The Development and Evaluation of a Literature-Based Dietary Index for Gut Microbiota

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Objectives: To develop and evaluate a novel dietary index for gut microbiota (DI-GM) that captures dietary composition related to gut microbiota profiles.

Methods: A literature review of longitudinal studies on the effect of diet on gut microbiota in adult populations was conducted, extracting those dietary components with evidence of beneficial or harmful effects on gut microbiota. Using 24-hour dietary recall data collected on two separate days from the National Health and Nutrition Examination Survey (NHANES, 2005–2010, n = 3,821), DI-GM scores were computed and associations with biomarkers of gut microbiota diversity (urinary enterodiol and enterolactone) were examined using linear regression. Analyses were adjusted for potential confounding effect of sociodemographic and lifestyle factors. Lastly, congruence of the DI-GM with pre-existing dietary indices (Healthy Eating Index (HEI-2015) and Mediterranean Diet Score (MDS)) were examined.

Results: From a review of 121 articles, 14 foods were identified as components of the DI-GM, including fermented dairy, chickpeas, soybean, whole grains, fiber, cranberries, avocados, broccoli, coffee, and green tea (beneficial components) and red meat, processed meat, refined grains, and high fat diet (≥40% of energy from fat) (harmful components). Each component was scored 0 or 1 based on sex-specific median intakes and scores were summed to develop the DI-GM score. In NHANES, DI-GM scores ranged from 0–13 because intake of green tea was not reported, and the mean DI-GM was 4.8 (SD = 0.04). Positive associations between DI-GM and urinary enterodiol (β=0.123, 95%CI: 0.079, 0.166) and enterolactone (β=0.138, 95%CI: 0.091, 0.184) were observed in multivariable-adjusted models. The DI-GM showed moderate positive correlation with HEI-2015 ($r = 0.537$, $p < 0.001$) and MDS ($r = 0.423$, $p < 0.001$).

Conclusions: A novel DI-GM was developed based on published literature to score the quality of diet in terms of maintaining healthy gut microbiota. The DI-GM was significantly associated with markers of gut microbiota diversity in NHANES, signifying the potential utility of this index for gut-health related studies.

Funding Sources: None.