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Importance of diet on disease prevention

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Over the last decades, a considerable body of evidence supported the hypothesis that diet and dietary factors play a relevant role in the occurrence of diseases. To date, all the major scientific associations as well as the World Health Organization, scientific and non-scientific organizations place an ever-increasing emphasis on the role of diet in the strategies able to prevent noncommunicable diseases. Many studies have evaluated the associations between food groups, foods, or nutrients and chronic diseases, and a consensus about the role of nutritional factors in the etiology of noncommunicable diseases such as cardiovascular and neoplastic diseases has gradually emerged. Indeed, data from analytical and experimental studies indicated a relation between increased consumption of some food categories such as fruits and vegetables, fiber and whole grains, fish and moderate consumption of alcohol and reduced risk of major chronic degenerative diseases, whereas increased total caloric intake, body weight, meat and fats are associated with greater risk. However, the appropriate dietary strategy to prevent chronic degenerative diseases remains a challenging and a highly relevant issue. Recently, Mediterranean diet has been extensively reported to be associated with a favorable health outcome and a better quality of life.

Key words: Diet, nutrition, diseases, health.

INTRODUCTION

During the past decades, a rapid expansion in the number of relevant scientific fields, and in particular, the amount of population-based epidemiological evidence has clearly demonstrated the role of diet in preventing and controlling morbidity and premature mortality resulting from non-communicable diseases (NCDs) (World Health Organization Study Group, 2003).

The burden of NCDs is rapidly increasing worldwide. It has been calculated that, in 2001, chronic diseases contributed approximately 60% of the 56.5 million total reported deaths in the world and approximately 46% of the global burden of disease. Moreover, the proportion of the burden of NCDs is expected to increase to 57% by 2020 (World Health Organization, 2005). Almost half of the total chronic disease deaths are attributable to cardiovascular diseases; obesity and diabetes are showing worrying trends, whereas neoplastic diseases are still one of the commonest causes of mortality and morbidity in Western countries, as well as neurodegenerative diseases which showed in the last years an increasing trend of incidence. Moreover, the chronic disease problem is far from being limited to the developed regions of the world.

Contrary to widely held beliefs, developing countries are increasingly suffering from high levels of public health problems related to chronic diseases (World Health Organization, 2005). The World Health Organization (WHO) in its recent documents places a great emphasis on the prevention of NCDs (World Health Organization Study Group, 2003; World Health Organization, 2005, 2006). The most important risk factors for NCDs include

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high blood pressure, high concentrations of cholesterol in the blood, inadequate intake of fruit and vegetables, overweight or obesity, stress, physical inactivity and tobacco use. Five of these risk factors are closely related to diet. Indeed, unhealthy diet is among the leading causes of NCDs, including cardiovascular diseases, type 2 diabetes and certain types of cancer, and contribute substantially to the global burden of disease, death and disability.

Currently, the relationship between diet and diseases has been studied intensively for nearly a century. The first evidence of a possible relationship between dietary habits and occurrence of diseases dates back to the years following the World War II, when significant variations in the incidence of major NCDs such as cardio-vascular diseases and certain cancers were observed in studies conducted in migrants that moved from countries with a favourable dietary profile to a country with an unfavourable and industrialized profile. Subsequently, many studies investigated the influence of diet and nutrition on the pathogenesis of the disease states through using analytical, ecologic and epidemiological approaches (Sofi et al., 2008).

To date, diet and nutrition are important factors in the promotion and maintenance of good health throughout the entire life course, and their role as determinants of chronic degenerative diseases is well established, thus occupying a prominent position in prevention activities.

DIET AND CARDIOVASCULAR DISEASES

Cardiovascular diseases are the first cause of mortality and morbidity in Western countries (World Health Organization, 2006). During the last decades, clinical investigation on the prevention of cardiovascular diseases has defined in an unquestionable manner, the role of diet as a modifiable risk factor. Currently, it has been largely demonstrated from epidemiologic studies that increased consumption of fruits, vegetables, non-refined cereals, and fish can reduce cardiac events and related mortality in the whole population (World Health Organization, 2005). The recent result from the "InterHeart" study, a large case-control study that investigated risk factors for myocardial infarction within 52 countries including non-developed, developing and industrialized countries, demonstrated that diet is one of the most important risk factors for the occurrence of myocardial infarction, independently from all the other parameters. In fact, consumption of fruit and vegetables has been reported to be responsible for a significant and relevant protection against the occurrence of myocardial infarction in all the countries (Yusuf et al., 2004). Furthermore, the significant interrelationships between some of the most important risk factors such as diabetes,

hypertension, and dyslipidemia and dietary habits gave further evidence towards the role of nutrition in preventing cardiovascular diseases.

The preliminary scientific evidence about the role of nutrition in the pathogenesis of cardiovascular diseases has been supplied by the "Seven Countries' Study", an epidemiologic study designed by Ancel Keys, the pioneer of nutritional studies, at the beginning of the 1950s (Keys et al., 1986). This study enrolled nearly 13,000 male subjects of age ranging from 40 to 59 years, living in 7 different countries (Italy, Greece, the Netherlands, United States, Finland, Japan, former Yugoslavia), with the aim of evaluating the possible association between diet and lifestyle habits and mortality and incidence of cardio-vascular and neoplastic diseases. Since the first results of the study, it became evident that there was a significant difference in terms of incidence of diseases, as well as of mortality among the cohorts of the study. At the end of the 25 years follow-up, about one half of these death cases were due to a coronary disease with mortality rates remarkably differing in the various study countries (Menotti et al., 1993).

In particular, a lower mortality rate for coronary heart disease was recorded in Greece and in the South of Italy, with 25 death cases every 1,000 inhabitants in a 25-year period, whereas the highest mortality rate was recorded in Finland with 268 death cases every 1,000 inhabitants in a 25-year period. The low rate of cardiovascular diseases in the Mediterranean regions of Europe stimulated an increasing interest for the potential role of their traditional diet in the protection from these diseases.

From that time onward, several studies have been conducted in different study populations with the aim of identifying the real relationship between nutrients, foods, food groups and diseases, by showing that a dietary profile typical of the Mediterranean regions is associated with a reduced incidence of NCDs, as well as with a reduced rate of mortality and morbidity (Sofi et al., 2008). In the Mediterranean diet, olive oil rich in monoun-saturated fatty acids is the prevalent visible fat, the intake of saturated fat is relatively low, while fish guarantees a substantial provision of polyunsaturated fats (n-3 polyunsaturated fatty acids). The Mediterranean diet is, in fact, characterized by a high amount of vegetables, fruits and whole grain products, which represent a good source of fiber, complex carbohydrates, proteins, potassium, antioxidant substances, and vitamins. Finally, the mode-rate consumption of red wine associated with the food is prevalent with respect to other types of alcoholic beverages.

The association between these nutrients and foods and the occurrence of cardiovascular diseases has been largely demonstrated in the last decades (World Health Organization, 2005; Sofi et al., 2008). However, the fail-ure of several recent clinical trials supplementing single

nutrients, suggested that the global Mediterranean nutrition pattern, rather than specific nutrients, might have protective effects on cardiovascular diseases. This is in agreement with some intervention studies, main ones being the Lyon Diet Heart Study and the Dietary Approaches to Stop Hypertension trial, which indicated that interventions to change dietary patterns into a Mediterranean-like pattern could be highly effective in reducing cardiovascular risk (de Lorgeril et al., 1999; Sacks et al., 2001).

The Lyon Heart Study conducted among those with existing heart disease, found a Mediterranean-type diet high in omega-3 fatty acids reduced recurrent infarction by 70%, compared with an American Heart Association diet (de Lorgeril et al., 1999). More recently, an intervention study led by Shai et al. (2008) and published in the New England Journal of Medicine, reported a benefit for Mediterranean diet on reducing cardiovascular risk profile of a population of obese. The authors considered a comparison of three diet regimens with regard to the body weight of more than 200 obese subjects: a typical low-calorie diet low in fat, a Mediterranean-type diet, and a low-calorie and low-carbohydrate diet without caloric restriction. After approximately two years of follow-up, the low-carbohydrate diets were more effective in obtaining weight loss in the short-term, but the long-term benefits obtained in addition to the weight loss, which included improvement of the metabolic parameters were obtained in the subgroup of people following the Mediterranean diet (Shai et al., 2008).

However, the intervention diets in those trials were very different from common dietary patterns in Western populations. People choose foods and combinations of foods rather than isolated nutrients, and practical dietary advice to the public in terms of foods is preferred. Dietary changes may be more readily achieved if recommended foods are compatible with existing patterns of food consumption. Until recently, research efforts to identify dietary means of reducing disease risk have focused on single-nutrient interventions to affect responses in single medical conditions. Determining appropriate dietary recommendations for improved health is further complicated by the paucity of information of the clinical value and feasibility of the interactive effects of multiple nutrients consumed in combination. Recognizing that nutrients are not ingested in isolation, but rather as interactive constituents of a complete diet, much of the focus in nutrition and cardiovascular research in recent years has shifted from assessment of single-nutrient effects on medical conditions associated with increased risk to that of the effects of the total diet or dietary pattern. Therefore, research efforts in this field switched progressively to the evaluation of a score for the adherence to the Mediterranean dietary pattern, rather than to the identification of single nutrients in association with the disease.

The most important attempt to define the degree of adherence to the Mediterranean diet has been released by Trichopoulou et al. (2003) on the frame of the European Prospective Investigation into Cancer and Nutrition (EPIC) study. The authors established a score of adherence that takes into account the main dietary variables, divided into food groups, typical of the Mediterranean diet. This adherence score, based on food groups typically present in the Mediterranean diet (bread, pasta, fruit, vegetables, fish, legumes, moderate red wine consumption, and olive oil), gives a positive score to people who consume more than the median of the overall population for foods typical of the Mediterranean diet, and a negative score to those who consume a higher amount of foods which are not typical of the Mediterranean diet. Hence, a score of 0 represents the lowest adherence to the Mediterranean diet, while a score of 9 represents the highest adherence to the Mediterranean diet.

In recent meta-analyses, we have demonstrated that a greater adherence to the Mediterranean diet, estimated through a computational score, was associated with a reduced incidence of overall mortality (-8%), as well as of cardiovascular mortality and/or incidence (-10%) (Sofi et al., 2010, 2008).

DIET AND NEOPLASTIC DISEASES

Cancer is a major cause of mortality throughout the world, and in the developed world, it is generally exceeded only by cardiovascular diseases (World Health Organization Study Group, 2003; World Health Organization, 2005; World Health Organization, 2006). An estimated 10 million new cases and over 6 million deaths from cancer occurred in 2000. As developing countries become urbanized, patterns of cancer, including those most strongly associated with diet, tend to shift towards those of economically developed countries. Between 2000 and 2020, the total number of cases of cancer in the developing world is predicted to increase by 73%, and in the developed world, to increase by 29%, largely as a result of an increase in the number of old people.

Dietary factors are estimated to account for approximately 30% of cancers in industrialized countries, making diet second only to tobacco as a theoretically preventable cause of cancer (Key et al., 2004). This proportion is thought to be about 20% in developing countries, but may grow with dietary change. Many of the prominent hypotheses for effects of diet on cancer risk are derived from examination of the associations between dietary patterns and cancer rates in different populations around the world. It was noted in the 1970s that developed Western countries have diets high in

animal products, fat and sugar, and high rates of cancers of the colorectum, breast and prostate developing countries typically have diets based on one or two starchy staple foods, low intakes of animal products, fat and sugar, low rates of these 'Western' cancers, and sometimes high rates of other types of cancer such as cancers of the esophagus, stomach and liver. Other studies have shown that cancer rates often change in populations that migrate from one country to another, and change over time within countries.

During the last 30 years, hundreds of studies that examined the association between diets of individuals and their risk for developing cancer have been published. Some studies have investigated the possible role of Mediterranean diet and the occurrence of neoplastic diseases showing a beneficial effect of such dietary pattern in the general population. The results of recent meta-analyses published by our group clearly showed that a strict adherence to the rules of the classical Mediterranean diet determines a 6% reduced risk of incidence and/or mortality from neoplastic diseases (Sofi et al., 2008, 2010).

DIET AND NEURODEGENERATIVE DISEASES

An interest association between diet and disease states is the one related to the reduced risk of incidence of neurodegenerative diseases such as Alzheimer's and Parkinson's disease that has been observed in some recent studies (Sofi et al., 2008). Indeed, several observations hypothesised a potentially important role for diet in the prevention and occurrence of Alzheimer's disease.

The links proposed between dietary factors and neurocognitive diseases are different. Neurodegenerative diseases are characterized in their prevalent forms, by an increased oxidative stress and inflammation (Rinaldi et al., 2003). To date, oxidative stress and inflammation can be modulated and influenced by many dietary com-pounds, hence supporting the hypothesis that nutritional habits may play a role on the pathogenesis of Alzheimer's disease. Moreover, another possible link between diet and such diseases are that related to the presence of high levels of homocysteine, an intermediate compound of the metabolic cycle of methionine in patients affected by cognitive impairment (Seshadri and Wolf, 2003). Finally, additional interesting links between diet and neurocognitive disorders are those related to dietary fats, alcohol and inflammatory parameters (Mukamal et al., 2003; Wärnberg et al., 2009). High intake of cholesterol has been shown to increase the deposition of beta-amyloid in animal brains and high intake of fats may also determine oxidative stress. In addition, some findings in animal models demonstrated

that alcohol is a neurotoxin, so acting as a modulator of the oxidative brain damage.

In the last few years, researches on diet and nutrition in relation to the occurrence of neurodegenerative diseases have been reported with interesting findings on Alzheimer's and Parkinson's diseases (Sofi et al., 2008). In fact, a greater adherence to a Mediterranean-type diet has been shown to decrease the risk of occurrence of both Parkinson's and Alzheimer's disease. The results of our meta-analyses showed that an increase of 2 points in the adherence score to Mediterranean diet is associated with a reduction of over than 10% of the risk of occurrence of such pathologies, by demonstrating the beneficial role of diet and dietary habits in the prevention of neurocognitive disorders (Sofi et al., 2008, 2010).

CONCLUSION

There is a vast amount of literature, to date, that reports a healthy dietary habit to be one of the strongest preventive measure for the general population, as well as for the population of patients with a manifested disease. Diet is able to decrease the risk of mortality and reduce the incidence of some of the most important disease states.

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