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The Association between Odds of Sarcopenia in Elderly and the Global and Prime Diet Quality Scores: A Case-Control Study

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ABSTRACT

Background: The gradual loss of skeletal muscle associated with aging is called sarcopenia, which significantly affects the health and independence of the elderly. Although dietary quality has been suggested as a modifiable risk factor, evidence remains limited. The goal of our research was to evaluate the link between sarcopenia and two comprehensive diet quality indices of the Global Diet Quality Score (GDQS) and the Prime Diet Quality Score (PDQS).

Methods: In the present case-control research, 160 older adults (>65 years) from Shiraz, Iran, were enrolled; while 80 were with confirmed sarcopenia and 80 were healthy controls. Applying a validated 168-item food frequency questionnaire, dietary intake was evaluated. PDQS and GDQS were calculated based on food group intakes. Sarcopenia diagnosis followed the Asian Working Group for Sarcopenia (AWGS) criteria. Associations were investigated using logistic regression models that had been modified to account for possible confounding variables.

Results: Greater PDQS and GDQS scores were significantly linked to reduced odds of sarcopenia. Individuals in the last tertile of PDQS and GDQS had 60% and 64% lower likelihood of sarcopenia, respectively, compared to those in the 1st tertile (PDQS: odds ratio (OR)=0.397, 95%confidence interval (CI): 0.161–0.976; GDQS: OR=0.357, 95%CI: 0.140–0.911).

Conclusion: Greater adherence to high-quality dietary patterns, as indicated by PDQS and GDQS, is inversely linked to sarcopenia odds in older adults. These findings support the implementation of diet-based interventions as a promising strategy to preserve muscle health and promote healthy aging.

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Introduction

Changes in body composition are linked to aging (1). A common problem among older adults is sarcopenia, which is defined as the gradual loss of the skeletal muscle, resulting in decreased muscular strength and performance and potentially impairing both quality of life and independence (2). Studies in the United States estimated that sarcopenia affects 25-45% of elderly population, amplifying the risk of falls, limitations in daily activities, and potential nursing home admissions (3). Recent research indicated the potential reversibility of sarcopenia, underscoring the significance of identifying interventions to address it from a public health perspective (4).

Lifestyle elements such as physical activity and diet could have a major impact on preventing sarcopenia (5). Older individuals experience health improvements from eating a better diet, like a decreased risk of age-related illnesses like cardiovascular diseases, type 2 diabetes and cancer, which leads to increased longevity and decreased mortality (6, 7). Despite the fact that the link between diet quality and sarcopenia in old age is not completely understood, more and more data indicate that a "healthier" diet is linked to improved muscle strength and physical performance in older persons (6-8).

Due to the intricacy of evaluating diet quality through singular nutrient intake, different dietary scoring systems like the Global Diet Quality Score (GDQS) and Prime Diet Quality Score (PDQS) have been developed (9, 10). Food-based scoring systems are easy to adapt for clinical use because they do not require particular software or databases for nutrient analysis (11). The GDQS is a food group of twenty-five items divided into three or four intake categories based on predetermined cutoffs (g/d), with each group's health effects rated (12). Excluding high-fat dairy products and red meat, nine unhealthy categories have given negative ratings, whereas sixteen healthy food groups receive positive marks. The range of scores is 0-49, with higher scores reflecting greater dietary quality (9).

It is believed that oxidative stress and cytokines cause the inflammatory condition known as sarcopenia, and that the buildup of reactive oxygen species (ROS) may result in oxidative damage, which probably leads to muscle atrophy and loss of strength (8). Moreover, "healthier diets" high in plant-derived chemicals like polyphenols may have anti-inflammatory and antioxidant properties, potentially mitigating sarcopenia risk (13). The results for sarcopenia, muscle strength, and muscle mass also point to a connection with "healthier" diets, but the evidence base has gaps (14). Hence, the goal of our research was to evaluate the link between GDQS and PDQS scores and the likelihood of sarcopenia in older persons. Through our investigation of these diet quality metrics, we seek to uncover the dietary factors impacting muscle health in older adults. This study may inform targeted interventions to decrease sarcopenia prevalence and enhance the standard of living and the results of healthcare among the elderly, thus contributing to evidence-based public health strategies for healthy aging.

Materials and Methods

The present case-control research was designed based on the previous cross-sectional research which was performed on older adults who came to healthcare centers between August 2017 and February 2018 in Shiraz, Iran (15). Based on inclusion and exclusion criteria, there were 80 participants equally in the control and case groups, while the control group consisted of individuals without sarcopenia, and individuals with confirmed sarcopenia were members of the case group. The following were the criteria for this case-control research: age >65 years, without a history of stroke, heart or pulmonary disease, neurological illnesses, or failure of any vital organ, and physically active. However, failure to complete the questionnaires and unwillingness to take part in the research were exclusion criteria.

The checklist was utilized for gathering demographic data, including smoking status, educational level, sex, and age. The International Physical Activity Questionnaire (IPAQ) was applied to evaluate physical activity (16). The Shiraz University of Medical Sciences validated the present case-control research. All study participants provided their informed consent by signing a formal agreement. Details of certain components of this cohort have been reported previously (17, 18). This study was approved by the Medical Research and Ethics Committee of Shiraz University of Medical Sciences (IR.SUMS.SCHEANUT.REC.1402.121). Also, this study was conducted in accordance with the ethical standards of the declaration of Helsinki. All participants read and signed the informed consent form.

Sarcopenia was defined by the criteria of the Asian Working Group for Sarcopenia (AWGS) as a decline in muscle mass and skeletal muscle function, including performance and strength (19). The bioelectrical impedance analysis (BIA) (South Korea) was utilized for measuring components of body composition. Using a formula, the skeletal muscle mass index (SMI) was determined (20, 21). Low SMI was considered SMI <7 and <5.7 kg/m^2 in men and women, respectively (15). Muscle strength was assessed using a hydraulic hand dynamometer (Korea) to measure hand grip strength (HGS). In a seated position, using both hands, the subjects applied pressure to a dynamometer three times, with a 15-second break between each application. For analyses, the maximum value was used. Low muscular strength was characterized as having an HGS of <18 kg for women and <26 kg for men (15). To evaluate physical performance, gait speed was measured over 4 meters. A gait speed of under 0.8 meters per second was considered evidence of poor physical performance (15).

A 168-item Food Frequency Questionnaire (FFQ) with conventional serving sizes and good validity and reliability, which was used in Iranian populations, was utilized for assessing the dietary intake of participants (22). A nutritionist conducted an in-person interview to administer the questionnaire. The daily, weekly, monthly, or annual food consumption was requested, and the data were then transformed into grams. After that, the daily food consumption was determined by multiplying the serving size by the frequency of eating. Finally, energy, macronutrients, and micronutrients were determined by the modified Iranian version of Nutritionist software.

The PDQS combined fourteen groups of healthy foods, including nuts, legumes, liquid vegetable oil, poultry, fish, low-fat dairy, whole grains, eggs, other fruits, other vegetables, deep orange vegetables, cruciferous vegetables, citrus fruits, and carrots, as well as seven groups of unhealthy foods, including fried foods, sugar-sweetened beverages, desserts and ice cream, red meat, potatoes, processed meat, and baked goods and refined grains. Individual items of food were placed into their PDQS food group (23).

Servings for all food items were calculated on a daily and then a weekly basis. Points were awarded for each food group based on the following criteria: 0 points for healthy and 0–1 servings/week, 1 point for healthy and 2–3 servings/week, and 2 points for healthy and 4 or >4 servings/week; 2 points for unhealthy and 0–1 servings/week, 1 point for unhealthy and 2–3 servings/week, and 0 points for unhealthy and 4 or >4 servings/week. Finally, the overall PDQS for each participant was calculated. The range of PDQS was between 0–42 and a better score indicated a better diet quality (23).

Also, for GDQS, foods were categorized into two groups of healthy (liquid oils, whole grains, fish, nuts, legumes, low-fat dairy, fruits, vegetables, poultry, and eggs) and unhealthy (refined grains, processed and red meat, sugar-sweetened beverages, high-fat dairy, sweets, and fried foods). Points were awarded according to three or four groups of intake quantities (grams per day), each of which is unique to each group. The GDQS range was between 0–49 points. Higher consumption of healthy food groups received higher points, while lower intake of unhealthy food groups received higher points (12).

To analyze the data, SPSS software (version 24, Chicago, IL, USA) was applied in current research. Statistical significance was defined as having a *p* value less than 0.05. To analyze categorical variables, the chi-square test was applied, and to analyze parametric continuous variables, the independent sample t-test was applied. The Mann-Whitney U test was employed to analyze non-parametric continuous variables. Binary logistic regression was utilized to analyze the link between the odds of sarcopenia and the GDQS and PDQS, with protein and energy consumption, physical activity, and age considered.

Results

Table 1 presents the study population characteristics and food group intake according to the PDQS for sarcopenic and healthy individuals. In the control group, the median physical activity (p=0.039) and age (p=0.037) between lower and higher PDQ scores were significantly different. However, in both the control and case groups, PDQS, energy, and protein consumption were different between lower and higher PDQ scores (p<0.001 for all). In the case group, the mean intake of dark green leafy vegetables (p=0.042), low-fat dairy products (p<0.001), other vegetables (p=0.004), and liquid oils (p=0.003) was significantly higher, but the higher PDQS group had much lower levels of other fruits, deep orange fruits, and citrus fruits (p<0.001 for all) than the other group. In the control group, however, the mean intake of citrus fruits, dark green leafy vegetables, deep orange vegetables, deep orange fruits, fish and shellfish (all p<0.001), legumes and soy (p=0.013), other vegetables (p=0.002), and other fruits (p=0.003) was considerably higher in the higher PDQS group.

In Table 2, the study of population characteristics and food group intake based on GDQS between the sarcopenic and healthy populations were reported. The median physical activity (p=0.006) and SMI (p=0.049) between lower and higher GDQS was significantly different, respectively, in the case and control groups. However, GDQS, energy, and protein intake were different between lower and higher GDQ scores in both the control and case groups (p<0.001 for all). In the higher GDQS, consumption of eggs (p=0.009), deep orange fruits (p=0.018), other fruits (p=0.008), liquid oils, other vegetables, citrus fruits, low-fat dairy products (p<0.001 for all), dark green leafy vegetables (p=0.002), and legumes (p=0.004) were significantly greater in the case group. Additionally, consumption of low-fat dairy products (p=0.030), liquid oils (p=0.007), other vegetables (p=0.001), other fruits (p=0.018), cruciferous vegetables (p=0.020), citrus fruits, deep orange tubers, dark green leafy vegetables, fish and shellfish, red meats (p<0.001 for all), deep orange vegetables (p=0.002), legumes (p=0.001), and refined grains and baked goods (p=0.002) were significantly higher in the higher GDQS in the control group.

Table 1: The study of population characteristics and food group intake is based on PDQS between sarcopenic and healthy population.

Variable	**Case (n=80)**		***P* value**	**Control (n=80)**		***P* value**
	PDQS≤20 (n=51)	**PDQS >20.1 (n=29)**		**PDQS ≤20 (n=20)**	PDQS >20.1 (n=60)	
Age (year)[1]	70.0 (67.0-74.0)	71.0 (67.5-76.5)	0.343	66.0 (65.0-69.0)	68.5 (66.0-71.0)	0.037
PDQS[2]	16.8±2.6	23.6±3.0	<0.001	17.9±1.8	26.1±3.4	<0.001
Energy (kcal/day)	1171.6±428.4	1606.4±422.4	<0.001	1503.0±327.5	1974.3±429.6	<0.001
Protein (g/day)	38.8±14.8	54.3±10.4	<0.001	52.4±13.1	69.1±18.4	<0.001
BMI (kg/m^2)[2]	24.1±3.7	25.2±4.8	0.238	30.6±4.3	28.8±3.5	0.064
Muscle strength (kg)[1]	16.0 (12.0-22.0)	15.0 (10.5-20.5)	0.169	50.83 (40.83-63.33)	50.83 (41.67-65.83)	0.675
SMI (kg/m^2)[1]	6.4 (5.4-6.9)	5.5 (5.4-6.6)	0.149	8.1 (7.5-8.8)	7.9 (7.4-8.4)	0.211
Gait speed (m/second)[2]	0.7±0.1	0.7±0.1	0.724	0.9±0.2	1.0±1.1	0.573
Physical activity (MET.hour/week)[2]	495.00 (0.00-1386.00)	346.50 (0.00-957.00)	0.401	0.00 (0.00-594.00)	594.00 (0.00-1386.00)	0.039
Gender, female, no, (%)[3]	20 (39.2)	16 (55.2)	0.242	10 (52.6)	26 (43.3)	0.599
Smoking history, no, (%[3])	37 (72.5)	24 (82.8)	0.415	14 (73.7)	44 (73.3)	1.000
Prime diet quality score components						
Dark green leafy vegetables (g/day)[4]	31.2±5.1	55.7±10.4	0.042	27.5±7.9	72.8±6.9	<0.001
Cruciferous vegetables (g/day)[4]	5.8±2.6	9.6±4.4	0.437	6.6±3.1	17.9±3.2	0.062
Deep orange vegetables (g/day)[4]	7.7±2.5	4.7±2.8	0.454	2.6±1.4	12.9±1.6	<0.001
Other vegetables (g/day)[4]	80.1±9.3	134.9±18.6	0.004	157.1±21.3	253.9±15.6	0.002
Citrus fruits (g/day)[4]	64.8±10.9	28.8±21.4	<0.001	101.0±16.8	205.2±11.3	<0.001
Deep orange fruits (g/day)[4]	156.2±27.6	490.9±63.1	<0.001	211.5±68.9	520.5±41.5	<0.001
Other fruits (g/day)[4]	146.7±20.6	349.6±45.3	<0.001	270.3±26.1	384.1±19.4	0.003
Legumes and soy (g/day)[4]	15.2±3.8	33.8±8.4	0.052	45.7±7.7	79.2±6.9	0.013
Nuts and seeds (g/day)[4]	1.3±0.3	5.5±2.2	0.070	0.3±0.1	3.0±0.4	0.001
Poultry (g/day)[4]	23.4±2.3	26.5±2.3	0.372	26.8±2.3	35.2±3.9	0.245
Fish and shellfish (g/day)[4]	6.9±1.5	11.4±2.7	0.092	0.7±0.7	10.4±1.5	<0.001
Low fat dairy products (g/day)[4]	117.4±19.6	264.0±30.4	<0.001	284.9±37.3	298.1±18.9	0.741
Whole grains (g/day)[4]	0.0±0.0	0.0±0.0	1.000	0.0±0.0	0.0±0.0	1.000
Liquid oils (g/day)[4]	9.1±0.5	11.6±0.6	0.003	11.6±0.7	13.4±0.6	0.077
White roots tubers (g/day)[4]	4.7±0.9	6.4±1.2	0.250	15.8±2.3	9.9±0.9	0.025
Red meats (g/day)[4]	5.1±0.7	7.3±2.7	0.447	1.9±0.6	8.4±0.9	<0.001
Processed meats (g/day)[4]	0.4±0.2	0.0±0.0	0.057	0.1±0.1	0.0±0.0	0.331
Eggs (g/day)[4]	19.3±1.9	22.8±2.9	0.311	29.7±3.9	24.6±1.8	0.196
Refined grains and baked goods (g/day)[4]	228.0±13.5	223.5±14.4	0.830	284.7±26.5	315.3±15.1	0.324
Sugar-sweetened beverages (g/day)[4]	34.1±14.5	8.3±4.4	0.096	8.4±3.4	6.9±2.3	0.739
Sweets and ice creams (g/day)[4]	26.4±4.0	26.1±7.1	0.966	27.4±6.7	26.0±3.6	0.851
Fried foods (g/day)[4]	0.0±0.0	3.8±3.8	0.323	0.0±0.0	0.0±0.0	0.006

PDQS, prime diet quality score; kcal, kilocalorie; g, gram; BMI, body mass index; kg, kilogram; m, meter; SMI, skeletal muscle mass index; MET, metabolic equivalent of task. [1]Using the Mann-Whitney U test for non-parametric continuous variables and the values are median (25th-75th). [2]Using independent samples T-test for parametric continuous variables and the values were mean±SD. [3]Using the chi-square test for categorical variables, and the values are frequencies (percentages). [4]Using independent samples T-test for parametric continuous variables and the values weare mean±SE.

Table 2: The study of population characteristics and food group intake is based on GDQS between sarcopenic and healthy population.

Variable	Case (n=80)		*P* value	Control (n=80)		*P* value
	GDQS≤27 (n=59)	GDQS >27.1 (n=21)		GDQS ≤27 (n=21)	GDQS >27.1 (n=59)	
Age (year)[1]	70.0 (67.0-75.0)	70.0 (66.0-77.0)	0.869	66.0 (65.0-69.7)	68.0 (66.0-71.0)	0.077
GDQS[2]	22.2±3.1	29.9±1.9	<0.001	23.9±2.1	31.9±2.5	<0.001
Energy (kcal/day)[2]	1237.9±473.3	1585.9±374.3	<0.001	1463.3±321.4	1995.8±411.6	<0.001
Protein (g/day)[2]	40.3±14.6	56.2±10.1	<0.001	47.3±14.2	71.2±15.9	<0.001
BMI (kg/m^2)[2]	24.7±4.0	23.8±4.4	0.408	30.4±4.6	28.8±3.4	0.118
Muscle strength (kg)[1]	16.00 (11.00-22.00)	15.00 (11.00-20.50)	0.410	44.58 (36.66-62.49)	54.17 (43.33-65.83)	0.107
SMI (kg/m^2)[1]	6.4 (5.4-6.9)	5.5 (5.3-6.4)	0.049	7.8 (7.3-8.5)	7.9 (7.6-8.4)	0.528
Gait speed (m/second)[2]	0.7±0.1	0.7±0.1	0.487	0.8±0.1	1.0±1.1	0.460
Physical activity (MET. hour/ week)[1]	462.00 (0.00-1386.00)	254.50 (0.00-957.00)	0.594	0.00 (0.00-594.00)	594.00 (0.00-1386.00)	0.006
Gender, female, no, (%)[3]	26 (44.1)	10 (47.6)	0.803	12 (60.0)	24 (40.7)	0.194
Smoking history, no, (%)[3]	45 (76.3)	16 (76.2)	1.000	15 (75.0)	43 (72.9)	1.000
Global diet quality score components						
Citrus fruits (g/day)[4]	82.3±11.7	214.3±27.6	<0.001	116.5±18.1	201.7±11.7	<0.001
Deep orange fruits (g/day)[4]	230.1±36.3	410.6±73.1	0.018	325.5±76.8	487.1±43.5	0.067
Other fruits (g/day)[4]	176.0±23.1	344.4±54.4	0.008	288.8±26.3	379.8±20.0	0.018
Dark green leafy vegetables (g/day)[4]	28.3±4.6	73.1±12.2	0.002	13.7±5.2	78.3±6.6	<0.001
Cruciferous vegetables (g/day)[4]	5.0±2.3	13.3±5.9	0.118	4.9±2.4	18.6±3.2	0.020
Deep orange vegetables (g/day)[4]	6.7±2.1	6.5±3.9	0.951	4.4±1.7	12.5±1.6	**0.002**
Other vegetables (g/day)[4]	79.2±9.2	158.2±20.4	<0.001	156.7±25.3	255.7±14.9	0.001
Legumes (g/day)[4]	12.8±3.2	47.5±10.5	0.004	39.3±8.0	81.9±6.7	0.001
Deep orange tubers (g/day)[4]	2.3±1.6	13.1±5.8	0.089	2.9±1.5	17.3±2.3	<0.001
Nuts and seeds (g/day)[4]	1.5±0.3	6.8±3.0	0.095	1.3±0.5	2.7±0.4	0.089
Whole grains (g/day)[4]	0.0±0.0	0.0±0.0	1.000	0.0±0.0	0.0±0.0	1.000
Liquid oils (g/day)[4]	9.4±0.5	11.7±0.3	<0.001	11.1±0.6	13.6±0.6	0.007
Fish and shellfish (g/day)[4]	7.2±1.4	12.6±2.6	0.063	1.4±0.9	10.3±1.5	<0.001
Poultry and game meats (g/day)[4]	25.3±1.9	22.2±3.2	0.414	26.1±2.2	35.6±3.9	0.179
Low fat dairy products (g/day)[4]	127.2±18.6	292.0±35.4	<0.001	232.4±40.5	316.1±17.3	0.030
Eggs (g/day)[4]	18.0±1.7	27.7±3.6	0.009	22.1±4.3	27.1±1.7	0.296
High fat dairy products (g/day)[4]	17.9±4.0	27.7±10.4	0.289	18.4±2.4	25.1±5.6	0.501
Red meats (g/day)[4]	4.7±0.6	9.1±3.7	0.255	1.8±0.6	8.5±0.9	<0.001
Processed meats (g/day)[4]	0.3±0.1	0.0±0.0	0.057	0.1±0.1	0.0±0.0	0.330
Refined grains and baked goods (g/day)[4]	229.6±11.7	217.1±19.8	0.586	239.6± 26.9	331.2±13.9	0.002
Sweets and ice creams (g/day)[4]	28.8±4.5	19.1±5.2	0.244	31.3±8.5	24.7±3.1	0.368
Sugar-sweetened beverages (g/day)[4]	29.7±12.6	10.8±6.0	0.387	4.5±2.9	8.2±2.4	0.409
Juices (g/day)[4]	1.1±1.1	5.4±5.4	0.443	0.0±0.0	0.0±0.0	1.000
White roots tubers (g/day)[4]	5.1±0.8	5.9±1.1	0.630	11.9±2.5	11.1±0.9	0.766
Fried foods (g/day)[4]	1.9±1.8	0.0±0.0	0.567	0.0±0.0	0.0±0.0	0.006

GDQS, global diet quality score; kcal, kilocalorie; g, gram; BMI, body mass index; kg, kilogram; m, meter; SMI, skeletal muscle mass index; MET, metabolic equivalent of task. [1]Using the Mann-Whitney U test for non-parametric continuous variables and the values are median (25th-75th). [2]Using independent samples T-test for parametric continuous variables and the values are mean±SD. [3]Using the chi-square test for categorical variables, and the values are frequencies (percentages). [4]Using independent samples T-test for parametric continuous variables and the values are mean±SE.

Table 3: Association between elderly dietary index and risk of sarcopenia.

Variable	Crude model		Adjusted model	
	OR (95% CI)	*P* value	OR (95%CI)	*P* value
PDQS				
Lower than mean score	Ref.	<0.001	Ref.	0.044
Higher than mean score	0.180 (0.090-0.358)		0.397 (0.161-0.976)	
GDQS				
Lower than mean score	Ref.	<0.001	Ref.	0.031
Higher than mean score	0.121 (0.059-0.246)		0.357 (0.140-0.911)	

OR, odds ratio; CI, confidence interval; PDQS, prime diet quality score; GDQS, global diet quality score; Ref, reference. Significant values are shown in bold. These values are odds ratios (95%CIs). Obtained from logistic regression by enter method. Adjusted for age, physical activity, energy and protein intakes.

In Table 3, the connection between the risk of sarcopenia and the scores of PDQS and GDQS is seen. In the crude model, the higher mean scores of PDQS and GDQS exhibited significantly decreased odds of sarcopenia compared to the mean scores of both indices (PDQS: odds ratio (OR)=0.180, 95% confidence interval (CI): 0.090-0.358; GDQS: OR=0.121, 95%CI: 0.059-0.246). In addition, the connection continued to be statistically significant in both indices after controlling for possible confounders (PDQS: OR=0.394, 95%CI: 0.161–0.976; GDQS: OR=0.357, 95%CI: 0.140–0.911).

Discussion

In our research, we observed a significant reverse link between dietary quality, as assessed by the GDQS and PDQS, and sarcopenia odds in elderly individuals. Participants with a greater PDQS had a 60% reduction in the chance of developing sarcopenia after controlling for confounding variables. Similarly, those with a higher GDQS experienced a 64% reduction in sarcopenia risk. According to these findings, preserving a high-quality diet may be essential in lowering the incidence of sarcopenia in the elderly, even when controlling for important lifestyle and dietary factors. According to several dietary indices, higher diet quality is associated with improved health outcomes in the elderly, such as longer life expectancy, lower risks of common age-related illnesses, and lower rates of all-cause mortality, cardiovascular disease, neurodegenerative diseases, cancer, and type 2 diabetes, as well as reduced mortality among cancer survivors (7, 24).

The present research is the first, to our knowledge, to evaluate the link between the risk of sarcopenia and diet quality scores as determined by the GDQS and PDQS. This novel focus makes direct comparisons with existing literature difficult, resulting in findings that are not readily comparable with other epidemiological studies. Nonetheless, it is well established that lifestyle factors, particularly dietary habits, significantly contribute to muscle health and the development of sarcopenia (14, 25). Evaluating dietary impacts on health in populations is essential for creating evidence-based approaches to enhance diet quality and reduce disease burden (26).

Our findings are consistent with earlier research that looked at the relationship between muscular health and diet quality. For instance, a systematic review highlighted that dietary patterns high in lean proteins, whole grains, vegetables, and fruits—items often rated highly in both the PDQS and GDQS—were linked to a lower risk of sarcopenia and improved muscle health (27). The Mediterranean diet, which is noted for its similarities to the PDQS and the GDQS, has been shown to be particularly advantageous (27). For instance, it was found by Chan *et al.* that better physical performance and muscular strength in older individuals were associated with higher adherence to a Mediterranean-like diet (28). Additionally, the Dietary Approaches to Stop Hypertension (DASH) diet, which is also reflected in the PDQS and GDQS, has been correlated with improved physical function and lower muscle loss (29).

The potential mechanisms by which diet quality may affect the risk of sarcopenia are multifaceted. Firstly, it is well-established that persistent low-grade inflammation is a major contributor to the reduction in muscle strength and mass that causes sarcopenia (30). The impact of diet quality on this process may be exerted through the modulation of inflammatory responses. Inflammation results in the activation of pro-inflammatory cytokines, including interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-α), and C-reactive protein (CRP), which have been demonstrated to prevent muscle regeneration and encourage muscle protein breakdown (31, 32).

These inflammatory markers cause skeletal muscle loss and speed up protein catabolism by blocking muscle protein synthesis, accelerating protein breakdown, and raising the formation of muscle growth inhibitors like muscle atrophy proteins such as Atrogin-1 and myostatin (33). High scores on the PDQS and GDQS are often associated with diets that are rich in anti-inflammatory foods like fatty fish, whole grains, vegetables, fruits, and olive oil, which are known to reduce levels of these pro-inflammatory indicators. As a result, eating a diet high in antioxidants and anti-inflammatory components may aid in maintaining muscular function and mass (13), thereby potentially reducing the risk of sarcopenia (34).

Secondly, another possible mechanism by which higher diet quality scores, such as PDQS and GDQS, may decrease sarcopenia risk is through the reduction in oxidative stress. An insufficient balance between the ROS production and the body's capacity to use antioxidants to lessen their negative consequences leads to oxidative stress. The aging process is linked to higher oxidative stress, which contributes to muscle fiber degradation, ultimately leading to sarcopenia (8, 35, 36). Because of their anti-inflammatory and antioxidant effects, the use of dietary antioxidants is thought to be a promising strategy for combating the age-related decline in muscle size and function (37). Therefore, diets rich in antioxidants, especially those with high PDQS and GDQS scores—characterized by an abundance of fruits, whole grains, nuts, and vegetables, and containing substantial amounts of vitamins C and E, carotenoids, and polyphenols—could reduce the likelihood of developing sarcopenia (8, 13, 38).

This study presents several strengths, including its distinction as the first to investigate the link between PDQS and GDQS and sarcopenia odds, thus offering new insights into the subject. The regression analysis's thorough adjustment for possible confounding variables is another notable advantage. Nonetheless, some limitations must be acknowledged. Although the case-control methodology is helpful for investigating correlations, it has intrinsic limitations in determining causation. In addition, there may be recall bias when using dietary data that is self-reported, potentially compromising the accuracy of the diet quality scores. Despite these limitations, the findings from this study lay robust groundwork for future research. These results need to be confirmed by longitudinal studies, which will also help us have a deeper understanding of the connection between the quality of our food and the chance of developing sarcopenia, as well as the possible influence of dietary changes on muscle health in the elderly even at cellular level (39, 40).

Conclusion

Our study offers strong evidence that higher scores on both the PDQS and GDQS are linked to a reduced likelihood of sarcopenia in older persons. The crucial importance of diet quality in preventing age-related muscle loss and maintaining muscle health is highlighted by these findings. The likelihood of developing sarcopenia, a disorder that significantly affects the physical health and well-being of older people, can be greatly reduced by following dietary patterns that are high in nutrients, such as lean meats, fruits, vegetables, and whole grains. By being the first study to demonstrate a clear association between these diet quality indicators and the odds of sarcopenia, this work contributes to the current body of knowledge. The associations observed in the present research suggest that dietary interventions could be a promising approach for reducing sarcopenia and its associated challenges. However, more research is necessary to continue investigating the underlying mechanisms of this connection and to determine the possible advantages of tailored dietary approaches in promoting healthy aging and preventing sarcopenia.

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Authors' Contribution

MRZ, AS, NA, MRD and MN; Contributed to writing the first draft. MM: Contributed to data collecting. MN and ZS; Contributed to all data and statistical analysis, and interpretation of data. MN and MHD; Contributed to the research concept, supervised the work and revised the manuscript. All authors read and approved of the final manuscript.

Conflict of Interest

None.

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