Body-mass index, blood pressure, diabetes and cardiovascular mortality in Cuba: prospective cohort study of 146,665 participants

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Topic(s):
Public Health

Citation:
Medical Research Council, British Heart Foundation, Cancer Research UK

Background: Cardiovascular disease (CVD) is a leading cause of premature death in Cuba, accounting for about one third of all deaths under age 70 years. Substantial uncertainty remains, however, about the relevance of major metabolic risk factors to CVD mortality in this population.

Purpose: To relate body-mass index (BMI), systolic blood pressure (SBP), and diabetes to risk of CVD death in Cuba.

Methods: In a prospective cohort study, 146,665 adults were recruited from the general population in five areas of Cuba between 1996 and 2002. Participants were interviewed, measured (height, weight and blood pressure) and followed up by electronic linkage to Cuban national death registries to Jan 1 2017; 24,345 participants were resurveyed between 2006 and 2008. After excluding all with missing data or chronic disease at recruitment or, to further limit reverse causality, those who died in the first 5 years, Cox regression (adjusted for age, sex, education, smoking, alcohol and, where appropriate, BMI) was used to relate mortality rate ratios (RRs) at ages 35–79 years to BMI, SBP and diabetes. Correlations of baseline and resurvey values were used to correct RRs for regression dilution, and thereby estimate associations with long-term average (‘usual’) levels of SBP and BMI.

Results: After exclusions, there were 117,008 participants age 35-79 (mean age 52 [SD 12]; 55% women). At recruitment, mean SBP was 124 mm Hg (SD 15), mean BMI was 24.2 kg/m² (SD 3.6) and 5% had diabetes; mean SBP and diabetes prevalence were both strongly related to BMI. Correlations of resurvey and baseline measurements were 0.48 for SBP and 0.60 for BMI. At ages 35-79 years, there were 3780 CVD deaths (1871 ischaemic heart disease [IHD], 766 stroke, and 1143 other). CVD mortality was positively associated with BMI (down to about 22-23 kg/m²; figure), SBP and diabetes: 10 kg/m² higher usual BMI approximately doubled CVD mortality (RR 1.90, 95%CI 1.61-2.24), as did 20 mmHg higher usual SBP (2.03, 1.88-2.20), and a prior diagnosis of diabetes (2.18, 1.97-2.42). The associations were similar in men and women. Given these associations, about one quarter (27%) of CVD deaths in this study were attributable to these metabolic risk factors combined.

Conclusion: These associations differ to those reported from other parts of Latin America, and are more consistent with studies in Europe and North America, highlighting the need for many more large-scale prospective studies in low and middle income countries. This study provides direct evidence for the expected benefit on CVD mortality of addressing major metabolic risk factors in Cuba. As the levels of these metabolic risk factors are increasing in Cuba, so too is their importance as determinants of premature CVD death.
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Figure. Usual systolic blood pressure and usual body-mass index vs cardiovascular mortality at ages 35-79 years in Cuba

Death rate ratios were adjusted for age, sex, education, smoking, alcohol and, where appropriate, body-mass index. Analyses omitted prior chronic disease and the first 5 years of follow-up. For each category, the area of the square is inversely proportional to the variance of the category-specific regression line, which also determines the 95% confidence interval (CI).