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Using reduced rank regression to identify patterns of diet and serum biomarkers of obesity and its predictive effects on risk of cardiovascular disease mortality

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Few predictive models are established based upon a large-scale population sample and driven from both mathematical and biological hypotheses. The present study aimed to apply reduced rank regression (RRR), a novel math model used in epidemiology and bioinformatics, to identify patterns of multiple risk factors of obesity and to test its predictive effect on cardiovascular disease (CVD) mortality.

Study design and Methods: Baseline diet intakes (vitamins C and D, magnesium, calcium, sodium, vegetable protein, dietary fiber, animal protein, and total fat) were measured using 24-hour recalls, and serum biomarkers (total cholesterol, LDL-C, HDL-C, triglycerides, HbA1c, and CRP) were measured using fasting blood samples in a population cohort of 13,687 U.S. adults aged 20 and older (White: 6081, Black: 3735, and Hispanic: 3871) in 1988-1994. Vital statistics were followed to the end of 2006. In data analysis, patterns of diet and serum biomarkers of obesity were estimated using RRR under the hypothesis that these biomarkers related changes in BMI and waist circumference. Hazard ratios (HRs) of increased RRR1 score (the primary pattern) for CVD mortality were estimated using Cox's proportional hazard regression model.

Results: During an average 12-year follow-up, 3,425 subjects died from all-causes (17.68%) and 1,375 died from CVD (6.90%). As compared to the first quintile of RRR1 scores, the HRs (95%CI) of the second to fifth quintiles for CVD mortality were 0.91 (0.68-1.21), 1.02 (0.74-1.39), 1.16 (0.89-1.51) and 1.88 (1.49-2.38), respectively (test for trend, $p<0.001$). Furthermore, Blacks had 23% higher risk of CVD mortality (HR: 1.23, 95%CI: 1.01-1.52) than Whites after adjustment for age, sex, and RRR1 score. In conclusion, the present study is among the first reports that demonstrate a risk model built upon multiple markers of obesity significantly predicting risk of CVD and all-cause mortality. Findings from the present study provide new insights into risk prediction of CVD mortality and outcome studies.

Biography

Longjian Liu, M.D., Ph.D., M.Sc., FAHA is an Associate Professor at Drexel University School of Public Health. He received his M.D., M.Sc., Ph.D., research fellow and postdoctoral trainings in China, the UK, Japan and the USA. His research activities cover nutrition, cardiovascular disease, diabetes, chronic kidney disease, and biostatistics and bioinformatics. At Drexel, he teaches graduate courses in cardiovascular epidemiology, and epidemiology for public health practice to students in MPH, Ph.D., DrPH and MD/MPH programs.

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