ESTABLISHING THE PREVALENCE AND SEVERITY OF TINNITUS AMONG SINGAPOREAN ELDERLY POPULATION

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Co-supervisor: Prof. William Hal Martin
Tinnitus Facts

USA: 25.3%
Australia: 30.3%
UK: 16.2%
Nigeria: 14.1%
Japan: 18.6%
China: 11.4%
Korea: 20.7%
Pakistan: 20.1%
São Paulo: 22.0%
Iran: 4.6%
Malaysia: 19.0%
Australia: 30.3%
Prevalence

1 in 6 people worldwide suffers from tinnitus

Severity

1 in 10 people perceived their tinnitus as severe
Severe Tinnitus Affects an Individual’s Ability to Lead a Normal Life
Research Gap

- Prevalence and severity of tinnitus
- Potential risk factors associated with tinnitus

Only 1 epidemiological study conducted in Southeast Asia!

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Iran: 4.6%
SINGAPORE

Background
Aims and Hypothesis
Methodology
Results
Discussion
Limitation
Conclusion
Future Work
1. Determine the prevalence and severity of tinnitus in the elderly population in Singapore, aged 50 years and above

2. Identify factors associated with the increased prevalence of tinnitus

3. Identify factors associated with severe tinnitus
## Hypotheses

### Increased Prevalence of Tinnitus
- Age
- Gender
- Ethnicity
- Hearing impairment
- HHIE-S score
- Exposure to loud noise

### Increased Tinnitus Severity
- Age
- Gender
- Ethnicity
- Hearing impairment
- HHIE-S score
- Emotional distress
- Sleep disorder
Methodology

Outline

Phase 1 (Prevalence of Tinnitus)
- Door-to-door interview
- 53-Item questionnaire administered
- Non-compulsory hearing screening

Phase 2 (Severity of Tinnitus)
- Door-to-door interview
- 39-Item questionnaire administered

Study Population
- Singapore Citizens and Permanent Residents
- 50 – 98 years old
- Ghim Moh Sub-Planning Zone estate
- Phase 1: 579 participants, Phase 2: 88 participants
Key Results
Tinnitus Prevalence

**Male**
- Tinnitus Present: 22.6%
- Tinnitus Absent: 77.4%
- Total: N=230

**Female**
- Tinnitus Present: 20.1%
- Tinnitus Absent: 79.9%
- Total: N=349

**Total**
- Tinnitus Present: 21.1%
- Tinnitus Absent: 78.9%
- Total: N=579
Factors Associated with Tinnitus

1. Ethnicity
2. HHIE-S score

Table 1: Percent prevalence of any tinnitus with corresponding OR and 95% CI

<table>
<thead>
<tr>
<th>Factors</th>
<th>Prevalence of Tinnitus (%)</th>
<th>Bivariate OR (95% CI)</th>
<th>P-value</th>
<th>Multi-adjusted OR (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>111/477 (23.3)</td>
<td>1.00</td>
<td>0.024*</td>
<td>1.00</td>
<td>0.239</td>
</tr>
<tr>
<td>Malay</td>
<td>7/46 (15.2)</td>
<td>0.59 (0.26 – 1.36)</td>
<td>0.217</td>
<td>0.60 (0.26 – 1.41)</td>
<td>0.019*</td>
</tr>
<tr>
<td>Indian</td>
<td>4/50 (8.0)</td>
<td>0.29 (0.10 – 0.81)</td>
<td>0.001*</td>
<td>0.30 (0.11 – 0.88)</td>
<td>0.028*</td>
</tr>
<tr>
<td>HHIE-S</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No handicap</td>
<td>95/509 (18.7)</td>
<td>1.00</td>
<td></td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Mild to moderate handicap</td>
<td>16/46 (34.8)</td>
<td>2.29 (1.20 – 4.37)</td>
<td>0.012*</td>
<td>2.32 (1.20 – 4.50)</td>
<td>0.013*</td>
</tr>
<tr>
<td>Significant handicap</td>
<td>11/24 (45.8)</td>
<td>3.63 (1.58 – 8.36)</td>
<td>0.002*</td>
<td>3.81 (1.62 – 8.97)</td>
<td>0.002*</td>
</tr>
</tbody>
</table>

* On chi-square test.
*Significance at P < 0.05.
Tinnitus Severity

Mild Tinnitus, 97.8% (n=86)

Severe Tinnitus, 2.2% (n=2)

N=88

• Both were of the female gender
• Found to be in the oldest two age groups
  o 70-79 years old
  o 80 years old and above
### Factors Associated with Severe Tinnitus

1. Ethnicity
2. HHIE-S score
3. Emotional distress

#### Table 2: Percent prevalence of severe tinnitus with corresponding P-value

<table>
<thead>
<tr>
<th>Factors</th>
<th>Prevalence of Severe Tinnitus (%)</th>
<th>P-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>1/82 (1.2)</td>
<td></td>
</tr>
<tr>
<td>Malay</td>
<td>0/5 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Indian</td>
<td>1/1 (100.0)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td><strong>HHIE-S</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No handicap</td>
<td>0/70 (0.0)</td>
<td></td>
</tr>
<tr>
<td>Mild to moderate handicap</td>
<td>1/12 (8.3)</td>
<td>0.010*</td>
</tr>
<tr>
<td>Significant handicap</td>
<td>1/6 (16.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Emotional Distress</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2/10 (20.0)</td>
<td>0.004*</td>
</tr>
<tr>
<td>No</td>
<td>0/78 (0.0)</td>
<td></td>
</tr>
</tbody>
</table>

* On chi-square test.

*Significance at P < 0.05.


Medical Help Sought by Participants

1. 35.2% sought professional help
2. Majority (48.4%) sought help from an otolaryngologist
3. Only 1 participant was advised to use sound therapy

Table 3: Professional help sought by participants reporting tinnitus, by gender

<table>
<thead>
<tr>
<th></th>
<th>Men (%)</th>
<th>Women (%)</th>
<th>Subjects (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons seeking help</td>
<td>12/37 (32.4)</td>
<td>19/51 (37.3)</td>
<td>31/88 (35.2)</td>
</tr>
<tr>
<td>Professionals contacted</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General practitioner (GP)</td>
<td>4/12 (33.4)</td>
<td>2/19 (10.5)</td>
<td>6/31 (19.3)</td>
</tr>
<tr>
<td>Otolaryngologist</td>
<td>5/12 (41.7)</td>
<td>10/19 (52.6)</td>
<td>15/31 (48.4)</td>
</tr>
<tr>
<td>TCM practitioner (TCM)</td>
<td>1/12 (8.3)</td>
<td>2/19 (10.5)</td>
<td>3/31 (9.7)</td>
</tr>
<tr>
<td>Polyclinic and TCM</td>
<td>1/12 (8.3)</td>
<td>2/19 (10.5)</td>
<td>3/31 (9.7)</td>
</tr>
<tr>
<td>Otolaryngologist and TCM</td>
<td>0/12 (0.0)</td>
<td>3/19 (15.8)</td>
<td>3/31 (9.7)</td>
</tr>
<tr>
<td>GP and ENT</td>
<td>1/12 (8.3)</td>
<td>0/19 (0.0)</td>
<td>1/31 (3.2)</td>
</tr>
</tbody>
</table>
1. 35.2% sought professional help
2. Majority (48.4%) sought help from an otolaryngologist
3. Only 1 participant was advised to use sound therapy

Table 4: Tinnitus management options received by participants reporting tinnitus, by gender

<table>
<thead>
<tr>
<th>Management Options</th>
<th>Men (%)</th>
<th>Women (%)</th>
<th>Subjects (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>9/12 (75.0)</td>
<td>12/19 (63.2)</td>
<td>21/31 (67.7)</td>
</tr>
<tr>
<td>Massage – Press tragus</td>
<td>1/12 (8.3)</td>
<td>0/19 (0.0)</td>
<td>1/31 (3.2)</td>
</tr>
<tr>
<td>TCM medication</td>
<td>2/12 (16.7)</td>
<td>2/19 (10.5)</td>
<td>4/31 (12.9)</td>
</tr>
<tr>
<td><strong>Sound therapy</strong></td>
<td>0/12 (0.0)</td>
<td>1/19 (5.3)</td>
<td>1/31 (3.2)</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>0/12 (0.0)</td>
<td>2/19 (10.5)</td>
<td>2/31 (6.5)</td>
</tr>
<tr>
<td>Acupuncture and TCM medication</td>
<td>0/12 (0.0)</td>
<td>2/19 (10.5)</td>
<td>2/31 (6.5)</td>
</tr>
</tbody>
</table>
Discussion
Prevalence and Severity of Tinnitus

Aim 1: Determine the prevalence and severity of tinnitus in the elderly population in Singapore

Table 5: Comparison of prevalence and severity of tinnitus with literatures

<table>
<thead>
<tr>
<th></th>
<th>Current Study</th>
<th>Literatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of Tinnitus</td>
<td>21.1%</td>
<td>4.6% - 30.3%&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Severity of Tinnitus</td>
<td>2.2%</td>
<td>0.4% - 34.0%&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup> Jalessi et al., 2013; Sindhusake et al., 2003  
<sup>b</sup> Fujii et al., 2011; Michikawa et al., 2010; Oiticica & Bittar, 2015; Pinto et al., 2010; Shargorodsky et al., 2010; Sindhusake et al., 2003
Factors Associated with Tinnitus

Aim 2: Identify factors associated with increased prevalence of tinnitus

- Ethnicity
- HHIE-S score
- Age
- Gender
- Hearing impairment
- Exposure to loud noise

Aim 3: Identify factors associated with severe tinnitus

- Ethnicity
- HHIE-S score
- Emotional distress
- Age
- Gender
- Hearing impairment
- Sleep disorder
Increased Prevalence of Tinnitus

1. Insufficient sample size

2. Older adults may learn to accept tinnitus as part of an aging process → result in under-reporting of tinnitus

3. Incomplete audiometric results obtained from all recruited participants

4. Variability in amount of noise exposure in different countries due to different occupations and non-occupational noise activities
Aim 3: Identify factors associated with severe tinnitus

Increased Tinnitus Severity

- Ethnicity
- HHIE-S score
- Emotional distress

- Age
- Gender
- Hearing impairment
- Sleep disorder

1. Insufficient sample size (n=2)
2. Incomplete audiometric results obtained from all recruited participants
3. All 88 participants reported no significant sleep distress despite having tinnitus
Medical Help Sought

- 48.4% of the participants who sought help for their tinnitus consulted an otolaryngologist
- **None tried hearing aids** as a management option for tinnitus
- **Only one participant used the radio** as a form of sound therapy

This might reflect:

1. General belief that there is no cure or treatment for tinnitus.
2. Lack of awareness that these patients may be referred to an audiologist for counselling and sound therapy options, including hearing aids.
3. Attitudes of patients towards hearing aids and other devices acquisition.
Limitations

1. Inability to generalise the research findings to the whole of Singapore
   ▪ Small sample size (N=579)
   ▪ Other epidemiological studies conducted worldwide had study population ranging from 1,337 to 172,621 participants

2. Information bias of tinnitus might have occurred since the presence of tinnitus was determined based on participant’s recollection
   ▪ Participants who reported presence of emotional distress might be more likely to recall tinnitus as compared to participants without emotional distress
Conclusion

- Prevalence and severity of tinnitus was 21.1% and 2.2% respectively.
- Ethnic group and HHIE-S score were found to be associated with increased prevalence of tinnitus.
- Ethnic group, HHIE-S score and emotional distress were found to be associated with severe tinnitus.
- Awareness should be raised among physicians that patients with tinnitus may be referred to an audiologist for counselling and sound therapy options, including hearing aids, which can potentially provide relief for tinnitus patients.
Future Work

- Large-scale epidemiological studies could be considered in other mature estates in Singapore
  - Jurong West, Clementi, Queenstown, Bukit Merah, Toa Payoh, Ang Mo Kio, Bedok and Tampines (Statistics, 2010)

- Further studies may include a wider age group
  - Include young adults aged 21 years old and above

- Questionnaire may be modified to document more information
  - Average household income, history of coronary heart disease and occupation
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All my classmates!!!
Thank You
References


References


