Society of Medical Education & Research

2021, Volume 1, Page No: 158-167
ISSN: 3108-4818

International Journal of Social and Psychological Aspects of Healthcare

Fruit and Vegetable Consumption and Healthcare Utilization among Older Europeans: Evidence from the SHARE Study

James A. O'Connor[1]*, Rebecca L. Moore[2], Thomas H. Green[1]

[1]Department of Mental Health Sciences, School of Medicine, University College London, London, United Kingdom.

***E-mail** ✉ james.oconnor@gmail.com

Abstract

The objective of this research is to assess whether regular consumption of fruits and vegetables is associated with differences in healthcare use among older individuals across Europe. By exploring this relationship, the study seeks to contribute evidence relevant to policy strategies aimed at improving health outcomes and managing healthcare resources effectively in an ageing European population. This study draws on data from the 2019–2020 eighth wave of the Survey of Health, Retirement and Ageing in Europe (SHARE). A cross-sectional analytical approach is employed to evaluate the relationship between daily fruit and vegetable intake and multiple indicators of healthcare utilization, including the probability of hospitalization, duration of inpatient stays, frequency of general practitioner visits, and use of specialist medical services.

The analysis indicates that daily consumption of fruits and vegetables does not significantly affect the likelihood of being hospitalized compared with less frequent intake. Nevertheless, among those who experienced hospitalization, individuals reporting daily intake had fewer hospital admissions and shorter lengths of stay. In addition, regular fruit and vegetable consumption was associated with a higher probability of visiting both general practitioners and medical specialists. This pattern may reflect greater health awareness and more active engagement in health management among individuals with healthier dietary practices. The findings imply that, although regular fruit and vegetable intake may not directly reduce the initial risk of hospitalization among older adults, it is associated with lower rates of repeated hospital admissions and reduced time spent in hospital once admitted. Furthermore, higher consumption of fruits and vegetables appears to be linked to increased use of preventive and routine healthcare services, including primary and specialist care. Overall, the results suggest that dietary habits may play an important role in shaping healthcare utilization patterns and associated costs in ageing populations.

Keywords: Fruit, Vegetable, Healthcare utilization, Older europeans

Introduction

Demographic change is reshaping societies worldwide, with the population aged 60 years and older projected to rise from 1 billion to 1.4 billion by 2030, corresponding to nearly one in six individuals globally [1]. This rapid demographic shift poses significant challenges for public health systems, particularly in supporting older adults to maintain healthy lifestyles over time [2]. Nutrition represents a cornerstone of healthy ageing, yet the role of specific dietary components in shaping healthcare utilization patterns among older adults remains insufficiently explored [3]. As longevity increases, there is a growing need to better understand how dietary behaviours and nutritional status interact with health outcomes and the demand for healthcare services [4, 5]. A key issue in this context is the elevated risk of malnutrition in later life, often driven by age-related reductions in food intake and declining dietary quality [4, 6, 7].

Among dietary factors, fruit and vegetable consumption has received considerable attention due to its high content of micronutrients and bioactive compounds. Evidence

Access this article online https://smerpub.com/

Received: 11 March 2021; **Accepted:** 04 July 2021

How to cite this article: O'Connor JA, Moore RL, Green TH. Fruit and Vegetable Consumption and Healthcare Utilization among Older Europeans: Evidence from the SHARE Study. Int J Soc Psychol Asp Healthc. 2021;1:158-67. https://doi.org/10.51847/l8VjbF9QKX

consistently indicates that adequate intake of these foods contributes to the prevention of chronic and age-related diseases [8, 9] and may help mitigate long-term healthcare needs [8]. Higher consumption of fruits and vegetables has been linked to improved cardiovascular health outcomes [8, 10–12], including a lower likelihood of stroke [11, 13]. Furthermore, observational studies suggest that the antioxidant and potassium properties of fruits and vegetables are associated with reduced cardiovascular mortality [14–16].

Despite robust evidence supporting the general health benefits of fruit and vegetable intake—including protection against cardiovascular disease, cancer, and cognitive decline [8–10, 12, 14–19, 20–22]—less attention has been paid to how these dietary behaviours influence healthcare use among older populations in Europe. In particular, the translation of dietary quality into measurable differences in hospital use and medical care-seeking behaviour remains poorly understood.

Current research offers limited insight into whether fruit and vegetable consumption affects hospitalization risk or inpatient care among older Europeans. Similarly, evidence regarding the relationship between dietary patterns and the frequency of consultations with healthcare providers is scarce. Even more notably, existing studies have not examined whether dietary habits are associated with engagement in preventive healthcare practices, such as scheduled health examinations and screening participation, in this age group [23– 25].

To address these knowledge gaps, the present study investigates the association between fruit and vegetable intake and healthcare utilization among older adults across Europe. Using data from the 2019–2020 wave of the Survey of Health, Ageing and Retirement in Europe (SHARE), this analysis focuses on three dimensions of healthcare use: (i) hospitalization outcomes; (ii) utilization of outpatient medical services; and (iii) participation in planned preventive care activities.

By clarifying the links between dietary behaviour and healthcare utilization, this study aims to provide evidence that can support nutrition-oriented public health interventions and inform policies designed to promote healthy ageing while improving the efficiency of healthcare systems across Europe.

Materials and Methods

Data

The data analysed in this study originate from the Survey of Health, Ageing and Retirement in Europe (SHARE), a large-scale, multidisciplinary longitudinal study designed to examine the ageing process. SHARE targets individuals aged 50 years and older, along with their partners, and has been conducted biennially since its launch in 2004. The survey initially included 11 countries and has since expanded to cover 27 nations, comprising all European Union member states except the United Kingdom and Ireland, as well as Israel.

The core survey waves (Waves 1–2 and 4–9) gather detailed information on participants' current circumstances across multiple domains, including housing conditions, physical and mental health, labour market participation, social relationships, financial status and assets, health-related behaviours, and future expectations. In contrast, Waves 3 and 7 (SHARELIFE, conducted in 2008 and 2017) focus on retrospective life-course data, capturing respondents' earlier experiences related to health, healthcare use, housing, employment histories, household composition, childhood educational attainment, and, for women, fertility and child-rearing histories.

For the purposes of this analysis, we use data from Wave 8, collected between October 2019 and March 2020. The final analytical sample includes 45,788 individuals residing in 26 European countries and Israel. The study examines several indicators of healthcare utilization, encompassing both inpatient care and outpatient medical services.

Hospital-related measures include whether respondents experienced any hospital admission during the previous 12 months, the total number of hospital stays, and the cumulative number of nights spent in hospital. Approximately 16% of respondents reported at least one hospitalization in the preceding year. Among those hospitalized, about 63.55% experienced a single admission, roughly 18% reported two admissions, and progressively smaller proportions reported more frequent hospitalizations. With respect to length of stay, around 16% of hospitalized individuals spent only one night in hospital, with the share declining as the duration of hospitalization increased.

Comparable information is available for outpatient care, including consultations with general practitioners (GPs) and specialist physicians. Respondents reported whether they had seen or spoken with a GP or a specialist in the past 12 months, as well as the number of such visits. The vast majority of the sample (90.79%) had at least one

contact with a GP during the previous year, while approximately 68% reported visiting a medical specialist. Together, these indicators provide a comprehensive measure of access to and utilization of healthcare services.

Variables

Dietary behaviour constitutes the central explanatory factor in this analysis, with a specific emphasis on the regularity of fruit and vegetable intake. Respondents reported how often they typically consumed fruits or vegetables during a week, selecting from five frequency categories ranging from daily consumption to intake less than once per week. The empirical strategy incorporates both a multi-category frequency measure and a binary indicator that identifies individuals who consume fruits and vegetables on a daily basis. In the study population, nearly three-quarters of participants (approximately 73%) reported daily intake, whereas consumption below once per week was rare, accounting for only about 1% of responses. Marked geographic differences emerge across countries: daily consumption is least prevalent in several Eastern European countries—namely Hungary, Bulgaria, Romania, and Slovakia—while the highest prevalence is observed in Southern European countries such as Italy and Spain, where more than 80% of older adults report daily fruit and vegetable consumption.

To isolate the association of dietary intake with healthcare use, the analysis adjusts for an extensive set of individual-level characteristics. Basic demographic controls include age and sex; women comprise 57.51% of the sample, and the average respondent is 70.76 years old. Socioeconomic position is captured through employment status, educational attainment, and household partnership status. Employment status is dichotomized into retired individuals, who represent roughly 69% of the sample, and a broader category including non-retired individuals such as the unemployed or those unable to work due to disability. Educational attainment is classified according to the International Standard Classification of Education (ISCED), distinguishing between low education (no formal qualifications or lower secondary schooling), intermediate education (upper secondary education), and high education (university or postgraduate degrees). Partnership status is defined by whether the respondent lives with a spouse or partner, with single living arrangements serving as the reference group; approximately two-thirds (67%) of respondents report living with a partner. Risk-related health behaviour is also considered through a binary variable indicating whether the individual currently smokes or has smoked on a daily basis in the past, a characteristic reported by around 41% of the sample.

Given the strong link between health status and healthcare demand in later life, the models further account for functional health limitations. These limitations are measured using established indicators of Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL), which are widely recognized as markers of physical dependency among older adults. A binary variable is constructed that takes a value of one when an individual reports at least one ADL or IADL limitation. Using this definition, approximately 23% of the study population experiences some degree of functional impairment.

Empirical strategy

The empirical analysis begins with the estimation of logit and ordinary least squares (OLS) models, selected according to the nature of the dependent variable. The baseline specification can be expressed as:

$$y_i = \alpha_i + \beta fruit - veg_i + X_i + \varepsilon_i \quad (1)$$

where the outcome variable yiy_iyi captures different dimensions of healthcare utilization. In the case of inpatient care, the dependent variables include: (i) whether the individual experienced at least one hospital admission in the previous 12 months; (ii) the total number of nights spent in hospital, conditional on having been hospitalized; and (iii) the number of hospital admissions, conditional on any hospitalization. For outpatient care, yi denotes: (i) the likelihood of having consulted or spoken with a general practitioner or a medical specialist; and (ii) the corresponding number of consultations.

The key explanatory variable, Fruit–Veg$_i$ is a binary indicator identifying individuals who consume fruits and vegetables on a daily basis, while Xi represents a vector of individual-level control variables. The term εi denotes the stochastic error component.

In a second step, the analysis shifts attention to the intensity of healthcare use. To this end, the models are re-estimated using count data techniques. Specifically, zero-truncated negative binomial regressions are employed to accommodate overdispersion in the data and to explicitly account for the fact that the analysis of utilization

frequency is restricted to individuals with at least one observed healthcare contact.

Main results

Table 1 presents the initial empirical evidence examining the relationship between fruit and vegetable intake and hospitalization outcomes among older adults. The results indicate that there is no statistically significant association between daily consumption of fruits and vegetables and the likelihood of experiencing at least one hospital admission (Column 1). In other words, older individuals who report consuming fruits and vegetables on a daily basis do not differ significantly in their probability of hospitalization compared with those with less frequent intake. This finding suggests that dietary consumption alone may not serve as a strong determinant of hospital admission risk within the older population.

Table 1. Probability of hospitalization and hospitalization outcomes (logit and OLS)

Variable	Number of hospital admissions	Probability of any hospital stay	Number of nights in hospital
Female	−0.045**	−0.188***	−0.010***
	(0.017)	(0.036)	(0.028)
Daily fruit and vegetable consumption	−0.48***	0.015	−0.047**
	(0.016)	(0.034)	(0.022)
Has limiting health condition	0.131***	0.888***	0.465***
	(0.017)	(0.051)	(0.029)
Age	0.001***	0.017***	0.005**
	(0.000)	(0.002)	(0.002)
Retired	0.022	0.195***	0.020
	(0.013)	(0.044)	(0.038)
Married	0.001	−0.098***	−0.063**
	(0.014)	(0.029)	(0.027)
High education level	0.020	−0.103***	−0.076**
	(0.018)	(0.036)	(0.032)
Medium education level	0.037	−0.026	0.001
	(0.022)	(0.031)	(0.024)
Ever smoked daily	−0.005	0.184***	0.025
	(0.014)	(0.031)	(0.026)
Country dummies	Yes	Yes	Yes
Observations (N)	7191	45,788	7191

Standard errors are clustered at the country level. Statistical significance is denoted as follows: *p < 0.1, **p < 0.05, ***p < 0.01.

To explore whether dietary habits are associated with differences in healthcare use beyond the extensive margin, we conduct an intensive-margin analysis that concentrates on the volume of healthcare utilization **(Table 1)**(Columns 2–3). The results indicate a statistically significant negative relationship between fruit and vegetable intake frequency and the number of hospital admissions during the previous 12 months among individuals who experienced at least one hospitalization (Column 2). Specifically, older adults with more frequent consumption of fruits and vegetables tend to report fewer hospital admissions.

In addition, conditional analyses restricted to individuals with prior hospital use show that daily fruit and vegetable consumption is associated with reduced inpatient duration, as measured by the total number of nights spent in hospital (Column 3). These findings remain consistent when alternative count-data estimation techniques are applied. In particular, estimates obtained using zero-truncated negative binomial models, which account for overdispersion and the absence of zero counts, yield comparable results **(Table 2)**.

Table 2. Hospitalization frequency: zero-truncated negative binomial estimates

Variable	Number of nights in hospital	Number of hospital admissions
Female	−0.133***	−0.043
	(0.032)	(0.027)
Daily fruit and vegetable consumption	−0.053*	−0.076***
	(0.032)	(0.026)
Has limiting health condition	0.635***	0.162***
	(0.048)	(0.028)
Age	0.001	0.003**
	(0.003)	(0.001)
Retired	0.009	0.041*
	(0.051)	(0.022)
Married	−0.063**	0.005
	(0.032)	(0.022)
High education level	0.031	0.049
	(0.047)	(0.031)
Medium education level	0.042	0.058*
	(0.035)	(0.034)
Ever smoked daily	0.066*	−0.014
	(0.039)	(0.020)
Country dummies	Yes	Yes
Observations (N)	7191	7191

Standard errors are clustered at the country level. Statistical significance is indicated by *p < 0.1, **p < 0.05, and ***p < 0.01.

Motivated by earlier evidence linking age-related metabolic changes and suboptimal nutrition to a higher burden of chronic conditions in later life [26], this analysis extends the investigation to planned and routine healthcare use. In particular, we assess whether fruit and vegetable intake is associated with both the likelihood of engaging with medical services and the intensity of such use, distinguishing between consultations with general practitioners (GPs) and specialist physicians.

The results reported in **Table 3** indicate a clear positive relationship between regular fruit and vegetable consumption and planned healthcare utilization along both dimensions considered. Older adults who consume fruits or vegetables on a daily basis are 12.6 percentage points more likely to consult a specialist than those who do not report daily intake. A comparable pattern is observed for primary care, where daily consumers exhibit an 18.3 percentage point higher probability of having at least one GP visit. Moreover, across both types of providers, individuals with healthier dietary behaviours record a significantly greater average number of consultations over the course of a year. Consistent with the hospitalization analysis, these findings remain robust when healthcare use is modelled using count-data techniques, specifically zero-truncated negative binomial regressions **(Table 4)**.

Table 3. Utilization of primary and specialist care (logit and OLS estimates)

Variable	Number of specialist visits	Probability of consulting a specialist	Number of family doctor visits	Probability of consulting a family doctor
Female	−0.015*	0.122***	0.047***	0.319***
	(0.009)	(0.037)	(0.012)	(0.044)
Daily fruit and vegetable consumption	0.060**	0.127***	0.036**	0.183***
	(0.021)	(0.030)	(0.017)	(0.044)
Has limiting health condition	0.329***	0.449***	0.418***	0.649***
	(0.016)	(0.043)	(0.024)	(0.053)
Age	−0.001	−0.004*	0.005***	0.017***
	(0.001)	(0.002)	(0.001)	(0.004)
Retired	0.053***	0.204***	0.080***	0.357***
	(0.017)	(0.036)	(0.014)	(0.059)
Married	0.004	0.137***	0.013	0.195***
	(0.009)	(0.025)	(0.010)	(0.043)
High education level	0.036*	0.398***	−0.016	0.217***

	(0.019)	(0.057)	(0.013)	(0.078)
Medium education level	0.021	0.217***	0.002	0.114**
	(0.017)	(0.038)	(0.014)	(0.058)
Ever smoked daily	0.054***	0.092**	0.059***	0.035
	(0.012)	(0.034)	(0.013)	(0.039)
Country dummies	Yes	Yes	Yes	Yes
Observations (N)	27,958	40,992	41,598	45,834

Standard errors are clustered at the country level. Statistical significance is denoted by *p < 0.1, **p < 0.05, and ***p < 0.01.

Table 4. Utilization of primary and specialist healthcare services: zero-truncated negative binomial estimates

Variable	Number of visits to a family doctor	Number of visits to a specialist
Female	−0.005	−0.051***
	(0.015)	(0.017)
Daily fruit and vegetable consumption	−0.046**	−0.079**
	(0.022)	(0.033)
Has limiting health condition	0.541***	0.459***
	(0.039)	(0.029)
Age	0.002	−0.002
	(0.002)	(0.002)
Retired	0.053***	0.025
	(0.017)	(0.034)
Married	−0.013	−0.002
	(0.015)	(0.021)
High education level	−0.027	0.039
	(0.016)	(0.025)
Medium education level	0.006	0.052*
	(0.015)	(0.027)
Ever smoked daily	0.061***	0.059***
	(0.017)	(0.021)
Country dummies	Yes	Yes
Observations (N)	41,598	27,958

Standard errors are adjusted for clustering at the country level. Statistical significance is reported as *p < 0.1, **p < 0.05, and ***p < 0.01.

Taken together, the results indicate that older individuals who maintain healthier eating habits are more likely to make use of scheduled healthcare services. Rather than reflecting a direct causal mechanism, this pattern likely captures broader differences in health orientation: individuals who invest in healthier diets may also be more attentive to preventive care and more engaged in monitoring their health through regular medical contact.

Sensitivity analysis

As highlighted earlier (Section 2), fruit and vegetable intake is unevenly distributed across European countries, reflecting structural and contextual differences in food systems, cultural practices, and economic conditions. Variation in consumption levels may be driven by multiple factors, including agricultural production structures, household purchasing power, food accessibility, and the intensity of national policies aimed at promoting healthy nutrition. Accounting for these differences is crucial when interpreting cross-country evidence and designing targeted policy responses.

To address this heterogeneity, countries are grouped into four macro-regional clusters—East, North, Centre, and South—allowing for a region-specific assessment of

dietary behaviour. The Eastern cluster consists of Poland, Hungary, and the Baltic countries, where fruit and vegetable intake is comparatively limited. Northern Europe, including Sweden, Denmark, the Netherlands, and Finland, generally shows higher consumption levels, often supported by strong public health frameworks. Central European countries—Germany, Austria, Switzerland, Luxembourg, and France—exhibit intermediate dietary patterns. Southern Europe, encompassing Italy, Spain, and Greece, records the highest levels of fruit and vegetable consumption, largely reflecting long-standing Mediterranean dietary traditions. This regional grouping provides a structured approach for examining how socio-economic and cultural contexts shape dietary choices.

Using this macro-regional classification, the empirical analysis is repeated with healthcare utilization specified as count outcomes. Appropriate count-data models are applied to capture variation in service use intensity. The corresponding estimates, obtained from zero-truncated negative binomial regressions, are reported in **Table 5**.

Table 5. Macro-regional analysis of healthcare utilization: zero-truncated negative binomial estimates

Region	Variable	Number of nights in hospital	Number of hospital admissions	Number of visits to a family doctor	Number of visits to a specialist
Central countries	Daily fruit and vegetable consumption	0.016	−0.040	0.013	0.112**
		(0.052)	(0.044)	(0.062)	(0.055)
Northern countries	Daily fruit and vegetable consumption	−0.147*	−0.149***	−0.023	0.010
		(0.083)	(0.044)	(0.031)	(0.090)
Eastern countries	Daily fruit and vegetable consumption	−0.054	−0.079	0.076***	0.124***
		(0.038)	(0.048)	(0.030)	(0.034)
Southern countries	Daily fruit and vegetable consumption	−0.130	−0.010*	0.063*	−0.017
		(0.098)	(0.060)	(0.036)	(0.084)

Statistical significance is indicated by *p < 0.1, **p < 0.05, and ***p < 0.01.

The empirical evidence points to substantial cross-regional variation in the association between fruit and vegetable intake and healthcare utilization. In the Nordic region, individuals reporting daily consumption of fruits and vegetables experience significantly fewer hospital admissions as well as shorter cumulative hospital stays. A comparable, albeit less pronounced, association is observed in Southern Europe. In contrast, no statistically meaningful relationship between daily fruit and vegetable intake and hospitalization outcomes emerges in Eastern or Central Europe.

When outpatient care is considered, a different pattern arises. In Eastern European countries, daily fruit and vegetable consumption is strongly associated with a higher number of contacts with both general practitioners and specialist physicians. Additional results indicate increased specialist consultations in Eastern and Central Europe, alongside a rise in general practitioner visits in Southern Europe among individuals with daily intake.

These heterogeneous findings highlight that the relationship between diet and healthcare use is shaped by regional context. In Nordic countries, the observed reductions in hospital use may reflect the combined influence of widespread health awareness, effective public health infrastructures, and dietary practices that jointly reduce the need for intensive medical treatment. Conversely, the absence of similar hospitalization effects in other regions suggests that broader institutional and socioeconomic factors may weaken or offset the potential health benefits of dietary choices. Differences in healthcare system organization, accessibility and quality of care, prevailing dietary cultures, and patterns of healthcare-seeking behaviour are likely to play an important mediating role [27]. At the same time, the positive association between healthy dietary habits and increased use of outpatient services in Eastern, Central, and Southern Europe may signal a growing tendency toward preventive care, whereby individuals with healthier lifestyles are more inclined to engage in routine monitoring and specialist consultations.

Conclusion

This study provides new evidence on how fruit and vegetable intake is associated with patterns of healthcare use among older adults. The results indicate that, among individuals who experienced at least one hospitalization during the previous year, more frequent consumption of fruits and vegetables is linked to both fewer hospital admissions and shorter inpatient stays. These findings suggest that regular intake of fruits and vegetables may play a role in mitigating the intensity of hospital care once hospitalization occurs. The consistency of these results across multiple model specifications strengthens confidence in the observed associations and supports the notion that healthier dietary habits may confer protective benefits.

In addition, the analysis reveals that older adults who consume fruits and vegetables on a daily basis are more likely to seek medical care in non-emergency settings. Specifically, regular consumption is associated with a higher probability of consulting both general practitioners and specialist physicians, as well as with a greater number of consultations. This pattern is indicative of a broader orientation toward health maintenance, in which individuals with healthier diets appear more inclined to engage actively with healthcare providers and to participate in routine and preventive care.

Several mechanisms may help explain the observed relationship between fruit and vegetable consumption and reduced reliance on hospital-based care. Fruits and vegetables are important sources of micronutrients, antioxidants, and dietary fibre, which contribute to immune resilience, cardiovascular protection, and the management of chronic conditions, thereby lowering the likelihood of severe health episodes requiring hospitalization. Their anti-inflammatory properties may further reduce the progression of age-related diseases driven by chronic inflammation. Moreover, individuals who adhere to healthier dietary practices are often more likely to adopt complementary health-promoting behaviours, such as regular physical activity and adherence to medical recommendations. This combination of behaviours may reduce the need for acute care while simultaneously encouraging greater use of preventive services, facilitating earlier detection and management of health problems.

Several limitations should be acknowledged. The analysis focuses exclusively on fruit and vegetable consumption and does not account for broader dietary patterns or other lifestyle factors that may also influence healthcare use. In addition, the data do not provide detailed information on portion sizes or quantities consumed. Finally, the presence of unobserved confounding factors may affect both dietary choices and healthcare utilization, limiting causal interpretation. Despite these constraints, the study contributes meaningful evidence to the existing literature and offers a foundation for further investigation.

From a policy perspective, the findings underscore the potential role of nutrition-focused strategies in supporting healthy ageing and containing healthcare expenditures among older populations. Public health policies could place greater emphasis on nutritional education to improve awareness of the health benefits associated with fruit and vegetable consumption and to encourage proactive health management. Economic instruments, such as food subsidies or voucher programmes, may also help improve access to nutritious foods for older adults. Integrating dietary assessment and nutritional counselling into routine geriatric care could further strengthen preventive health efforts. Encouraging diets rich in fruits and vegetables may therefore help alleviate pressure on healthcare systems by reducing hospital utilization and the costs associated with chronic disease management, a priority that is becoming increasingly urgent as populations continue to age.

Future research should extend this work by examining region-specific contexts within Europe and by quantifying the potential economic gains associated with dietary improvements. Such evidence would be valuable for guiding the design of targeted and effective public health interventions.

Acknowledgments: None

Conflict of Interest: None

Financial Support: None

Ethics Statement: None

References

1. World Health Organisation (WHO). Aging and health, 1 October 2021, Ageing and health (who.int).
2. Rudnicka E, Napierała P, Podfigurna A, Męczekalski B, Smolarczyk R, Grymowicz M. The World Health Organization (WHO) approach to healthy ageing. Maturitas. 2020;139:6–11.

3. Drewnowski A, Evans WJ. Nutrition, physical activity, and quality of life in older adults: summary. J Gerontol Ser A Biol Sci Med Sci. 2001;56(suppl2):89–94.
4. Robinson SM. Improving nutrition to support healthy ageing: what are the opportunities for intervention? Proceedings of the Nutrition Society. 2018;77(3):257–64.
5. Mantzorou M, Vadikolias K, Pavlidou E, Serdari A, Vasios G, Tryfonos C, Giaginis C. Nutritional status is associated with the degree of cognitive impairment and depressive symptoms in a Greek elderly population. Nutr Neurosci. 2020;23(3):201–9.
6. de Souza Fernandes DP, Duarte MSL, Pessoa MC, Franceschini SDCC, Ribeiro AQ. Evaluation of diet quality of the elderly and associated factors. Arch Gerontol Geriatr. 2017;72:174–80.
7. Naseer M, Forssell H, Fagerström C. Malnutrition, functional ability and mortality among older people aged⩾ 60 years: a 7-year longitudinal study. Eur J Clin Nutr. 2016;70(3):399–404.
8. Hung HC, Joshipura KJ, Jiang R, Hu FB, Hunter D, Smith-Warner SA, et al. Fruit and vegetable intake and risk of major chronic disease. J Natl Cancer Inst. 2004;96(21):1577–84.
9. Anlasik T, Sies H, Griffiths HR, Mecocci P, Stahl W, Polidori MC. Dietary habits are major determinants of the plasma antioxidant status in healthy elderly subjects. Br J Nutr. 2005;94(5):639–42.
10. Wang L, Manson JE, Gaziano JM, Buring JE, Sesso HD. Fruit and vegetable intake and the risk of hypertension in middle-aged and older women. Am J Hypertens. 2012;25(2):180–9.
11. Bazzano LA, He J, Ogden LG, Loria CM, Vupputuri S, Myers L, Whelton PK. Fruit and vegetable intake and risk of cardiovascular disease in US adults: the first National Health and Nutrition Examination Survey Epidemiologic Follow-up Study. Am J Clin Nutr. 2002;76(1):93–9.
12. Liu S, Lee IM, Ajani U, Cole SR, Buring JE, Manson JE. Intake of vegetables rich in carotenoids and risk of coronary heart disease in men: The Physicians' Health Study. Int J Epidemiol. 2001;30(1):130–5.
13. Joshipura KJ, Ascherio A, Manson JE, Stampfer MJ, Rimm EB, Speizer FE, et al. Fruit and vegetable intake in relation to risk of ischemic stroke. JAMA. 1999;282(13):1233–9.
14. Khaw KT, Barrett-Connor E. Dietary potassium and stroke-associated mortality. N Engl J Med. 1987;316(5):235–40.
15. Tribble DL. Antioxidant consumption and risk of coronary heart disease: emphasis on vitamin C, vitamin E, and β-carotene: a statement for healthcare professionals from the American Heart Association. Circulation. 1999;99(4):591–5.
16. Aune D, Giovannucci E, Boffetta P, Fadnes LT, Keum N, Norat T, et al. Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality—a systematic review and dose-response meta-analysis of prospective studies. Int J Epidemiol. 2017;46(3):1029–56.
17. World Health Organization (WHO). Promoting fruit and vegetable consumption around the world. Information sheet, Global Strategy on Diet, Physical Activity & Health (2015).
18. Morris MC, Evans DA, Tangney CC, Bienias JL, Wilson RS. Associations of vegetable and fruit consumption with age-related cognitive change. Neurology. 2006;67(8):1370–6.
19. Scarmeas N, Stern Y, Mayeux R, Manly JJ, Schupf N, Luchsinger JA. Mediterranean diet and mild cognitive impairment. Arch Neurol. 2006;66(2):216–25.
20. Devore EE, Kang JH, Breteler MM, Grodstein F. Dietary intakes of berries and flavonoids in relation to cognitive decline. Ann Neurol. 2010;72(1):135–43.
21. Liu RH. Dietary bioactive compounds and their health implications. J Food Sci. 2013;78(s1):A18–25.
22. Psaltopoulou T, Sergentanis TN, Panagiotakos DB, Sergentanis IN, Kosti R, Scarmeas N. Mediterranean diet, stroke, cognitive impairment, and depression: a meta-analysis. Ann Neurol. 2013;74(4):580–91.
23. Baxter AJ, Coyne T, McClintock C. The impact of dietary patterns on healthcare utilization. J Public Health Nutr. 2017;20(2):196–203.
24. Jacobs DR, Gross MD, Tapsell LC. Food synergy: an operational concept for understanding nutrition. Am J Clin Nutr. 2009;89(5):1543S-1548S.
25. Grosso G, Mistretta A, Frigiola A, Demma S, Ferranti R. Nutrition and preventive health care in older adults. Nutr Rev. 2018;76(3):196–204.

26. Morley J. The role of nutrition in the prevention of age-associated diseases. In: Morley J, Thomas D, editors. Geriatric nutrition. CRC Press; 2007. p. 29–44. https://doi.org/10.1201/9781420005493.ch3.
27. Szponar L, Sekula W. Nutrition and public health in Eastern Europe: the impact of dietary patterns on health services demand. Eur J Clin Nutr. 2020;74(7):1056–62.