Unanticipated Lipid Profiles in Victims of Sudden Unexpected Death: Low-density Lipoprotein Cholesterol and an Elevated Triglyceride to High-Density Lipoprotein Cholesterol Ratio

Nisha Hosadurg, MBBS1; Brittany Bogle PhD, MPH2; Golsa Joodi MD, MPH1; Murrium I. Sadaf, MD1; Philip M. Mendys, PharmD3; Ross J. Simpson, Jr. MD, PhD1

1Division of Cardiology, University of North Carolina (UNC) School of Medicine; 2Department of Epidemiology, UNC Gillings School of Public Health; 3UNC Eshelman School of Pharmacy

University of North Carolina, Chapel Hill, NC

Introduction

- Although low-density lipoprotein cholesterol (LDL-C) is a proven cardiovascular risk factor, substantive data on LDL-C levels in victims of sudden cardiac or sudden unexpected death is lacking.
- Several post-mortem studies have demonstrated higher concentrations of remnant-like lipoprotein particles (RLP) in sudden cardiac death victims.
- The triglyceride to high-density lipoprotein cholesterol ratio (TG/HDL) is reflective of serum RLP levels, but has not been reported in victims of sudden death.

Hypothesis

We hypothesized that out-of-hospital sudden unexpected death (OHSUD) victims would have similar or higher calculated LDL-C levels and higher TG/HDL ratios when compared with living National Health and Nutrition Examination Survey (NHANES) participants.

Methods

- From March 1, 2013 to February 28, 2015 all EMS (Emergency Medical Services) attended out-of-hospital deaths in Wake County, North Carolina, were screened to identify OHSUD cases among free living 18-64 year-olds.
- All available data from death certificates, EMS narratives, medical examiner and/or autopsy reports and medical records was used to ascertain the group of sudden unexpected death victims pertinent to this study [Figure 1].

Wake County, NC, out of hospital deaths attended by EMS (n=1,592)
- Cases reviewed by adjudication committee (n=639)
- All 2013-2015 OHSUD victims (n=399)
- OHSUD victims with medical records (n=278)
- OHSUD victims with lipid panels (n=138)

Figure 1. Ascertainment process for OHSUD Victims

Results

<table>
<thead>
<tr>
<th>NHANES 2009-10 cycle participants</th>
<th>OHSUD Victims (n=138)</th>
<th>NHANES Participants (n=1316)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excluded:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Age &lt;18 or &gt;64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Non-NC residents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Non-natural/violent deaths</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Non-free living (hospital, nursing, correctional facilities)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excluded:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Victims with no available healthcare provider based medical records.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excluded:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Victims with at least one lipid panel containing both TG and HDL within 5 years of death.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Unadjusted Population Characteristics of OHSUD Victims with Lipid Panels and NHANES Participants

Methods (contd.)

- The final 138 victims had an available lipid panel at an average of 1.2 years prior to death.
- Excluding a similar follow-up period, we constructed a control group of NHANES participants (2005-10 cycle) to serve as a comparison group [Figure 2].
- Only Non-Hispanic black and Non-Hispanic white races were included as adjudicated OHSUD victims were only black or white.

Figure 2. Ascertainment process for NHANES Participants comparison group.

Results (contd.)

- OHSUD victims consisted of a higher proportion of males and blacks, had a higher BMI, and had more prevalent dyslipidemia, diabetes, hypertension and coronary artery disease than NHANES participants [Table 1].
- OHSUD victims had a lower unadjusted mean LDL than NHANES participants [Figure 3].
- After multivariable adjustment, mean LDL of OHSUD victims was still 22.3 mg/dL lower than NHANES participants (p<0.001) [Figure 4].
- OHSUD victims had a higher unadjusted mean TG/HDL ratio than NHANES participants [Figure 5]; this difference was mildly attenuated on adjustment for age, gender and race (p=0.05).

Conclusions

- Contrary to expectations, OHSUD victims had a more favorable LDL cholesterol profile, unexplained by differences in demographics, comorbid conditions or use of lipid lowering medication.
- The elevated TG/HDL ratio in victims corroborates an evolving hypothesis on the contributory nature of vasoactive, prothrombotic remnant-like lipoprotein particles to sudden unexpected death.

Limitations

- Inclusion of only OHSUD victims with lipid panels available in medical records. These results may be selectively biased towards sicker victims who had greater access to medical care and not reflective of all OHSUD victims.
- The use of NHANES participants for comparison as opposed to an appropriately matched control group from the same population.

Acknowledgements:
We thank Clarence Potter at the North Carolina Clinical and Translational Sciences Institute, Ohyo Puri and Corinna Volin for facilitating and assisting the study.

Disclosures: Ross J. Simpson, MD, PhD consults with Merck, Pfizer, and Aegerion. Philip M. Mendys, PharmD is an employee of Pfizer.

References, Acknowledgements and Disclosures