

Title: The high prevalence of metabolic syndrome in premature out-of-hospital sudden death

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Introduction: Metabolic syndrome (MetS) is the presence of a combination of comorbid conditions associated with cardiovascular disease. However, the association of MetS with all-cause out-of-hospital sudden death (OHSD) has not been studied. Purpose: To compare the prevalence of MetS and its individual components in OHSD victims to a sample of the US population and to model the association between metabolic syndrome and OHSD.

Methods: From 2013-2015, all out-of-hospital deaths reported by emergency medical services aged 18-64 were adjudicated using medical records and post-mortem examinations in a Southeastern United States metropolitan county (pop. ~ 950,000). Based on National (US) Cholesterol Education Program Adult Treatment Panel III, MetS was defined as presence of ≥ 3 of the following conditions: increased waist circumference (WC), elevated triglycerides (TG), low HDL-cholesterol (HDL), elevated blood pressure (BP) or on antihypertensives, and elevated fasting glucose (FG) or on glucose-lowering treatment. WC was calculated by converting body mass index using a published validated model. For comparison, we used the National Health and Nutrition Examination Survey (NHANES) 2009-2010 participants, aged 18-64 who were alive after two years of follow-up. OHSD and NHANES subjects were included if they had information available to assess the presence of every MetS component. Two sample t-tests were used to assess differences in prevalence of individual components and overall MetS between OHSD and NHANES groups. We fitted logistic regression models to assess the unadjusted odds ratio (OR) associated with MetS with OHSD. We further adjusted for age, race, and sex.

Results: Overall, 408 OHSD events were adjudicated (14% of county deaths aged 18-64) and 141 OHSD and 1330 NHANES subjects met the inclusion criteria. Data on MetS criteria were available an average of 1.2 years prior to OHSD. The distribution of the number of MetS components was right-skewed amongst OHSD cases compared to NHANES as a higher proportion of OHSD cases met at least 4 MetS criteria, but nearly half of NHANES subjects met 1 or less MetS criteria (Figure). OHSD cases had a significantly higher overall prevalence of MetS than NHANES participants (58.2% vs. 30.8%, $p < 0.001$), increased WC (61.7% vs. 51.7%, $p = 0.02$), elevated TG (38.3% vs. 22.6%, $p < 0.001$), low HDL-C (45.4% vs 31.4%, $p < 0.001$), elevated BP (86.5% vs 34.7%, $p < 0.001$), and elevated FG (60.3% vs 42.5%, $p < 0.001$). MetS was associated with 3 times higher unadjusted odds of OHSD (OR 3.1, 95% CI:2.2-4.5). After adjustment for age, race, and sex this association was attenuated but remained significant (OHSD OR 1.9, 95% CI:1.3-2.8).

Conclusion: Metabolic syndrome is prevalent among premature out-of-hospital sudden death victims where criteria were readily identifiable within the medical record. Interventions that target risk factors constituting metabolic syndrome have the potential to reduce the overall rate of premature death.