Serum copper and the risk of CVD mortality in normal weight, pre-obese and obese men in Finland

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Copper

- An essential micronutrient and trace element
- Component of enzymes that catalyze oxidation-reduction reactions.
- Copper has potential role in atherogenesis

Cardiovascular disease (CVD)

- About 18 million deaths annually
- 32% of all deaths worldwide
- In Finland, CVD contributes to 37% of mortality among Finnish men

Is elevated copper concentration associated with risk of CVD mortality?

Kang JY 2011

WHO 2021
Using a northern European population

- Database - Kuopio Ischaemic Heart Disease (KIHD) study, Finland

- KIHD- designed to investigate the different risk factors for developing CVD and other chronic diseases

- 2682 men at baseline (1984-1989), aged 42 to 60 years

- **1911 men** (in present study)
Serum copper concentration

- Determined from frozen (at $-20^\circ$C) serum specimens
- Using the Atomic Absorption Spectrometer (PerkinElmer, Norwalk, Connecticut)

Serum copper

- Quartile 1: $<1.00\text{mg/l}$
- Quartile 2: $1.00\text{ to }<1.10\text{mg/l}$
- Quartile 3: $1.10\text{ to }<1.21\text{mg/l}$
- Quartile 4: $\geq1.21\text{mg/l}$

BMI Categories

- Normal weight $<25\text{kg/m}^2$
- Pre-obese $25-29.9\text{ kg/m}^2$
- Obese $>30\text{ kg/m}^2$

CVD mortality

Prospectively collected till end of 2014
- Sources of information
  - Hospital documents
  - Interviews
  - Death certificates
  - Autopsy reports
  - Medicolegal reports
Findings

Baseline
1911 Men
53 years (mean)

26 years follow-up

CVD mortality: 358

Model adjusted for age, blood pressure, socioeconomic status, high density cholesterol, total cholesterol, smoking, alcohol and history of type 2 diabetes

Serum Copper and CVD Mortality/ Isiozor et al.
## Across the BMI categories in the Highest quartile

<table>
<thead>
<tr>
<th>Serum copper (Quartile)</th>
<th>Events/ Total</th>
<th>Normal weight N=627</th>
<th>Pre-obesity N=986</th>
<th>Obese N=298</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>HR (95% CI); p-value</td>
<td>HR (95% CI); p-value</td>
<td>HR (95% CI); p-value</td>
</tr>
<tr>
<td>1</td>
<td>76/609</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>71/401</td>
<td>1.03 (0.58-1.81); 0.929</td>
<td>1.77 (1.10-2.84); 0.018</td>
<td>1.87 (0.80-4.35); 0.148</td>
</tr>
<tr>
<td>3</td>
<td>107/473</td>
<td>0.75 (0.41-1.36); 0.343</td>
<td>2.26 (1.46-3.50); &lt;0.001</td>
<td>2.90 (1.36-6.19); 0.006</td>
</tr>
<tr>
<td>4</td>
<td>104/428</td>
<td>1.13 (0.66-1.95); 0.649</td>
<td>2.03 (1.29-3.21); 0.002</td>
<td>2.72 (1.28-5.76); 0.009</td>
</tr>
</tbody>
</table>

**Highest quartile of serum copper**

- Normal weight Men
- Pre-obese Men
- Obese Men

*1st quartile as the referent comparison

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**Risk of CVD mortality**

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**Events**
Conclusion

- Elevated serum Cu level was **directly associated** with the risk of CVD mortality in middle-aged Finnish men.

- Men with **obesity** had the **highest risk of CVD mortality** across the highest quartiles of serum Cu levels after controlled risk factors.

Implications and future direction

- Serum Cu can possibly be a prognostic marker or a risk factor for CVD mortality
- Further studies needed.
Thank you!