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Nutrition in Aging: Dietary Strategies to Promote Longevity and Sarcopenia Prevention

Nutrition in Aging: Dietary Strategies for Promoting Longevity and Preventing Sarcopenia

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Summary

Population aging is a global phenomenon that requires interdisciplinary approaches, especially in the field of nutrition, to ensure quality of life and functionality. Sarcopenia, characterized by the progressive loss of skeletal muscle mass and strength, is one of the main geriatric syndromes associated with malnutrition, sedentary lifestyle, and chronic inflammation. This article proposes a review of the main dietary strategies based on scientific evidence to prevent sarcopenia and promote healthy longevity in older adults. The importance of adequate consumption of proteins, vitamin D, antioxidants, and bioactive compounds is considered, in addition to the synergy between diet and exercise. The findings reinforce the need for specific and individualized nutritional protocols in the care of the elderly.

Keywords

Aging; Sarcopenia; Longevity; Nutritional strategies; Elderly health.

Abstract

Population aging is a global phenomenon that requires interdisciplinary approaches, particularly in the field of nutrition, to ensure quality of life and functionality. Sarcopenia, characterized by the progressive loss of skeletal muscle mass and strength, is one of the main geriatric syndromes associated with malnutrition, sedentary behavior, and chronic inflammation. This article proposes a review of the main evidence-based dietary strategies to prevent sarcopenia and promote healthy longevity in elderly adults. The importance of adequate intake of protein, vitamin D, antioxidants, and bioactive compounds is considered, as well as the synergy between nutrition and physical activity. The findings reinforce the need for specific and individualized nutritional protocols in elderly care.

Keywords

Aging; Sarcopenia; longevity; nutritional strategies; Elderly health.

1. Introduction

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Human aging is a biological, social, and physiological process characterized by progressive changes that directly impact quality of life. In Brazil, according to the Brazilian Institute of Geography and Statistics (IBGE, 2019), the population aged 60 or over represented 14.7% of the total population, with significant growth expected in the coming decades. This demographic transition phenomenon poses significant challenges for public health, especially with regard to maintaining functionality, preventing chronic diseases, and promoting healthy aging.

Among the various geriatric syndromes, sarcopenia stands out, defined as the progressive and generalized loss of muscle mass and strength, leading to decreased functional capacity and increased risk of falls, fractures and dependence (Cruz-Jentoft et al., 2019). Sarcopenia is multifactorial, involving hormonal changes, chronic inflammation, sedentary lifestyle and mainly nutritional factors, which justifies the growing research on dietary strategies as a form of prevention and intervention.

The role of nutrition in aging goes beyond providing calories and macronutrients. Diet quality, micronutrient bioavailability and consumption of bioactive compounds have been shown to be essential for preserving lean mass, reducing inflammation and contributing to the maintenance of autonomy. Studies indicate that adequate nutritional interventions, associated with physical activity, significantly delay the sarcopenic process (Beaudart et al., 2017).

Thus, this article aims to review and discuss the main dietary strategies based on scientific evidence that promote longevity and prevention of sarcopenia, contributing to active aging. In addition, it seeks to highlight the importance of interdisciplinary approaches and individualized protocols that integrate nutrition, physical activity and clinical monitoring in the care of the elderly population.

2. Pathophysiology of Sarcopenia in the Aging Process

Sarcopenia is a clinical condition recognized by the International Classification of Diseases (ICD-10, code M62.84) and its pathophysiological basis is the imbalance between muscle protein synthesis and degradation. With aging, there is a reduction in the rate of protein synthesis stimulated by nutrients and exercise, which compromises the maintenance of muscle mass. In addition, there are significant hormonal changes, such as a drop in testosterone, growth hormone (GH) and insulin levels, which directly affect muscle anabolism (Volpi et al., 2013).

Another relevant factor is the increase in low-grade chronic inflammation, a common characteristic of aging, known as "inflammaging". This inflammatory state is associated with the exacerbated production of inflammatory cytokines such as TNF-ÿ, IL-6 and CRP, which promote protein degradation and inhibit anabolic pathways (Ferrucci et al., 2005). Oxidative stress, also present, aggravates muscle loss and contributes to mitochondrial dysfunction.

From a functional point of view, sarcopenia compromises simple daily activities such as walking, climbing stairs and getting up from a chair. Studies indicate that its presence is

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strongly associated with a higher incidence of hospitalizations, clinical complications and mortality in the elderly (Landi et al., 2013). The progression of sarcopenia can culminate in the frailty syndrome, characterized by weight loss, fatigue, motor slowness and low physical activity.

Early detection of sarcopenia is essential and can be performed through handgrip strength tests, body composition analysis by bioelectrical impedance or DEXA, in addition to the application of functional scales such as SARC-F. Once diagnosed, nutritional intervention becomes one of the fundamental pillars for the effective management and reversal of the condition.

3. Nutritional Requirements of the Elderly

As we age, physiological changes occur that directly impact the nutritional needs of older adults. Decreased basal metabolic rate, reduced lean mass, and changes in body composition require careful dietary planning. In addition, factors such as reduced appetite, changes in chewing and swallowing, use of multiple medications, and sensory changes (taste and smell) can compromise adequate nutrient intake (Morley et al., 2010).

Among macronutrients, the need for greater protein consumption stands out in relation to young adults. Studies recommend an intake of between 1.0 and 1.2 g/kg/day of high-quality proteins to maintain muscle mass and prevent sarcopenia (Bauer et al., 2013). Protein sources with high biological value, such as eggs, dairy products, lean meats and legumes, should be prioritized. The homogeneous distribution of protein throughout the day has also shown positive effects on protein synthesis.

Regarding micronutrients, the importance of vitamin D stands out, as a deficiency is associated with loss of muscle strength and a higher risk of falls and fractures. In addition, B vitamins, such as B12 and folic acid, play an essential role in maintaining
cognitive and hematologic function. Minerals such as calcium, magnesium, and zinc are also relevant for bone and muscle health (Wolfe, 2012).

Hydration is important because the perception of thirst decreases with age, increasing the risk of dehydration, constipation and urinary infections. Encouraging regular consumption of water and clear liquids throughout the day is essential, especially for institutionalized elderly people or those with limited mobility. Regular nutritional monitoring allows adjustments to be made according to clinical conditions, medication use and laboratory tests.

Therefore, understanding the specific nutritional demands of aging is a fundamental step in planning effective prevention and care strategies. Individualizing recommendations, considering physiological and social aspects, is essential to ensure safe and effective nutritional intervention in the elderly.

4. Dietary Strategies for Preventing Sarcopenia

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Preventing sarcopenia through diet requires a multifactorial approach that considers both the quality and quantity of nutrients ingested. One of the most robust strategies involves adjusting daily protein intake, prioritizing sources of high biological value. It is recommended that older adults consume proteins distributed across all meals, with 25 to 30 g of protein per meal, which favors muscle protein synthesis and combats the anabolic resistance typical of aging (Paddon-Jones et al., 2008).

In addition to quantity, the choice of protein source is crucial. Proteins of animal origin, such as lean meats, eggs, fish and dairy products, have a higher content of leucine, an essential amino acid for the activation of the mTOR pathway, responsible for stimulating muscle protein synthesis. The use of whey protein supplementation, especially post-exercise, has also been investigated as an effective strategy for preserving muscle mass in the elderly (Moore et al., 2015).

Incorporating foods rich in antioxidants into the diet, such as berries, dark green vegetables, extra virgin olive oil and nuts, helps combat oxidative stress, one of the causes of muscle degradation. Bioactive compounds such as polyphenols, carotenoids and omega-3 fatty acids have shown anti-inflammatory and muscle mass-preserving effects in experimental and clinical studies (Zanchi et al., 2011).

Another important aspect is the consumption of complex carbohydrates with a low glycemic index, such as whole grains, legumes and vegetables, which promote greater satiety and provide sustained energy. The combination of soluble fibers also helps with glycemic control, improves intestinal microbiota and contributes to the adequate absorption of essential micronutrients.

Furthermore, adequately dividing meals throughout the day promotes protein metabolism and avoids long periods of fasting, which are common among the elderly. Providing balanced meals with good visual and sensory presentation is essential to stimulate appetite, which often decreases with aging. Nutritional education strategies should be applied in accessible language, respecting the sociocultural and economic particularities of the elderly.

Finally, the implementation of dietary strategies must be accompanied by periodic nutritional assessment, preferably with the support of a multidisciplinary team. The integration of dietary measures with supervised physical activity enhances the positive effects on the preservation of muscle mass and functionality. In this context, nutrition is understood not only as a biological act, but as a therapeutic and preventive tool in aging.

5. Role of Nutritional Supplementation

Nutritional supplementation is a valuable complementary strategy in the prevention and treatment of sarcopenia, especially when dietary intake is insufficient or limited due to clinical issues. Among the most investigated supplements, fast-absorbing proteins, such as whey protein isolate, stand out, which contribute to increasing

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postprandial protein synthesis, especially when administered after resistance exercise (Phillips et al., 2016).

Creatine monohydrate is another supplement that has been widely studied for its ergogenic effects. Research shows that creatine supplementation, combined with physical training, can promote significant increases in strength and muscle mass in older adults, as well as improving functional capacity and bone mineral density (Candow et al., 2014). Its use should be prescribed with nutritional and clinical monitoring, respecting individual contraindications.

Vitamin D is considered essential in preventing sarcopenia due to its role in muscle function and regulation of calcium metabolism. Deficiency of this nutrient is common in the elderly, and its replacement, when indicated, contributes to improving muscle strength and reducing the risk of falls (Bischoff-Ferrari et al., 2009). Serum 25(OH)D levels should guide the need for and appropriate dose of supplementation.

Other micronutrients frequently used as supplements include calcium, magnesium and B vitamins, notably B12, whose deficiency is related to sarcopenia and loss of cognition. Omega-3 fatty acid supplementation has also been studied, with promising results in reducing inflammation and improving muscle function in the elderly (Smith et al., 2015).

However, it is important to emphasize that supplementation should always be based on individualized assessment, laboratory tests and monitoring by a qualified professional. Self-medication or indiscriminate use can lead to adverse effects or harmful drug interactions. Nutritional supplementation, when properly managed, can act synergistically with diet and exercise, maximizing results in the fight against sarcopenia.

Therefore, the nutritional approach to aging should consider the possibility of including supplements as support tools, especially in at-risk populations, such as institutionalized elderly people, those with chronic diseases or severe dietary restrictions. The integration of diet, supplementation and a healthy lifestyle represents the most effective way to promote longevity and maintain quality of life.

6. Integration between Nutrition and Physical Exercise

The integration of nutrition and physical exercise is one of the most effective pillars for combating sarcopenia and promoting healthy aging. Scientific evidence shows that the combination of adequate nutrition with structured physical activity programs enhances the beneficial effects of both factors, resulting in greater gains in strength, muscle mass and functionality (Deutz et al., 2014).

Physical exercise, especially resistance exercise (weight training), stimulates muscle protein synthesis through the activation of anabolic pathways such as mTOR. When combined with the intake of high-quality proteins, this stimulus is amplified, promoting muscle hypertrophy.

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even in elderly people of advanced age. This synergy between nutrition and physical activity represents a safe, accessible and effective intervention in the context of geriatrics.

In addition to resistance exercises, aerobic activities such as walking, cycling and water aerobics should also be encouraged. Although they do not have the same direct impact on muscle mass, they contribute to cardiovascular health, glycemic control, balance and general well-being. Regular exercise is also associated with improved mood, sleep quality and cognition in older adults.

Protein intake immediately after exercise, preferably within two hours, is a practical recommendation widely supported in the literature. This period, known as the "anabolic window", represents the moment in which the muscle is most sensitive to nutritional stimulus, favoring recovery and muscle growth. Supplements such as whey protein are especially useful in this context due to their rapid absorption and high leucine content.

The integration of nutrition and physical exercise must be personalized, considering physical limitations, dietary preferences, clinical conditions and individual therapeutic goals. The joint action of nutritionists, physical educators and health professionals is essential for the success of the interventions. Adherence to the plan must be monitored regularly, with adjustments according to the patient's progress.

Therefore, promoting integrated nutrition and physical exercise programs aimed at the elderly population is a public health strategy with high potential for impact. Maintaining functional autonomy and quality of life in aging depends largely on this synergistic, preventive and individual-centered approach.

7. Conclusion

Promoting healthy longevity and functional autonomy among older adults requires coordinated actions involving nutritional and lifestyle interventions based on scientific evidence. Sarcopenia, a prevalent and multifactorial condition in aging, can be prevented or mitigated with dietary strategies that prioritize protein quality and quantity, micronutrient adequacy, and the judicious use of nutritional supplementation. These resources, combined with regular physical exercise, particularly resistance exercise, represent an integrated and effective approach to combating age-related muscle loss.

The literature indicates that preventive actions should begin early and be individualized, respecting the physiological needs, clinical conditions and socioeconomic context of the elderly. Monitoring by a multidisciplinary team, with an emphasis on joint work between nutritionists, physical educators, geriatricians and other health professionals, is essential to ensure adherence and success of the proposed interventions. In addition, public health policies focused on nutritional education and encouraging physical activity are essential to reduce the burden of chronic diseases and promote healthier aging.

Another crucial aspect is raising social awareness about the role of food as a determining factor in quality of life. Encouraging healthy eating habits from a young age,

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Promoting active aging and ensuring access to nutritious and safe food are measures that transcend the individual and reach the collective sphere. The nutritional approach, in this sense, should be seen as a tool for citizenship and promoting dignity in old age.

Therefore, tackling sarcopenia and promoting longevity require more than generic guidelines: they require technical and scientific knowledge, cultural sensitivity and an ongoing commitment to comprehensive care for the elderly. Nutrition, combined with healthy practices and social support, constitutes one of the most solid pillars for transforming aging into an active, productive and well-being-filled process.

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