack of research examining airport workers' knowledge, perceptions, and awareness regarding occupational noise and its long-term effects. This knowledge is vital, as previous studies suggest that individuals who underestimate noise-related risks are less likely to use hearing protection devices (HPDs) or adhere to safety protocols. Conversely, heightened awareness and accurate risk perception are positively correlated with improved compliance (Guo et al., 2024; Ishak et al., 2023; Vosoughi et al., 2022). Understanding these perceptions is essential for developing targeted interventions and training programs that address the specific needs of this workforce, ultimately aiming to reduce NIHL and enhance the overall safety culture (Bandyopadhyay, 2024).

In Malaysia, where airports serve as key transport hubs, there is limited research on how airport workers perceive occupational noise risks. Although NIHL remains one of the most reported occupational illnesses (Aziz et al., 2017; Nasir & Rampal; 2012; Department of Statistics Malaysia [DOSM], 2023; Department of Safety and Health [DOSH], 2024), much of the existing literature focuses on large industrial sectors, overlooking smaller regional airports. Workers in these settings, such as Kuantan Airport in Pahang, may face unique challenges, including fewer resources for noise mitigation and limited enforcement of protective practices (Farah et al., 2017).

This preliminary study is part of a larger, ongoing project aimed at understanding and addressing occupational noise exposure among airport workers. Specifically, it explores airport staff's perceptions of occupational noise and document their self-reported hearing-related experiences and the use of hearing protection measures. By addressing this gap, the findings are expected to guide the development of targeted health and safety interventions, with a particular focus on regional airports where access

to noise management resources is often limited.

## **METHODOLOGY**

### **Study Design**

This study employed a cross-sectional observational design to assess airport workers' perceptions, attitudes, and hearing health status related to occupational noise exposure. The design was chosen to capture a snapshot of workers' self-reported experiences and audiometric outcomes within their existing workplace environment.

### **Study Location**

This investigation was carried out at Sultan Ahmad Shah Airport (Kuantan Airport) – located approximately 15 kilometres from the town centre of Kuantan, Pahang. As a dual-use facility operated by Malaysia Airports Holdings Berhad (MAHB), Kuantan Airport shares its runway with the Royal Malaysian Air Force (RMAF Kuantan), a configuration that contributes to consistently elevated occupational noise levels. The airport accommodates over one million passengers annually and maintains two daily commercial flights to and from Kuala Lumpur International Airport (PKNP, 2024).

### **Participants**

Participants were recruited from the Malaysia Airports Holdings Berhad (MAHB) workforce at Kuantan Airport. A total of 29 employees volunteered to participate, representing approximately 64% of the airport's estimated 45-member MAHB staff. With institutional support from the MAHB Safety Office, participants were drawn from various units, including safety, technical and operations, engineering, sales, and cargo. All participants were Malaysian nationals aged between 33 and 58 years. Given the small and well-defined population, the high response rate supports the sample's representativeness for the scope of this study.

### **Questionnaire**

To investigate workers' perceptions of occupational noise and self-reported hearing-related experiences, a two-phase data collection approach was adopted: (1) questionnaire administration and (2) audiometric screening. Prior to participation, informed consent was obtained from all respondents.

The questionnaire comprised two sections. The first section was on demographic and auditory health. This portion gathered socio demographic information (e.g., age, gender, education, job role) and included targeted

items about tinnitus, self-reported hearing difficulties, and perceived noise exposure. These questions allowed for capturing both environmental risk factors and participants' subjective auditory health status.

The second section deployed the Malay version of the Noise at Work (NAW) questionnaire originally developed by Purdy & Williams (2002) to evaluate attitudes and perceptions related to occupational noise exposure. This version, translated and psychometrically validated by Ismail (2013), demonstrated strong internal consistency in prior studies (Cronbach's  $\alpha = .89-.93$ ). In the current study, reliability analysis yielded a Cronbach's alpha of  $\alpha = .87$ .

The NAW questionnaire comprised 20 items across five conceptual domains: (1) attitudes toward noise, (2) perceived barriers to hearing loss prevention, (3) perceived self-efficacy, (4) perceived benefits of noise reduction, and (5) perceived susceptibility to hearing loss. Items were rated on a 5-point Likert scale (1 = Strongly Agree to 5 = Strongly Disagree), with selected statements reverse scored to ensure interpretive consistency. Higher scores in the attitude and susceptibility domains were interpreted as indicating elevated concern about occupational noise and greater behavioural intent toward hearing conservation interventions.

### Hearing Screening

The second phase of data collection involved pure tone audiometry (PTA) and tympanometry testing. All procedures were conducted in a sound-treated mobile unit stationed on the MAHB premises. Otoscopic examinations were performed using a Heine otoscope, while tympanometry was conducted with a Grason-Stadler GSI TympStar.

Hearing screening was performed using a calibrated portable Madsen audiometer, in accordance with ANSI S3.1-1999 standards. The minimum threshold was set at 20 dB HL for the 1, 2, and 4 kHz frequencies in each ear. Failure to respond at any of these frequencies constituted a refer/fail criterion. This threshold reflects established adult screening protocols and ensures consistency with standard practice, even in mobile settings. Ambient noise levels during testing were monitored using a sound level meter (SLM) and maintained within permissible limits for audiometric assessment in mobile environments.

In compliance with the Occupational Safety and Health (Noise Exposure) Regulations 2019, participants were required to abstain from significant noise exposure for at least 14 hours prior to testing. Individuals presenting with abnormal middle ear function—identified through Type B

or Type C tympanograms—were referred to an audiology clinic for further diagnostic evaluation.

### Procedures

Questionnaires were distributed and collected via an appointed officer at Kuantan Airport. Each participant received a comprehensive informed consent form attached to the questionnaire, which detailed the purpose and procedures of the study, and data confidentiality. Completed forms were returned in sealed envelopes to ensure confidentiality. Clear written instructions were provided to facilitate accurate and independent completion.

All data were systematically coded and analysed using SPSS software (Version 20).

## RESULTS

### Participant Characteristics

Of the 29 Malaysia Airports Holdings Berhad (MAHB) employees who participated, 95.7% were male. Ages ranged from 33 to 58 years ( $M = 44.6$ ,  $SD = 7.62$ ), and average work tenure was substantial ( $M = 22.4$  years,  $SD = 8.89$ ). Participants reported daily working hours of 8 to 12 hours ( $M = 9.13$ ,  $SD = 1.25$ ), with approximately two-thirds having attained secondary-level education. In terms of departmental affiliation, 30.4% were employed in operations, 26.1% in cargo, 13% in safety, and 4.3% in administration. Notably, 65.2% indicated prior exposure to informational material on NIHL.

These demographic findings suggest prolonged occupational exposure in a predominantly male workforce, which is consistent with trends in aviation ground operations and aligns with the study's focus on long-term auditory risk.

### Self-Reported Hearing Difficulties and Noise Exposure

A significant proportion of participants (82.6%) self-reported hearing difficulties, and 69.6% indicated challenges hearing in noisy environments. Familial concern regarding hearing health was present for 56.5% of respondents, while 87% reported having undergone previous hearing assessments. Tinnitus emerged as a prevalent symptom, reported occasionally by 78.3%, frequently by 17.4%, and constantly by 4.3% of participants.

Regarding workplace noise exposure, 61% identified high levels of acoustic stress, and 59.1% indicated use of

hearing protection devices. Additionally, 60.9% reported never having smoked—a relevant factor when considering hearing health and susceptibility. These findings reflect high self-awareness of hearing impairment and notable prevalence of auditory symptoms, consistent with chronic exposure patterns identified in airport environments.

### Objective Hearing Screening Outcomes

Of the 29 participants, nine underwent hearing screening through audiometric testing. Limited participation was attributed to scheduling challenges and operational demands. Among these, eight (88.9%) failed to meet minimum hearing threshold criteria and were referred for further diagnostic evaluation.

The comparison between self-reported hearing difficulties, family concern, and audiometric outcomes is summarized in **Table 1**. As shown, six of the seven individuals who self-reported hearing difficulties also failed the screening. Notably, two participants who denied having hearing problems likewise failed, suggesting a potential gap between perceived and actual hearing status. Similarly, three of the four participants whose family members had expressed concern about their hearing failed screening, while five without such concern also did not pass. These discrepancies highlight the limited accuracy of self-assessment and underscore the importance of routine clinical evaluation to complement personal awareness.

**Table 1:** Hearing Screening and Self-Reported Hearing (N=9)

Subject	Self-Reported Hearing Problem	Family Concern	Hearing Screening Result
1	Yes	Yes	Fail
2	Yes	Yes	Fail
3	Yes	No	Fail
4	Yes	No	Fail
5	Yes	No	Fail
6	Yes	Yes	Fail
7	No	No	Fail
8	No	No	Fail
9	Yes	No	Fail

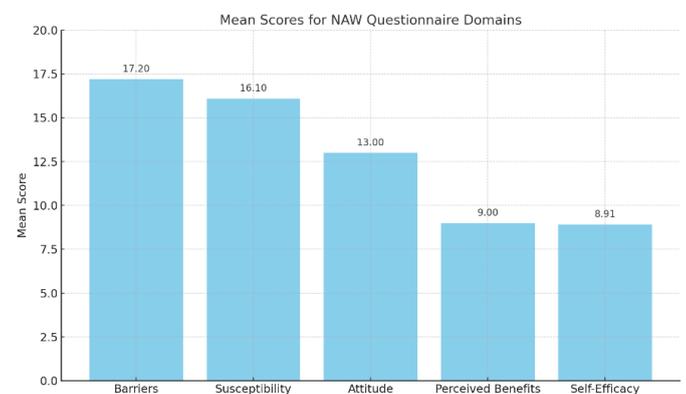
**Note.** All nine participants underwent audiometric screening. “Fail” indicates hearing thresholds above 20 dB HL at one or more test frequencies (1, 2, or 4 kHz) in either ear.

### Noise at Work (NAW) Questionnaire Analysis

Mean scores across the five domains of the NAW questionnaire are presented in Figure 1. The highest values were observed in the Perceived Barriers (M = 17.2) and Perceived Susceptibility (M = 16.1) domains, followed by Attitude Toward Noise (M = 13.0), Perceived Benefits of Prevention (M = 9.0), and Self-Efficacy (M = 8.91). Higher scores reflect stronger perceptions of risk and the importance of noise reduction.

These findings suggest that while participants recognized the risks associated with occupational noise and expressed annoyance toward it, internalized confidence in managing or preventing hearing loss (self-efficacy) was comparatively low.

**Figure 1.** Mean Scores Across NAW Questionnaire Domains



### DISCUSSION

This study examined perceptions of occupational noise and hearing health among personnel at Kuantan Airport—a regional facility noted for persistently high ambient noise levels associated with aviation operations. Analysis of self-reported data and audiometric screening revealed a high prevalence of hearing difficulties and tinnitus symptoms, alongside an elevated rate of screening failures. These outcomes reflect the cumulative impact of chronic noise exposure and highlight the need for comprehensive hearing conservation programs in comparable aviation settings.

Participants’ responses to the Noise at Work (NAW) questionnaire revealed high perceived susceptibility and negative attitudes toward workplace noise, indicating general awareness of associated health risks. Notably, the “Perceived Barriers” domain received the highest scores, pointing to discomfort, communication challenges, and inconsistent access to hearing protection as key impediments to preventative action. These findings align

with prior research suggesting that such barriers may undermine workers' confidence in managing noise risks and hinder compliance with safety measures (Doutres et al., 2022; Ishak et al., 2023; Sameli et al., 2017).

Despite widespread awareness, low scores in self-efficacy and perceived benefits suggest limited confidence in adopting protective behaviours. Similar trends have been documented in other occupational contexts, emphasizing the importance of perceived control and risk perception in shaping hearing conservation outcomes (Fauzan et al., 2023; Orikpete et al., 2024; Vosoughi et al., 2022). These findings indicate that awareness alone may be insufficient to drive sustained behavioural change without targeted, supportive interventions. Practical strategies—such as improving the comfort and usability of hearing protection devices (HPDs), increasing access to routine audiometric evaluations, and enhancing communication during training—are essential to strengthen self-efficacy and facilitate consistent protective behaviour (Sedghi Noushabadi, 2024).

The discrepancy between self-assessed hearing and audiometric results is particularly concerning. Several participants who did not report hearing problems nevertheless failed screening, revealing gaps in self-awareness. This underscores the need to pair educational initiatives with clinical surveillance to promote early intervention. Periodic hearing assessments, combined with personalized risk communication, can bridge this perception gap and foster a proactive approach to occupational hearing health.

However, only a subset of participants (9 out of 29) completed the audiometric screening due to scheduling constraints and operational duties, which limited the strength of the objective findings. Future research could improve participation in hearing assessments by offering more flexible screening schedules, integrating testing into regular occupational health routines, or providing small incentives or honoraria to encourage employee engagement. These adjustments would enhance data completeness and strengthen the validity of future analyses.

Additionally, the study highlights the importance of context-specific solutions for regional airports such as Kuantan, where resource limitations and infrastructure constraints challenge the implementation of standard conservation measures. These findings support broader efforts to develop scalable, evidence-based interventions tailored to aviation environments and other high-noise industries. Sustained initiatives—both technical and behavioural—are critical to improving long-term

occupational safety (Doutres et al., 2022; Fauzan et al., 2023; Ismail, 2013).

While the single-site design and modest sample size limit the generalizability of the findings, the high participation rate strengthens their internal validity. Future research should expand to include a larger sample from multiple airports and diverse occupational roles to enable comparative analysis and enhance external validity. Incorporating advanced psychometric tools may also help capture behavioural determinants more comprehensively. Such efforts will be instrumental in shaping national policy and targeted health programs for Malaysia's evolving aviation workforce.

## CONCLUSION

This preliminary study offers valuable insights into airport workers' perceptions of occupational noise and their attitudes toward hearing conservation practices within a regional aviation context. Findings from Kuantan Airport revealed widespread self-reported hearing difficulties, frequent tinnitus symptoms, and a high failure rate in audiometric screening—underscoring the long-term health risks associated with chronic noise exposure. Participants demonstrated strong awareness of NIHL and expressed openness to protective behaviour, yet low self-efficacy and perceived benefits signal a disconnect between risk recognition and sustained action.

Importantly, barriers such as discomfort with HPDs, communication interference, and limited access to protective resources were prominent but not perceived as insurmountable. Addressing these challenges through regular hearing evaluations, improved HPD design, and tailored training programs could significantly empower workers and reinforce protective behaviours. Priority should be given to implementing targeted noise awareness campaigns and toolbox talks for airside ground crew and maintenance staff, integrating hearing protection modules into regular aviation safety briefings, and mandating annual audiometric screening within the airport's occupational health surveillance. These findings highlight the importance of combining education with workplace-specific interventions to promote meaningful and sustained behavioural change.

Although this study was conducted at a single regional airport with a modest sample size, the high participation rate enhances the internal validity of its findings. The results provide an important foundation for developing scalable, context-specific hearing conservation strategies applicable to Malaysia's regional airports and other high-noise occupational settings. Future research should

incorporate larger and more diverse samples while exploring behavioural and organisational enablers of long-term compliance to support national policy development and strengthen occupational health frameworks.

From a practical standpoint, policymakers and airport management should prioritize the institutionalization of hearing conservation within workplace safety systems. This includes enforcing existing noise exposure regulations, implementing routine hearing surveillance, improving access to comfortable and effective hearing protection devices, and delivering regular awareness and training programs tailored to operational realities. Continuous evaluation of these initiatives will be essential to ensure sustained effectiveness and foster a culture of proactive hearing health among aviation personnel.

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