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Associations between gut microbiota and health behaviours in a cross-sectional sample of young adult cancer survivors: Secondary analysis from the Chemo-Gut study

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Background: Health behaviours are a modifiable factor that can potentially impact the gut microbiota, physical and psychosocial health. Chemotherapy adversely affects the gut microbiota during treatment, but little is known about the long-term effects or how health behaviours are related.

Methods: This secondary analysis from a cross-sectional pilot study investigated relationships between chemotherapy treatment, gut microbiota, and patient reported outcomes for health behaviours (i.e. diet and exercise) and psychosocial symptoms in cancer survivors aged 18-39 years old, compared to healthy controls. Gut microbial diversity and composition was assessed from stool samples using 16S rRNA gene sequencing. Descriptive statistics, one-way ANOVA, and Spearman's correlation analyses are reported.

Results: Survivors (n=17) and healthy controls (n=18) participated. Mean age at diagnosis was 31 (±5) years. Mean time off treatment was 17 (±16) months. 23.5% of survivors and 38.9% of controls used probiotics in the last 2 years. Survivors tended to rate their diet as moderately healthy (58.8%) while controls rated their diet as moderately healthy (50%) or healthy (44.4%). Survivors (76.5%) reported engaging in less exercise (≤5 hours/week), compared to controls (44.4% ≥6 hours/week). Both groups reported moderate exercise intensity (76.5% of survivors vs. 61.1% of controls). Survivors ≤6 months post-treatment had lower gut microbiota alpha diversity than both survivors >6 months post-treatment (p= 0.04) and controls (p= 0.19). In survivors, poorer self-rated diet quality correlated with greater anxiety (rho= -.52, p= .033), while greater depressive functional interference correlated with higher exercise intensity (rho= .57, p= .018). In survivors, higher abundance of *Lachnospiraceae* (rho= .51, p= .05) correlated with better diet health, but higher *Bacteroides* (rho= -.62, p= .023) abundance correlated with poorer diet health. Higher abundance of *Lachnospiraceae* (rho= .51, p= .035), *Faecalibacterium* (rho= .65, p= .013), *Anaerostipes* (rho= 53, p= .042), *Subdoligranulum* (rho= .59, p= .027), *Alistipes* (rho= .75, p= .013), and *Bacteroides* (rho= .66, p= .027) correlated with greater exercise frequency. Lower abundance of *Lachnospiraceae* correlated with higher exercise intensity (rho= -.63, p= .012).

Conclusion: This small exploratory study provides evidence of potential longer-term gut microbial dysbiosis in cancer survivors. Diet and exercise behaviours may be related to certain types of bacteria, but the direction of causality is unknown. The first-year post-treatment may be a key time to intervene with behavioural and dietary-based interventions. Larger trials are needed.

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