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Caso clínico

Increased dietary beta-carotene intake associated with better asthma quality of life

Asthma prevalence and morbidity have steadily increased in last decades in face of our improved knowledge of the disease. Changing patterns and interactions among asthma risk factors may contribute to these trends, in which diet is a recognized risk factor for asthma occurrence. Although a possible protective role of dietary antioxidants in asthma has been proposed, little is known about possible relationship between dietary intake and asthma severity, if any. Our objective was to investigate whether asthma severity is associated with antioxidants consumption. We found that better asthma quality of life was associated, in females, with increased consumption of beta-carotene, even after adjustment for energy intake and potential confounders ($p=0.023$) and in males, with lesser consumption of dietary iron (13.9 ± 2.1 vs. 17.8 ± 2.1 mg, $p=0.026$; after adjustment for energy intake and confounders, $p=0.012$). Our study shows promising results that need further investigation relating these two nutrients involved in several antioxidant mechanisms.

Key words: Beta-carotene. Asthma. Antioxidant mechanisms.

Una mayor ingesta dietaria de β -caroteno se asocia a mejor calidad de vida en el asma

La prevalencia y la morbilidad del asma han aumentado de forma continua a lo largo de las últimas décadas, a pesar de los avances en nuestro conocimiento de la enfermedad. Cambios en los perfiles e interacciones entre factores de riesgo del asma podrían contribuir a esta tendencia, y entre ellos la dieta es un factor de riesgo reconocido para el desarrollo de asma. Aunque se ha sugerido un posible papel protector de los antioxidantes dietarios en el asma, es poco lo que se sabe acerca de la posible relación, si es que existe una, entre ingesta dietaria y gravedad del asma. Nuestro objetivo fue investigar si la gravedad del asma muestra asociación con el consumo de antioxidantes. Hemos observado que existe una asociación entre mejor calidad de vida en el asma y el consumo aumentado de β -caroteno en mujeres, incluso después del ajuste en función de la ingesta calórica y de posibles factores de confusión ($p = 0,023$), y entre mejor calidad de vida en el asma y menor consumo dietario de hierro ($13,9 \pm 2,1$ frente a $17,8 \pm 2,1$ mg; $p = 0,026$) en varones, asimismo tras ajuste según ingesta calórica y factores de confusión. Nuestro estudio ofrece resultados prome-

tedores que requieren y justifican investigación adicional acerca de estos dos nutrientes involucrados en diversos mecanismos antioxidantes.

Palabras clave: Beta-caroteno. Asma. Mecanismos antioxidantes.

INTRODUCTION

Asthma prevalence and morbidity have steadily increased in last decades in face of our improved knowledge of the disease. Changing patterns and interactions among asthma risk factors may contribute to these disease trends, in which diet is a recognized potential risk factor for asthma occurrence. Feeding practices and dietary constituents traditionally include: antioxidants and vitamins; sodium and magnesium; and polyunsaturated fatty acids n-3 and n-6. At present, available data are insufficient to clearly implicate any dietary constituent as a potential causal risk factor for asthma. Although a possible protective role of dietary antioxidants in asthma has been proposed¹⁻⁴, little is known about the possible relationship between dietary intake and asthma severity, if any. Our objective was to investigate whether asthma severity is associated with antioxidants consumption.

Consecutive adult asthmatic patients, from 18 to 75 years old (n=41) attending our outpatient Allergology Clinic were informed about study objective and after providing informed consent were included. All had a previous medical diagnosis of asthma and were taking asthma medication. Height (± 0.5 cm) and weight (± 0.1 kg) were measured and the body mass index (BMI) was calculated (weight/height²). Cigarette smoking and physical activity (daily walking, frequency, duration and intensity of sport activity) were also measured. Quality of life was assessed with "The Life Quality Test" (ALQ)⁶. The ALQ is a simple self-administered questionnaire that includes 20 questions in yes/no answer format, addressing six dimensions of impact of asthma in patients lives: 1) activity and sleep; 2) symptoms; 3) triggers; 4) unscheduled healthcare utilization; 5) medication and 6) psychological. All questions have equal weight; and, for each patient, a total ALQ score, was calculated as the sum of all positive (yes) responses, ranging from 0 to 20. Peak expiratory flow (PEF) was registered and asthma control was assessed using "The Asthma Control Questionnaire" (ACQ)⁷. The ACQ is a 6-item questionnaire that has been developed to measure the

adequacy of clinical asthma control with a score ranging from 0 to 6. Dietary intake, including antioxidants, was measured using a semi-quantitative food frequency questionnaire (FFQ) validated for portuguese adults⁸. The FFQ consists of a list of 85 food items for which average food consumption was determined in reference to nine specified periods in the previous year (from "never or less than 1 time per month", to "6 or more times a day"). The food list consists of foods that contributed to a majority of nutrients in the diet according to previous studies. A trained nutritionist, who was unaware of the subjects' characteristics, administered the FFQ. The Food Processor[®] computer program was used to analyse the energy and antioxidants intake. Association between asthma quality of life and dietary antioxidants and other nutrients involved in cellular defence against reactive oxygen species (iron, copper, magnesium, manganese, selenium, vitamins C, E and beta-carotene) was tested using multivariate analysis of variance design. Nutritional variables were the dependent variables and ALQ the independent variable (sample was divided into high/low ALQ groups according to median score). In further analysis of variance, results between groups were analysed by gender and adjusted for energy intake, physical activity, age and BMI.

We evaluated 31 females and 10 males, aged 38 ± 16 years, with mean BMI 25.8 ± 5.3 (weight/height²). High/low ALQ groups had mean scores respectively of 5.9 ± 4.0 and 14.8 ± 2.4 . Mean predicted PEF was 91 ± 11 and $68\pm 20\%$ ($p=0.036$), and ACQ score was 0.7 ± 0.8 and 2.3 ± 1.4 ($p=0.013$) respectively for high and low ALQ groups. In female, high ALQ group showed increased consumption of beta-carotene (1822 ± 266 vs. 1039 ± 258 mcg, $p=0.043$), even after adjustment for energy intake and potential confounders ($p=0.023$). In males, high ALQ group consumed lesser amounts of iron (13.9 ± 2.1 vs. 17.8 ± 2.1 , $p=0.026$; after adjustment for energy intake and confounders, $p=0.012$). No differences were found for the other antioxidants intake both in males and females.

The evidence that dietary antioxidants protect against oxidative damage is known⁹. In our study, better asthma quality of life was associated with increased beta-carotene intake. The carotenoids are naturally occurring pigments in fruits and vegetables. However, the complexity of these relations raises many important questions before we can suggest dietary recommendations. Primary concerns include toxicity, potential for exacerbating preexisting pathological states, and antioxidant organ specificity. Toxicity con-

cerns involving carotenoids appear minimal. Beta-carotene is not mutagenic, carcinogenic, or embryotoxic even when consumed in large amounts. Beta-carotene, the most abundant carotenoid in nature, is a multifunctional lipid-soluble antioxidant capable of physically quenching singlet oxygen and peroxy radicals at low oxygen pressure, inhibiting free radical chain reactions and lipoxygenase activity. The nature of its free radical chain-breaking mechanism separates beta-carotene from the more conventional antioxidants and reducing agents. However, results of randomised controlled trials clearly indicate that cigarette smokers, or other individuals at high risk for lung cancer, should not take beta-carotene supplements, and healthy adults will receive no benefit from beta-carotene supplementation¹⁰. The safest approach to antioxidant intervention should be to increase the frequency of fruit, grain, and vegetable consumption, which are the primary dietary sources of several antioxidants, namely beta-carotene. Iron has been recently suggested as having some pro-oxidant properties possible increasing the risk of colorectal carcinomas¹¹. Its role affecting the oxidative stress balance in human airways is still under investigation. Our study shows promising results that need further investigation relating these two nutrients involved in several antioxidant mechanisms.

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