Educational attainment is an independent predictor of adverse outcomes in patients with coronary artery disease

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Background:
Educational attainment is an indicator of socioeconomic status and is inversely associated with cardiovascular risk factors and risk for incident coronary artery disease (CAD). Whether the level of educational attainment (EL) in patients with CAD influences outcomes remains understudied.

Purpose:
To ascertain the relationship between EL and adverse outcomes in patients with CAD. We hypothesize that EL will be inversely associated with adverse outcomes in this high-risk patient population.

Methods:
Subjects undergoing cardiac catheterization for known or suspected CAD were recruited in a cardiovascular biobank and had their highest level of educational attainment assessed using predefined options of elementary/middle school, high school, college, or graduate education. The primary outcome of interest was all-cause mortality and secondary outcomes included a composite of cardiovascular deaths and nonfatal myocardial infarction (MI) events, and nonfatal MI events during follow-up. Cox proportional hazards regression models were used to analyze the association between EL and adverse outcomes after adjustment for demographic characteristics, cardiovascular risk factors, cardiovascular medication use, and estimated zip code-based annual family income.

Results:
Among the 6,318 subjects (mean age 64 years, 63% male, 23% black) enrolled, 998 (16%) had received graduate or a higher qualification, 2,689 (43%) had received a college education, 2,403 (38%) had received a high school education, and 228 (3%) had received elementary/middle school education. During a median follow-up of 3 years, there were 1,110 deaths from all causes, 851 cardiovascular deaths/nonfatal MI, and 286 nonfatal MI events. After adjusting for covariates and compared to patients with graduate education or higher, those with lower EL (elementary/middle school, high school, or college education) had a higher risk of all-cause
mortality [hazard ratio 1.66, (95% CI 1.08, 2.54), 1.58 (95% CI 1.22, 2.04), and 1.45 (95% CI 1.13, 1.57), respectively]. Similar findings were observed for secondary outcomes. EL dichotomized at graduate education was associated with all-cause mortality (hazard ratio 1.48, 95% CI 1.16, 1.88), but this relationship was significantly modified by sex (p-interaction 0.023) and the association was attenuated among male patients (hazard ratio 1.23, 95% CI 0.94, 1.61) but not female patients (hazard ratio 2.70, 95% CI 1.53, 4.77).

Conclusions:

Lower educational attainment is an independent predictor of adverse outcomes in patients with CAD. The causal link between low education level and increased CV risk needs further investigation.

![Figure 1]

Kaplan-Meier curves for association between level of educational attainment and all-cause mortality

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<th>Graduate</th>
<th>Number at Risk</th>
<th>921</th>
<th>871</th>
<th>896</th>
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<th>607</th>
<th>455</th>
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<td>380</td>
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<td>1575</td>
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<tr>
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<td>144</td>
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