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Body composition of New Zealand European and Pacific women is associated with lower dietary fibre intake and gut microbiota diversity.

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Introduction: Diet is considered one of the key drivers of the world-wide obesity epidemic, and the gut microbiota may play a role in this multifaceted disease due to their mutualistic relationship. This study investigated relationships between habitual dietary intake of New Zealand European and Pacific women and their gut microbiota and body fat content.

Methods: Pacific (44%) and NZ European (NZE; 56%) women ($n=287$) aged 18-45 years were recruited based on body mass index (normal versus obese) and stratified as low (<35% body fat) or high ($\geq 35\%$ body fat) body fat percentage (BF%). Dietary intake was assessed with a 5-day estimated food record and a semi-quantitative food frequency questionnaire, which were used to calculate habitual dietary intake using the National Cancer Institute (NCI) method. BF% was assessed by dual-energy x-ray absorptiometry (DXA). Fasting blood samples were analysed for markers of insulin sensitivity. The DNA from faecal samples was analysed following shotgun sequencing.

Results: There were no significant differences in BF% between Pacific and NZE women ($p=0.498$). Significant differences in homeostasis model assessment of insulin resistance (HOMA-IR) index were observed between Pacific (3.4 [2.3, 5.9]) and NZE (2.1 [1.5, 3.1], $p\leq 0.001$) women, and between; low-BF% (1.9 [1.3, 2.7]) and high-BF% (3.4 [2.5, 5.9], $p\leq 0.001$) groups. The highest (27.6g/d [24.9, 30.6]) compared to the lowest tertile (16g/d [13.3, 17.6]) of habitual total dietary fibre (DF) intake was associated with a significantly lower HOMA-IR (2.1 [1.3, 3.1] versus 3.3 [2.1, 5.3] $p\leq 0.001$) respectively. Higher DF intake was also associated with significantly lower BF% ($\beta -0.35$, $p\leq 0.001$), and this relationship became stronger when considering the intake of other macronutrients ($\beta -0.47$, $p\leq 0.001$). Alpha diversity; observed taxonomic units (OTU's; $r_s = -0.15$, $p=0.011$), Pielou's evenness ($r_s = -0.20$, $p=0.001$), and Shannon index ($r_s = -0.22$, $p\leq 0.001$), were all negatively correlated with BF%. In contrast BF% was positively correlated with the Firmicutes:Bacteroidetes ratio ($r_s = 0.26$, $p\leq 0.001$).

Conclusions: HOMA-IR index was significantly higher in Pacific and women in the higher BF% group, indicating an increased metabolic disease risk. Higher habitual DF intake was associated with lower BF% and HOMA-IR, suggesting a potential metabolically protective effect. The positive effects of higher DF intake may be associated with microbiota diversity, as higher BF% was associated with reduced alpha diversity and an increased Firmicutes:Bacteroidetes ratio. Further analysis will explore which foods contributed to the higher DF intake, and associations with body composition, microbiota and biomarkers of metabolic health.