Gut microbiome characteristics at the crossroads of metabolic health and lifestyle patterns in an adult population

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Abstract

Introduction: Cumulative findings have recently highlighted the role of gut microbiota as a novel environmental factor in the fight against obesity and related comorbidities. We aimed to investigate (1) the gut microbiome characteristics of a Greek adult population in terms of adiposity prevalence and (2) to further elucidate the potential effect of physical activity level and adherence to *a-priori* (Mediterranean Diet) and *a-posteriori* dietary patterns in gut microbiota profiling after accounting for sex, age and obesity status.

Materials and Methods: Adult participants (n = 125) underwent clinical, anthropometric, dietary, physical activity and lifestyle evaluation. Obesity status [normal-weight (NW), overweight (OW), obesity (OB)] was defined based on body weight and height measurements, Body Mass Index calculation and the World Health Organization criteria. Levels of physical activity (low/medium/high) were estimated according to International Physical Activity Questionnaire (IPAQ) scoring. Dietary intake was evaluated through a food frequency questionnaire. Adherence to the Mediterranean diet was based on the MedDietScore and Principal Component Analysis (PCA) was applied for dietary patterns analysis. Gut microbial community characteristics (diversity, richness and proportions at phylum level) were calculated based on 16S rRNA gene sequencing.

Results: A total of 122 subjects (58 females; mean age 42.4 ± 13.1 years) completed the study. OB was characterized by lower proportions of Verrucomicrobia compared to NW state ($p = 0.034$ for univariate), unidentified bacteria ($p = 0.014$) and the Archaea Euryarchaeota ($p = 0.003$) compared to OW status, and the phylum Candidatus Saccharibacteria compared to NW ($p = 0.027$) and OW ($p = 0.039$) after sex and age adjustments. Regarding lifestyle parameters, our data proposed no significant effect of total physical activity levels on gut microbiome; notably, a 'fruit and vegetables' dietary pattern and adherence to Mediterranean diet were both characterized by lower microbial diversity and proportions of Actinobacteria but higher proportions of Cyanobacteria/Chloroplast and Lentisphaerae, respectively. Furthermore, a Western-type dietary pattern (high in full fat dairy products, potatoes, refined cereals, red meat, snacks and junkfood) was characterized by lower gut microbial richness (Chao1 index), whereas a healthy dietary pattern (high in low fat dairy and wholegrain cereals and low in snack and junk food) was characterized by higher proportion of Firmicutes.

Discussion: Our data proposed variable connections of metabolic health and dietary patterns with features of gut microbiota; design of gut microbiome studies is advisable to account for host- and lifestyle-related potential confounders.

Conflict of Interest
There is no conflict of interest