SHORT REPORT

Hearing protection device usage at a South African gold mine

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Background Occupational noise-induced hearing loss (NIHL) occurs in many industries despite interventions such as hearing conservation programmes.

Aims To determine the actual and reported use of hearing protection devices (HPDs) in noise-exposed gold mine workers and their reported knowledge, attitudes and practices relating to NIHL and HPDs.

Methods A cross-sectional descriptive study was conducted in which 101 noise-exposed mine workers were interviewed and their use of HPDs observed.

Results Thirteen percent of respondents erroneously indicated that their workplaces were not noisy, 16% did not appreciate noise as a hearing loss hazard, 6% did not know that HPDs protect hearing and 3% believed that HPDs did not protect hearing. While 93% of respondents reported using HPDs, only 50% were observed to be doing so. Observed use was less among lower skilled workers, and, despite training, 8% of respondents claimed never to have been informed about the benefits of HPDs. Consistent and continuous use was reported by 24% and 31% of respondents, respectively. Reasons for not using HPDs included discomfort. Most respondents (57%) preferred training methods other than the current computer-assisted training.

Conclusions The persistence of NIHL may be explained by limited use of HPDs, along with the suboptimal knowledge of noise as a hazard, workplace noisiness and the benefits of HPDs among some workers. Concurrent with engineering controls, a range of HPDs should be available free of charge, and HPD training reviewed particularly for lower skilled workers.

Key words Gold mine workers; hearing defenders; hearing loss; personal protective equipment training.

Introduction

In industries like gold mining in which equipment generates noise greater than 85 decibels—time-weighted average [dB (A)] [1,2], noise can result in irreversible noise-induced hearing loss (NIHL) [3]. Despite South African legislation [4] requiring mines to implement hearing conservation programmes (HCPs) and to provide personal protective equipment to individuals exposed to such noise, NIHL still occurs [5]. NIHL is currently considered compensable in South Africa when an exposed individual experiences a 10% or more increase in percentage loss of hearing from baseline at 500, 1000, 2000, 3000 and 4000 Hz. This has been reported to have occurred at a rate of 2 per 1000 employees at an underground gold mining company in 2008 [6].

The study site is an underground gold mine employing approximately 14 500 people. Work involves the use of noisy equipment such as hand-held rock drills in a hot environment. The use of water for cooling and dust control creates a humid uncomfortable environment. Current HCPs include literacy-adjusted computer-based training. Various types of hearing protection devices (HPDs) (ear plugs at this mine) are provided free of charge to workers. This research aimed to determine the following:

• Workers’ perceptions of their noise exposure and knowledge regarding NIHL and HPDs;
• The proportion reporting wearing HPDs in noisy environments (reported use) and reasons for non-use;
• The proportion observed using HPDs in noisy environments (observed use) and
• Workers’ preferences for training on NIHL and HPDs.

Methods

This was a cross-sectional descriptive study in which all workplaces with noise levels in excess of 85 dB (A) were selected using Microsoft Excel® random number...
generation. Workers in these workplaces were approached until 101 workers consented in writing to participate, exceeding the required sample of 95 calculated using Epi Info® based on 50% assumed HPD usage, a worst acceptable frequency of 40% and a 10% assumed margin of error.

Knowledge, attitudes and practices were determined by face-to-face structured interviews conducted by members of the occupational hygiene department. Although the questionnaire was in English, interviewers were trained to administer it in the vernacular languages of interviewees. Prior to the interview, participants were observed for wearing of HPDs while still in a noisy environment as they were approached by the interviewer. The interview took place away from noise sources and co-workers.

Data were captured in Microsoft Excel version XP, and chi-squared analysis was performed using Number Cruncher Statistical Systems® at the \( P < 0.05 \) level of significance. Formal ethics approval was obtained (Wits University, Johannesburg—protocol number M050914).

**Results**

The response rate was 99%. The study participants were similar to the mine workforce in most demographic variables except for more years in their current occupations (10 versus 2) and a longer period in the industry (14 versus 10) for the former.

The majority of participants correctly indicated that they worked in noisy environments (84%), that their noise exposure could damage their hearing (82%) and that HPDs are beneficial (89%).

However, the consistency of reported use was lower: 24% reported using HPDs all the time, 42% every day but only when there was a lot of noise, 20% on some days and 10% on most days when there was a lot of noise.

Only 31% of respondents claimed to use HPDs always for the entire shift, while 58% reported doing so sometimes and 9% claimed never to do so.

Reported use (93%) was notably higher than the observed use (50%). Observed use of HPDs was not recorded, due to difficulties of observation, with 13% of participants. The higher the skill level, the greater the proportion observed using HPDs \( (P < 0.05) \) (Table 1).

Reasons for not using HPDs included discomfort (50%), interference with hearing warning signals (23%), HPDs not working (13%) or falling out of the ears (10%).

Eight percent of respondents indicated that they were never informed about the benefits of HPDs. Also, while 36% preferred the current (computer-based) training, the majority of respondents preferred personal training on an individual basis (39%), in large groups (12%) or in small groups (6%). Although the current training department was the most popular training deliverer (28%), occupational health staff (23%), direct supervisors (21%) and safety staff (18%) comprised a higher combined proportion. Respondents in lower skilled occupations preferred training delivery by the training and safety departments.

**Discussion**

Despite training and signage, 13% of respondents incorrectly indicated that their workplaces were not noisy. While the numerous languages spoken by participants and translation by interviewers could have influenced responses, this finding is comparable with others [1, 7–9]. The findings highlight the importance of adequate noise demarcation signage and enforcement.

Observed use of HPDs (50%) was much lower than reported use (93%), in line with research in construction workers who reported always using HPDs in high-noise zones but were found to wear them only one-third of the time [10]. Furthermore, observed use was much lower among lower skilled workers, suggesting that this group should be targeted to reduce NIHL.

The cited reasons for not using HPDs are consistent with the reasons reported by diamond miners [2], but another reason for not using HPDs may be that workers were unaware that a range of HPDs were available since 32% incorrectly reported that only one type of HPD was available.

These misperceptions can be addressed through improved education, instruction on the correct insertion of HPDs and providing a range of HPDs to cater for anatomical variation.

Finally, the fact that training is a prerequisite to work suggests that the 8% of respondents who indicated that they were never informed about the benefits of HPDs may reflect inadequate or inappropriate training for some individuals. The additional use of other methods of training and other trainers should therefore be considered.

In conclusion, it is recommended that the barriers to HPD access are removed and that further research focusing on the observation of actual use of HPDs is conducted following targeted training programmes.

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**Table 1.** Observed HPD use by skill level \((n = 88)\)

<table>
<thead>
<tr>
<th>Observed use of HPDs</th>
<th>Yes, ( n (%) )</th>
<th>No, ( n (%) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled</td>
<td>20 (83)</td>
<td>4 (17)</td>
</tr>
<tr>
<td>Semi-skilled</td>
<td>18 (55)</td>
<td>15 (45)</td>
</tr>
<tr>
<td>Unskilled</td>
<td>5 (11)</td>
<td>11 (69)</td>
</tr>
<tr>
<td>Not recorded</td>
<td>7 (47)</td>
<td>8 (53)</td>
</tr>
<tr>
<td>Total</td>
<td>50 (57)</td>
<td>38 (43)</td>
</tr>
</tbody>
</table>
Key points

- Despite training and signage 13% of respondents did not indicate that their workplaces were noisy.
- The observed use of hearing protection was much lower than reported use particularly among lower skilled workers, suggesting that this group should be targeted.
- Workers were unaware that a range of hearing protection devices were available, which could be corrected through better education and training.

References