

Combined association of diet and physical activity with plasma concentrations of markers of the kynurenine pathway

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Metabolites in the kynurenine pathway (KP) are associated with inflammation and health. Using data from the Melbourne Collaborative Cohort Study (MCCS), we previously found that plasma concentrations of several of these were associated with age and mortality⁽¹⁾ as well as indicators of diet quality such as the Mediterranean Diet Score (MDS).⁽²⁾ We recently reviewed the literature and found physical activity (PA) also had an effect on KP metabolites, in relationships that varied with duration and intensity of the activity (unpublished). Given the growing interest in the kynurenine pathway and in the separate and combined associations of diet and PA on health (e.g.⁽³⁾), our aim was to examine independent and joint associations of PA and diet quality with KP metabolites. We also assessed the associations with CRP, interleukin-6 (IL-6) and tumour necrosis factor- α (TNF- α), for comparison. In 970 people, we assessed the associations for MDS (using data from a food frequency questionnaire) and total metabolic equivalent of task (METs, data from IPAQ short) with marker concentrations. Marker concentrations were log-transformed before being winsorized at ± 3 SDs from the mean and converted to z-scores for analysis. Linear regression models adjusting for age, sex and country of birth were used to assess associations between MDS (score 0–9 reflecting increasing adherence to the Mediterranean Diet) and METs as continuous variables, and an interaction term, with the transformed marker values. We included inflammation biomarkers, kynurenine, kynurenic acid, quinolinic acid, 3-hydroxykynurenine, anthranilic acid, nicotinamide, KTr (kynurenine/tryptophan ratio), and PA index (ratio of 4-pyridoxic acid and the sum of pyridoxal 5'-phosphate and pyridoxal). The associations of MDS with marker values were also calculated for categories of METs: < 25th percentile, 25–75th percentile and > 75th percentile. All markers except IL-6 were inversely associated with MDS (β –0.04 to –0.08, $p < 0.05$). When METs was added to the models, associations were minimally changed (β –0.04 to –0.07, $p < 0.05$). Several markers, including CRP, IL-6, quinolinic acid, and KTr (β –0.05 to –0.08, $p < 0.05$) were inversely associated with METs independent of MDS. Significant interactions ($p < 0.05$) between MDS and METs were observed for more markers than expected by chance only, for kynurenine, kynurenic acid, anthranilic acid, with borderline significant interaction for KTr. In analyses stratified by PA levels the inverse associations for kynurenine-related markers were strongest in the middle METs group. IL-6, unlike the other markers, was inversely associated with MDS only in the lowest METs group. Significant interactions of MDS with PA categories were seen for IL-6, kynurenine, quinolinic acid and KTr. While the large UK Biobank study⁽³⁾ found healthy diet was similarly, albeit weakly, associated with mortality at every level of PA, our findings for inflammation / KP marker outcomes suggest that associations with diet might vary depending on physical activity levels.

References

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