

Capturing Review of Protein and Vitamin D Needs in the Elderly

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Abstract: Background: Aging is a complex biological process, resulting in various physiological changes, psychosocial behavior, and cognitive changes. In addition, the elderly also experience changes in protein metabolism, and vitamin D. Where protein and vitamin D are very important for the elderly to stay healthy and the body's metabolism continues to work normally. Objective: The aim of this study was to determine the protein and vitamin D requirements of the elderly population and evaluate the impact of these nutritional deficiencies on their physical and cognitive health. Methods: This research uses a literature review method using relevant quantitative or qualitative methods. Results: The results of the review of 22 journals showed that 9 out of 22 journals resulted in an influence between protein and elderly health problems, while 3 journals said there was no influence. Another 7 journals also showed an effect of vitamin D on the health problems of the elderly, while the other 3 journals showed no effect. Conclusion: Most studies show that there is an influence between protein and vitamin D requirements on physical and cognitive health problems in the elderly

1 INTRODUCTION

Aging is a complex biological process that brings progressive changes to cells, tissues, organs, and systems in the human body. In older adults, these changes manifest as physiological decline, psychosocial behavior shifts, and cognitive impairments. Reduced brain function often leads to memory loss, difficulty concentrating, slower information processing, and communication challenges. Elderly individuals also experience alterations in protein metabolism, such as increased splanchnic extraction and anabolic resistance. Thus, they require higher protein intake to manage inflammation and catabolic conditions associated with acute or chronic illnesses. An imbalance between protein intake and requirements may lead to skeletal muscle loss, causing reduced physical

function and limited daily activities (Muhammad Iqbal et al., 2023).

In addition, older adults experience changes in protein metabolism, such as increased splanchnic extraction and anabolic resistance. They require higher protein intake to counteract inflammatory processes and catabolic conditions associated with both acute and chronic diseases that commonly occur with aging. An imbalance between protein supply and requirements may lead to the loss of skeletal muscle mass due to chronic disturbances in the balance between muscle protein synthesis and degradation. Consequently, older adults who lose muscle mass and strength often face limitations in performing daily activities (Halim, 2017).

In Indonesia, population projections in 2017 indicated that there were 23.66 million older adults, accounting for approximately 9.03% of the total

population. This number is expected to rise to 48.19 million by 2035, equivalent to 15.77% of the population. With such a significant proportion of older adults, Indonesia ranks fourth in the world after China, India, and the United States. The growing elderly population carries important health implications, including an epidemiological transition from infectious diseases to degenerative conditions such as cognitive decline. This presents challenges not only for older adults themselves but also for their families and surrounding communities (Zahra et al., 2019)

One condition suspected to be associated with cognitive decline is vitamin D deficiency (Fauzi, 2023). In humans, vitamin D functions as a hormone that regulates various processes in the brain, including neurotransmission, neuroprotection, and neuroimmunomodulation. Research by Eyles and colleagues demonstrated that vitamin D can be locally synthesized and metabolized in the central nervous system, influenced by the enzyme 1-hydroxylase. Furthermore, numerous vitamin D receptors are found in the hippocampus, cortex, and limbic system, all of which are closely related to cognitive function (Fauzi, 2023). Vitamin D receptors are also present in most body tissues, including muscles and bones. This explains why vitamin D deficiency may result in myopathy, muscle weakness, and muscle pain. Hypovitaminosis D is considered a significant risk factor for falls among older adults, as it reduces bone mineral density and bone strength, ultimately increasing instability in mobility (Muhammad Iqbal et al., 2023)

In addition to vitamin D, protein is an essential nutrient for older adults. The primary function of protein is to repair body tissues to ensure optimal

cellular function. Older adults who receive adequate protein intake tend to have better immunity, as one of the key roles of protein is to support the immune system. Conversely, protein deficiency may lead to various health problems, including hair loss, mental health disorders, anemia, weight loss, and a weakened immune system (Kusudaryati DPD et al., 2022).

Several studies have shown that increased intake of total protein and branched-chain amino acids (BCAAs) has a positive impact on muscle health. Adequate protein intake enhances the availability of amino acids, which subsequently stimulates muscle protein synthesis. BCAAs, particularly leucine, serve as strong stimulators of this process through the mammalian target of rapamycin (mTOR) pathway. By regulating these variables, enhanced protein synthesis contributes to improvements in muscle mass, strength, and function. This is closely associated with better overall health outcomes in older adults (Halim, 2017).

The objective of this study is to determine the requirements for protein and vitamin D in the elderly population and to evaluate the impact of deficiencies in these nutrients on their physical and cognitive health. This research aims to identify the relationship between protein and vitamin D intake and the physiological changes that occur in older adults, including muscle decline, cognitive impairment, and fall risk. Through an in-depth literature review, this study seeks to provide a better understanding of the crucial role of these two nutrients in maintaining the health and quality of life of older adults. The findings are expected to serve as a foundation for developing more effective nutritional intervention strategies to improve the well-being of the elderly in the community.

2 METHOD

The research method used in this study is a literature review focusing on protein and vitamin D requirements in older adults. The literature sources were obtained from online databases such as Google Scholar, PubMed, and ResearchGate. The search was conducted using the keywords “protein requirements,” “vitamin D,” and “older adults.”

The inclusion criteria consisted of articles discussing protein and vitamin D requirements in

older adults, published between 2014 and 2024, and employing relevant quantitative or qualitative methods. The exclusion criteria included articles not directly related to the topic, publications released before 2014, and articles that were not available in full-text or not published in either English or Indonesian.

3 RESULT

Table 1 Result Table

Title	Author	Objective	Method	Result	Conclusion
Hubungan Asupan Zat Gizi Makro, Status Gizi dan Aktivitas Fisik Terhadap Tingkat Kebugaran pada Lansia di Kampung Jasugih Provinsi Banten <i>(The Relationship between Macro Nutrient Intake, Nutritional Status, and Physical Activity on Fitness Levels among Elderly People in Jasugih Village, Banten Province)</i>	Evita Ellawati, Yulia Wahyuni, Mertien Sapang	The aim of this study was to analyze the relationship between macronutrient intake (energy, protein, fat, carbohydrates), nutritional status, and physical activity with fitness levels among older adults in Jasugih Village, Banten Province.	Chi-Square test	The findings from Jasugih Village, with respondents aged 65–80 years, showed a significant association between energy, fat, carbohydrate intake, and physical activity with fitness levels ($p < 0.05$). However, no significant relationship was found between protein intake, nutritional status, and fitness levels ($p > 0.05$).	There is a relationship between energy, fat, carbohydrate intake, and physical activity with fitness levels in older adults. However, protein intake and nutritional status were not significantly associated with fitness levels.
Hubungan antara Pengetahuan Gizi, Asupan Purin, dan Status Gizi terhadap Kejadian Gout Arthritis <i>(The Relationship between Nutritional Knowledge, Purine</i>	Susi Yulianingsih, Anggray Duvita Wahyani, Yuniarti Dewi Rahmawati	To determine the relationship between nutritional knowledge, purine intake, and nutritional status with the incidence of gout arthritis in the working area of Bulakamba	Chi-Square test	There is a relationship between nutritional knowledge, purine intake, and nutritional status with the incidence of gout arthritis in the Bulakamba Health Center area.	Nutritional knowledge, purine intake, and nutritional status are significantly associated with the incidence of gout arthritis.

<i>Intake, and Nutritional Status on the Incidence of Gout Arthritis)</i>		Public Health Center.			
Edukasi Tentang Asupan Protein Serta Pemeriksaan Status Gizi Lansia <i>(Education on Protein Intake and Nutritional Status Checkups for the Elderly)</i>	Abimanyu Birawa	To improve nutritional knowledge regarding protein intake among older adults and assess their nutritional status..	Observational Analytic.	Elderly participants' knowledge increased before and after receiving nutrition education.	Education and nutritional assessment are crucial as they improve the overall health status of older adults.
Edukasi Mengenai Asupan Protein Dan Pemeriksaan Status Gizi Lansia Di Posyandu Kenanga Desa Genjeng Weru Sukoharjo <i>(Education on Protein Intake and Nutritional Status Checkups for Elderly People at the Kenanga Health Center in Genjeng Weru Village, Sukoharjo)</i>	Dewi Pertiwi Dyah Kusudaryati, Retno Dewi Noviyanti, Tiya Wahyuningsih	To improve nutritional knowledge about protein intake in older adults and measure their nutritional status..	Observational Analytic	Nutrition education led to increased knowledge among older adults.	Nutrition education and assessment of nutritional status are important as they can improve the health of older adults.
Hubungan Riwayat Sakit dan Asupan Gizi (Energi dan Protein) dengan Status Gizi Lansia di Wilayah Kerja Puskesmas Padangmatinggi Kota Padangsidempuan <i>(The Relationship between Medical History and Nutritional Intake</i>	Johanna Christy	To analyze the relationship between disease history, energy intake, and protein intake with the nutritional status of older adults in the Padangmatinggi Health Center area, Padangsidempuan	Chi Square test	There is a significant relationship between disease history, energy intake, and protein intake with the nutritional status of older adults.	Both disease history and macronutrient intake (energy and protein) are significantly associated with nutritional status in older adults

<i>(Energy and Protein) with the Nutritional Status of Elderly People in the Working Area of the Padangmatinggi Community Health Center, Padangsidempuan City)</i>					
<p>Hubungan Asupan Makan dan Lingkar Pinggang dengan Status Gizi pada Lansia di Panti Wreda Rindang Asih I</p> <p><i>(The Relationship between Food Intake and Waist Circumference with Nutritional Status in Elderly People at the Rindang Asih I Nursing Home)</i></p>	<p>Natalia Desy Putriningtyas, Wiga Nurlatifa Romadhoni, Adiska Rani Ditya Candra</p>	<p>To examine the relationship between food intake and waist circumference with nutritional status in older adults at Rindang Asih I Nursing Home.</p>	<p>Pearson Test and Linear Regression</p>	<p>Nutritional status was correlated with body weight, waist circumference, energy intake, protein intake, fat intake, and carbohydrate intake ($p < 0.01$).</p>	<p>Nutritional status is associated with anthropometric measures (weight, waist circumference) and macronutrient intake in older adults.</p>
<p>Korelasi Antara Asupan Energi dan Protein dengan Indeks Massa Tubuh Penduduk Lansia</p> <p><i>(Correlation Between Energy and Protein Intake and Body Mass Index in the Elderly Population)</i></p>	<p>Marsella Dervina Amisi, Yulianty Sanggelorang, Asep Rahman</p>	<p>To examine the correlation between energy and protein intake and Body Mass Index (BMI) among older adults in Paniki Satu Subdistrict, Mapanget District, Manado City.</p>	<p>Kolmogorov-Smirnov Test and Rank-Spearman Correlation Test</p>	<p>The study showed that 51% of older adults were severely overweight, 29% had excessive energy intake, and 50% had protein intake above 120% of the RDA. A significant positive correlation was found between energy intake ($r = 0.447$; $p = 0.000$) and protein intake ($r = 0.324$; $p = 0.001$) with BMI.</p>	<p>Body Mass Index in older adults is influenced by energy and protein intake.</p>
<p>Hubungan Antara Asupan Makronutrien dan Status Nutrisi</p>	<p>Rita halim, Sri Sukmaniah</p>	<p>To assess the relationship between muscle strength and</p>	<p>Chi-Square Test</p>	<p>The study showed a significant positive correlation between handgrip strength and</p>	<p>Energy intake, particularly from carbohydrates, is associated with</p>

dengan Kekuatan Otot Pada Lansia di Panti Werdha Jakarta (<i>The Relationship Between Macronutrient Intake and Nutritional Status with Muscle Strength in Elderly People at Nursing Homes in Jakarta</i>)		macronutrient intake as well as nutritional status among older adults.		energy intake ($r = 0.32$; $p = 0.02$) as well as carbohydrate intake ($r = 0.46$; $p = 0.01$). Fat intake, protein intake, BCAAs, serum prealbumin, and BMI were not associated with handgrip strength.	muscle strength in older adults.
Pengaruh EDAMTIKA terhadap Tingkat Konsumsi Makro dan Berat Badan Lansia di Tresna Werdha Jember (<i>The Effect of EDAMTIKA on Macro Consumption Levels and Body Weight of Elderly People at Tresna Werdha Jember</i>)	Agatha Widiyawati, Rahma Aisyah Ardiyani, Niken Pratiwi, Yoswen ita Susindra	To determine the effect of EDAMTIKA food formula supplementation on macronutrient intake (energy, protein, fat, carbohydrates) and body weight in undernourished older adults.	Wilcoxon Test	Supplementation with EDAMTIKA formula significantly increased protein intake ($p = 0.000$) and body weight ($p = 0.000$). It also significantly improved intake of all macronutrients (energy, protein, fat, carbohydrates).	EDAMTIKA supplementation has a significant effect on macronutrient intake and body weight among undernourished older adults.
Hubungan Asupan Zat Gizi Makro Dengan Status Gizi Lansia Di Desa Jenggik Kabupaten Lombok Timur (<i>The Relationship Between Macro Nutrient Intake and the Nutritional Status of Elderly People in Jenggik Village, East Lombok Regency</i>)	Febrina Sulistiawati, Baiq Dewi Sukma Septiani	To examine the relationship between macronutrient intake (carbohydrates, protein, and fat) and nutritional status (BMI) in older adults in Jenggik Village.	Spearman Test	Nearly all respondents had inadequate protein intake (94%), with 34% classified as severely undernourished. The analysis showed no significant relationship between protein intake and nutritional status ($p > 0.05$, $r = 0.240$). However, carbohydrate and fat intake were significantly	The most common nutritional status among respondents was severely underweight, with a percentage of 34%. Nutritional status among older adults is strongly related to carbohydrate and fat intake, but not to protein intake.

				associated with nutritional status.	
<p>Hubungan Pola Makan Dengan Status Gizi pada Lansia di Posyandu Lansia (<i>The Relationship Between Dietary Patterns and Nutritional Status in Elderly People at Elderly Health Centers</i>)</p>	<p>Roosmaida Dinawati Sinambela, Rachmanida Nuzrina, Lilik Sri Hartati</p>	<p>To determine the relationship between carbohydrate, protein, and fat intake with nutritional status among older adults at Posyandu Lansia in Pagongan Village in 2023.</p>	<p>Chi-Square Test</p>	<p>Among 39 respondents with inadequate protein intake, 46.2% had undernutrition and 53.8% had normal nutritional status. Among 36 respondents with sufficient protein intake, 86.1% had normal nutritional status, while 13.9% had undernutrition. Statistical analysis showed a significant association ($p = 0.000$; $OR = 8.052$).</p>	<p>The results of the chi-square statistical test showed a p-value of 0.000, which means that there is a relationship between protein intake and nutritional status in the elderly at the Pagoongan Village Elderly Health Center.</p>
<p>Hubungan Asupan Protein dan Status Gizi Dengan Tekanan Darah Penderita Hipertensi di Puskesmas Mengwi II (<i>The Relationship Between Protein Intake and Nutritional Status with Blood Pressure in Hypertensive Patients at the Mengwi II Community Health Center</i>)</p>	<p>Novita Permatasari , Gusti Ayu Dewi Kusumayanti, K, Ni Komang Wiardan</p>	<p>To analyze the relationship between protein intake and nutritional status with blood pressure in hypertensive patients at Mengwi II Health Center.</p>	<p>Chi-Square Test</p>	<p>Most respondents had inadequate protein intake (47.1%). The most consumed sources were animal protein (chicken, eggs) and plant protein (tofu, tempeh). Among respondents with inadequate protein intake, 64.7% had stage I hypertension. Statistical analysis showed a significant relationship ($p = 0.039 < 0.05$).</p>	<p>Most hypertensive patients have insufficient protein intake and are classified as obese with stage I hypertension.</p>
<p>The Effects of Four Doses of Vitamin D Supplements on Falls in Older Adults: A Response-</p>	<p>Lawrence J. Appel, Erin D. Michos, Christine M. Mitchell, Amanda L. Blackford, Alice L. Sternberg, Edgar</p>	<p>To compare the effects of four different doses of vitamin D on fall incidence among older adults.</p>	<p>Longitudinal Linear Regression</p>	<p>The study found that a dose of 1000 IU/day was the most effective among the tested doses. However, supplementation of</p>	<p>High-dose vitamin D supplementation (≥ 1000 IU/day) does not prevent falls compared to low-dose</p>

Adaptive, Randomized Clinical Trial	R. Miller III, Stephen P. Juraschek, Jennifer A. Schrack, Sarah L. Szanton, Jeanne Charleston, Melissa Minotti, Sheriza N. Baksh, Robert H. Christenson, Josef Coresh, Lea T. Drye, Jack M. Guralnik, MD, Rita R. Kalyani, Timothy B. Plante, David M. Shade, David L. Roth, and James Tonascia			1000 IU/day or higher did not significantly prevent falls compared to the lower dose of 200 IU/day and was associated with more severe falls and higher hospitalization rates.	supplementation (200 IU/day) and may increase adverse effects.
Effect of vitamin D supplementation on depression in elderly patients: A randomized clinical trial	Negin Masoudi Alavi, Saeed Khademalhosseini, Zarichehr Vakili dan Fatemeh Assarian	To determine the effect of vitamin D supplementation on depression treatment in older adults.	Mann-Whitney U Test, Wilcoxon Rank Test, Chi-Square, and Multiple Regression Analysis	The results of this study showed that after subjects were given 50,000 IU of vitamin C per week for 8 consecutive weeks, the elderly experienced a decrease in depression scores from 9.25 to 7.48.	Vitamin D supplementation can help reduce depression scores in adults over 60 years of age.
Vitamin D and Lung Outcomes in Elderly COVID-19 Patients	Alberto Sulli, Emanuele Gotelli, Andrea Casabella, Sabrina Paolino, Carmen Pizzorni, Elisa Alessandri, Marco Grosso, Diego Ferone, Vanessa Smith and Maurizio Cutolo	To analyze the relationship between serum 25(OH) vitamin D concentrations and lung involvement in elderly patients hospitalized with SARS-CoV-2 infection.	Mann-Whitney U, Kruskal-Wallis, Spearman Rank Correlation, Simple and Multiple Regression, Kolmogorov-Smirnov, Chi-Square, and Multiple Linear Regression	Vitamin D deficiency was associated with more severe lung involvement and higher mortality risk among elderly hospitalized COVID-19 patients. Recommendations suggest 50,000 IU/week for older adults.	Vitamin D deficiency is significantly linked with worse lung conditions, longer illness duration, and higher mortality risk in elderly COVID-19 patients.
Vitamin D Supplementation Reduces Both Oxidative DNA Damage and	Sylwia Wenclewska, Izabela Szymczak-Pajor, Józef Drzewoski,	To determine whether three months of vitamin D supplementation is sufficient to	Pearson Correlation, Snedecor-Fisher Test, Shapiro-Wilk Test	Supplementation of 2000 IU/day vitamin D for three months reduced oxidative DNA	Vitamin D supplementation at 2000 IU/day reduces oxidative stress, lowers DNA

Insulin Resistance in the Elderly with Metabolic Disorders	Mariusz Bunk dan Agnieszka Sliwińska	achieve physiological concentrations, reduce oxidative DNA damage, and affect metabolic parameters and insulin resistance in older adults with metabolic disorders.		damage, prevented oxidative stress, and lowered endogenous DNA damage in lymphocytes. It also increased HDL levels and decreased TG/HDL ratio, HbA1c, and HOMA-IR.	damage, improves lipid profile, and decreases insulin resistance markers in elderly patients with metabolic disorders.
Physical Performance and Vitamin D in Elderly Black Women–The PODA Randomized Clinical Trial	John F. Aloia, Mageda Mikhail, Melissa Fazzari, Shahidul Islam, Louis Ragolia dan Jack Guralnik ²	To investigate whether maintaining serum 25(OH)D prevents physical performance decline in elderly Black women.	Wilcoxon T-Test, Spearman Correlation, Multivariate Regression, ANOVA	Vitamin D supplementation (60,000 IU/month or 2000 IU/day) for three years did not produce significant benefits in physical performance, handgrip strength, or six-minute walk ability.	Vitamin D supplementation does not significantly affect physical performance in elderly Black women.
The Relationship Between Vitamin D Levels and Uric Acid Levels In The Elderly at Santa Anna Home	Ester Elida O Harita, Felicia Kurniawan, Linawati Hananta, Isadora Gracia Sahusilawane	To examine the relationship between vitamin D and uric acid levels in elderly residents at Santa Anna Nursing Home.	Univariate Analysis, Spearman or Pearson Correlation Test	Two elderly participants had hypervitaminosis D (>150 ng/mL) but remained healthy without symptoms, thus excluded. Overall, 54% of participants had vitamin D insufficiency or deficiency. A negative correlation was found between vitamin D and uric acid levels.	The elderly residents of Santa Anna Nursing Home were classified as having insufficiency and deficiency, totaling 27 elderly residents (54%). The results showed a negative correlation between vitamin D levels and uric acid levels in the elderly residents of Santa Anna Nursing Home.
Effect of Vitamin D Supplementation, Omega-3 Fatty Acid Supplementation, or a Strength-Training Exercise Program on	Bischoff-Ferrari, H. A., Vellas, B., Rizzoli, R., Kressig, R. W., da Silva, J. A. P., Blauth, M., Felson, D. T., McCloskey, E. V., Watzl, B., Hofbauer, L. C.,	To test whether vitamin D, omega-3 fatty acids, and strength-training exercise, alone or in combination, improve six health outcomes in older	Randomized, Double-Blind, Placebo-Controlled, Factorial Clinical Trial	Among 2157 randomly assigned participants (mean age, 74.9 years; 61.7% women), 1900 (88%) completed the study. The median follow-up was 2.99 years. Overall, there were no	Vitamin D, omega-3, and strength-training exercise did not significantly improve major clinical outcomes in older adults.

Clinical Outcomes in Older Adults: The DO-HEALTH Randomized Clinical Trial	Felsenberg, D., Willett, W. C., Dawson-Hughes, B., Manson, J. E., Siebert, U., Theiler, R., Staehelin, H. B., de Godoi Rezende Costa Molino, C., Chocano-Bedoya, P. O.	adults.		statistically significant benefits for any intervention individually or in combination for the 6 endpoints at 3 years. A total of 25 deaths were reported, with an equal number in all treatment groups.	
Folate, vitamin B12 and vitamin D status in healthy and active home-dwelling people over 70 years	Felix Kerlikowsky, Jan Philipp Schuchardt, dan Andreas Hahn	To assess vitamin D status in unsupplemented, healthy, and active home-dwelling adults aged ≥ 70 years in Germany.	Uji Shap-iro-Wilk, analisis regresi linier	No significant association was found between dietary vitamin D intake and serum 25(OH)D concentration. Food sources covered only 10–20% of vitamin D needs, and thus did not significantly affect vitamin D status.	Healthy, independent older adults with higher education, physical activity, and health awareness are not necessarily at greater risk of vitamin D, folate, or cobalamin deficiency.
Low Vitamin D Levels and Frailty Status in Older Adults: A Systematic Review and Meta-Analysis	Diego Marcos-Perez, Maria Sanchez-Flores, Stefania Proietti, Stefano Bonassi, Solange Costa, Joao Paulo Teixeira, Juan Fernandez-Tajes, Eduardo Pasaro, Vanessa Valdiglesias, and Blanca Laffon	To examine the possible association between low serum concentrations of 25-hydroxyvitamin D (25(OH)D), a marker of vitamin D status, and physical frailty in later life among older adults.	Meta-analysis, cross-sectional, fenotipe Fried	The relationship between serum 25(OH)D and cognitive performance remains unclear, as intervention studies yielded inconsistent findings. However, vitamin D deficiency negatively affects specific cognitive functions such as episodic memory. Lower serum 25(OH)D levels were significantly associated with higher frailty levels.	Low vitamin D levels are significantly associated with increased frailty in older adults. Supplementation may help prevent or alleviate frailty, but further research is required.
The Global Prevalence of Vitamin D Deficiency in the Elderly: A Meta-analysis	Ahmad Meshkin, Fatemeh Badiee, Nader Salari, Masoud Hassanabadi	To determine the global prevalence of vitamin D deficiency in older adults.	Meta-analysis, Heterogeneity I Test, Egger's Test	The global prevalence of vitamin D deficiency (< 20 ng/mL or < 50 nmol/L) was found to be 59.7% (95% CI: 45.9–	Vitamin D deficiency is highly prevalent worldwide among older adults, highlighting the

				72.1). Among 6,748 older adults, 27.5% had deficiency levels between 20–30 ng/mL (50–75 nmol/L). In another sample of 6,918 older adults, 16% had deficiency above 30 ng/mL (>75 nmol/L).	urgent need for global health policies to address screening and prevention strategies to reduce its negative impact on quality of life.
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4 DISCUSSION

Protein Intake in the Elderly

According to research by Birawa, older adults need education regarding the importance of protein consumption. The purpose of this education is to increase the knowledge of older adults about the significance of protein intake and the impact of protein deficiency. Furthermore, such education aims to improve the overall health status of older adults (Birawa, 2024). According to Christy’s study, protein deficiency affects the immune system of older adults (Christy, 2019). This statement is consistent with the findings of Widiyawati, which showed that older adults categorized as underweight and having a history of diabetes mellitus, gout, and dementia experienced an improvement in protein levels in the body after receiving a high-protein formula diet (Widiyawati et al., 2024).

Meanwhile, Christy’s study stated that older adults with a history of hypertension require a high-protein diet in order to help maintain blood pressure (Christy, 2019). However, Yulianingsih’s research suggested that excessive protein intake may become a risk factor for gout (Yulianingsih et al., 2022). Another consequence of excessive protein

consumption is obesity; according to Amisi, older adults who consume protein in excessive amounts are likely to experience an impact on their nutritional status (Amisi et al., 2020). In contrast, Halim’s study reported no association between protein intake patterns and the nutritional status of older adults (Halim & Sukmaniah, 2020), a finding consistent with Ellawati’s research, which showed that protein consumption patterns were not related to the physical fitness of older adults (Ellawati et al., 2021).

Vitamin D intake in the Elderly

Vitamin D supplementation is highly important for older adults. According to Meshkin’s study, the World Health Organization should prioritize disseminating information regarding the importance of vitamin D intake among the elderly (Meshkin et al., 2024). This effort aims to minimize the negative impacts of vitamin D deficiency. These findings are consistent with Marcos-Perez’s research, which emphasized that assessing vitamin D levels requires testing serum 25(OH)D concentrations and highlighted that low 25(OH)D levels are associated with frailty in older adults (Marcos-Pérez et al., 2020). Similarly, Alavi’s study reported that vitamin D supplementation helps reduce depression in adults aged 60 years and above (Alavi et al., 2019). This aligns with the findings of Wenclewska, who stated

that consuming vitamin D supplements at doses above 2000 IU/day reduces oxidative stress, DNA damage, insulin resistance, and HbA1c levels, while also increasing HDL levels in older adults with metabolic disorders (Wenclewska et al., 2019). Likewise, Sulli's research on elderly COVID-19 patients demonstrated the crucial role of vitamin D, showing that those consuming less than 50,000 IU/week experienced more severe lung conditions and an increased risk of mortality (Sulli et al., 2021).

Vitamin D intake has a significant impact on health, as shown in the study by Bischoff-Ferrari, which found an inverse relationship between vitamin D levels and uric acid levels; higher vitamin D concentrations were associated with lower uric acid levels (Bischoff-Ferrari et al., 2020). It is therefore important to understand the appropriate and safe dosage of vitamin D supplementation. Ellawati's study reported that high-dose supplementation (1000 IU/day) in older adults tends to be associated with greater side effects (Ellawati et al., 2021). However, in some cases, vitamin D intake does not yield significant effects. For example, Aloia's study demonstrated that supplementation of 2000 IU/day had no significant impact on physical performance among Black older women (Aloia et al., 2019). This is consistent with the findings of Kerlikowsky and Bischoff-Ferrari, who observed that in older adults aged ≥ 70 years without major comorbidities and with active lifestyles, supplementation with vitamin D3 (2000 IU/day) and omega-3 fatty acids (1 g/day) did not significantly influence blood pressure, fracture risk, or cognitive function. These findings suggest that active and healthy older adults may not be at risk of vitamin D deficiency (Kerlikowsky et al., 2023).

5 CONCLUSIONS

From the reviewed journals, it can be concluded that the majority of studies demonstrate an influence of protein and vitamin D requirements on both physical and cognitive health problems in older adults.

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