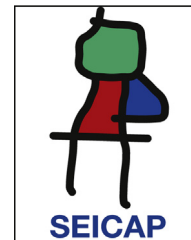




## Allergologia et immunopathologia

Sociedad Española de Inmunología Clínica,  
Alergología y Asma Pediátrica

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### ORIGINAL ARTICLE

## Mediterranean diet and childhood asthma



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Received 19 November 2014; accepted 2 April 2015

Available online 14 August 2015

### KEYWORDS

Bronchial hyperreactivity;  
Childhood asthma;  
Dietary pattern;  
Dietary programme;  
Mediterranean diet;  
Nutritional assessment

### Abstract

**Background:** The incidence of bronchial hyperreactivity has increased to one-third of the population in developed countries, which requires the adoption of preventive and therapeutic measures. The objective of the present study was to assess the effects of a traditional Mediterranean diet on patients diagnosed with childhood asthma and determine if there is a beneficial effect from this dietary intervention.

**Methods:** Prospective before–after comparison study of 50 girls and 54 boys aged 1–5 years, who were enrolled in the 1-year programme "Learning to Eat from the Mediterranean", designed to promote the adoption of a traditional Mediterranean diet. We studied the clinical and therapeutic variables and anthropometric measurements.

**Results:** All studied symptomatic indicators (number and intensity of asthmatic attack, infections and hospital admissions) showed a positive and statistically significant evolution of bronchial hyperreactivity from the first weeks of the intervention onwards. Throughout the treatment, 32.2% of patients remained free of crisis, 35.3% of the patients only had one attack throughout the year and 24.9% had two episodes, compared to 4.73 episodes on average in the previous year. The use of inhaled corticosteroids markedly decreased from  $3.92 \pm 1.61$  to  $1.11 \pm 1.09$  times per patient per year ( $P < 0.001$ ) and that of inhaled bronchodilators decreased from  $4.14 \pm 1.61$  to  $1.12 \pm 1.40$  ( $P < 0.001$ ). As a result, the families involved in the programme reported a high level of satisfaction.

**Conclusions:** The adoption of a traditional Mediterranean diet could contribute significantly to the improvement of patients diagnosed with childhood asthma.

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## Introduction

The incidence of childhood asthma and bronchial hyperreactivity (BHR) has been progressively increasing in developed countries, reaching nearly one-third of the population.<sup>1</sup> This disease causes educational, economic and health problems for patients, their families, and society, which requires the adoption of preventive and therapeutic measures. The degree of asthma varies from patients who experience only a few episodes of wheezing, coughing with mild bronchospasm to patients with repeated episodes and persistent symptoms. The diagnosis of BHR in children is primarily clinical and can be complicated due to the subjective symptoms, which are sometimes difficult for their parents to assess.<sup>2</sup> There is no universal test to determine the exact diagnosis. It has been demonstrated that the fundamental pathophysiological basis is bronchial inflammation, which triggers hypersensitivity to a variety of stimuli such as upper respiratory tract infections, air pollution, tobacco, smoke, exercise, central heating, seasonal pollination and obesity.

Current treatment is based on the use of bronchodilator  $\beta_2$ -agonists (which reduce bronchial muscle spasticity), anti-inflammatory corticosteroids and anti-leukotrienes (which reduce BHR and clinical symptoms). All are effective upon acute application, but prolonged use is more questionable due to the limited evidence supporting efficacy and the emergence of adverse effects such as abnormal growth in children.<sup>3</sup> It has been suggested that dietary interventions could be of potential use based on a number of publications that have linked the disease with the loss of traditional dietary patterns. Some of these results, however, are controversial.<sup>4-7</sup> One of our recent studies on overweight and obese children supports this idea because patients with BHR improved considerably after controlling the quality of their diet.<sup>8</sup> We therefore hypothesise that restoring traditional, healthy diets such as the Mediterranean diet could help decrease bronchial hyperreactivity significantly. In accordance with this idea, a meta-analysis has recently been published supporting the positive influence of Mediterranean diets on respiratory outcomes in children.<sup>9</sup> The present study aims to extend knowledge in this direction by studying the effects of a traditional Mediterranean diet (TMD), on patients diagnosed with childhood asthma through a food re-education programme developed in the family sphere. The study diet was based on the Decalogue proposed by the Mediterranean Diet Foundation.<sup>10</sup> The Mediterranean diet was proclaimed an Intangible Cultural Heritage of Humanity by UNESCO in 2010 and is characterised by a high intake of unrefined plant-based foods such as fruits and fresh vegetables, whole grains, legumes, olive oil and nuts; low to moderate consumption of foods of animal origin such as fermented milk, fish, eggs and lean meats; and by a low intake of sugar, refined flour and fast food.

## Methods

### Study design

The study was approved by the Research and Ethics Committees of the General University Hospital of Ciudad Real, Spain. The research design was an analytical, before-after

comparison study, which consecutively enrolled patients 1–5 years of age who met childhood asthma criteria<sup>11</sup> and who attended a consultation at a primary care practice between May 2009 and September 2013. It was considered necessary to include the medical history of at least 1 year prior to the study and informed consent signed by their parents or guardians. The intervention focused on dietary re-education based on the TMD by a nutritional education programme named ‘‘Learning to Eat from the Mediterranean’’. This programme is based on a series of visits to the nutritionist and paediatrician that are designed to assist the entire family. The visits were monthly during the first 4 months and bimonthly the rest of the year. To start the programme a 7-day recall questionnaire was required. On the first visit, we evaluated the food choices of each child and family. Based on the problems identified, we proposed dietary changes by providing dietary patterns, recipes, sample menus, etc. An anthropometric assessment was also performed and key health issues were explained, such as the importance of a good breakfast, variability in menus, the balance between food consumption and energy expenditure, the quality of fats, proteins and carbohydrates, understanding labels and creating a healthy shopping list. The patients were followed-up for 1 year to evaluate growth, clinical evolution, treatment needs, adherence to the TMD and the degree of family satisfaction. The conventional treatment remained initially unchanged and the drugs were reduced only when clinical improvements were observed.

## Study variables

### Clinical parameters and treatment

**Primary end point:** The number of BHR episodes and childhood asthma attacks per person per year (relapses or exacerbations). The Third International Pediatric Consensus has defined childhood asthma as a condition in which there are three or more episodes of wheezing and/or coughing in a clinical setting in which the diagnosis of asthma is the most likely after excluding other less common conditions. This conceptually strategic definition is still in use (2008 PRAC-TALL consensus) because it includes the expression of the disease (wheezing, coughing), recurrent episodes (three or more) and the absence of other conditions (wheezing and coughing unrelated to asthma).<sup>12</sup>

**Secondary end points:** Intensity of attacks, evaluated according to the protocols of the Spanish Pediatrics Association (1 – mild, 2 – moderate, 3 – severe),<sup>13</sup> upper respiratory tract infections (URTIs), bacterial complications, emergency room visits, hospital admissions, drugs administered (inhaled corticosteroids, oral corticosteroids, short-acting bronchodilators, antibiotics and symptomatic treatment).

### Clinical and therapeutic evaluation index

To evaluate the patients’ clinical outcome, in addition to clinical assessment made by the paediatrician, we have developed a questionnaire given to the parents or guardians that assessed symptoms related to childhood asthma. Ten questions concerning the past 4 weeks were evaluated and scored from a minimum of 0 (poor control) to a maximum of

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