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The effect of Mediterranean diet on the development of type 2 diabetes mellitus: A meta-analysis of 10 prospective studies and 136,846 participants

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ABSTRACT

Objective. The purpose of this work was to meta-analyze prospective studies that have evaluated the effect of a Mediterranean diet on the development of type 2 diabetes.

Materials/Methods. PubMed, Embase and the Cochrane Central Register of Controlled Trials databases were searched up to 20 November 2013. English language publications were allocated; 17 original research studies (1 clinical trial, 9 prospective and 7 cross-sectional) were identified. Primary analyses were limited to prospective studies and clinical trials, yielding to a sample of 136,846 participants. A systematic review and a random effects meta-analysis were conducted.

Results. Higher adherence to the Mediterranean diet was associated with 23% reduced risk of developing type 2 diabetes (combined relative risk for upper versus lowest available centile: 0.77; 95% CI: 0.66, 0.89). Subgroup analyses based on region, health status of participants and number of confounders controlling for, showed similar results. Limitations include variations in Mediterranean diet adherence assessment tools, confounders' adjustment, duration of follow up and number of events with diabetes.

Conclusions. The presented results are of major public health importance, since no consensus exists concerning the best anti-diabetic diet. Mediterranean diet could, if appropriately adjusted to reflect local food availability and individual's needs, constitute a beneficial nutritional choice for the primary prevention of diabetes.

1. Introduction

The prevalence of diabetes mellitus has reached an epidemic level of 340 million people worldwide [1], with type 2 diabetes dominating and growing incessantly in parallel with obesity [2]. Not without reason, "diabesity" has become a major health concern, with serious quality of life and economic impact, stressing the need for immediate actions with effective interventions. Medical nutrition therapy, physical activity and education have an important contribution to the general management of a patient with diabetes [3]. Weight loss is part of the initial treatment as most patients are overweight [4]. In addition, specific foods and nutrients have been identified to exert a protective [5] or aggravating [6] effect on type 2 diabetes

Abbreviations: DM, Diabetes mellitus; BMI, Body Mass Index; WC, Waist Circumference; WHR, Waist to Hip Ratio; MetS, Metabolic syndrome; CVD, Cardiovascular disease; MI, Myocardial infarction; TC, Total cholesterol; CHD, Coronary heart disease; SBP, Systolic blood pressure; DBP, Diastolic blood pressure; MET, Maximum exercise tolerance; FSG, Fasting serum glucose; MDS, Mediterranean diet score; MD, Mediterranean Diet; PA, Physical activity; TEI, Total energy intake.

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mellitus. The past years, scientific research in nutrition and health has focused on the holistic dietary patterns approach, instead of the evaluation of single foods or nutrients. This was, mainly, because it was understood that foods might have synergistic or antagonistic (competing) properties that may alter the true food–health relationship. Moreover, in the real world individuals consume a variety of foods, in different combinations, and therefore the approach of single food or nutrient does not reflect the reality [7]. Based on this holistic approach, many dietary patterns have been suggested and some of them seem to play a role in the prevention and/or management of various chronic diseases [8,9]. One of the most studied patterns is the Mediterranean diet, initially introduced by Ancel Keys of the Seven Countries Study, in the late 1970's [10]. However, defining and measuring the Mediterranean diet can be challenging, since various Mediterranean-style tools have been proposed, which revolve similar dietary components [11]. Overall, Mediterranean-type diets share some common characteristics, i.e., basically, high consumption of olive oil, legumes, whole grain cereals, fruits and vegetables and moderate wine drinking, and, secondarily, moderate consumption of fish, dairy products and low consumption of poultry, meat and its products, highly processed foods, refined grains and sugars [12]. Recently, in 2010, Mediterranean diet was recognized by UNESCO as a cultural heritage of Humanity, incorporating other aspects, such as conviviality, socialization, biodiversity and seasonability, in its definition [13]. Therefore, beyond food per se, other components of the dietary pattern may be important. Mediterranean diet has been related to various health outcomes, for example coronary heart disease [14], hypertension, dyslipidemia, obesity [15], cognitive impairement [16],metabolic syndrome and its components [17,18], i.e., waist circumference >102 cm for men or >88 cm for women; triglyceride level >150 mg/dL; HDL cholesterol level <40 mg/dL for men or <50 mg/dL for women; blood pressure >130/85 mm Hg; or fasting plasma glucose >110 mg/dL [19]). It has also been suggested to have a beneficial effect in the primary prevention of diabetes [20–22], but results have not been consistent [23,24]. To the best of our knowledge no previous systematic work exists regarding the relationship of the Mediterranean dietary pattern to the onset of type 2 diabetes.

Thus, the aim of this work was to perform a systematic review and a meta-analysis of the findings of published original research studies that have evaluated the effect of a Mediterranean type diet on the development of type 2 diabetes among healthy adults and identify potential interactions, depending on studies' methodological differences.

2. Methods

2.1. *Data sources and searches*

Internet searches in PubMed, Embase and the Cochrane Central Register of Controlled Trials databases up to 20 November 2013, using a search strategy that included the following keywords:

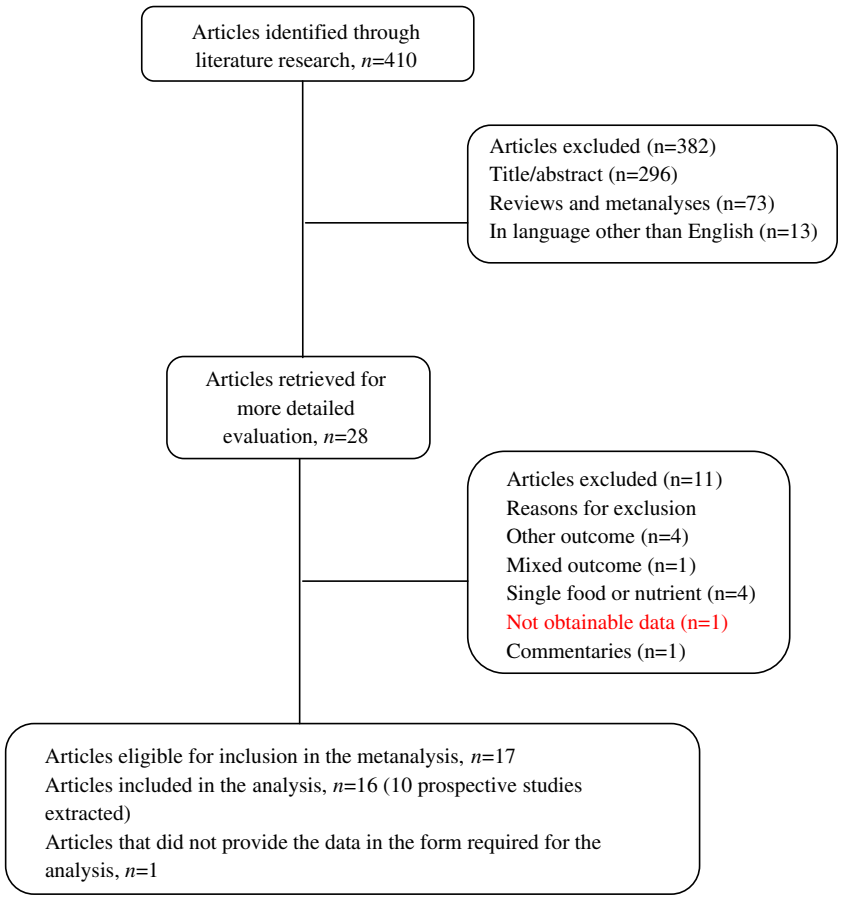

Fig. 1 – Process of studies' selection for the meta-analysis.