Gut microbial richness as an earlier biomarker of Mediterranean diet intervention in type 2 diabetes metabolic control

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Mediterranean diet has been recommended for type 2 diabetes treatment(¹). The impact of diet in shaping the gut microbiota is well known, particularly Mediterranean diet(²–⁴). However, the link between Mediterranean diet and diabetes outcomes improvement is not completely clear. The aim of this clinical trial was to study the role of microbiota modulation by a Mediterranean diet intervention on the clinical outcomes in a diabetic population.

In this 12-week single-arm pilot study, nine participants received individual nutritional counselling sessions promoting Mediterranean diet. Gut microbiota was analysed by next-generation sequencing at baseline, 4 weeks, and 12 weeks after the intervention. Biochemical parameters, body composition and blood pressure were assessed at the same time-points (baseline, 4 weeks, and 12 weeks). Mediterranean diet adherence was assessed by MEDAS score at baseline and after 12 weeks. Statistical analysis was performed using One-way ANOVA followed by Bonferroni test for parametric variables and Friedman test followed by repeated measures ANOVA for non-parametric variables. Effect sizes (Cohen d test) are also presented to decide whether a clinically relevant effect is found (|d| > 0.50 indicates a medium effect size and |d| > 0.80 a large effect size)(⁵). This study was approved by the Ethics Committee of Administração Regional de Saúde de Lisboa e Vale do Tejo (Ref: 016/CES/ INV/2019) and Faculdade de Ciências Médicas|NOVA Medical School, Universidade NOVA de Lisboa, Lisboa, Portugal (Ref. 55/2018/CEFCM) and was registered at clinicaltrials.gov as NCT04403217.

Data are presented as mean±SD. Adherence to the Mediterranean diet (MEDAS score) increased from 8.11±2.26 at baseline to 10.8±1.25 after the intervention (p < 0.05; Cohen d = 1.58). Changes in microbial richness was observed right after 4 weeks of the intervention (73.14±39.91 to 100±41.5, p = 0.205; Cohen d = 0.66), being negatively correlated with fasting glucose levels (r = −0.634; p < 0.05) and HOMA-IR (rs = −0.464; p < 0.05). On the other hand, HbA1c decreased from 7.53±1.07% to 6.86±0.85% (p < 0.05; Cohen d = −0.70) and HOMA-IR decreased from 3.79±2.98 to 2.76±2.05 at the end of study (12 weeks) (p < 0.05; Cohen d = −0.41). Alkaline phosphatase activity was assessed in faecal samples and was negatively correlated with HbA1c (rs = −0.584; p < 0.05) and positively correlated with microbial diversity (rs = 0.608; p < 0.05).

This study reinforce that increasing adherence to the Mediterranean diet resulted in a better glycaemic control in subjects with type 2 diabetes. Gut microbial richness changes seemed relevant in mediating the metabolic impact of therapeutic interventions and may constitute new target for the treatment of type 2 diabetes. Nonetheless, the number of participants that enrolled in this pilot study was small (9 participants), thus studies with a larger sample size are needed to confirm these findings.

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References

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