Epidemiology of Comorbid Hearing Loss and Tinnitus in a Military Population: Findings from the NOISE Study

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Introduction

Hearing loss (HL) and tinnitus are two of the most prevalent service-connected disabilities among U.S. military Veterans1. Compared to civilians, military members have greater risk of HL and tinnitus due to occupational risk factors, including noise and chemical exposures. Though HL and tinnitus share common associated risk factors and have been correlated with adverse effects on overall well-being, few studies have explored the effects of comorbid HL and tinnitus compared to either condition alone. The Noise Outcomes in Servicemembers Epidemiology (NOISE) study is a multi-site longitudinal epidemiologic study that explores the impacts of military exposures on auditory function in Service members and Veterans over time.

Methods

Participants: n=987 • 441 active-duty Service members and 546 Veterans were recruited from two NOISE study sites • Extreme audiometric and questionnaire data were collected for each participant

Exposure: • Presence of Tinnitus and HL • Hearing loss (yes/no): indicated if Pure Tone Average (PTA) ≥ 20 dB HL in both ears for any of the following groups: • Low frequencies (0.25, 0.5, 1 kHz) • High frequencies (3, 4, 6 kHz) • Extended high frequencies (9, 10, 11.2, 14 and 16 kHz)

Presence of tinnitus (yes/no) indicated by the Tinnitus Screener (TS) questionnaire • Participants included into one of four exposure groups: 1) No tinnitus or HL (NTHL), 2) tinnitus only (TO), 3) hearing loss only (HLO); or 4) comorbid tinnitus and HL (THL)

Outcomes: Questionnaires of auditory function and general disability included: • Speech, Spatial and Qualities of Hearing Scale 12 (SSQ12*) • Hearing Handicap Inventory for Adults (HHIA) (yes/no) • Hearing difficulty score >18 • World Health Organization Disability Assessment Schedule (WHODAS 2.0*)

Results

Table 1: Participant characteristics by exposure groups for Service members and Veterans.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age Group</th>
<th>Men</th>
<th>Women</th>
<th>N (%)</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Members</td>
<td>NTHL</td>
<td>TO</td>
<td>HLO</td>
<td>THL</td>
<td>All</td>
</tr>
<tr>
<td>Men</td>
<td>108 (36.6)</td>
<td>53 (18)</td>
<td>50 (16.9)</td>
<td>84 (28.5)</td>
<td>295</td>
</tr>
<tr>
<td>Women</td>
<td>71 (48.6)</td>
<td>17 (11.6)</td>
<td>43 (29.5)</td>
<td>15 (10.3)</td>
<td>146</td>
</tr>
</tbody>
</table>

Table 2: Results of the regression models for SSQ-12 (including subscales) and WHODAS 2.0 presented as the parameter estimate, odds ratio (OR), and 95% confidence interval (CI). THL and upper and lower 95% CI, NTHL exposure group was used for reference. The SSQ and WHODAS 2.0 estimates can be interpreted as the mean difference in scores between those with tinnitus, HL or both and those who have neither. Positive values suggest increased disability.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Sex</th>
<th>Service Members</th>
<th>Estimate</th>
<th>CI Lower</th>
<th>CI Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>TO</td>
<td>Men</td>
<td>10 (6.0)</td>
<td>0.6</td>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>THL</td>
<td>Men</td>
<td>10 (6.0)</td>
<td>0.6</td>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>HLO</td>
<td>Men</td>
<td>10 (6.0)</td>
<td>0.6</td>
<td>0.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Discussion

• HL and tinnitus were both more prevalent in Veterans than in Service members • Among both Service members and Veterans, most participants with hearing loss had comorbid tinnitus • THL groups generally yielded the poorest SSQ, HHIA and WHODAS 2.0 outcomes among Service members and Veterans compared to HL or tinnitus alone • One exception appeared in the WHODAS 2.0 scores where the TO group reported worse scores than the THL group in Service members. • Service members and Veterans with tinnitus only (TO) generally had poorer outcomes than those with HL only (HLO). • Future research is needed to determine if tinnitus distress, severity and outcomes vary based on the severity and/or configuration of comorbid HL. • Future studies could also inform causal factors associated with HL and tinnitus comorbidity.

References


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