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Does gender of the consumer influence the potential for dietary microbes to confer health benefits? – A scoping review

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There has been significant expansion in the breadth of research towards understanding the role of dietary microbes in improving human health in the last couple of decades, owing to better research tools and bioinformatics pipelines. However, the high variability in the quality of evidence and non-uniform methodologies have contributed toward the attrition of trust in the health claims associated to dietary microbes [(1)].

A scoping review was performed focusing on the health outcomes reported from the consumption of probiotics and fermented foods in non-patient populations. The focus was to look for evidence (or lack thereof), supporting the hypothesis that regular consumption of dietary microbes conveyed significant health benefits.

The protocol for the scoping review is available at: https://osf.io/kvhe7/[(2)]. Briefly, a structured keyword was used for systematic literature search in PubMed, Scopus, and Web of Science. Information such as the experimental setup, participant characteristics and final outcomes were extracted and tabulated from relevant titles. Additionally, a Jadad score analysis for each publication was performed as a cursory measure of quality. Searches were based on eight health-categories of physiological relevance, namely: Antibiotic associated diarrhoea" (AAD), "Gastrointestinal health" (GIH), "Immunological health" (ImH), "Cardiovascular health and metabolic syndrome" (CvHMS), "Cancer prevention" (CanPr), "Respiratory health" (ReH), "Weight management" (WtMgt), and "Urogenital health" (UrGH). In the case where studies addressed multiple categories, the primary category was assigned to the biomarker for which the study was powered to measure, while the others were deemed secondary.

An outcome was deemed neutral if insignificant changes in biomarker was reported. When a change was significant and beneficial (e.g, decreased Gastrointestinal lesions), the outcome was deemed positive. A potentially detrimental change (e.g. increased calprotectin) was deemed negative. The outcome associated to the primary and secondary categories was termed "primary outcome" and "secondary outcome", respectively.

A univariate-scaled PCA analysis was performed to model neutral, positive and negative outcomes reported in literature using male participation (%), age (years) and dietary microbe exposure (cfu) as factors. To investigate the association of sex on the study outcomes, a

$\chi 2$ test was performed to check for significant differences in the male participation (%) in studies with positive, neutral or negative outcomes. Male participant in studies with positive, neutral and negative outcomes were 35.8%, 36.0% and 46.0% respectively. A significant association was observed for primary outcomes (Kruskal–Wallis $\chi 2(2) = 6.849$, $p = 0.033$), but a subsequent *post hoc* Dunnett's test revealed insignificant pairwise-differences. No significant associations were found for secondary outcomes (Kruskal–Wallis $\chi 2(2) = 3.701$, $p = 0.157$).The benefits associated to the consumption of dietary microbes appear to be independent of the gender of the consumer.

References

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2. Mukherjee A, Iyer A, Gómez-Sala B, *et al. BMJ Open*, In Press.