The impact of smoking on cardiometabolic risk among male adults with disabilities in Taiwan

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The authors declare that there is no conflict of interests.
Individuals with disabilities have health needs similar to the general populations.

Smoking and metabolic syndrome have emerged as major cardiovascular risks to systemic inflammation and mortality burden.

The smoking rate for individuals >18 years in Taiwan was 28.5% for men and 1.9% for women.

Few studies have focused on the association of smoking on cardiometabolic risks in adult men with disabilities in Taiwan.
Chronic diseases by cigarette smoking-2

- Cancer, lung disease, oral disease, and cardiovascular disease.
- Possibly by causing vascular disruption and platelet activation
- Oxidation and inflammation, endothelial dysfunction.
- Increased vascular stiffness, and changes in vascular structure.
Chronic diseases by cigarette smoking

- Diabetes mellitus
- Metabolic syndrome
- Insulin resistance
- Increased visceral fat
- Chronic diseases by cigarette smoking
- Beta cell dysfunction
- Carotid plaque formation

Diabetes Pathophysiology

- Genetic Predisposition
  - Genetic defects
  - Beta-cell Dysfunction
    - Impaired insulin secretion
- Environment
  - Obesity
  - Insulin Resistance
    - Poor glucose utilization

HYPERGLYCEMIA

BETA-CELL EXHAUSTION

TYPE 2 DIABETES
Cardiometabolic-related diseases in Taiwan-4

Heart disease, the 2nd most common causes of death.

Stroke, the 3rd most common causes of death.

Diabetes, the 5th most common causes of death.

Hypertension, the 8th most common causes of death.
Aim

To explore the prevalence of smoking and its association on cardiometabolic risk among male adults with disabilities.
Methodology-1

**Design, sample, and setting**

This study was part of a nurse-led health promotion program, a community-based, cross-sectional study.

Collaboration with a local hospital and the Bureau of Health Promotion in Chiayi County, Taiwan.

It is designed to examine the needs of health programs for adults with disabilities.

Statistical analyses included descriptive and multivariate analysis.
Methodology-2

- Male sex with a certified disability
- Age > 20 years
- Ability to sign an informed consent form
- Ability to complete the questionnaire with or without assistance
- Ability to walk to the study setting
Methodology-3

The exclusion criteria were

- inability to answer questions
- severe cognition limitation
- unable to provide informed consent

Procedure and ethical considerations

- The institutional ethical committee review board approved (No 102-3331B) and conducted in accordance with the principles of the Declaration of Helsinki (2008).
**Cardiometabolic risk factors biomarkers:**

- waist circumference > 90 cm (central obesity)
- systolic/diastolic blood pressure > 130/85 mmHg
- high-density lipoprotein-cholesterol (HDL-C) < 40 mg/dL
- fasting blood glucose > 100 mg/dL
- triglyceride level > 150 mg/dL

* **metabolic syndrome (MetS)** was defined as the presence >= 3 of the risk factors
Methodology-5

Measurements-2

Healthy lifestyle:

- Regular exercise: 30 minutes/per day
- Adequate vegetable intake: 3 portion
- Adequate fruit intake: 2 portion
- Adequate water intake: .1500 mL
Results-1

*The prevalence of cigarette smoking is 42%.

*The prevalence of metabolic syndrome is 33.3%.

*Five most common disabilities:

• Physical disability.
• Loss of vital organs.
• Hearing impairment.
• Intellectual disability.
• A combination of disabilities.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Total (N = 874)</th>
<th>Non-smoker (n = 507)</th>
<th>Smoker (n = 367)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>55.6 ± 17.5</td>
<td>54.8 ± 19.3</td>
<td>56.8 ± 14.5</td>
<td>0.085</td>
</tr>
<tr>
<td>Education level (year)</td>
<td>8.7 ± 4.3</td>
<td>8.9 ± 4.6</td>
<td>8.3 ± 3.7</td>
<td>0.050</td>
</tr>
<tr>
<td>Disability classification</td>
<td></td>
<td></td>
<td></td>
<td>0.007</td>
</tr>
<tr>
<td>Physically / visually impaired</td>
<td>289 (33.1)</td>
<td>148 (29.2)</td>
<td>141 (38.4)</td>
<td></td>
</tr>
<tr>
<td>Hearing / dumb impaired</td>
<td>139 (15.9)</td>
<td>86 (17.0)</td>
<td>53 (14.4)</td>
<td></td>
</tr>
<tr>
<td>Mental illness</td>
<td>238 (27.2)</td>
<td>156 (30.8)</td>
<td>82 (22.3)</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>208 (23.8)</td>
<td>117 (23.1)</td>
<td>91 (24.8)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>477 (54.6)</td>
<td>263 (51.9)</td>
<td>214 (58.3)</td>
<td>0.059</td>
</tr>
<tr>
<td>Occupation</td>
<td>283 (32.4)</td>
<td>153 (30.2)</td>
<td>130 (35.4)</td>
<td>0.102</td>
</tr>
<tr>
<td>Adopting regular exercise</td>
<td>560 (64.1)</td>
<td>353 (69.6)</td>
<td>207 (56.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Intake of water ≥ 1500cc per day</td>
<td>469 (53.7)</td>
<td>272 (53.6)</td>
<td>197 (53.7)</td>
<td>0.993</td>
</tr>
<tr>
<td>Intake vegetable ≥ 3 portions per day</td>
<td>251 (28.7)</td>
<td>160 (31.6)</td>
<td>91 (24.8)</td>
<td>0.029</td>
</tr>
<tr>
<td>Intake fruit ≥ 2 portions per day</td>
<td>171 (19.6)</td>
<td>112 (22.1)</td>
<td>59 (16.1)</td>
<td>0.027</td>
</tr>
<tr>
<td>Cardiometabolic risk factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waist circumference¹</td>
<td>380 (43.5)</td>
<td>201 (39.6)</td>
<td>179 (48.8)</td>
<td>0.007</td>
</tr>
<tr>
<td>SBP/DBP ≥ 130/85 mmHg²</td>
<td>548 (62.7)</td>
<td>316 (62.3)</td>
<td>232 (63.2)</td>
<td>0.789</td>
</tr>
<tr>
<td>HDL-C &lt; 40 mg/dL³</td>
<td>183 (20.9)</td>
<td>91 (17.9)</td>
<td>92 (25.1)</td>
<td>0.011</td>
</tr>
<tr>
<td>FBG ≥ 100 mg/dL⁴</td>
<td>325 (37.2)</td>
<td>174 (34.3)</td>
<td>151 (41.1)</td>
<td>0.039</td>
</tr>
<tr>
<td>Triglyceride ≥ 150 mg/dL</td>
<td>275 (31.5)</td>
<td>132 (26.0)</td>
<td>143 (39.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Metabolic syndrome (Mets)⁵</td>
<td>291 (33.3)</td>
<td>148 (29.2)</td>
<td>143 (39.0)</td>
<td>0.002</td>
</tr>
<tr>
<td>Number of component of MetS</td>
<td>2.0 ± 1.3</td>
<td>1.8 ± 1.3</td>
<td>2.2 ± 1.3</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
## Results - 2

Table 2. The impact of smoking on metabolic syndrome.

<table>
<thead>
<tr>
<th>Model</th>
<th>OR (95% CI of OR)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1, unadjusted model</td>
<td>1.55 (1.17–2.06)</td>
<td>0.003</td>
</tr>
<tr>
<td>Model 2, adjusted for age, education, disability level</td>
<td>1.50 (1.12–2.00)</td>
<td>0.006</td>
</tr>
<tr>
<td>Model 3, further adjusted for marry status, job, exercise</td>
<td>1.51 (1.13–2.03)</td>
<td>0.006</td>
</tr>
<tr>
<td>Model 4, further adjusted for consumption of water, vegetable, fruit</td>
<td>1.49 (1.11–2.01)</td>
<td>0.008</td>
</tr>
</tbody>
</table>

OR, odds ratio; CI, confidence interval.
### Results - 3

**Table 3.** The impact of smoking on the number of component of metabolic syndrome.

<table>
<thead>
<tr>
<th>Model</th>
<th>$B$ (95% CI of $B$)</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 1, unadjusted model</td>
<td>0.37 (0.19–0.54)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Model 2, adjusted for age, education, disability level</td>
<td>0.33 (0.16–0.50)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Model 3, further adjusted for marry status, job, exercise</td>
<td>0.34 (0.17–0.52)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Model 4, further adjusted for consumption of water, vegetable, fruit</td>
<td>0.33 (0.16–0.51)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

* $B$, unstandardized regression coefficient; CI, confidence interval.*
The prevalence of cardiometabolic risk factors and MetS between the non-smokers and smokers
The cross-tabulation between smoking status and number of component of cardiometabolic risk factors
Discussion
Key findings

*A high prevalence of cigarette smoking and cardiometabolic risk was found.

*Smoking was an independent factor for cardiometabolic risk.

*Smokers tended to adopt an unhealthy lifestyle.

Cardiovascular Risk Factors

- **Non-modifiable**
  - Age
  - Gender
  - Family History

- **Modifiable**
  - Hypertension
  - Smoking
  - Diabetes
  - Hyperlipidemia
  - Other:
    - Homocysteine levels
    - CRP levels
    - Sedentary life style
    - obesity
Unhealthy behaviors are clustering together

* More likely to smoke cigarettes.

* Have a poor nutrition diet.

* Be less physically active.
Limitations

* Smoking variables were determined by self-report and without confirmation using urinary nicotine levels.

* The nonrandom sampling and limited geographical scope limit the generalizability of these findings.

* Recall bias must be considered because the participants had different durations of disability, nor did we control for other health conditions.
* Disabled men exhibited more smoking and cardiometabolic risk.

* Disabled men have inadequate vegetable/fruit intake and regular exercise.

* Smoking is an independent factor associated with cardiometabolic risk, after adjusted potential confounders.

* A nurse-led community health promotion program for disabled men is needed.
Conclusions

* A high prevalence of smoking, unhealthy habits, and cardiometabolic risk factors among male adults with disabilities.

* Reducing health disparities is an important goal for public and private health agencies in Taiwan.

* Early initiation of innovative smoking cessation and health promotion strategies for these disadvantaged people is an important issue.