Review Article

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Reference dietary patterns in Portugal: Mediterranean diet vs Atlantic diet

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Abstract: Portugal is influenced by the Atlantic Ocean to the west and the Mediterranean Sea to the south. Thus, the dietary patterns in Portugal include both the Mediterranean diet (MD) and the Atlantic diet (AD). This review examines the characteristics of both diets, highlighting their commonalities and unique features. This descriptive literature review analyses scientific articles on the MD and AD. It addresses the health effects of both diets based on published evidence. It includes a review of 15 studies specifically focused on the Portuguese population. Most of the studies were conducted with younger people (children or adolescents) or older people, and some were made with patients suffering from a specific pathology, like heart disease, AIDS, or macular degeneration. Both diets emphasize natural, local, and seasonal foods prepared using traditional methods. They consist of foods rich in macronutrients, micronutrients, and bioactive compounds that offer health benefits. Both the MD and the AD are recommended as healthy diets, associated with physical activity as fundamental elements of a healthy lifestyle promoting general well-being. While the health effects of the MD have been extensively studied, the AD remains under-researched.

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1 Introduction

Food choice is a complex decision-making process and many factors of different nature influence food purchasing and consumption. Dietary patterns are shaped according to different types of influencing factors, which include interaction between personal traits and the external food environments surrounding the consumers. Considering the individual factors, it is important to not only mention the personal preferences and what the consumer likes or dislikes but also eating habits along the consumer's life, and health stimuluses or restrictions. Additionally, factors of social nature, such as income and affordability, also influence people's food purchase [1–3]. On the other hand, one must also consider the factors linked with the external food environment, and these include, e.g. availability of the food items (both in quantity and quality), convenience of the food available for purchase, marketing campaigns, food product promotions, and product quality. In the latest years, the increased awareness of consumers about the sustainability of the foods they consume and of the food supply chains from primary production up to final disposal of the food residues or package used for food items has also gained a huge relevance [4]. Finally, it is acknowledged that the political and the sociocultural environments help shape consumer patterns in what concerns food choice and diets [5].

In recent years, policy-makers have recognized the importance of assisting and empowering consumers so that they are able to make appropriate food choices, that contribute to their improved health as well as to achieve more sustainable food supply systems. As a consequence, presently the food systems are confronted with several challenges focusing not only on public health and food security on one side but also on environmental factors, such as climate change, environmental degradation, and loss of biodiversity. Finally, other motivators have a

considerable influence, like some economic and social factors [6,7]. Social norms and consumption trends are also pivotal, since many people tend to adopt current trends, and they tend to adapt their behaviour to that of other people, regardless of being their friends, their peers or influencers [8].

Portugal has a long tradition linked with gastronomy and use of local, seasonal foods, that comply with culinary traditions [9]. One such example is the use of dried codfish, which is the basis for hundreds of recipes in the Portuguese culinary tradition, as seen by a Portuguese recipe book called "1000 Receitas de Bacalhau" (1000 codfish recipes) [10]. One important aspect linked with eating practices in Portugal relates to the social dimension of eating. People share food in moments of relaxation, meetings with friends and family, and the many festivals and religious celebrations all around the country, with particular relevance on the rural areas, where people interconnect much through these meetings and food is all around [11]. On the other hand, food also serves as an attraction for tourists, which value the Portuguese cuisine very much. One such example is the "Leitão à Bairrada" (small pork roasted in oven) which attracts a huge number of tourists to the Mealhada Region in the Centre of Portugal every year [12,13]. Also, the gastronomic heritage is one pivotal aspect for gastronomic tourism in the Algarve Region in South Portugal [14]. However, not only the traditional and regional factors dictate today's dietary patterns since, owing to globalization and touristic and migration moves, people travel all over the world and share culinary traditions as well. For example, Portuguese culinary traditions have been valued in Brazil because the Portuguese and Brazilian cultures have a historical relationship dating back five centuries, and this has developed since colonization until the present day [15]. In the present, Portugal is assisting to an increase in the number of immigrants from different parts of the world, and these also bring along some of their gastronomic cultures. Nevertheless, the immigrants tend to make their own clusters, essentially in the two major cities in Portugal – Lisbon and Porto. Although they do not really contribute to a significant change in the Portuguese daily life dietary habits, sometimes they promote opening of typical restaurants that are used by their countrymen residing in Portugal, as well as by the Portuguese who wish to experience different types of food, like Mexican, Indian, or Italian cuisines, for example. Although these culinary traditions do not influence significantly the everyday life eating habits, they bring some new elements that are important to consider, e.g. the increase in consumption of sushi that is not traditional in Portugal, and is becoming more frequent among the Portuguese, and especially for the younger generations [16,17].

Dietary patterns are greatly shaped according to culture and tradition, but they change according to new trends and updated information that can help make healthier and more sustainable food choices. Considering the cultural and social aspects that help shape dietary patterns, some examples include the Nordic diet (ND), also knowns as Baltic Sea Diet, the Mediterranean diet (MD), the Atlantic diet (AD), and the specific South European Atlantic diet (SEAD). All these dietary patterns are considered healthy and sustainable [18,19].

Portugal is situated in the Iberian Peninsula, with a longer western coast facing the Atlantic Ocean, but with the South coast still considerably influenced by the Mediterranean Sea. Therefore, although Portugal was one of the first subscribers of the request to the United Nations (UN) to recognize the MD as intangible heritage of Humanity, it is also a fact the influence of the Atlantic Ocean helps shape the dietary habits of the Portuguese. In this context, the objective of this review was to analyse the food consumption habits of the Portuguese, in light with the MD and AD established dietary patterns, and conclude about possible associations between these diets and positive health outcomes.

2 MD

In 2013, the MD was inscribed on the representative list of the Intangible Cultural Heritage of Humanity of the UN, following an application subscribed by seven Mediterranean countries (Croatia, Cyprus, Greece, Italy, Morocco, Portugal, and Spain). Nevertheless, this dietary pattern refers to eating habits that are common to people around the Mediterranean Sea, and not only to those seven countries that first proposed it to the UN [20].

The MD is characterized by the consumption of fresh and seasoned foods, such as fruits, vegetables, whole grains, legumes, oilseeds, fish, seafood, cheeses, and yogurts. Red meat is eaten in moderation and red wine is appreciated at meals. One of the essential elements of the MD is the use of extra virgin olive oil as the primary source of added fat, while suggesting low intake of refined sugars [20] (Figure 1).

However, the dietary pattern of the MD cannot be taken as isolated. The MD also takes into consideration some skills, knowledge, traditions, rituals, and symbols associated with the activities supporting food production (vegetable or animal production) or fishing, transformation, and consumption. These include handling of agricultural crops, harvesting, fishing, animal husbandry, conservation of food products, food processing, cooking, and particularly the sharing and consumption of food. This is the

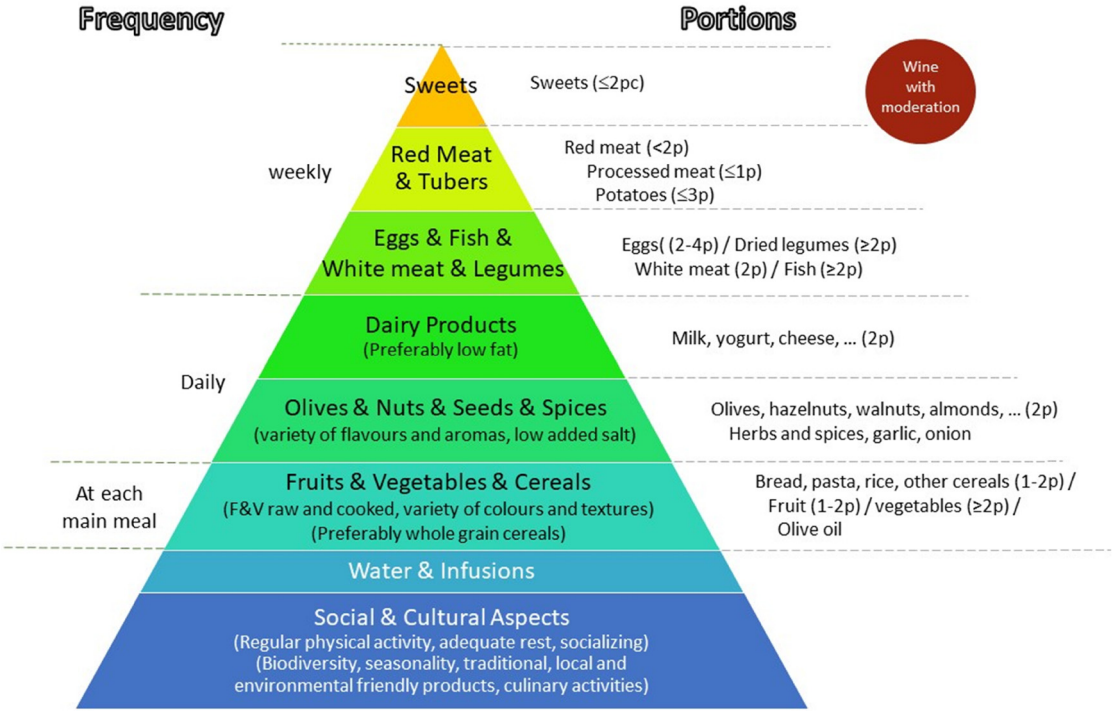

Figure 1: Pyramid of the MD (Work by Raquel Guiné, adapted from [21]).

reason why the "concept" of MD encompasses social aspects and cultural practices as inseparable components. The act of consuming food together, as a social moment of sharing, is the essence of the cultural identity and continuity through times of peoples around the Mediterranean Sea [20,22,23].

The traditional MD was shaped along centuries by many factors, like climate, geography, tradition, history, religion, politics, economy, society, and also adversity and poverty. As so, MD goes way beyond just a food recommendation pattern, and includes all the following aspects [20,22]:

- Moderation, in terms of serving sizes;
- Socialization and interaction with family and friends during meals;
- Values of hospitality, neighbourliness, intercultural dialogue, mutual respect, and creativity;
- Culinary activities and optimization of resources, for example, achieving maximum performance with minimal resources and preparation of a large diversity of dishes with the same products prepared either for everyday meals or celebrations;
- Cultural spaces and events, festivals, and celebrations, bringing together people of all ages, conditions, and social classes;
- Markets as spaces for cultivating and transmitting the MD during the daily practice of exchange, agreement, and mutual respect;
- Seasonality, showing a preference towards seasonal, fresh, and minimally processed foods, which potentiates the foods' increased nutritional value and bioactive compounds with health protective effects;
- The role of women as playing an important role in transmitting knowledge related to the MD, safeguarding and transmitting to the new generations the MD techniques, the respect for seasonal rhythms and festive events;
- Physical activity involving not only sports but also walking, gardening, house works, etc. and mainly practicing leisure activities outdoors;
- Appropriate rest, which may include napping after lunch;
- Traditional, local, eco-friendly, and biodiverse products are the essence of MD, and these are based on respect for the territory and on activities performed by local communities;
- Craftsmanship and production of traditional receptacles for the transport, preservation, and consumption of food.

These aspects include strong components of eating, socialization, healthy lifestyle, sustainability of the food systems, and healthy foods. It is widely acknowledged that the MD is considered one of the healthiest dietary patterns in the world [24]. Epidemiological studies associate the MD with a decrease in the incidence of noncommunicable diseases and mortality. The review by Sánchez-Sánchez et al. [25] indicates that the beneficial effects of the MD are

particularly seen in the following chronic noncommunicable diseases: cardiovascular disease, diabetes, several types of cancer, cognitive decline, and depression.

3 AD and SEAD

The AD is a dietary pattern based on the habits of people living in areas of the Atlantic region of Europe, such as Portugal, some regions of Spain, part of France, Ireland, the United Kingdom, Belgium, the Netherlands, Denmark, Norway, and Iceland. In particular, the SEAD is maintained in Galicia and northern Portugal. The AD emerged more than two decades ago as an alternative to the MD, which was considered more popular and widespread. The SEAD emerged in 2019 from the concept of the AD at the Congress held in Galicia in 1999, where several institutions and organizations from Portugal and Spain joined together with the aim of disseminating the benefits of the AD for health and for the environment [26,27].

The AD is a traditional eating pattern of the coastal populations of the North Atlantic, particularly in regions of Portugal and Spain. This style of diet emphasizes the consumption of fresh, local, and seasoned foods, with a focus on seafood, vegetables, fruits, whole grains, and olive oil. In fact, the fat of choice is olive oil, used both for seasoning and cooking.

The AD dietary pattern characterized by the consumption of typical foods from the Atlantic coast, such as fish (especially sardines), crustaceans (such as mussels and clams), molluscs (such as squid and octopus), algae (such as nori), milk and derivatives (such as butter, yogurt, and cheese), meats (such as pork and beef), cereals (such as rye and maize), vegetables (such as cabbage and turnips), potatoes, chestnuts, and fruits (such as apples and pears, among many others) (Figure 2) [22,28,29].

Similar to the MD in many ways, the AD is rich in omega-3 fatty acids, derived mainly from fish and seafood caught in the cold waters of the Atlantic Ocean. Furthermore, the diet includes a variety of vegetables, fruits, and nuts, as well as moderate amounts of dairy products and meat, especially from local sources and from sustainable production [22,28,29].

The key principles of the AD are as follows [28,29]:

- High consumption of fish and seafood;
- Predominant use of olive oil as the main source of fat;
- High consumption of vegetables, fruits, legumes, and nuts;
- Moderate intake of dairy products, preferably of local origin;
- Moderate to low consumption of meat and meat products;
- Inclusion of whole grains as a fundamental part of meals;
- Low consumption of saturated and refined fats;
- Moderate wine intake, generally during meals.

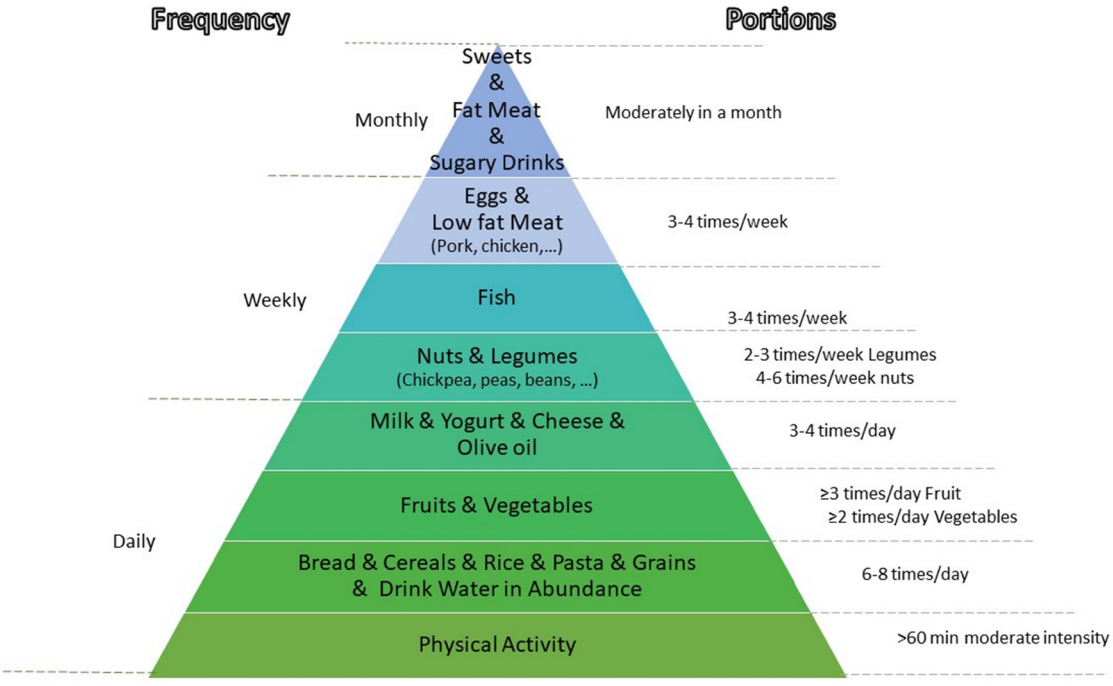

Figure 2: Pyramid of the AD (Work by Raquel Guiné, adapted from [30]).

Other complementary elements of the AD include cooking as the most commonly used method of preparation, with a particular emphasis for soups. The culinary techniques used are simple and include: boiling, grilling, baking, and stewing. Similar to the MD, daily practise of physical activity is also a characteristic of the AD.

The AD has been linked to a lower prevalence of cardiovascular disease, obesity, and other chronic conditions, including diabetes. Additionally, it has demonstrated benefits for certain diseases, such as cancer, and has been associated with improved cognitive function by reducing the risk of age-related cognitive decline. Furthermore, AD supports digestive health and aids in weight loss [26,31,32].

4 Similarities and differences between MD and AD

Both dietary patterns, MD and AD, especially the SEAD, have many common elements, but they also present some dissimilarities (Figure 3). Both diets are based on the consumption of varied, natural, local, and seasonal foods. These contain important macro and micronutrients as well as bioactive compounds with beneficial effects for the human Health. Another common element is the pivotal role of fish and seafood as sources of animal protein and omega-3 fatty acids, which have proven beneficial for cardiovascular diseases. In both, the consumption of red wine in moderate doses is a way to increment the ingestion of valuable antioxidants. Apart from the characteristics of the foods, they also share common respect and valuation of traditions, simple culinary practices, traditional gastronomic knowledge, social contact, sharing meals, and festivities. However, they present some differences in some types of grains, vegetables and fruits. While the MD is more based on wheat as the basic cereal for bread and pasta, the AD relies more on rye and corn. On the other hand, the MD favours a higher consumption of legumes, while the AD is more rich in leafy vegetables like cabbage, tubers like potatoes or turnips, and chestnut as a source of carbohydrates and energy. Also, some fruits are more present in the MD, such as citrus fruits, and particularly orange and lemon, while the AD includes more temperate like apples, pears, and plums [21,28,30,33].

5 MD and AD as healthy diets

Many studies have corroborated the health benefits of the MD, with a multiplicity of studies along the last decades that it is practically impossible to focus each of them individually. However, because there are so many studies addressing the health effects of the MD, it is also true that a great number of authors have already done some categorization and compilation of the studies according to certain topics, and this gives place to an impressive number of reviews devoted to the health effects of the MD. The number of studies focusing on the AD is much lower, and it still needs further attention form the scientific as well as medical communities.

A review by Lorenzo et al. [33] focuses on the SEAD/AD as a healthy dietary pattern, and reviews studies focusing on the health effects of the AD. These studies showed that AD has benefits at several levels, like chronic diseases, cancer, cardiovascular diseases, among others. Scientific evidence published indicates that the AD is associated with an improvement in the global health status, and lower all-cause mortality.

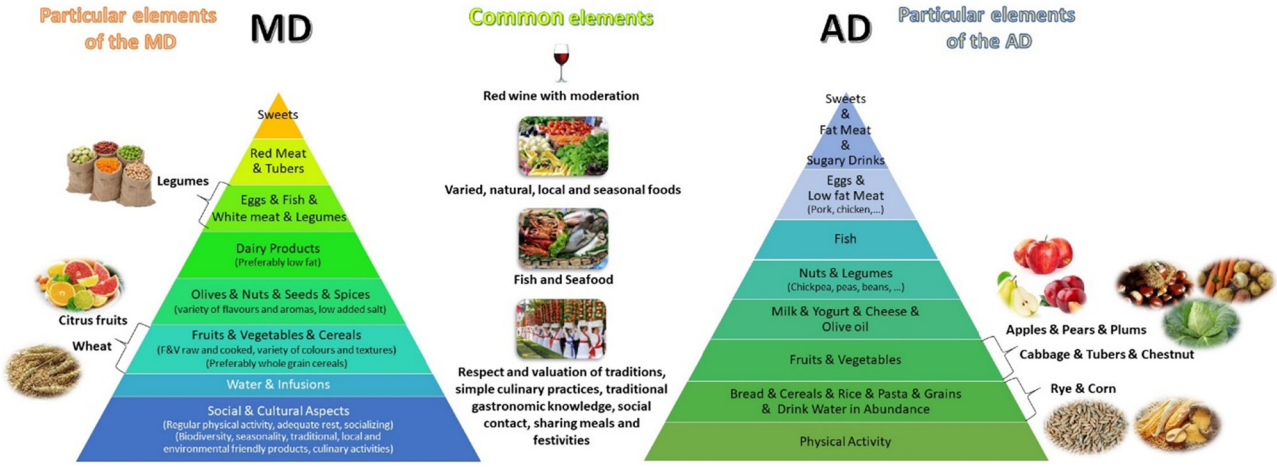

Figure 3: Comparison between MD and AD (Work by Raquel Guiné).

The MD has some elements that have been associated with a beneficial effect for heart health. The omega-3 fats found in fish are associated with reduced inflammation and improved cardiovascular health. The primary fat of the MD is olive oil, which is rich in monounsaturated fatty acids, also contributing to heart health. This association between olive oil, the MD, and cardiovascular health was object of the collective review undertaken by Huang and Sumpio [34]. The review by Sebastian et al. [35] highlighted that the MD significantly reduces major adverse cardiovascular events, like stroke or myocardial infarction. It was also established that MD reduces the risk of cardiovascular death. Similar findings have been reported in the reviews by Salas-Salvadó et al. [36] or Martínez-González and Hernández [37]. According to the review by Lorenzo et al. [33], the AD also shows benefits for the cardiovascular health, a reduced probability of myocardial infarction. This review highlights the role of the AD to decrease concentrations of inflammation markers and reduce blood total cholesterol and triglycerides, while improving insulin concentrations, resistance to insulin, and blood pressure. These factors contribute for an improved heart health.

The review by Yang et al. [38] focused on the female reproductive health. These studies included only women and focused on the effects of the MD on conditions like gestational diabetes mellitus, preterm birth, gestational hypertension, and preeclampsia. All these health conditions were found to be inversely associated with adherence to the MD, confirming the beneficial effects of MD on these pathologies. Similar findings were reported by Waugh et al. [39] in their review about MD and gestational diabetes mellitus.

The review by Yannakoulia et al. [40] assessed the association between MD and cognitive health. The study focused not only on longitudinal studies about cognitive assessments, but also focused on the Mediterranean way of living. There is evidence of the association between MD and a reduction or protective effect in cognitive decline, dementia, Alzheimer's disease, and mild cognitive impairment. The review by Siervo et al. [41] highlights that some components of the MD, such as essential fatty acids, polyphenols, and vitamins, have demonstrated the ability to reduce the oxidative stress and therefore, demonstrated a beneficial role in promoting brain health. The review by van Soest et al. [42] indicated a positive effect of MD dietary approaches on cognition and memory, preventing memory decline and risk of dementia. The review by Solch et al. [43] gathers evidence that adherence to the MD is associated with a lower risk of developing Alzheimer's or Parkinson's diseases.

Abbasi et al. [44] conducted a review about the association between the MD and multiple sclerosis. Their results showed a beneficial effect of the MD on reducing inflammation and some symptoms of the disease, such as fatigue, quality of life, attack rate, and cognitive dysfunction.

The MD has also demonstrated beneficial effects on gastrointestinal health. Regular consumption of fibre from whole grains, fruits, and vegetables promotes digestive health and helps prevent constipation. A review by Gundogdu and Nalbantoglu [45] focused on the role of the MD as modulator of the gut microbiome. Their results indicated that MD shows some primary health benefits of the gut microbiome which are mediated by the bioactive compounds, but also some secondary benefits can arise from the additional probiotic properties of the organisms in the gut.

The MD has demonstrated a protective effect for some chronic diseases like obesity or diabetes mellitus, for example. Although the diet is not focused on calorie restriction, it can contribute to weight loss due to the high fibre content of vegetables and whole grains, which help promote satiety and prevent excessive calorie consumption. A review by Dominguez et al. [46] highlights the evidence that there is an inverse association between the MD and incidence of overweight and obesity. Moreover, it also focuses on the inverse associations of the MD and some age-associated chronic diseases that are directly linked with obesity. López-Gil et al. [47] also conducted a review about the associations between MD and obesity indicators, but they attended specifically to children and adolescents. The findings reported indicate a reduction in body mass index and incidence of obesity for those adhering to the MD. Longo et al. [48] analysed studies relating the MD with type 2 diabetes mellitus. Because the MD is rich in antioxidants, dietary fibres, and polyunsaturated fatty acids, it contains elements essential to preserve health and well-being. Adherence to MD allied to physical activity constitutes an effective strategy to control blood glycaemic levels and reduce the risk of other complications in individuals with type 2 diabetes mellitus, such as cardiovascular diseases and sexual dysfunctions.

Cancer risk and its associated morbidity and mortality is considerably associated with lifestyle, diet being the principal component that strongly influences the disease onset and development. Much evidence has been collected as to the beneficial association between MD and cancer prevention or survival. Monllor-Tormos et al. [49] in their review present evidence that the MD reduces the risk for most cancer types, and the benefits to survival are at several levels, namely, recurrence, short- and long-term morbidity. The types of cancer addressed in their review include those of the gastrointestinal system (liver, pancreas, upper gastrointestinal tract including gastric cancer, colorectal cancer) and other types of cancer: breast, ovary, endometrium, prostate, lung, bladder, head, neck, thyroid,

skin, lymphoma). The review by Lu et al. [50] focuses on the effects of the MD in improving the quality of life of cancer patients, alleviating fatigue, reducing weight and fat, improving serum glucose and lipids, and enhancing the body's antioxidant capacity to fight cellular stress. The review by Lorenzo et al. [33] points out that, although there is no scientific evidence on the role of the AD in cancer, certain components of the AD are common to the MD dietary pattern, and therefore, they are associated with a decreased risk of incidence of some types of cancer.

6 Studies conducted on the Portuguese population

The methodology followed by the authors to prepare this collection of studies focusing specifically on the Portuguese population consisted in different steps. In the first step, the pertinence of the subject was analysed, given that Portugal has a particular geographical location in the Iberian Peninsula, considered, on one hand, a country of Mediterranean influences, and on the other hand, is also much influenced by the Atlantic Ocean given its long Atlantic Coast. Therefore, it would be relevant to assess the dietary habits of the Portuguese based on the influences of two established dietary patterns: the MD and the AD. After establishing the study topic, a search was conducted on the following scientific databases: Web of Science, Scopus, ScienceDirect, DOAJ, Medline, PubMed, and Institutional Repositories. Some inclusion criteria were defined, namely, the relevance for the specific topics addressed on in this review (MD, AD, dietary habits of the Portuguese), and publication date being as recent as possible. Some exclusion criteria were also defined, namely, to exclude studies about dietary habits exclusively in Mediterranean countries other than Portugal, and exclude studies in North Atlantic countries. Studies including Portugal together with other countries were also considered in this review (Figure 4).

The software VOSviewer Version 1.6.18 was used to analyse the bibliography, in order to identify the co-occurrences between keywords in the studies. This software is freeware and can be found online at: https://www.vosviewer.com/ (accessed on 26/06/2024). The program uses as input the list of bibliographic references, which are imported based on the metadata of all sources. In this work, the bibliographic sources included in the review, i.e. about studies conducted on the Portuguese population focusing on adherence to the MD and AD, were analysed for co-occurrence and links between the keywords.

The 15 bibliographic sources included in the review were analysed with the software VOSviewer, resulting in the graph presented in Figure 5. The schematic representation of the links highlights the connections between keywords in the bibliographic sources included in the review. The size of the circles and the corresponding label are directly associated with the relative frequency of

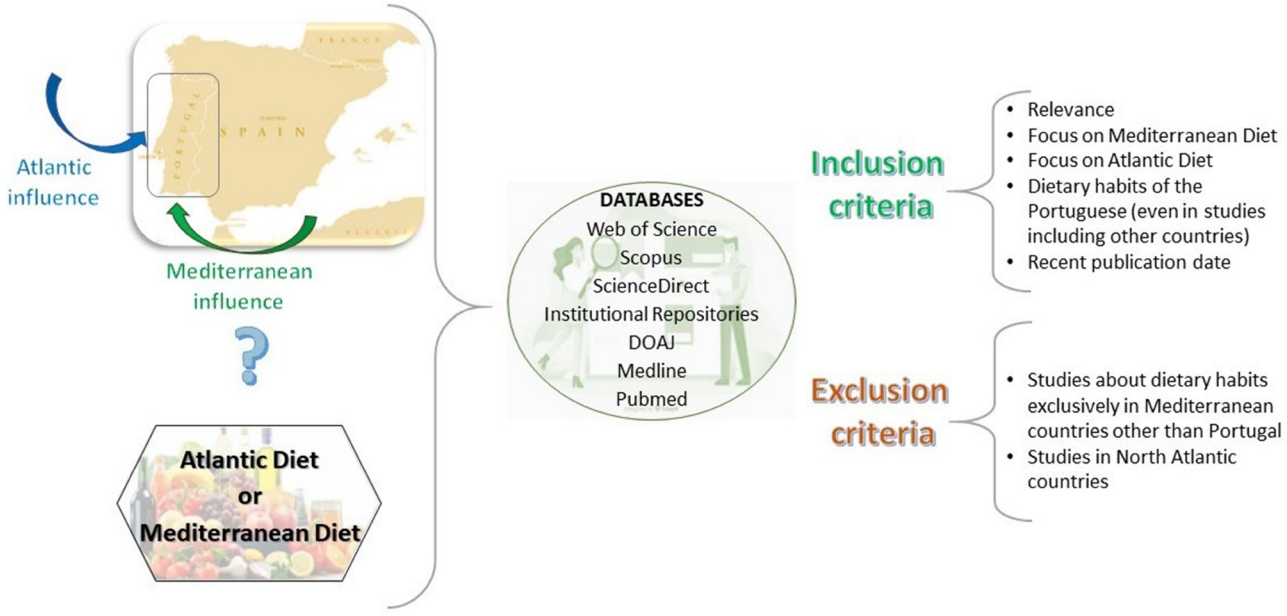

Figure 4: Flowchart of the Review Methodology (Systematic steps taken to gather and analyse literature on the MD and AD in Portugal, including topic selection, literature search, and study selection criteria (Work by Raquel Guiné).

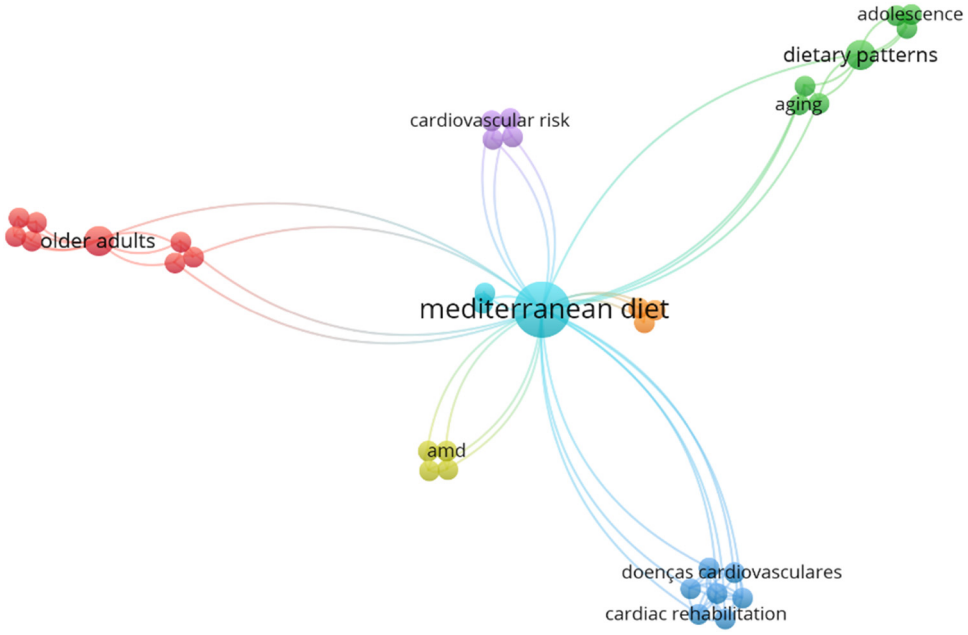

Figure 5: Analysis of co-occurrence links between keywords (Work by Raquel Guiné, using VOSviewer).

occurrence for each of the keywords considered. The proximity of the circles represents the sources in which the keywords occur jointly.

The analysis with the VOSviewer software produced a graph based on 45 keywords, of which only 36 were connected with some other keywords. The diagram in Figure 4 highlights 7 clusters and 93 links. The most frequent keywords were MD (n = 7), dietary patterns (n = 2), and older adults (n = 2).

Table 1 presents the studies found on the scientific literature about adherence to the MD and AD dietary patterns, that have been conducted on the Portuguese population. The time period of the studies goes form 2010 until 2023, with a predominance of studies in 2017 and 2018 (three studies in each year). It is also possible to observe that the great majority of the studies focused on the MD (13 studies) while only two focused on the AD.

Regarding the target groups, one focused on children, four on adolescents, one on young adults, and another on adults, while a greater number focused on older adults (five studies). Three of them focused on participants with some kind of health condition (coronary artery disease, age-related macular degeneration, HIV infection) (Table 1).

From the studies included in this review (Table 1), one of them did not confirm the role of MD in improving health, specifically did not find association between MD and bone mineral density [51], and another study did not find association between MD and bobs image [52]. Two studies reported a low adherence to MD [53,54], and one reported increased adherence to MD in HIV infected patients with comorbidities [55]. In most of the studies, positive health benefits were confirmed from adherence to MD or AD. In the case of AD, it was confirmed to reduce myocardial infarction [27] and to reduce cardiometabolic risk [31]. As for the MD, higher adherence to this dietary pattern was found associated with a reduced body fat [56], a reduced incidence of frailty in older adults [57], to a higher grey matter density in the brain [58] and a protecting effect against age-related macular degeneration [59]. However, complying with the MD dietary recommendations has been demonstrated to imply a higher food cost [60].

7 Conclusion

Both the MD and the AD are dietary patterns based on natural, local, seasonal healthy foods, prepared according to traditional simple cooking methods, thus minimizing processing and additives. They include appropriate amounts of foods rich in dietary fibre, macronutrients, vitamins and minerals, and bioactive compounds with health protective roles in the human body. Consequently, both the MD and AD

Table 1: Studies regarding adherence to MD and AD, conducted on the Portuguese population

Year	Authors/ Reference	Title	Dietary pattern	Target group	Methodology	Place	Sample size	Findings
2010	Oliveira et al. [27]	Adherence to the SEAD and occurrence of nonfatal acute myocardial infarction	AD	Adults	Population-based case-control study	Porto, Portugal	820 patients and 2,196 controls	Adherence to the SEAD reduced the probability of myocardial infarction
2011	da Rocha Leal et al. [61]	Relationship between cooking habits and skills and MD in a sample of Portuguese adolescents	MD	Adolescents	Questionnaire survey to assess self-reported cooking habits and skill; Adherence to MD evaluated using the KIDMED index	Semi-urban region in northern Portugal	390 adolescents	Improved cooking habits and skills were positively associated with adherence to MD
2014	Monjardino et al. [51]	Associations between a priori-defined dietary patterns and longitudinal changes in bone mineral density in adolescents	MD	Adolescents	Longitudinal study; MD quality index; Dietary Approaches to Stop Hypertension diet index; Oslo Health Study dietary index	Porto, Portugal	1,180 adolescents evaluated at 13 years and again at the age of 17	No significant associations were identified between adherence to MD and bone mineral density
2014	Santos et al. [62]	Parental education level is associated with clustering of metabolic risk factors in adolescents Independent of cardiorespiratory fitness, adherence to the MD, or pubertal stage	MD	Adolescents	Cross-sectional study; cardiorespiratory fitness was estimated by the 20 m shuttle-run test; dietary intake assessed by a food frequency questionnaire; The best of parental education was used as a proxy measure of socioeconomic status	Azores, Portugal	517 adolescents aged from 15 to 18 years	Lower socioeconomic status increased metabolic risk regardless of adherence to the MD
2015	Noites et al. [56]	Effects of the MD and exercise in subjects with coronary artery disease	MD	Patients with CAD[1]	Experimental study; Montreal Cognitive Assessment was used for cognitive screening; A semiquantitative food frequency questionnaire was applied to determine food intake; Polar® RS300 heart rate monitor was used during exercise	Vila Nova de Gaia, Portugal	20 patients, 10 in experimental and 10 in control groups	MD reduced carbohydrate and saturated fat intake, which causes a diminishing in fat mass
2017	Agostinis-Sobrinho et al. [31]	Muscular fitness, adherence to the SEAD and cardiometabolic risk factors in adolescents	AD	Adolescents	Cross-sectional study; adherence to SEAD was obtained using a food frequency questionnaire; Sum of the *Z*-Scores of Curl-Up and Push-Up tests was used to create a muscular fitness score; A cardiometabolic risk score was calculated from sum of *Z*-score of triglycerides, systolic blood pressure, total cholesterol/HDL ratio, HOMA-IR, and waist circumference	Azores, Portugal	467 adolescents	Muscular fitness and adherence to SEAD may reduce cardiometabolic risk

(Continued)

Table 1: *Continued*

Year	Authors/ Reference	Title	Dietary pattern	Target group	Methodology	Place	Sample size	Findings
2017	Albuquerque et al. [60]	Adherence to the MD in children: Is it associated with economic cost?	MD	Children	Community-based survey; dietary intake assessed by a 24 h recall and adherence to MD evaluated by the KIDMED index; Diet cost calculated based on food prices was expressed as Total Daily Cost and Total Daily Cost-Adjusted for Energy	Guimarães, Portugal	586 children from 6 to 12 years	Adherence to MD implies a higher diet cost
2017	Policarpo et al. [55]	Adherence to MD in HIV infected patients: Relation with nutritional status and cardiovascular risk	MD	HIV infected adults	Adherence to the MD was made by the questionnaire MedDietScore; Cardiovascular risk was estimated using the Framingham Risk Score	Lisbon, Portugal	571 patients	Patients showed a moderate adherence to the MD, but a higher adherence was associated to individuals with comorbidities.
2018	Nunes et al. [59]	Adherence to a MD and its association with age-related macular degeneration. The Coimbra Eye Study–Report 4	MD	Patients with and without AMD[2]	Case-control study	Coimbra, Portugal	1,992 patients, 768 with AMD and 1,224 without AMD	High adherence to MD and regular physical activity protect against AMD
2018	Sousa [52]	Body image and adherence to the MD in a sample of young adults	MD	Young adults	Distortion of body image was assessed by the Body Shape Questionnaire; Adherence to MD was assessed by the PREDIMED questionnaire (PREvención with DIeta MEDiterránea)	Not available	145 young adults	No association was found between body image and adherence to MD
2018	Sousa [53]	MD, a way to reduce atherosclerosis: The adherence in a Portuguese sample	MD	Participants over 55 years	Adherence to MD was assessed by the PREDIMED questionnaire; Anthropometric data were measured and BMI was calculated	Portugal	346 adults between 18 and 65 years	Low adherence to MD was observed
2019	Teixeira et al. [54]	Adherence to a Mediterranean Dietary Pattern status and associated factors among Portuguese older adults: Results from the Nutrition UP 65 cross-sectional study	MD	Participants aged 65 years and over	Cross-sectional observational study; Adherence to MD was evaluated with the Portuguese version of the Prevention with MD tool	All seven regions in Portugal	1,403 participants aged 65 years or more	Low adherence to MD was observed
2020	Mendes et al. [63]	Adherence to a Mediterranean dietary pattern and functional parameters: A cross-sectional study in an older population	MD	Participants aged 65 years and over	Cross-sectional study; Adherence to MD was assessed through the PREDIMED questionnaire	All seven regions in Portugal	1,491 participants aged 65 years or more	Non-adherence to MD was associated with handgrip strength and longer sitting time

(Continued)

Table 1: *Continued*

Year	Authors/ Reference	Title	Dietary pattern	Target group	Methodology	Place	Sample size	Findings
2022	Gängler et al. [57]	Adherence to the MD and incidence of pre-frailty and frailty in community-dwelling Adults 70+: The 3-year DO-HEALTH Study	MD	Participants aged 70 years and over	Three-year follow-up study; Adherence to MD was assessed by the Panagiotakos' MedDietScore; Frailty was assessed based on the Fried frailty phenotype	Switzerland, Austria, Germany, France, Portugal	1,811 participants without frailty at baseline	Adherence to MD over time diminished incidence of frailty
2023	Rodrigues et al. [58]	Larger dlPFC and vmPFC grey matter volumes are associated with high adherence to the MD: A cross-sectional study in older adults	MD	Participants aged 50 years and over	Prospective cohort study with individuals randomly selected from a previous larger cross-sectional study (SWITCHBOX Consortium project); Adherence to MD was made by the MD Adherence Screener	North region of Portugal	100 participants	Increased adherence to MD was associated with greater grey matter density in the brain

[1]CAD: coronary artery disease.
[2]AMD: age-related macular degeneration.

are recommended as healthy diets, associated with physical activity as fundamental elements of a healthy lifestyle promoting general well-being. From the studies included in the review, two confirmed a positive association between AD and improved health, specifically reducing myocardial infarction and cardiometabolic risk. Additionally, five studies reported health benefits from adhering to MD, particularly in reduced body fat and reduced incidence of frailty, while protecting against age-related macular degeneration and improving grey matter density in the brain.

Although the MD dietary pattern has been intensively studied for evaluation of the effects on several diseases and pathologies, leading to a great deal of information confirming the role of the MD as a healthy diet, the AD has not yet been object of many studies, and therefore, the need to focus more on studies about the AD to achieve a similar level of knowledge as that that is today available for the MD is highlighted.

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References

[1] Bacârea A, Bacârea VC, Cînpeanu C, Teodorescu C, Seni AG, Guiné RPF, et al. Demographic, anthropometric and food behavior data towards healthy eating in Romania. Foods. 2021;10:487. doi: 10.3390/foods10030487.

[2] Bartkiene E, Steibliene V, Adomaitiene V, Juodeikiene G, Cernauskas D, Lele V, et al. Factors affecting consumer food preferences: food taste and depression-based evoked emotional expressions with the use of face Reading technology. BioMed Res Int. 2019;2097415:1–10. doi: 10.1155/2019/2097415.

[3] Downs SM, Fox EL, Zivkovic A, Mavros T, Sabbahi M, Merchant EV, et al. Drivers of food choice among women living in informal settlements in Nairobi, Kenya. Appetite. 2022;168:105748. doi: 10.1016/j.appet.2021.105748.

[4] Downs SM, Ahmed S, Fanzo J, Herforth A. Food environment typology: advancing an expanded definition, framework, and methodological approach for improved characterization of wild, cultivated, and built food environments toward sustainable diets. Foods. 2020;9:532. doi: 10.3390/foods9040532.

[5] Turner C, Aggarwal A, Walls H, Herforth A, Drewnowski A, Coates J, et al. Concepts and critical perspectives for food environment research: A global framework with implications for action in low- and middle-income countries. Glob Food Secur. 2018;18:93–101. doi: 10.1016/j.gfs.2018.08.003.

[6] Fernqvist F, Spendrup S, Tellström R. Understanding food choice: A systematic review of reviews. Heliyon. 2024;10:e32492. doi: 10.1016/j.heliyon.2024.e32492.

[7] Guiné RPF, Bartkiene E, Florença SG, Djekić I, Bizjak MČ, Tarcea M, et al. Environmental issues as drivers for food choice: study from a multinational framework. Sustainability. 2021;13:2869. doi: 10.3390/su13052869.

[8] Dannenberg A, Klatt C, Weingärtner E. The effects of social norms and observability on food choice. Food Policy. 2024;125:102621. doi: 10.1016/j.foodpol.2024.102621.

[9] Cabral Ó, Galego L. "Milhos aferventados" from the Algarve (Portugal): An historical, culinary, and biochemical interdisciplinary approach on a regional dish. Int J Gastron Food Sci. 2024;35:100866. doi: 10.1016/j.ijgfs.2023.100866.

[10] Ricci M. 1000 Receitas de Bacalhau. Lisbon, Portugal: Girassol Edições; 2006.

[11] Azenha da Rocha JC. Festas cíclicas de partilha alimentar em Portugal. RIVAR (Santiago). 2023;10:215–34. doi: 10.35588/rivar.v10i28.5299.

[12] Oliveira S. Gastronomy as a primary tourist attraction of a destination. Food tourism in Mealhada, Portugal. Estud Perspect Tur. 2011;20:738–52.

[13] Oliveira S. The importance of food tourism. A case study of Mealhada, Portugal. Estud Perspect Tur. 2007;16:261–82.

[14] Henriques C, Custódio MJ. Tourism and gastronomy: The valuation of Algarve´s Gastronomic Heritage. Rev Encontros Científicos – Tour Manag Stud. 2010;6:69–81.

[15] Martins UMO, Teixeira Baptista MMR. Heritage of Portuguese culinary in Brazil as a product of cultural tourism. Estud Perspect Tur. 2011;20:404–24.

[16] Alegria SJC, Santos MIS, Furtado RMS, Correia CB, Lima AIG, Pedroso LR, et al. Assessment of the microbiological quality and safety in takeaway sushi meals in Portugal. Port J Public Health. 2022;40:69–80. doi: 10.1159/000525005.

[17] Sousa M, Amaral R, Oliveira B. Good practices that contribute to sushi quality in restaurants. Rev Nutr. 2012;15:31–3.

[18] Hanbali S, Avgerinou C. Association between adherence to the Nordic diet and frailty in older adults: A systematic review of observational studies. Maturitas. 2024;182:107923. doi: 10.1016/j.maturitas.2024.107923.

[19] Meltzer HM, Brantsæter AL, Trolle E, Eneroth H, Fogelholm M, Ydersbond TA, et al. Environmental sustainability perspectives of the Nordic diet. Nutrients. 2019;11:2248. doi: 10.3390/nu11092248.

[20] Papageorgiou M, Zinoviadour KG, Guiné RPF. Mediterranean habits and patterns of consumption; interrelation with sustainability aspects. In: Betoret N, Betoret E, editors. Resources, strategies and potentialities for food system sustainability in the Mediterranean area. vol. Chap. 8. Valencia, Spain: CEMAS/FAO; 2022. p. 132–52.

[21] Real H. Dieta Mediterrânica – um padrão de alimentação saudável. Porto, Portugal: Associação Portuguesa dos Nutricioninstas; 2014.

[22] UN. UNESCO – Mediterranean diet 2013. https://ich.unesco.org/en/RL/mediterranean-diet-00884 (accessed June 24, 2024).

[23] Hidalgo-Mora JJ, García-Vigara A, Sánchez-Sánchez ML, García-Pérez M-Á, Tarín J, Cano A. The Mediterranean diet: A historical perspective on food for health. Maturitas. 2020;132:65–9. doi: 10.1016/j.maturitas.2019.12.002.

[24] Bernardi E, Visioli F. Fostering well-being and healthy lifestyles through conviviality and commensality: Underappreciated benefits of the Mediterranean Diet. Nutr Res. 2024;126:46–57. doi: 10.1016/j.nutres.2024.03.007.

[25] Sánchez-Sánchez ML, García-Vigara A, Hidalgo-Mora JJ, García-Pérez M-Á, Tarín J, Cano A. Mediterranean diet and health: A systematic review of epidemiological studies and intervention trials. Maturitas. 2020;136:25–37. doi: 10.1016/j.maturitas.2020.03.008.

[26] García-Gómez B, Rivas-Casais A, Lorences-Touzón R, Piedrafita-Páez N, Muñoz-Ferreiro N, Vázquez-Odériz L, et al. Adherence to and knowledge about the Atlantic Diet pattern in the senior population of the Galician region (NW-Spain). J Funct Foods. 2022;91:105015. doi: 10.1016/j.jff.2022.105015.

[27] Oliveira A, Lopes C, Rodríguez-Artalejo F. Adherence to the Southern European Atlantic Diet and occurrence of nonfatal acute myocardial infarction. Am J Clin Nutr. 2010;92:211–7. doi: 10.3945/ajcn.2009.29075.

[28] Almeida MSM. Dieta Mediterrânica e Dieta Atlântica – efeitos na saúde. Porto, Portugal: Universidade Fernando Pessoa; 2017.

[29] Almeida M, Oliveira A. Mediterranean and atlantic dietary patterns – An approach to key characteristics and health effects. Acta Port Nutr. 2017;11:22–8.

[30] Sierra RT, Trabazo MRL. La dieta atlántica - el pescado y las algas: su importancia en el neurodesarrollo y la función cerebral. Santiago de Compostela, Spain: Universidad de Santiago de Compostela; 2009.

[31] Agostinis-Sobrinho C, Abreu S, Moreira C, Lopes L, García-Hermoso A, Ramírez-Vélez R, et al. Muscular fitness, adherence to the Southern European Atlantic Diet and cardiometabolic risk factors in adolescents. Nutr Metab Cardiovasc Dis. 2017;27:695–702. doi: 10.1016/j.numecd.2017.04.008.

[32] Carballo-Casla A, Stefler D, Ortolá R, Chen Y, Knuppel A, Kubinova R, et al. The Southern European Atlantic diet and all-cause and cause-specific mortality: a European multicohort study. Eur J Prev Cardiol. 2023;19:zwad370. doi: 10.1093/eurjpc/zwad370.

[33] Lorenzo PM, Izquierdo AG, Rodriguez-Carnero G, Fernández-Pombo A, Iglesias A, Carreira MC, et al. Epigenetic effects of healthy foods and lifestyle habits from the Southern European Atlantic Diet pattern: a narrative review. Adv Nutr. 2022;13:1725–47. doi: 10.1093/advances/nmac038.

[34] Huang CL, Sumpio BE. Olive oil, the mediterranean diet, and cardiovascular health. J Am Coll Surg. 2008;207:407–16. doi: 10.1016/j.jamcollsurg.2008.02.018.
[35] Sebastian SA, Padda I, Johal G. Long-term impact of mediterranean diet on cardiovascular disease prevention: A systematic review and meta-analysis of randomized controlled trials. Curr Probl Cardiol. 2024;49:102509. doi: 10.1016/j.cpcardiol.2024.102509.
[36] Salas-Salvadó J, Becerra-Tomás N, García-Gavilán JF, Bulló M, Barrubés L. Mediterranean diet and cardiovascular disease prevention: what do we know? Prog Cardiovasc Dis. 2018;61:62–7. doi: 10.1016/j.pcad.2018.04.006.
[37] Martínez-González MÁ, Hernández AH. Effect of the Mediterranean diet in cardiovascular prevention. Rev Esp Cardiol (Engl Ed). 2024;77:574–82. doi: 10.1016/j.rec.2024.01.006.
[38] Yang J, Song Y, Gaskins AJ, Li L-J, Huang Z, Eriksson JG, et al. Mediterranean diet and female reproductive health over lifespan: a systematic review and meta-analysis. Am J Obstet Gynecol. 2023;229:617–31. doi: 10.1016/j.ajog.2023.05.030.
[39] Waugh C, Pencheva N, Woolner A, Black M. Introduction of the Mediterranean diet in pregnancy and the incidence of gestational diabetes mellitus: A systematic review of randomised controlled trials and *meta*-analysis. Eur J Obstet Gynecol Reprod Biol. 2024;299:199–207. doi: 10.1016/j.ejogrb.2024.05.024.
[40] Yannakoulia M, Kontogianni M, Scarmeas N. Cognitive health and Mediterranean Diet: Just diet or lifestyle pattern? Ageing Res Rev. 2015;20:74–8. doi: 10.1016/j.arr.2014.10.003.
[41] Siervo M, Shannon OM, Llewellyn DJ, Stephan BCM, Fontana L. Mediterranean diet and cognitive function: From methodology to mechanisms of action. Free Radic Biol Med. 2021;176:105–17. doi: 10.1016/j.freeradbiomed.2021.09.018.
[42] van Soest AP, Beers S, van de Rest O, de Groot LC. The Mediterranean-dietary approaches to stop hypertension intervention for neurodegenerative delay (MIND) diet for the aging brain: a systematic review. Adv Nutr. 2024;15:100184. doi: 10.1016/j.advnut.2024.100184.
[43] Solch RJ, Aigbogun JO, Voyiadjis AG, Talkington GM, Darensbourg RM, O'Connell S, et al. Mediterranean diet adherence, gut microbiota, and Alzheimer's or Parkinson's disease risk: A systematic review. J Neurol Sci. 2022;434:120166. doi: 10.1016/j.jns.2022.120166.
[44] Abbasi H, Shakouri F, Mosaddeghi-Heris R, Gholipour-Khalili E, Jahanshahlou F, Sanaie S, et al. Mediterranean-like diets in multiple sclerosis: A systematic review. Rev Neurol. 2023;180:1021–30. doi: 10.1016/j.neurol.2023.07.017.
[45] Gundogdu A, Nalbantoglu OU. The role of the Mediterranean diet in modulating the gut microbiome: A review of current evidence. Nutrition. 2023;114:112118. doi: 10.1016/j.nut.2023.112118.
[46] Dominguez LJ, Veronese N, Di Bella G, Cusumano C, Parisi A, Tagliaferri F, et al. Mediterranean diet in the management and prevention of obesity. Exp Gerontol. 2023;174:112121. doi: 10.1016/j.exger.2023.112121.
[47] López-Gil JF, García-Hermoso A, Sotos-Prieto M, Cavero-Redondo I, Martínez-Vizcaíno V, Kales SN. Mediterranean diet-based interventions to improve anthropometric and obesity indicators in children and adolescents: a systematic review with meta-analysis of randomized controlled trials. Adv Nutr. 2023;14:858–69. doi: 10.1016/j.advnut.2023.04.011.
[48] Longo M, Scappaticcio L, Caputo M, Maiorino MI, Esposito K. Mediterranean diet in type 2 diabetes: An updated overview of pharmacological activities of cardiometabolic and reproductive outcomes. Curr Opin Pharmacol. 2021;60:27–33. doi: 10.1016/j.coph.2021.06.005.
[49] Monllor-Tormos A, García-Vigara A, Morgan O, García-Pérez M-Á, Mendoza N, Tarín JJ, et al. Mediterranean diet for cancer prevention and survivorship. Maturitas. 2023;178:107841. doi: 10.1016/j.maturitas.2023.107841.
[50] Lu S, Sun X, Zhang W, Li X, Zhou Z, Xiao R, et al. Effects of the Mediterranean Diet on metabolic indices and quality of life in cancer patients: A systematic review and meta-analysis of randomized controlled trials. J Funct Foods. 2024;114:106074. doi: 10.1016/j.jff.2024.106074.
[51] Monjardino T, Lucas R, Ramos E, Barros H. Associations between a priori-defined dietary patterns and longitudinal changes in bone mineral density in adolescents. Public Health Nutr. 2014;17:195–205. doi: 10.1017/S1368980012004879.
[52] Sousa B. Body image and adherence to the mediterranean diet in a sample of young adults. Clin Nutr. 2018;37:S141–2. doi: 10.1016/j.clnu.2018.06.1524.
[53] Sousa B. Mediterranean diet, a way to reduce atherosclerosis: The adherence in a Portuguese sample. Atherosclerosis. 2018;275:e207. doi: 10.1016/j.atherosclerosis.2018.06.644.
[54] Teixeira B, Afonso C, Sousa AS, Guerra RS, Santos A, Borges N, et al. Adherence to a Mediterranean Dietary Pattern status and associated factors among Portuguese older adults: Results from the Nutrition UP 65 cross-sectional study. Nutrition. 2019;65:91–6. doi: 10.1016/j.nut.2019.03.005.
[55] Policarpo S, Rodrigues T, Moreira AC, Valadas E. Adherence to Mediterranean diet in HIV infected patients: Relation with nutritional status and cardiovascular risk. Clin Nutr ESPEN. 2017;18:31–6. doi: 10.1016/j.clnesp.2017.01.008.
[56] Noites A, Pinto J, Freitas CP, Melo C, Albuquerque A, Teixeira M, et al. Effects of the Mediterranean diet and exercise in subjects with coronary artery disease. Rev Port Cardiol (Engl Ed). 2015;34:655–64. doi: 10.1016/j.repce.2015.09.005.
[57] Gängler S, Steiner H, Gagesch M, Guyonnet S, Orav EJ, von Eckardstein A, et al. Adherence to the mediterranean diet and incidence of pre-frailty and frailty in community-dwelling adults 70+: The 3-year DO-HEALTH study. Nutrients. 2022;14:4145. doi: 10.3390/nu14194145.
[58] Rodrigues B, Portugal-Nunes C, Magalhães R, Schmidt L, Moreira PS, Soares JM, et al. Larger dlPFC and vmPFC grey matter volumes are associated with high adherence to the Mediterranean diet: A cross-sectional study in older adults. Aging Brain. 2023;3:100064. doi: 10.1016/j.nbas.2023.100064.
[59] Nunes S, Alves D, Barreto P, Raimundo M, da Luz Cachulo M, Farinha C, et al. Adherence to a Mediterranean diet and its association with age-related macular degeneration. The Coimbra Eye Study–Report 4. Nutrition. 2018;51–52:6–12. doi: 10.1016/j.nut.2017.12.010.
[60] Albuquerque G, Moreira P, Rosário R, Araújo A, Teixeira VH, Lopes O, et al. Adherence to the Mediterranean diet in children: Is it associated with economic cost? Porto Biomed J. 2017;2:115–9. doi: 10.1016/j.pbj.2017.01.009.
[61] da Rocha Leal FM, de Oliveira BM, Pereira SS. Relationship between cooking habits and skills and Mediterranean diet in a sample of Portuguese adolescents. Perspect Public Health. 2011;131:283–7. doi: 10.1177/1757913911419909.
[62] Santos R, Moreira C, Abreu S, Lopes L, Ruiz JR, Moreira P, et al. Parental education level is associated with clustering of metabolic risk factors in adolescents independently of cardiorespiratory fitness, adherence to the mediterranean diet, or pubertal stage. Pediatr Cardiol. 2014;35:959–64. doi: 10.1007/s00246-014-0882-x.
[63] Mendes J, Afonso C, Borges N, Santos A, Moreira P, Padrão P, et al. Adherence to a Mediterranean dietary pattern and functional parameters: A cross-sectional study in an older population. J Nutr Health Aging. 2020;24:138–46. doi: 10.1007/s12603-019-1300-0.