Is the link between alcohol and cardiovascular death among young Russian men attributable to misclassification of acute alcohol intoxication? Evidence from the city of Izhevsk

V M Shkolnikov, M McKee, V V Chervyakov, N A Kyrianov

Background: Research on the aetiology of sudden cardiac death among young men in Russia strongly suggests an association with binge drinking. However, the possibility remains that such deaths are misclassified as being attributable to cardiovascular disease when they are really caused by acute alcohol poisoning.

Objective: To describe postmortem levels of blood alcohol in Russian men dying from various causes and so determine whether deaths from alcohol poisoning are being misclassified as cardiovascular deaths.

Setting: Ishevsk, capital of the Udmurt Republic, situated in the Ural region of the Russian Federation.

Methods: The study was part of a larger one on adult mortality. The study sample was 309 deaths among men aged 20–55 dying between August 1998 and March 1999 from other than neoplasms, infectious diseases or unspecified causes and on whom necropsy records could be obtained. Information on cause of death was extracted from death certificates and data on postmortem blood alcohol concentration (BAC) from forensic records. Blood alcohol concentrations were adjusted where necessary to allow for delay in necropsy.

Results: Medium or greater levels of intoxication occurred in a quarter of those recorded as dying from cardiovascular disease but in over half of those dying from external causes. BAC levels consistent with at least strong intoxication were seen in 13.5% of deaths from cardiovascular disease and 27.1% from external causes. No cardiovascular deaths had BAC at levels usually thought to be fatal while this level was seen in 26% of deaths from accidental poisoning.

Conclusion: Evidence of recent consumption of alcohol is common among Russian men dying under the age of 55, with severe intoxication common where death is from external causes. However, the high death rates from cardiovascular disease in Russia cannot be explained by misclassification of deaths attributable to acute alcohol poisoning. This study thus resolves one of the outstanding controversies in the story of alcohol and cardiovascular disease in the former Soviet Union.
Some 61.8% deaths had more than none or insignificant levels of alcohol detected. Table 2 shows that 42.7% of deaths had moderate intoxication or above (that is, 150 mg/dl and higher) and 22% in strong or advanced intoxication (that is, above 250 mg/dl). Thus, many Russian men who die at this age are intoxicated at the time of death. No men dying from cardiovascular disease had blood alcohol concentrations in excess of 400 mg/dl although 5.6% had concentrations above 300 mg/dl while corresponding figures for external causes were 5% and 16% respectively. Fourteen per cent of deaths from cardiovascular causes had levels consistent with strong intoxication, although a quarter had levels consistent with moderate intoxication.

RESULTS

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Nearly all cardiovascular deaths with significant quantities of alcohol detected were ascribed to “Other forms of ischaemic heart disease without hypertensive disease” or “Other heart diseases” (using the Russian classification of causes of death). The first group includes deaths attributable to atherosclerosis, acute forms of ischaemic heart disease other than myocardial infarction including ill defined acute ischaemic heart disease; the second group includes cardiomyopathies, cardiac arrhythmias, myocarditis, pericarditis, conduction disorders and heart failure.
In contrast, advanced intoxication was more common in deaths from external causes, over half of whom had levels consistent with moderate intoxication and over a quarter with severe intoxication. Rates were especially high for accidental poisoning by alcohol, which included most cases with very high levels. The relative rarity of intoxication in deaths from motor vehicle accidents is plausibly attributable to those who had not been drinking being killed by those who had.

**DISCUSSION**

This study does not support the argument that most young and middle aged Russian men, whose deaths are ascribed to cardiovascular disease, are in reality killed simply by alcohol poisoning. It does confirm the high frequency of intoxication among those dying in this age group, although the immediate cause of death is commonly alcohol poisoning or injury.

The proposed role of alcohol in cardiovascular death requires a brief explanation. While we argue that binge drinking is causally associated with sudden cardiac death, the physiological pathways do not require that death necessarily occur during a binge. The threshold for ventricular irritability is reduced after recovery from a binge and changes in blood coagulability are most adverse after cessation of heavy drinking. Thus, the findings that many of those dying have been drinking, but are not fatally intoxicated, is entirely consistent with the proposed mechanisms.

Research on this topic, and in this setting, is not easy and, inevitably, the findings are subject to many limitations. It was retrospective so blood samples were not taken under standardised conditions, although this would anyway have been difficult because of differing intervals before bodies were transmitted to pathologists. Recorded levels could plausibly overestimate values at death because of postmortem production of alcohol but this would not affect our conclusions. It is also possible that metabolism of alcohol after cessation of drinking could produce lower levels postmortem than were present at the onset of illness or injury. Superficially this seems more likely to be able to challenge our conclusion, and it would certainly suggest that the true level of intoxication in those dying from injury, where survival is more probable, is higher than in our results. However, it would require that men dying from alcohol poisoning lived long enough for their blood levels to fall to those consistent with only moderate intoxication, at which stage they died. On the basis of published rates of alcohol breakdown, this is likely to take about 8–10 hours. While not inconceivable, it seems implausible that this would be a sufficiently common situation. It is unlikely to be sufficient to explain the very much higher Russian death rate (515 deaths/100,000 in Russia in 1996 compared with 162/100,000 in the European Union) as being attributable, to any significant extent, to misclassification of deaths attributable to alcohol poisoning.

### Table 2

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Number of deaths (% of row total)</th>
<th>Of which BAC &gt;150 mg/dl</th>
<th>Of which BAC &gt;250 mg/dl</th>
<th>Of which BAC &gt;400 mg/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular diseases</td>
<td>89</td>
<td>22 (24.7)</td>
<td>12 (13.3)</td>
<td>0</td>
</tr>
<tr>
<td>Of which:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other forms of ischaemic heart disease</td>
<td>40</td>
<td>13 (32.5)</td>
<td>7 (17.5)</td>
<td>0</td>
</tr>
<tr>
<td>Other heart diseases†</td>
<td>22</td>
<td>8 (36.4)</td>
<td>5 (22.7)</td>
<td>0</td>
</tr>
<tr>
<td>External causes of death</td>
<td>199</td>
<td>104 (52.3)</td>
<td>54 (27.1)</td>
<td>10 (5.0)</td>
</tr>
<tr>
<td>Of which:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road vehicle accident</td>
<td>22</td>
<td>8 (36.4)</td>
<td>2 (9.1)</td>
<td>1 (4.5)</td>
</tr>
<tr>
<td>Accidental poisonings</td>
<td>27</td>
<td>20 (74.1)</td>
<td>18 (66.7)</td>
<td>7 (25.9)</td>
</tr>
<tr>
<td>Fire related accident</td>
<td>6</td>
<td>4 (66.7)</td>
<td>1 (16.7)</td>
<td>0</td>
</tr>
<tr>
<td>Accidental drowning</td>
<td>6</td>
<td>3 (50)</td>
<td>2 (33.3)</td>
<td>0</td>
</tr>
<tr>
<td>Suicide</td>
<td>69</td>
<td>30 (43.5)</td>
<td>10 (14.5)</td>
<td>2 (2.9)</td>
</tr>
<tr>
<td>Homicide</td>
<td>31</td>
<td>17 (54.8)</td>
<td>4 (12.9)</td>
<td>0</td>
</tr>
<tr>
<td>Ill defined violent cause</td>
<td>5</td>
<td>2 (40)</td>
<td>2 (40)</td>
<td>0</td>
</tr>
<tr>
<td>Other diseases</td>
<td>21</td>
<td>6 (28.6)</td>
<td>3 (14.3)</td>
<td>0</td>
</tr>
<tr>
<td>Of which:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chronic alcoholism</td>
<td>6</td>
<td>4 (66.7)</td>
<td>2 (33.3)</td>
<td>0</td>
</tr>
<tr>
<td>Other causes combined</td>
<td>309</td>
<td>132 (42.7)</td>
<td>69 (22.3)</td>
<td>10 (3.2)</td>
</tr>
</tbody>
</table>


### Key points

- Although there is now considerable evidence to link binge drinking with the high rates of cardiovascular disease, in particular sudden cardiac death, in Russia, a counter-argument is that the apparent association may arise because of misclassification of deaths from acute alcohol poisoning.
- This study, in which postmortem blood alcohol concentrations were measured in young Russian men, shows that this is not the case, and while many of those dying from cardiovascular disease have been drinking, the levels are not sufficient to cause death from acute alcohol poisoning.

### Policy implications

This study dispels one of the remaining objections to the argument that alcohol is a major factor in the high rate of cardiovascular disease in the former Soviet Union and strengthens the case for an effective policy response to this major cause of premature death.
Obviously these findings can only be extended to other parts of Russia with caution. Izhevsk and its neighbouring Udmurt cities are typical of the urban population of Russia in terms of patterns of mortality, economic indicators, and socio-demographic composition. However, it must be accepted that medical diagnosis and practices involved in cause of death coding and necropsy may differ significantly between Russian regions.

Clearly more research is required to understand why premature cardiovascular death is so common among young and middle aged men in Russia cannot simply be dismissed as coding artefact.

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References

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