Proceedings of the Nutrition Society (2023), **82 (OCE4)**, E254 doi:10.1017/S0029665123003300

Irish Section Conference 2023, 14–16 June 2023, Understanding the role of sex and gender in nutrition research

Exploring sex-differences in dietary intake biomarkers and cardiometabolic health parameters at baseline in the PAD-Q Study

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Sex-specific body fat deposition influences the respective metabolic and cardiometabolic risks for females and males[(1)]. Furthermore, differential dietary patterns, may also play a role[(2,3)]. However, public dietary guidelines still follow a population-based approach rather than providing individual personalised dietary advice[(4)]. The aim of the PAD-Q Study is to use a diet quality score (Prime Diet Quality Score (PDQS)) in conjunction with food biomarkers to provide personalised dietary advice, and consequently improve cardiometabolic health.

The aim of this work was to analyse baseline characteristics of the PAD-Q study population for sex-specific differences, and understand associations with diet quality, food biomarkers and cardiometabolic risk factors.

The PAD-Q Study is a dual-centre, 6-month, parallel, controlled, randomized, single-blinded intervention study conducted at Queen's University Belfast and University College Dublin. The primary outcome is diet quality assessed via the PDQS Score at six months. Secondary outcomes are changes in cardiometabolic factors (blood pressure, cholesterol, HbA1c, anthropometric measures, physical activity).

Food intake biomarkers were measured in fasted urine and plasma samples via NMR and GC-MS. Baseline data were analysed to investigate sex-differences using a combination of Pearson correlation, t-test, and ANOVA.

The PAD-Q study recruited 149 participants (n = 43 males, n = 106 females) at both study sites. Diet quality scores and dietary biomarker levels at baseline indicated a low intake of fruits, vegetables, and fish (PDQS Score 16 ± 4 out of 42 points, 87% with low fruit biomarker levels, 98% with low cruciferous vegetable biomarker levels, 88% with low or medium omega-3 index).

At baseline, 38% of participants were hypertensive (systolic blood pressure above 135 mmHg; n = 41 females, n = 16 males), 17% of participants had increased HbA1c levels (above 5.7%; n = 19 females, n = 6 males). In males fruit biomarker levels were positively associated with cruciferous vegetable biomarker levels ($R = 0.35$, $p = 0.022$), omega-3 index ($R = 0.35$, $p = 0.028$), age ($R = 0.38$, $p = 0.013$) and PDQS Score ($R = 0.33$, $p = 0.030$). Males with lower omega-3 index (below 4.5), had higher systolic blood pressure (140 mmHg) compared to males with higher omega-3 index (above 4.5, 126 mmHg, $p = 0.0009$). There was a positive association between the PDQS Score and cruciferous vegetable biomarker levels in females ($R = 0.27$, $p = 0.006$).

The baseline data analysis indicated that the PDQS adequately captured diet quality when compared with objective food intake biomarkers in both sexes. Interestingly, the fruit biomarkers levels in males were linked with a broader range of parameters, while more limited associations were observed in females. Future analysis will determine the efficacy of providing personalised dietary advice in conjunction with dietary biomarker levels to improve diet quality and cardiometabolic health.

Acknowledgments

We thank all our participants taking part in the PAD-Q Study

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