North West Adelaide Health Study - Obesity

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Research Fellow

The Health Observatory, TQEH
- Obesity increases the risks for chronic conditions
- single biggest threat to public health in Australia
Obesity in Australia

- 1995 ABS National Nutrition Survey
- 2007-08 ABS National Health Survey

Taken from Overweight and Obesity in Adults in Australia: A Snapshot (cat. no. 4842.0.55.001).

<table>
<thead>
<tr>
<th></th>
<th>stage 1</th>
<th>stage 2</th>
<th>stage 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>underweight</td>
<td>1.2</td>
<td>1.3</td>
<td>8.8</td>
</tr>
<tr>
<td>normal</td>
<td>35.5</td>
<td>31.9</td>
<td>26.7</td>
</tr>
<tr>
<td>overweight</td>
<td>36.3</td>
<td>37.4</td>
<td>39</td>
</tr>
<tr>
<td>obese</td>
<td>27</td>
<td>29.4</td>
<td>33.4</td>
</tr>
</tbody>
</table>
Obesity Trends* Among U.S. Adults
BRFSS, 1990, 2000, 2010
(*BMI ≥30 kg/m²)

- In 2009–2010, 35.7% of U.S. adults were obese
- No change from 2003-2008

from http://www.cdc.gov/obesity/data/adult.html
Metabolically healthy obese (MHO) phenotype

- normal metabolic parameters despite elevated body mass index (BMI)
- 10-15% of population samples
- The longitudinal course of this phenotype is not well-described
- follow-up: conflicting results regarding mortality outcomes
- CVD risk attributable to obesity requires the concomitant presence of metabolic risk factors
- Framingham Offspring study reported a borderline increased risk of developing diabetes over an 11 year period.
- Outcomes in the MHO may be related to differences in
  - body composition (less visceral and hepatic fat),
  - fitness
  - inflammatory profiles
Methods

Study population

- 3743 stage 1 participants free of cardiovascular disease and not underweight.
- Stratified at baseline by body mass index [normal :18.5-24.9, overweight: 25.0-29.9, obese ≥30.0 kg/m2] and metabolic risk.

Metabolic risk

- at least two of the following International Diabetes Federation abnormalities:
  - triglyceride ≥1.7mmol/l;
  - HDL cholesterol <1.0mmol/l (men), <1.3mmol/l (women)
  - blood pressure ≥130/85mmHg
  - fasting glucose ≥5.6mmol/l or self-reported diabetes;
  - treatment for these disorders.

- Dual energy x-ray absorptiometry (DXA) derived body composition was obtained at stage 2 on participants aged at least 50 yr.
Metabolic health was present in 67% of the population
Factors associated with obesity among the metabolically healthy

- Ages 40-54, 55-69
- Neighbourhood disadvantage
- Former smoking
- Low level physical activity
- Impaired quality of life
Factors associated with metabolic health among obese subjects

- female
- younger
- lower levels of waist circumference
- engaging in moderate to high level physical activity
- neighbourhood advantage
Adjusted OR (95% CI) for incident events in relation to BMI and metabolic status

**Diabetes (4.9%, n=112)**

- MH-OvW: 0.9
- MH-Ob: 2.21
- MR-NW: 2.45
- MR-OvW: 4.61
- MR-Ob: 8.04

**CVD/stroke (6.3%, n=167)**

- MH-OvW: 1.17
- MH-Ob: 1.16
- MR-NW: 1.17
- MR-OvW: 1.39
- MR-Ob: 2.24

<table>
<thead>
<tr>
<th>%</th>
<th>1.7</th>
<th>3.7</th>
<th>5.3</th>
<th>8.6</th>
<th>14.3</th>
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</thead>
<tbody>
<tr>
<td>%</td>
<td>5.2</td>
<td>4.7</td>
<td>8.5</td>
<td>8.8</td>
<td>10.7</td>
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Are BMI/metabolic phenotypes static?

<table>
<thead>
<tr>
<th>STAGE 1</th>
<th>Metabolic health</th>
<th>Metabolic risk</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (n)</td>
<td>% (n)</td>
</tr>
<tr>
<td>Metabolic health</td>
<td>% (n)</td>
<td>% (n)</td>
</tr>
<tr>
<td>BMI (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.5-24.9</td>
<td>58.8</td>
<td>23.7</td>
</tr>
<tr>
<td>25.0-29.9</td>
<td>8.1</td>
<td>46.1</td>
</tr>
<tr>
<td>≥ 30.0</td>
<td>0.4</td>
<td>8.9</td>
</tr>
<tr>
<td>Metabolic risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.5-24.9</td>
<td>28.8</td>
<td>9.6</td>
</tr>
<tr>
<td>25.0-29.9</td>
<td>3.6</td>
<td>17.3</td>
</tr>
<tr>
<td>≥ 30.0</td>
<td>0.3</td>
<td>3.8</td>
</tr>
</tbody>
</table>

33% of MHO developed metabolic risk
Maintenance of metabolic health

- occurred in 67% (n=188) of MHO participants
- associated with baseline variables:
  - younger age (< 40 yrs, OR, 95% CI =8.38, 2.13-33.0),
  - lower levels of waist circumference (OR per cm increase in waist circumference =0.97, 0.95-0.99)
  - low –middle quintiles of area level SES (2nd SEIFA IRSD quintile OR=2.34, 0.93-5.88, p=0.07; 3rd SEIFA IRSD quintile OR=2.72, 1.14-6.50 compared to the lowest quintile).
- No significant association with
  - physical activity
  - low/no risk alcohol consumption
  - smoking behaviour was observed
Incident diabetes and CVD in relation to change in status

- Stable MHO
  - incident diabetes (1.1%, n=2)
  - CVD/stroke cases (3.7%, n=7)
- progression from the MHO to the MRO
  - diabetes (8.3%, n=7, OR=14.1, 95% CI 2.82, 70.2)
  - not CVD/stroke events (7.0%, n=6, OR=2.19, 95% CI 0.72-6.67).
- stable MRO
  - diabetes: 18.5%, n=38, (OR=33.3, 95% % CI 7.8-143.3)
  - CVD/stroke: 13.7%, n=36, OR=4.1, 95% CI 1.9-8.9)
Mean* (SE) body composition in MHO and MRO females

<table>
<thead>
<tr>
<th></th>
<th>MH-NW (n=167)</th>
<th>MH-O(n= 86)</th>
<th>MR-O (151)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>61.3 (0.7)</td>
<td>60.1 (0.8)</td>
<td>62.0 (0.7)</td>
</tr>
<tr>
<td>Adiposity BMI</td>
<td>22.5 (0.1)</td>
<td>34.3 (0.5)</td>
<td>34.7 (0.3)</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>77.5 (0.6)</td>
<td>101.1*(0.8)</td>
<td>104.0 (0.6)</td>
</tr>
<tr>
<td>Fat Mass Index</td>
<td>7.5 (0.2)</td>
<td>16.5 (0.2)</td>
<td>16.0 (0.2)</td>
</tr>
<tr>
<td>% fat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>32.9 (0.4)</td>
<td>47.8 (0.5)</td>
<td>46.5 (0.4)</td>
</tr>
<tr>
<td>Arm</td>
<td>33.8 (0.4)</td>
<td>48.9 (0.6)</td>
<td>48.4 (0.5)</td>
</tr>
<tr>
<td>Leg</td>
<td>38.7 (0.5)</td>
<td>53.2 * (0.7)</td>
<td>49.9 (0.5)</td>
</tr>
<tr>
<td>Fat free mass (FFM)</td>
<td>15.1 (0.1)</td>
<td>17.8 *(0.1)</td>
<td>18.3 (0.1)</td>
</tr>
<tr>
<td>Leg FFMI</td>
<td>4.5 (0.04)</td>
<td>5.3 (0.05)</td>
<td>5.3 (0.04)</td>
</tr>
<tr>
<td>Grip strength</td>
<td>26.0 (0.4)</td>
<td>26.9 (0.6)</td>
<td>25.3 (0.5)</td>
</tr>
</tbody>
</table>

*Adjusted for age and smoking
Conclusions

- “Healthy” obesity was a transient state for a third of subjects.
- Persistence of MHO was associated with younger age and a more peripheral fat distribution, with low diabetes and CVD risks.
- Development of metabolic risk in the MHO was associated with significantly increased diabetes risks.
- Longitudinal study of the MHO phenotype is important to identify a potential protective effect of peripheral fat distribution and avoid inappropriate health messages about the risks of obesity.
Acknowledgements

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The Health Observatory

THE UNIVERSITY OF ADELAIDE
AUSTRALIA

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