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Nutrition: Dietary prevention of obesity and cardiometabolic disease

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Abstract

A new study suggests that an energy-dense dietary pattern that is high in saturated fat and low in fibre is associated with cardiovascular risk factors, but not incident cardiovascular disease, among people with severe obesity, which highlights the urgent need for obesity prevention. Analysis of dietary patterns can bolster the evidence base for prevention-oriented dietary recommendations.

In a recent article published in *Obesity*, Johns and colleagues used reduced rank regression (RRR) to identify a dietary pattern characterized by low fibre and high energy density and saturated fat intake among 2,037 Swedish adults with severe obesity (body mass index [BMI] >34 and >38 kg/m² for men and women, respectively).¹ The authors found longitudinal associations between this unhealthy dietary pattern and cardiovascular risk factors (increases in weight, waist circumference, BMI, cholesterol, insulin, triglycerides and blood pressure). Multiple randomized controlled trials have demonstrated benefits of healthy dietary patterns for cardiometabolic risk factors (such as blood pressure and blood levels of lipids)² and the incidence of cardiovascular disease (CVD) in high-risk individuals.³ However, despite adverse associations between the unhealthy dietary pattern and risk factors for CVD, Johns and co-workers found no statistically significant association with incident CVD after 10 years of follow-up.

In a plausible hypothesis, the authors suggest that while diet influences the development of severe obesity and CVD risk factors, the effects of severe obesity on incident CVD might only be mitigated by substantial reductions in weight, rather than by a modest improvement in diet quality. If this is the case, the findings of Johns and colleagues highlight the critical need for obesity prevention, for which diet quality is one of the most important modifiable risk factors. However, this interpretation is tempered by two caveats. First, this study is fairly small ($n=2,037$ middle-aged individuals), with 211 cases of CVD during the 10-year follow-up. Thus, the statistical power is limited. Second, previous observational studies and randomized clinical trials demonstrated that several dietary patterns, including Prudent⁴ and Mediterranean-style patterns,³ are associated with a reduced risk of developing CVD in individuals with a normal weight or obesity. In fact, the PREDIMED trial³ mainly included individuals with overweight or obesity and demonstrated a 30% reduction in the incidence of

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CVD in intervention groups who received supplementary foods (extra virgin olive oil or nuts) compared with the control diet, with the strongest effects among individuals with a BMI >30kg/m². These results suggest that dietary patterns influence incident CVD even among those with obesity.

Research in dietary patterns can strengthen evidence for public health recommendations to prevent obesity and CVD. In contrast to analysing individual nutrients and foods, which tend to be correlated, dietary patterns encompass the whole diet and its interactive and cumulative associations with disease. From the perspective of national guidelines, recommendations based on a composite measure of diet quality might be most applicable: individuals consume foods in combination and when intake is manipulated, important substitution effects occur that are best captured by examining the whole diet.⁵

The US Department of Agriculture conducted a series of systematic reviews and concluded that the evidence was “strong and consistent... that in healthy adults increased adherence to dietary patterns scoring high in fruits, vegetables, whole grains, nuts, legumes, unsaturated oils, low-fat dairy, poultry and fish; low in red and processed meat, high-fat dairy, and sugar-sweetened foods and drinks; and moderate in alcohol is associated with decreased risk of fatal and non-fatal cardiovascular diseases.”⁶ This conclusion is built on a broad evidence base that encompasses multiple methodologies ranging from empirical to *a priori*, including RRR, the method used by Johns and colleagues. Similar to purely empirical methods such as principal components analysis (which identifies nonexclusive ‘factors’ to explain variation among food items on the basis of inter-correlations) and cluster analysis (which groups individuals into mutually exclusive clusters on the basis of differences between mean intakes), RRR is a largely *a posteriori* method. In RRR, patterns are derived to explain the largest variation in intermediate outcomes, which are typically biomarkers of disease.⁷ As dietary patterns defined via *a posteriori* methods do not necessarily represent ideal diets, numerical indices are used to measure adherence to a predefined, science-based pattern: individuals are scored based on recommended intakes or population-specific cut-offs of component foods.

Despite the advantages assessing dietary patterns offers, synthesizing evidence across studies that use disparate scoring algorithms or derive patterns dependent on population-specific intakes is a challenge. Methodologies to analyse dietary patterns continue to evolve to address these limitations, and efforts have been made to standardize numerical indices for dietary quality across various population-based cohorts.⁸ On the basis of this robust evidence base, the 2015 US Dietary Guidelines Advisory Committee Report focuses on overall dietary patterns for prevention of obesity and diet-related chronic diseases instead of individual nutrients, which is a paradigm shift. The Report emphasizes that no single optimal dietary pattern fits everyone, and suggests that multiple dietary patterns can achieve the desired health benefits; thus, personalized dietary patterns can be devised to maximise health benefits.⁹

The work of Johns *et al.* is an important contribution to research on dietary patterns by obtaining repeated measures of diet (a rarity in epidemiologic studies) in a cohort of patients with severe obesity, which is an understudied and growing population.¹⁰ As lifetime

exposure to high levels of adiposity carries an enormous chronic disease burden and few individuals are able to successfully maintain weight loss, prevention of excess weight gain through diet and lifestyle is of the utmost importance. As national guidelines are shifting to put greater emphasis on improving overall dietary quality, analysis of dietary patterns can be utilized in combination with other methods in nutritional epidemiology to build a strong evidence base for dietary recommendations for the general populations as well as for high-risk groups. The implementation of these recommendations requires individual behavioural changes, and, more importantly, drastic policy change targeted to improve the ‘obesogenic’ food environment.

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Biographies

Frank B. Hu is Professor of Nutrition and Epidemiology at Harvard School of Public Health and Professor of Medicine, Harvard Medical School and Channing Laboratory,

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Elizabeth M. Cespedes obtained an MSc in Social and Behavioral Sciences and a dual doctorate in Nutrition and Epidemiology from the Harvard T.H. Chan School of Public Health. Her research focuses on evaluating dietary and behavioral risk factors for obesity and related chronic diseases. Much of her work has focused on the influence of dietary patterns and sleep duration in obesity and type 2 diabetes. Her more recent research interests include energetics and cancer.

Pullquotes

- the findings of Johns and colleagues highlight the critical need for obesity prevention
- dietary patterns can strengthen evidence for public health recommendations [for] obesity and CVD