Open Access

OBM Geriatrics

LIDSEN Publishing Inc.

Review

Review of the Nutritional Status in Older Adult Population

José Antonio Latorre [1], Cristóbal Abellán [1], Alejandro López-Moro [2], Nuria Giménez-Blasi [3], Javier Conde-Pipo [2], Miguel Mariscal-Arcas [2, 4, *]

1. Department of Food Technology, Nutrition and Food Science (Campus of Lorca), University of Murcia. Lorca (Murcia), Spain; E-Mails: joseantonio.latorre@um.es; mariscal@um.es
2. Department of Nutrition and Food Science. University of Granada. Campus of Cartuja s/n. 18071. Granada, Spain; E-Mails: alexlopez@ugr.es; javiconde@correo.ugr.es; mariscal@ugr.es
3. Department of Health Sciences. Catholic University of Avila. Avila, Spain; E-Mail: nuria.gimenez@ucavila.es
4. Instituto de Investigación Biosanitaria de Granada (ibs.GRANADA), Granada, Spain

* **Correspondence:** Miguel Mariscal-Arcas; E-Mail: mariscal@ugr.es

Academic Editor: Noelia González Gálvez

Special Issue: Older People, Health, Functionality and Physical Activity

OBM Geriatrics
2023, volume 7, issue 1
doi:10.21926/obm.geriatr.2301224

Received: November 07, 2022
Accepted: February 21, 2023
Published: February 27, 2023

Abstract

The leading causes of death in older adults involve nutritional risk factors, heart disease, cancer, stroke and diabetes. Prevalence of lifestyle diseases, older adults consider themselves in good, very good or excellent health. Older adults want to remain independent and not burden others; they believe proper nutrition and sufficient exercise will help them maintain their autonomy and independence. To describe the diet, nutrition and general health status of the older adult population in Spain and their adherence to the traditional MD. A bibliographic search was performed in the following databases: PubMed, ScienceDirect, and Google Scholar for original research articles, clinical trials, and observational studies published in the last 10 yrs. The articles were selected using filters and eligibility criteria. Many articles were found, and through applying the selection criteria, 21 articles were chosen for a full review. Older adults present a multitude of pathologies that are treated with drugs that with the help of an optimal diet would promote a better quality of life. Cognitive deterioration

leads older adults to suffer a great loss of quality of life and must be alleviated in the best way possible. Most people meet dietary needs, but high body mass indexes are obtained. MD is a reference and a technique put into practice by this part of the population that is developed in most of life and helps them to have better aging.

Keywords
Nutrition; Mediterranean diet; older adults; health requirements

1. Introduction

1.1 Demographic Data and Determinants of Poor Nutritional Health in the Spanish Older Adult Population

The increase in life expectancy and, in some countries, the low birth rate is leading to accelerated growth in the percentage of older adult people, increasing the aging of the population [1]. Individuals are reaching ages unthinkable in previous eras, and the number of octogenarians has increased significantly [2].

In the case of Spain, the number of people over 65 has doubled in less than 40 years. Current data show that the population over 65 is around 20%, with over 9 million people, of which approximately 30% are octogenarians. In this sense, and according to projections made by the INE (i.e., Spanish "Instituto Nacional de Estadística"), it is estimated that by 2050 the number of people over 65 years of age will be over 30% of the population (almost 13 million). The number of octogenarians will reach over 4 million [1].

Of all the physiological changes that occur during aging, the greatest is due to changes in the musculoskeletal system, which loses up to 15% of its fat-free mass. Compared to men in their 20s and 30s, those in their 70s and 80s have about 11 kg less muscle and 10 kg more fat. Losing 11 kg of muscle over 50 years equates to 227 g per year, so individuals may not notice this, because weight remains relatively stable [3].

Losses of fat-free mass leave older people with fewer mineral, muscle and water reserves to draw on when needed. After the age of 70, weight begins to decline. Age-associated changes in body composition are related to lower levels of physical activity, food intake and hormonal changes [4].

On the other hand, certain senses such as sight, taste, smell and hearing deteriorate and thus prevent people from enjoying the details of life in the same way [5]. Thus, visual acuity is lost about vision, colors are not easily distinguishable, vision in poorly or brightly lit places becomes difficult, spatial perception (movement and speed) is complicated and difficulties in focusing on distances occur, increasing the reaction time to visual stimuli.

Hearing acuity is also lost, with difficulty perceiving high frequencies and distinguishing background noises, confusing consonant recognition and not detecting warnings. Impairment of taste and smell also occur, affecting the choice of foods, with preferences for those with a stronger aroma and sweet taste.

In terms of general health, complications at the digestive level are common among the older population, including decreased saliva production, jaw wear and loss of teeth in the mouth,

decreased peristalsis and acid production in the esophagus and stomach, decreased absorption of nutrients in the small intestine, changes in digestive transit in the large intestine and decreased pancreatic function. At the cardiovascular level there is a decrease in vascular elasticity, with consequent hypertension, as well as a decrease in gas exchange and cough reflex at the respiratory level. In addition, there is impaired renal function and decreased number of neurons, with possible memory and motor coordination failures [3].

1.2 Food and Nutrition in Spain

The diet in Spain has changed significantly over the last 40 years, moving away in part from the traditional model of the Mediterranean Diet. However, there are still higher intakes of bread, vegetables, fruit, pulses, fish and vegetable oils than in other European countries. This is one of the conclusions included in the "White Paper on Nutrition in Spain," published by the Spanish Nutrition Foundation (FEN) in collaboration with the Spanish Agency for Food Safety and Nutrition (AESAN) [6]. According to recent studies, we consume more fatty meats, sausages and foods rich in simple sugars than recommended. On the other hand, the consumption of cereals, derivatives, vegetables and pulses has decreased, implying an unbalanced calorie profile. Furthermore, the mean salt consumption in Spain is 9.9 g/day, double the current World Health Organisation (WHO) recommendation of a maximum of 5 g per day [7]. The evolution of the pattern of food consumption in Spain is similar to that in the rest of the world's industrialized countries. Thus, from 1950 until well into the first decade of the 2000s, the mean consumption of Kcal/day has been increasing [8]. Furthermore, there is an incorrect distribution of macronutrients, with a greater contribution of proteins and lipids to total daily energy, to the detriment of carbohydrates.

The shift away from the Mediterranean dietary pattern may have health implications, mediated by losses in balance, variety, adequacy, antioxidant content, vegetable weight and cultural aspects that have traditionally been hallmarks of the Mediterranean dietary pattern. This deterioration of the traditional feeding pattern in Spain is shown in many important research studies, such as PREDIMED-Plus or ANIBES [9-11].

Cardiovascular disease is the leading cause of death and disability in Western countries, accounting for 1 in 3 deaths in the United States and 1 in 4 in Europe. In 2013, 9 of the top 25 risk factors for this potential loss of life years were related to poor dietary habits.

Cardiovascular disease development is related to several risk factors, such as high blood pressure, dyslipidaemia, type 2 diabetes, smoking and a sedentary lifestyle. The first three are closely related to the type of diet and often to excess weight. Therefore, effective nutritional interventions, smoking cessation and regular physical activity are crucial in reducing these events' incidence or recurrence. Epidemiological evidence indicates that adherence to the Mediterranean Diet is generally associated with reductions in the risk of cardiovascular disease [12].

1.3 Nutritional Risks in the Older Adult Population

Preventive nutrition services should address health promotion and disease prevention with a focus on healthy eating and physical activity to reduce the progression of chronic diseases, and maintain functionality and quality of life in the face of disability and dependency.

There are several factors related to nutritional risk in this sector of the population (advanced age, illness, polipharmacy, functional disability, social isolation, depression, etc.), which are closely related to inadequate food and nutrient intakes.

The nutritional requirements at risk for this population sector and their approach can be summarised in Table 1.

Table 1 Requirements in old age and approach.

Nutrition	Changes with ageing	Solution
Energy 1500-1600 kcal/day	Basal metabolic rate decreases with age due to changes in body composition. Energy needs decrease by approximately 3% every decade in adults.	Consumption of adequate amounts of nutrient-dense foods for caloric needs.
Proteins 0,8g/kg/day	Minimal changes with age, although research is inconclusive. Requirements vary with chronic disease, decreased absorption and synthesis.	Protein intake should not be routinely increased; excess protein may unnecessarily strain the ageing kidneys.
Carbohydrates 45-65% of total calories.		Intake of complex carbohydrates: pulses, vegetables, whole seeds, fruits, to provide fibre, essential vitamins and minerals.
Fibre: 30 g/day men, 21 g/day women	Constipation can be a serious problem for many patients.	Increase daily fibre to improve bowel movements, especially in older adults.
Lipids 20-35% of total calories	Heart disease is a common diagnosis.	Excessive intense restriction of fat in the diet alters the taste, texture and enjoyment of food; it can affect overall diet, weight and quality of life. Emphasise healthy fat intake rather than restricting it.
Vitamins and minerals	Knowledge of the requirements, absorption, use and excretion of vitamins and minerals with ageing has increased, but much remains to be known.	Intake of nutrient-dense foods in adequate amounts for caloric needs. The oxidative and inflammatory processes that affect ageing reinforce the central role of micronutrients, especially antioxidants.
Vitamin B12 2,4 mg	The risk of deficiency is increased due to low vitamin B12 intake and decreased gastric acid, which facilitates its absorption.	People aged 50 and over should eat foods fortified with the crystalline form of vitamin B12, such as fortified cereals or supplements.
Vitamin D 600-800 IU*.	The risk of deficiency increases as synthesis becomes less efficient; skin response and sun exposure decrease; the kidneys are less able to	Supplements may be necessary and are not expensive. They are indicated for almost all institutionalised older adults.

	convert vitamin D3 to the active hormonal form. Up to 30-40% of hip fracture patients are vitamin D deficient.	
Folate 400 µg	Homocysteine levels may decrease; possible risk marker for atherothrombosis, Alzheimer's disease and Parkinson's disease.	Fortification of seed products has improved folate status. When folate supplementation is given, vitamin B12 values should be monitored.
Calcium 1,200 mg	Dietary requirements may increase due to decreased absorption; only 4% of women and 10% of men aged 60 and over meet the daily recommendations from dietary sources alone.	Recommend foods with natural and fortified Ca. Supplements may be necessary. In older adults, supplements may ensure higher intake.
Potassium 4,700 mg	A diet rich in potassium can mitigate the effect of sodium on blood pressure.	Recommend meeting the recommendations for potassium from foods, especially fruits and vegetables.
Sodium 1,500 mg	Risk of hypernatremia caused by dietary excess and dehydration. Risk of hyponatraemia caused by fluid retention.	New evidence based on direct health outcomes is not consistent with the recommendation to reduce dietary sodium to 1,500 mg per day in the general population. More research is needed.
Zinc Males:11 mg Females: 8 mg	Low intake is associated with impaired immune function, anorexia, loss of taste, delayed wound healing and development of pressure ulcers.	Encourage consumption of food sources: lean meats, oysters, dairy products, beans, peanuts and other nuts, and seeds.
Water	Hydration status can be problematic. Dehydration is caused by decreased fluid intake, decreased renal function, increased losses due to increased urine output from medications (laxatives, diuretics). Symptoms: electrolyte imbalance, altered drug effect, headache, constipation, blood pressure changes, dizziness, confusion, dry mouth and nose.	Fluid intake of at least 1,500 ml/day or 1 ml per calorie consumed. Risk increases due to altered thirst sensation, fear of incontinence and dependence on others for drinks. Dehydration often goes unrecognised; it may present as falls, confusion, changes in level of consciousness, weakness or change in functional status, or fatigue.

Modified from Mahan LK et al. [4] *

In the older population, nutritional care is not limited to disease management and medical nutritional treatment. However, it has broadened to focus more on healthy lifestyle and disease prevention, where improved nutrition and increased physical activity become crucial.

More than any other age group, the older population requires health and nutrition information and is willing to change to maintain their independence and quality of life. They often need help to improve their self-care behaviors and want to know how to eat healthier, exercise safely and be motivated [4].

2. Material and Methods

A narrative literature review was conducted to determine the nutritional status and risk in the Spanish older adult population. Three databases were searched, and although the articles included in this review were selected from the search results in the PubMed and Google Scholar databases, no usable results for this research could be found among the Science Direct results, despite the large number of them.

An initial general search was conducted to give context to the research topic. The search for articles in these databases was carried out using the keywords "nutrition," "Mediterranean diet," "requirements," “health" and "Elderly," using the boolean operator "and."

Following this, more specific research objectives were set, seeking to address the current health Status and body composition of the Spanish elderly population (The keywords used were: Older Adult Health Status Spain); malnutrition figures and energy and nutrient intake profiles in the Spanish Older population (The keywords used were: Nutritional Status Older adult Spain) and food intake and adherence to the traditional Mediterranean diet pattern in the older population (The keywords used were: Nutritional Status older adult Spain); and the nutritional Status of the Spanish older population (The keywords used were: Nutritional Status older adult Spain, Nutritional Status older adult Spain).

2.1 Eligibility

The reading of the titles found in the databases was followed by a first selection based on whether the title provided sufficient information to cover the focus of the selected topic. Some main filters bounded the choice of articles and references: *Year of publication:* Articles published in the last 10 years (from 2012 to 2022), *place of research:* Articles carried out in Spain, *language of publication:* Articles in English or Spanish, *study subjects:* Older population over 65 years of age, *type of publication:* Research articles, reports and briefings, *availability:* Results were limited to only those articles that were published in full text.

2.2 Selection Criteria

Repeated or duplicate articles in the different databases were eliminated. The abstract submitted for the remaining articles were read using the following inclusion and exclusion criteria for their selection or discarding:

2.3 Inclusion Criteria

Studies dealing with the health status of the old population. Studies relating dietary intake based on the Mediterranean Diet. Studies that identify the nutrients and energy intake of our older population.

2.4 Exclusion Criteria

Reviews of the subject or articles that are not complete. Studies include patients with other degenerative pathologies, chronic diseases or age ranges under 60 years. Opinion articles, commentaries or economic studies.

3. Results

The bibliographic searches described above yielded more than 7000 articles between the two databases. The application of the eligibility and exclusion criteria reduced this number to 21 scientific papers, 7 of which served to answer more than one specific question. The research results are described below in Tables 2, 3 and 4 dedicated to the 3 research questions. Each table shows the main characteristics of the articles collected for the bibliographic review, such as author, year and country of publication, type of article, the methodology followed and the main results presented.

Table 2 Articles describing the health status and body composition of older adults in Spain.

Author (year)	Title	Country	N	Methodology	Main results
Iglesias L. (2019) [5]	**Nutritional status and factors related to malnutrition in an older adult care home**	SPAIN	113	Descriptive and cross-sectional study.	The mean BMI of the population was 25.54 kg/m^2 (SD:4.99). Cognitive impairment was present in 57.5% of the sample. Respiratory and cardiac problems also presented high frequencies with 43.4% of the sample affected.
Guzmán Díaz L. (2014) [13]	**Estudio y seguimiento nutricional en una población de ancianos de un centro geriátrico**	SPAIN	28	Cross-sectional study	The mean BMI of the population was 27.8 kg/m^2.
Arija V. (2017) [14]	**Effectiveness of a physical activity programon cardiovascular disease risk in adultprimary health-care users: the"Pas-a-Pas"community intervention trial**	SPAIN	364	Multicentre, randomised, controlled, community-based intervention	The mean BMI of the population was 29.95 kg/m^2 (SD:4.88) and the mean waist circumference was 100.31 cm (SD:11.74). Hypertension was present in 54% of the patients and dyslipidaemia in 49% and DM2 in 18% of them.
Muñoz B. (2018) [15]	**Estado nutricional y factores asociados en pacientes ancianos ambulatorios**	SPAIN	255	Cross-sectional study	The frequency of occurrence of AHT was 79.4%, of dyslipidaemia 36.4%, of DM 27.6% and of dementia 15.6%. The mean BMI of the population was between 24 and 30 kg/m^2
Arauco-Lozada T. (2020) [16]	**Impact on the risk of malnutrition and depression of a clinical trial with nutritional educational intervention in**	SPAIN	38	Randomised experimental	The mean BMI of the population was 26.8 kg/m^2 (SD:4.75). Of the subjects, 63% had AHT, 40% had dyslipidaemia and 21% had DM.

Cuervo M. (2009) [17]	**non-institutionalized elderly subjects receiving a telecare service in Terrassa (Spain) Nutritional assessment interpretation on 22007 Spanish community-dwelling elders through the Mini Nutritional Assessment test**	SPAIN	22007	Cross-sectional study	The mean BMI of the population was 28.0 kg/m^2 (SD:4.7). Obesity was present in 30% of the sample. Dementia or depression was present in 23% of the sample.
Fernández López MT. (2015) [18]	**Prevalencia de desnutrición en pacientes ancianos hospitalizados no críticos**	SPAIN	174	Cross-sectional, observational study	The mean BMI of the study population was 27.56 kg/m^2 (SD:5.04), with a frequency of overweight of 21.84%. The most frequent comorbidity was DM (35%), followed by cancer (23%) and respiratory problems (20%).
Méndez Estévez E. (2013) [19]	**¿Tienen nuestros ancianos un adecuado estado nutricional? ¿Influye su institucionalización?**	SPAIN	311	Descriptive observational study	The mean BMI of the population was 28.51 kg/m^2 (SD: 5.04). The median number of pathologies per individual was 3 (SD: 1.42) and the median number of drugs used was 4 (SD:2.44).
Machón M. (2018) [20]	**Dietary Patterns and Their Relationship with Frailtyin Functionally Independent Older Adults**	SPAIN	527	Cross-sectional study	48% of the population was obese and the mean waist circumference was 95.4 cm (SD:12.5). Seventy-seven percent of the sample believed they were in good health, although 14% showed symptoms of depression. 43% were polymedicated with more than 4 drugs.

Badía T. (2015) [21]	**Multifactorial assessment and targeted intervention in nutritional status among the older adults: a randomized controlled trial: the Octabaix study**	SPAIN	328	Randomised Clinical Trial	The frequency of hypertension was 75.9%, dyslipidaemia 51.2%, cardiovascular disease around 12% and DM 17%.
Machón M. (2019) [22]	**Self-perceived health in functionally independent older people: associated factors**	SPAIN	634	Cross-sectional study	29% had more than three chronic diseases and 33% were taking more than three drugs.

Table 3 Energy and nutrient intake and undernutrition in the older adult population in Spain.

Author (year)	Title	Country	N	Methodology	Main results
Ortega-Anta RM (2014) [23]	**Adequacy of vitamin K intake in a representative sample of Spanish adults; dietary factors**	SPAIN	1068	Cross-sectional study	The mean energy intake was 2536 Kcal/day.
Martínez-Tomé MJ (2011) [24]	**Food habits andnutritional status of eldery people living in a Spanish Mediterranean city.**	SPAIN	200	Descriptive cross-sectional study	The mean energy intake was between 2000-2400 Kcal/day. The mean % of protein intake ranged between 21 and 23.5%. Fat and CH intake ranged between 37 and 41% of intake respectively. Fiber intake was between 25 and 33 g/day. Calcium intake was between 537 and 1100 mg/day.
Martini D. (2020) [25]	**Estimated Intakes of Nutrients and Polyphenols in Participants Completing the MaPLE Randomised Controlled Trial and**	SPAIN	51	Randomised controlled clinical trial	Intakes mean 1518 kcal, 50% carbohydrates (20% simple carbohydrates), 17% protein and 32%

	Its Relevance for the Future Development of Dietary Guidelines for the Older Subjects				fat. The amount of fibre was around 11.2 g and calcium 894 mg.
Schröeder H. (2011) [26]	**A Short Screener Is Valid for Assessing Mediterranean Diet Adherence among Older Spanish Men and Women**	SPAIN	7146	Multicentre, parallel-group, randomised, controlled, multicentre clinical trial.	Intake of 43% carbohydrates, 16% protein, 38% fat, 10.8 g/day of fibre.
Moller G. (2018) [27]	**Higher Protein Intake Is Not Associated withDecreased Kidney Function in Pre-Diabetic OlderAdults Following a One-YearIntervention—A Preview Sub-Study**	EU (SPAIN)	310	Multicentre randomised controlled trial	Mean energy intake was 2261 Kcal/day (SD:518) and mean protein intake was 90.6 g/day (SD:22.9).
Guzmán Díaz L. (2014) [13]	**Nutritional study and follow-up in a population of older adults in a geriatric centre.**	SPAIN	28	Cross-sectional study	The mean energy intake of the population was 2470 Kcal/day. Protein intake was 89.77 g/day. The mean fibre intake was 24.14 g/day and calcium intake was 1040 mg/day.
Iglesias L. (2018) [5]	**Estado nutricional y factores relacionados con la desnutrición en una residencia de ancianos**	SPAIN	113	Descriptive and cross-sectional study	22% of the study population had some form of malnutrition, 8% had protein malnutrition and 2% had mixed malnutrition.
Cuervo M. (2009) [17]	**Nutritional assessment interpretation on 22007 Spanishcommunity-dwelling**	SPAIN	22007	Cross-sectional study	Malnutrition was present in 4.3% of the study population and a further 25.4% were at risk.

	elders through the Mini NutritionalAssessment test				
Fernández López MT. (2015) [22]	**Prevalencia de desnutrición en pacientes ancianos hospitalizados no críticos**	SPAIN	174	Cross-sectional, observational study	The risk of undernutrition in the study population was 29%.
Méndez Estévez E. (2013) [19]	**¿Tienen nuestros ancianos un adecuado estado nutricional? ¿Influye su institucionalización?**	SPAIN	311	Descriptive observational study	No cases of malnutrition were found, but 20.3% of patients had risk values.
Govindaraju T. (2018) [28]	**Dietary Patterns and Their Relationship with Frailtyin Functionally Independent Older Adults**	SPAIN	527	Cross-sectional study	The proportion of individuals at risk of malnutrition was very low (3.3%). There were no malnourished individuals in the sample
Machón Mónica (2019) [18]	**Self-perceived health in functionally independent older people: associated factors**	SPAIN	634	Cross-sectional study	5.5% had a poor nutritional pattern.

Table 4 Food intake and adherence to the Mediterranean diet.

Author (year)	Title	Country	N	Methodology	Main results
Govindajaru T. (2018) [28]	Dietary Patterns and Their Relationship with Frailtyin Functionally Independent Older Adults	SPAIN	527	Cross-sectional study	53% of the population met the recommendation for fruit, 11% for vegetables, 79% for olive oil, 73% for cereals, 88% for fish, white meat, eggs, nuts and legumes. 81% complied with the recommendation for red meat intake. The mean frequency of vegetable consumption was 1.25 servings/day. Fruit consumption was 2.61 servings/day. Dairy products consumption was 2.42 portions/day. Olive oil consumption was 2.51 portions/day.

Schröeder H. (2011) [26]	A Short Screener Is Valid for Assessing Mediterranean Diet Adherence among Older Spanish Men and Women	SPAIN	7146	Multicentre, parallel-group, randomised, controlled, multicentre clinical trial.	The % of the population meeting the consumption recommendations were: 67% for vegetables, 33% for fruits, 63% for olive oil, 69% for protein foods, 24.1% for pulses.
Hernandez-Galiot A. (2015) [29]	**Calidad de la dieta de la población española mayor de 80 años no institucionalizada**	SPAIN	159	Longitudinal Study	The % of the population meeting the consumption recommendations were: 86% for cereals, 32% for vegetables, 94% for fruits, 95% for olive oil, 55% for protein foods, 74% for pulses, 89% for dairy.
Zaragoza-Martí A. (2015) [30]	Adherence to the Mediterranean diet and its relationship to nutritional status in older adults	SPAIN	60	Descriptive and cross-sectional study	Low compliance with recommendations for consumption of whole grains (6.7%), fruit (15%), and nuts (30%). high consumption of olive oil (98.3%), pulses (86.7%) and eggs (88.3%). 51.7% adherence to the Mediterranean Diet.
Arija V. (2017) [14]	Effectiveness of a physical activity programon cardiovascular disease risk in adultprimary health-care users: the“Pas-a-Pas”community intervention trial	SPAIN	364	Multicentre, randomised, controlled, community-based intervention	The population consumed the equivalent of 2 servings of dairy products per day, 2 servings of protein foods, 2.5 servings of farinaceous foods, 1.5 servings of fruits and vegetables.
Jimenez-Redondo S. (2016) [31]	**Consumo de alimentos y riesgo de malnutrición en personas mu mayores (>80 años) de vida independiente**	SPAIN	98	Cross-sectional study	There was a correct intake of >3 servings of dairy, >3 servings of fruit, <69 g/day of oil, on the contrary the daily servings of cereals (2/6), vegetables (1.5/4) and protein foods (1.5/3) were not met.
Galilea-Zabalza I. (2018) [32]	**Mediterranean diet and quality of life: Baseline cross-section alanalysis of the PREDIMED-PLUStrial**	SPAIN	6403	Cross-sectional study	24% of the population had a low adherence to the Mediterranean Diet, 23% a high adherence, the rest a medium adherence.

We can see as results of the different BMIs in each article, with overweight and obesity, as well as the reflection of different pathologies referred to the study population, from Diabetes Mellitus 2, dyslipidemia, chronic diseases, depression, heart problems, respiratory diseases and the consumption of drugs (Table 2).

We observed many cases of malnutrition, as well as inadequate nutrient intakes, where dietary recommendations are not met in terms of the percentages of macronutrients, micronutrients and recommended daily portions in the research population (Table 3).

4. Discussion

This research work has been developed to establish the nutritional status of older adults in the Spanish population. In order to answer this question, aspects of special relevance for the determination of this nutritional status were addressed, such as the general state of health of the older adults, their body composition and of course their intakes, reflected in the form of compliance or non-compliance with the recommendations both in terms of energy and nutrients, and in the general pattern of food intake and its relationship with the diet that is traditionally followed by them, the Mediterranean Diet.

4.1 Body Composition and Health Status in the Older Adult Population

Maintaining an adequate nutritional status is a preventive element against complications and diseases. In older adults, nutrition has different conditioning factors due to decreased physical activity, decreased thirst, loss of teeth and alterations in taste and smell, which result from aging. In addition, other non-physiological conditions influence the maintenance of appropriate nutritional status, such as functional limitations that impede food preparation, social circumstances, etc. The association of chronic diseases, which increases with age, further increases the nutritional deterioration of individuals. In addition, socio-economic hardship in certain vulnerable groups can exacerbate undernutrition in older adults with illness [13].

Among the selected scientific papers, BMI values ranging from 4 to 33 kg/m^2 represent levels of overweight and obesity in the older adult population [5, 13-20]. These values are much higher than those defined as optimal by nutritional guidelines.

A high percentage of subjects participating in the different studies present cognitive deterioration, an aspect that usually leads to the onset of different pathologies such as arterial hypertension, dyslipidemia, diabetes mellitus, cancer, dementia or other pathologies that originate or develop at this stage of age, being risk factors that increase and condition the state of health [5, 14-22].

The geriatric assessment uses different scales to detect frail older adults, some of which address the nutritional status assessment.

4.2 Energy Intake, Nutrient Intake and Malnutrition

Early diagnosis of malnutrition in primary care is important to prevent its progression through effective interventions. Thus, it is known that a good nutritional status could reduce the number of hospitalizations, increase longevity and improve the quality of life of this population [33].

About energy intake, the study of the different studies present in the results reveals that only in one of the articles did the participating population comply with the dietary recommendations established for the older adult population. In the rest, diets over 2000 kcal/day are highlighted, which implies high energy intakes, an aspect that can lead to episodes of obesity in certain cases [5, 13, 23-27].

In terms of nutrient intake, the recommendations of the SEGG (Spanish Society of Gerontological Geriatrics) recommend that the energy intake of the main macronutrients should be distributed as follows: 60% carbohydrates, less than 30% fat, 15% protein, adequate fiber content (20-35 g), vitamins, minerals (calcium 1,200 mg) and fluid intake around 30-35 mL/kg/day [33]. Studies can reflect high amounts of fat, reaching 36-37% and in other cases stable amounts of protein of around 13-18% [13, 24-27]. As has been proven throughout the different bibliographic searches, the MNA is the most widely used instrument for assessing nutritional status as it is a validated tool, simple and quick to use in institutionalised patients.

Among the studies reviewed to estimate the occurrence of malnutrition, this appeared in approximately 3-4% of the subjects and it is noteworthy that in a high percentage we found the risk of malnutrition [5, 17-22]. Illness-related malnutrition impacts quality of life, contributing to frailty and dependence and leading to vulnerability in older adults. It reduces autonomy, limiting or making tasks such as shopping, carrying bags, preparing food or even eating impossible.

4.3 Food Intake and Adherence to the Mediterranean Diet

About the eating habits of older adults, the data provided by the "Food and Nutrition Guide for our Adults" shows that the diet should include a wide variety of fruit, vegetables and pulses, due to their high fiber, vitamin (antioxidants) and mineral content.

Fish consumption should be higher than meat consumption and 3 to 4 eggs per week. Dairy consumption should reach 3 servings per day, following the food pyramid recommendations that highlight the Mediterranean Diet [33].

With the results obtained, we can highlight a variety of population that complies and does not comply with the dietary recommendations, obtaining a greater or lesser adherence to the Mediterranean Diet. 53% of the population met the recommendation for fruit consumption, 11% for vegetables, 79% for olive oil, 73% for cereals, 88% for fish, white meat, eggs, nuts and legumes. 81% complied with the recommendation for red meat and intake [28].

In another article, the percentages of the population that complied with the consumption recommendations were: 67% for vegetables, 33% for fruit, 63% for olive oil, 69% for protein foods, and 24.1% for pulses [26].

In general, there are better results for the percentage of subjects complying with protein intake recommendations and worse results for plant-based foods [14, 26, 28, 31]. However, one study reported interesting results with high frequencies of compliance for cereals, fruits, legumes, dairy products and olive oil (>70%) and lower frequencies for vegetables (30%) and protein foods (55%) [29].

In contrast, in another article [30] there was low compliance with the recommendations in the consumption of whole grains (6.7%), fruit (15%), and nuts (30%). There was high consumption of olive oil (98.3%), legumes (86.7%) and eggs (88.3%), but analyzing the total results, adherence to the Mediterranean Diet was 51.7% of the sample [31]. It is worth noting that 76% of the population

of the different articles we have analyzed, as I have shown, comply with the objectives set for a healthy state of health and daily adherence to a Mediterranean Diet [32]. 24% of subjects do not have a healthy lifestyle, which can be associated with poor education in habits or poor personal nutrition.

4.4 Clinical and Practical Implications

In aging adults, nutritional care is not limited to disease management and medical nutritional treatment, but has broadened to focus more on healthy lifestyle and disease prevention.

Without an increased emphasis on improving diets and eating habits, it is not possible to achieve a better quality of life as we age, thus leaving a huge field where nutritionists and other healthcare colleagues have a great job to do to make the lives of our older adult population longer and healthier.

Limitations of the work and suggestions for future research. The main obstacles encountered in the development of the current study were the scarcity of articles that meet our specific objectives in the Spanish population. Much information was found about this pathologies and research projects in different fields. However, developing them about nutrition and original food in our country is essential.

Food is a constant action developed by mankind, it has been evolving and with it, always has the door open to new research to develop new methods or other techniques to learn how to help the older adult population to have a better nutritional status and improve the day to day to contribute to the pathologies that are original in this stage of life.

5. Conclusions

The older adult population presents a multitude of pathologies that are treated with drugs. In addition to these drugs, dietary optimization would promote a better quality of life. Most older adults adhere to the traditional dietary patterns of the Spanish population, resulting in a reasonably good state of health. There is a small percentage of the older adult population in a state of malnutrition but a large percentage at risk, indicating that nutritionists still have much work to do with this sector. The Mediterranean Diet is a benchmark in dietary patterns whose adherence by this part of the population leads to better aging. Cognitive deterioration means that older adults suffer a great loss of quality of life and must be alleviated in an interdisciplinary way, with the essential participation of nutritional advice. The body mass index is often high, many people have a diet very high in calories and added to the incompatibility of the development of activity can result in the appearance of obesity in the older adult population. Intake of fiber, calcium, vitamin D and protein in the correct amounts is essential to keep the older patient in the best condition.

Acknowledgments

This paper will be part of Alejandro Lopez-Moro's doctoral thesis. Being completed as part of the “Nutrition and Food Sciences Program” at the University of Granada. Spain. Authors would like to thank the Poncemar Foundation of Lorca Campus (Lorca, Murcia, Spain) for their support.

Author Contributions

The study was designed by JAL, NG-B and MM-A; data were collected and analysed by CA, JC-P and AL-M; data interpretation and manuscript preparation were undertaken by CA, JA-L, AL-M, NG-B, JC-P and MM-A.

Funding

This study was funded by FEDER-ISCIII PI14/01040 by the Counselling of Economic Transformation, Industry, Knowledge and Universities-Junta de Andalucía (P18-RT-4247) and by The High Council for Sports (CSD), Spanish Ministry of Culture and Sport (RED RDFD "Functional Sports Dynamometry" Ref. 06/UPB/22). This research was supported by an FPU grant from the Spanish Ministry of Universities to Alejandro Lopez-Moro (FPU20/00210).

Competing Interests

All authors reviewed and approved the manuscript. None of the authors had a conflict of interest.

References

1. INE. INE base/Demografía y población/Cifras de población y Censos demográficos/Cifras de población. Últimos datos [Internet]. España: INE; 2022 [cited date 2022 May 28]. Available from: https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176951&menu=ultiDatos&idp=1254735572981.
2. Imserso. Instituto de mayores y servicios sociales. Libro Blanco del envejecimiento activo. Madrid, España: IMSERSO.; 2011. Available from: https://imserso.es/documents/20123/102884/8088_8089libroblancoenv.pdf/358004b5-399a-236b-bf30-bb88e8946059.
3. Sede. IV Congreso internacional de investigación en salud y envejecimiento & ii congreso internacional de investigación en salud [Internet]. Murcia: Sede; 2017 [cited date 2022 May 28]. Available from: https://formacionasunivep.com/IVciise/sede.
4. Mahan LK, Raymond JL. Krause dietoterapia 14.ª edición. Barcelona, España: Elsevier Inc.; 2017.
5. Iglesias L, Bermejo JC, Vivas Á, León R, Villacieros M. Estado nutricional y factores relacionados con la desnutrición en una residencia de ancianos [Internet]. 2020 [cited date 2022 May 24]. Available from: https://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1134-928X2020000200004.
6. AESAN. Agencia Española de seguridad alimentaria y nutrición [Internet]. AESAN. [cited date 2022 May 28]. Available from: https://www.aesan.gob.es/AECOSAN/web/home/aecosan_inicio.htm.
7. Fundación Española de la Nutrición (FEN), Ministerio de Sanidad Servicios Sociales e Igualdad. Libro Blanco de la Nutrición en España. Madrid, España: FEN.; 2013.
8. Trescastro-López EM, Galiana-Sánchez ME, Bernabeu-Mestre J. Transición epidemiológica-nutricional y cambios demográficos en la España contemporánea [Internet]. España; 2016 [cited date 2022 May 28]. Available from: https://www.funcas.es/articulos/transicion-epidemiologica-nutricional-y-cambios-demograficos-en-la-espana-contemporanea.

9. Sayón-Orea C, Razquin C, Bulló M, Corella D, Fitó M, Romaguera D, et al. Effect of a nutritional and behavioral intervention on energy-reduced Mediterranean diet adherence among patients with metabolic syndrome: Interim analysis of the PREDIMED-Plus randomized clinical trial. JAMA. 2019; 322: 1486-1499.
10. Partearroyo T, Samaniego-Vaesken MD, Ruiz E, Aranceta-Bartrina J, Gil Á, González-Gross M, et al. Current food consumption amongst the Spanish ANIBES study population. Nutrients. 2019; 11: 2663.
11. Varela-Moreiras G, Ávila JM, Cuadrado C, del Pozo S, Ruiz E, Moreiras O. Evaluation of food consumption and dietary patterns in Spain by the food consumption survey: Updated information. Eur J Clin Nutr. 2010; 64: S37-S43.
12. Li J, Guasch-Ferré M, Chung W, Ruiz-Canela M, Toledo E, Corella D, et al. The Mediterranean diet, plasma metabolome, and cardiovascular disease risk. Eur Heart J. 2020; 41: 2645-2656.
13. Díaz LG, de la Serrana HL, López MJ. Estudio y seguimiento nutricional en una población de ancianos de un centro geriátrico. Eur J Investig Health Psychol Educ. 2014; 4: 89-99.
14. Arija V, Villalobos F, Pedret R, Vinuesa A, Timón M, Basora T, et al. Effectiveness of a physical activity program on cardiovascular disease risk in adult primary health-care users: The "Pas-a-Pas" community intervention trial. BMC Public Health. 2017; 17: 576.
15. Díaz BM, de la Iglesia JM, Recio GM, Taberné CA, Sánchez JR, Blanco MC, et al. Estado nutricional y factores asociados en pacientes ancianos ambulatorios. Nutritional status and associated factors in ambulatory elderly patients. Aten Primaria. 2020; 52: 240-249.
16. Arauco Lozada T, Garrido Carrasco P, Farran Codina A. Impacto sobre el riesgo de malnutrición y depresión en un ensayo clínico con intervención educativa nutricional en adultos mayores no institucionalizados, receptores de un servicio de teleasistencia en la ciudad de Tarrasa (España). Impact on the risk of malnutrition and depression of a clinical trial with nutritional educational intervention in non-institutionalized elderly subjects receiving a telecare service in Terrassa (Spain). Nutr Hosp. 2021; 38: 260-266.
17. Cuervo M, García A, Ansorena D, Sánchez-Villegas A, Martínez-González M, Astiasarán I, et al. Nutritional assessment interpretation on 22,007 Spanish community-dwelling elders through the mini nutritional assessment test. Public Health Nutr. 2009; 12: 82-90.
18. Fernández López MT, Fidalgo Baamil O, López Doldán C, Bardasco Alonso ML, de Sas Prada MT, Lagoa Labrador F, et al. Prevalencia de desnutrición en pacientes ancianos hospitalizados no críticos. Prevalence of malnutrition in not critically ill older inpatients. Nutr Hosp. 2015; 31: 2676-2684.
19. Méndez Estévez E, Romero Pita J, Fernández Domínguez MJ, Troitiño Álvarez P, García Dopazo S, Jardón Blanco M, et al. ¿Tienen nuestros ancianos un adecuado estado nutricional? ¿Influye su institucionalización? Do our elderly have an adequate nutritional status? Nutr Hosp. 2013; 28: 903-913.
20. Machón M, Mateo-Abad M, Vrotsou K, Zupiria X, Güell C, Rico L, et al. Dietary patterns and their relationship with frailty in functionally independent older adults. Nutrients. 2018; 10: 406.
21. Badia T, Formiga F, Ferrer A, Sanz H, Hurtos L, Pujol R. Multifactorial assessment and targeted intervention in nutritional status among the older adults: A randomized controlled trial: The Octabaix study. BMC Geriatr. 2015; 15: 45.
22. Machón M, Vergara I, Dorronsoro M, Vrotsou K, Larrañaga I. Self-perceived health in functionally independent older people: Associated factors. BMC Geriatr. 2016; 16: 66.

23. Ortega Anta RM, González-Rodríguez LG, Lombán BN, López-Sobaler AM. Adecuación de la ingesta de vitamina K en una muestra representativa de adultos españoles: Condicionantes dietéticos. Nutr Hosp. 2014; 29: 187-195.
24. Tomé MM, Rodríguez A, Jiménez AM, Mariscal M, Murcia MA, García-Diz L. Food habits and nutritional status of elderly people living in a Spanish Mediterranean city. Nutr Hosp. 2011; 26: 1175-1182.
25. Martini D, Bernardi S, Del Bo' C, Hidalgo Liberona N, Zamora-Ros R, Tucci M, et al. Estimated intakes of nutrients and polyphenols in participants completing the MaPLE randomised controlled trial and its relevance for the future development of dietary guidelines for the older subjects. Nutrients. 2020; 12: 2458.
26. Schröder H, Fitó M, Estruch R, Martínez-González MA, Corella D, Salas-Salvadó J, et al. A short screener is valid for assessing Mediterranean diet adherence among older Spanish men and women. J Nutr. 2011; 141: 1140-1145.
27. Møller G, Rikardt Andersen J, Ritz C, Silvestre MP, Navas-Carretero S, Jalo E, et al. Higher protein intake is not associated with decreased kidney function in pre-diabetic older adults following a one-year intervention-a preview sub-study. Nutrients. 2018; 10: 54.
28. Govindaraju T, Sahle BW, McCaffrey TA, McNeil JJ, Owen AJ. Dietary patterns and quality of life in older adults: A systematic review. Nutrients. 2018; 10: 971.
29. Hernández Galiot A, Goñi Cambrodón I. Calidad de la dieta de la población española mayor de 80 años no institucionalizada. Quality of the diet of the Spanish population over 80 years non-institutionalized. Nutr Hosp. 2015; 31: 2571-2577.
30. Zaragoza Martí A, Ferrer Cascales R, Cabañero Martínez MJ, Hurtado Sánchez JA, Laguna Pérez A. Adherencia a la dieta mediterránea y su relación con el estado nutricional en personas mayores. Adherence to the Mediterranean diet and its relation to nutritional status in older people. Nutr Hosp. 2015; 31: 1667-1674.
31. Jiménez-Redondo S, de Miguel BB, Gómez-Pavón J, Vives CC. Food consumption and risk of malnutrition in community-dwelling very old Spanish adults (≥80 years). Nutr Hosp. 2016; 33: 572-579.
32. Galilea-Zabalza I, Buil-Cosiales P, Salas-Salvadó J, Toledo E, Ortega-Azorín C, Díez-Espino J, et al. Mediterranean diet and quality of life: Baseline cross-sectional analysis of the PREDIMED-Plus trial. PLoS One. 2018; 13: e0198974.
33. Gregorio PG, Cordero PR, Hernández JA, Díaz AC, Busto FG, Alcocer MILI, et al. Alimentación y nutrición saludable en los mayores. Sociedad Española de Geriatría y Gerontología. International marketing & communication S.A; 2012.