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Prospective Study of Alternate Health Eating Index 2010 and Asthma Symptom Score: Mediation through Body Mass Index and Effect Modification by Smoking

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Rationale: The Alternate Health Eating Index 2010 (AHEI-2010), a new measure reflecting healthy diet, has been associated with reduced risk of major chronic diseases and chronic obstructive pulmonary disease. However, its association with asthma remains unknown. When looking into the diet-asthma association, two issues need to be carefully addressed: the role of body mass index (BMI) as a potential mediator, and possible effect modification by smoking. We aimed to investigate the longitudinal association between the AHEI-2010 and an asthma symptom score, and to assess effect modification by smoking, while accounting for BMI as a potential mediator.

Methods: The study was conducted using data from the French Epidemiological study on the Genetics and Environment of Asthma (EGEA) (EGEA2: 2003-2007, baseline; EGEA3: 2011-2013, follow-up). The AHEI-2010 dietary score was calculated from the food frequency questionnaire administered at EGEA2, based on the consumption of vegetables, fruits, whole grains, polyunsaturated fatty acids, nuts, long-chain omega-3 fats, red/processed meat, sugar sweetened drinks, sodium and alcohol. The score ranged from 0 to 100 (higher score representing a healthier diet) and was used as a continuous variable. An asthma symptom score ranging from 0 to 5 based on the number of respiratory symptoms during the past 12 months was assessed at EGEA2 and EGEA3. The change of the score between EGEA2 and EGEA3, ranging from -5 to 5 (negative score=worsening, 0=stable, positive score=improved), was used as a continuous variable. BMI (kg/m²), smoking status (never/ever), and potential confounders (age, sex, education, physical activity, total energy intake, and asthma status) were measured at baseline. Mediation analysis in the counterfactual framework was used to disentangle the direct effect and the indirect effect mediated by BMI.

Results: The study sample included 969 adults (16-76 years; 49% men; 42% ever asthma, mean AHEI-2010: 51.7). The interaction between smoking and the AHEI-2010 on the asthma symptom score was statistically significant (PInteraction=0.04). Among never smokers (n=499, 52%), the AHEI-2010 diet score was positively associated with improved symptoms over time (adjusted total effect: β (95% Confidence Interval) = 0.14 (0.02-0.26), for 10-point increased diet score). The direct effect accounted for 93% of the association; β (95% CI)= 0.13 (0.01-0.26). The indirect effect mediated though BMI accounted for 7%; β (95% CI)= 0.01 (-0.01-0.03). Among ever smokers, all the effects were non-significant (all P>0.5).

Conclusion: The AHEI-2010 dietary score was associated with the improvement of asthma symptoms over time only in never smokers, independently of BMI.