Research report

Nutrition knowledge is associated with higher adherence to Mediterranean diet and lower prevalence of obesity. Results from the Moli-sani study ☆

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ABSTRACT

A Mediterranean dietary pattern has been associated with reducing the risk of cardiovascular and chronic disease. The aim of this study was to evaluate the role of nutrition knowledge in determining possible differences among dietary patterns in a general population from a Mediterranean region. We conducted a cross-sectional study on a subsample of 744 subjects enrolled in the population-based cohort of the Moli-sani Project. A 92-item questionnaire on nutrition knowledge was elaborated, validated and administered. Dietary information were obtained from the EPIC food frequency questionnaire and adherence to a Mediterranean dietary pattern was evaluated both by the a priori Greek Mediterranean diet score and the a posteriori approach obtained by principal component analysis. Nutrition knowledge was significantly associated with higher adherence to a Mediterranean dietary pattern. The odds of having higher adherence to a Mediterranean dietary pattern increased with greater nutrition knowledge. The odds ratio of being obese significantly decreased with increasing nutrition knowledge levels. The results showed that nutrition knowledge was significantly associated with higher adherence to a Mediterranean dietary pattern and with lower prevalence of obesity in a Southern Italian region with Mediterranean diet tradition independently from education and other socioeconomic factors.

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Introduction

Mediterranean diet (MD) is one of the most effective eating patterns associated with the reduction of the risk of cardiovascular and other chronic disease (Bonaccio, Iacoviello, de Gaetano, & On Behalf of the Moli-sani Investigators, 2012; Sofi, Abbate, Gensini, & Casini, 2010; Tangney et al., 2011). Nevertheless, adherence to MD has dramatically decreased in recent years and this trend is even more evident in the southern European and Northern African countries, where the Mediterranean eating pattern originated

(Mehio Sibai et al., 2010). Studies performed in a southern region of Italy, which is supposed to have a Mediterranean-like dietary tradition, highlighted that the Mediterranean pattern is becoming dramatically unpopular among the youngest while it remains a widespread choice just for the elderly (di Giuseppe et al., 2008). Increasing trends in cardiovascular risk factors, primarily obesity and hypertension, have been linked to changing patterns in lifestyle behaviors across Southern Italy and other Mediterranean countries (Laccetti et al., 2013).

In addition, social and cultural changes have been ascribed a leading role in determining the shifting of dietary habits towards other types of diet such as the Western diet model, which is rich in refined grains, saturated fats, sugars, red meat and processed meat. Several investigations highlighted a conditioning role of socioeconomic status (SES) showing that persons in the lower SES groups are more likely to exhibit poorer diets (Darmon & Drewnowski, 2008). A major role is played by income which turned out to be a strong obstacle towards healthy eating patterns in particular to MD (Bonaccio, Bonanni et al., 2012). Low education also

has been linked to poor adherence to Mediterranean-like eating patterns. The Social Cognitive Theory (Bandura, 1991) suggests that to perform a particular behavior a person has to know what the behavior is and how to perform it. In the case of diet, according to this theory, a person has to know what a good diet is before asking him/her to follow it properly.

That is why more recently, research focused on the possible relationship between diet quality and other social and cultural factors, such as nutrition knowledge and beliefs which are considered to be important factors explaining variations in food choices (Sharma, Gernand, & Day, 2008; Wardle, Parmenter, & Waller, 2000). Nutrition knowledge has also been shown to act as an effect modifier (Beydoun & Wang, 2008) and to be a mediator between socioeconomic position and diet quality (McLeod, Campbell, & Hesketh, 2011). The aim of this study was to test the association between nutrition knowledge (NK) and adherence to MD in an adult population living in a central-southern region of Italy, with Mediterranean dietary traditions.

Methods

Study population

The Moli-sani Project is a population-based cohort study on 24,325 citizens of Molise, a region placed between Central and Southern Italy. The study enrolled men and women aged ⩾35 years, randomly recruited from subjects included in the city-hall registries of Molise (Iacoviello et al., 2007). Exclusion criteria were pregnancy, disturbances in understanding/willing processes, ongoing poly-traumas or coma, refusal to sign the informed consent; 30% of subjects refused to participate; these were generally older and had a higher prevalence of cardiovascular disease or cancer. This study was conducted in the framework of a sub-study of the Moli-sani Project aimed at investigating the association between nutrition knowledge, mass media media exposure (Bonaccio, Di Castelnuovo et al., 2012) and dietary habits and lifestyle. In 2009, we elaborated an additional questionnaire on nutrition knowledge and mass media exposure. Once validated, the questionnaire was administered to participants recruited from May 2009 to April 2010 (*n* = 1571), when the Moli-sani study officially closed the enrolment phase, with participation rate equal to 72%. Finally, 1132 subjects completed the questionnaire.

Dietary information

The validated Italian EPIC food frequency questionnaire (FFQ) was used to assess food intake (Pala et al., 2003; Pisani et al., 1997). The questionnaire, computerized with tailor-made software, allowed interviewing participants in an interactive way, including illustrations of sample dishes of definite sizes or by reference to standard portion sizes. To simplify interpretation of data and to minimize within-person variations in intakes of individual foods, 188 food items were classified into 45 predefined food groups on the basis of similar nutrient characteristics or culinary usage (Appendix A).

Food consumption patterns were generated by using Principal Components Analysis (PCA) conducted on the correlation matrix of 45 food groups (Centritto et al., 2009). Three main factors emerged, in agreement with previous findings in the same population (Centritto et al., 2009). The first pattern, identified as "Olive Oil and Vegetables", was characterized by high positive loadings for olive oil, vegetables, legumes, soups, fruits and fish. The second pattern, named "Pasta and Meat", was characterized by high positive loadings for pasta, cooked tomatoes, red meat, animal fats and alcoholic beverages, and negative loadings of breakfast cereals and

yogurt. The "Eggs and Sweets" pattern was characterized by high positive loadings for eggs, margarines, processed meat and sugar and sweets. This "a posteriori" approach, based on the foods actually consumed by participants, allows to overcome the limitations of the "a priori" scores, not accounting for correlations in foods consumption.

We evaluated the adherence to the Mediterranean diet by using the Mediterranean diet score (MDS) elaborated by Trichopoulou, Costacou, Bamia, and Trichopoulos (2003). Scoring was based on the intake of the following nine items: vegetables, legumes, fruit and nuts, dairy products, cereals, meat and meat products, fish, alcohol, and the ratio of monounsaturated:saturated fat. For most items, consumption above the study median received 1 point; all other intakes received 0 points. For dairy products, meat and meat products, consumption below the median received 1 point. Medians are gender specific. For ethanol, men who consumed 10–50 g/day and women who consumed 5–25 g/day received 1 point; otherwise, the score was 0. The possible scores ranged between 0 and 9, the latter reflecting the maximal adherence.

Data collection

Body mass index (BMI) was calculated as kg/m^2. Waist circumferences were measured according to the NIH, Heart, Lung, and Blood guidelines (Janssen, Katzmarzyk, & Ross, 2002). Blood pressure was measured by an automatic device (OMRON-HEM-705CP) three times on the non-dominant arm, with the patient lying down for about 5 min. Hypertension was defined as systolic BP ⩾ 140 mmHg or diastolic BP ⩾ 90 mmHg, or using pharmacological treatment. Diabetes was defined as blood glucose >126 mg/dl or using pharmacological treatment. Physical activity was assessed by a structured questionnaire (24 questions on working time, leisure time and sport participation) and expressed as daily energy expenditure in metabolic equivalent task-hours (MET/d). Obesity was defined as BMI > 30.

Socioeconomic variables

Household net income categories were considered as low (⩽25,000 euro/year), medium (>25,000 and ⩽40,000 euro/year) and high (>40,000 euro/year). We recorded a high percentage (30%) of non-respondent subjects who refused to declare or did not know their household income. Yet, such a large non-respondent group is very common in this type of investigations, especially among women and the elderly (Kaplan & Keil, 1993).

Education level was considered as low (⩽8 years) and higher (>8 years). Socioeconomic status (SES) was expressed as a score based on five variables: dwelling ownership and ratio between the number of rooms and number of living-in family members (rooms per person), both currently and during childhood, and availability of hot water at home during childhood. The five components were dichotomized according to the median value, and a score of one was attributed to the category supposed to be marker of higher social status in comparison with the opposite category: thus we assigned a score of 1 to people living in a house with living-in family members/room density >0.6 or dwelling ownership or with availability of hot water and a score 0 to people with living-in family members/room density ⩽0.6, no dwelling ownership or with unavailability of hot water. We recorded missing values for SES for 6.3% of the subjects.

The SES score did not include income and education. Marital status was considered as married or live-in partner versus others (divorced, unmarried and widower).