Differences in gut microbiome abundances and diversity by physical activity levels and BMI among patients with colorectal cancer

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Background: Physical activity and BMI are convincingly associated with colorectal cancer risk, yet the gut microbiome has not been investigated in the context of underlying mechanisms. Here, we investigated the impact of physical activity and BMI on the gut microbiome among patients with colorectal cancer.

Methods: A total of 175 patients with newly diagnosed colorectal cancer (stages I-IV), were included. Physical activity at baseline was assessed using an adapted International Physical Activity Questionnaire (IPAQ) and participants were classified as being active or inactive based on physical activity guidelines. BMI at baseline was abstracted from medical records. Pre-surgery stool samples were used to perform 16S rRNA gene sequencing using an Illumina platform. Relative abundances were determined for each taxonomic level and used to calculate alpha and beta diversity metrics.

Results: Patients had a mean BMI classified as overweight (27.3 kg/m^2), and 60% were inactive per physical activity guidelines. Firmicutes were the most dominant phyla among all BMI and physical activity groups. Faecalibacteria were most dominant among normoweight/active (38%) as compared to normoweight/inactive (19%), overweight/obese/active (23%) and overweight/obese/inactive (19%) patients. Within this genus, *Faecalibacterium prausnitzii* was the species enriched among normoweight/active patients (42%) as compared to normoweight/inactive (25%), overweight/obese/active (30%), and inactive patients (23%). Overweight/obese/inactive patients had statistically significantly lower alpha diversities (Shannon diversity and observed features) as compared to normoweight/active patients after adjusting for sex, race, study site, antibiotic use, and neoadjuvant treatment (p=0.03 and 0.04, respectively). Bray-Curtis dissimilarity did not differ by BMI and physical activity groups.

Conclusions: Our data suggests for the first time that physical activity and BMI are associated with gut microbiome abundances and diversity among patients with colorectal cancer. Future studies should expand on these findings to decipher the mechanistic underpinnings of the gut microbiome in the relationship between physical activity, BMI, and colorectal cancer.

Keywords: gut microbiome, colorectal cancer, physical activity, body mass index

Conflict of interest: None