Çiftçi and Erdem *BMC Geriatrics* (2025) 25:102
https://doi.org/10.1186/s12877-025-05751-w

BMC Geriatrics

RESEARCH

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Comparing nutritional status, quality of life and physical fitness: aging in place versus nursing home residents

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Abstract

Background Quality of life (QoL) is a key indicator of well-being in older adults (OAs) and several factors, including nutrition, physical fitness, and dwelling place, can influence QoL. OA residing in institutional settings, such as nursing homes (NH), often can exhibit different QoL outcomes, nutrition status and physical fitness compared to those living independently in age-in-place (AIP) environments. This study seeks to compare the QoL, and physical activity levels of OA residing in NH with those AIP and to evaluate their dietary quality.

Methods This cross-sectional study included a total of 400 voluntary OAs, residing either in Narlıdere Nursing Home and Aged Care Rehabilitation Centre ($n=200$) or aging in place ($n=200$) in İzmir, Turkey. Participants were recruited between May 2023 and December 2023. Data collection involved face-to-face interviews using a questionnaire that covered demographic and anthropometric measurements, Mini Nutritional Assessment (MNA), Older People's Quality of Life (OPQOL-brief), Physical Fitness and Exercise Activity Levels of Older Adults Scale (PFES), and a 24-hour dietary recall. Nutritional status was further assessed using the Healthy Eating Index for Older Adults (HEI-OA).

Results Mean age of OAs was 77.8 ± 6.5 years and BMI was 25.8 ± 3.9 kg/m^2. HEI scores were not differed between groups (NH: 42.8 ± 8.1, AIP: 42.2 ± 11.0, $p<0.542$), but AIP residents had lower poor diet quality (NH: 40.4 ± 5.9, AIP: 37.5 ± 7.9, $p<0.001$). NH residence had higher OPQOL scores (NH: 54.8 ± 7.8, AIP: 47.6 ± 10.4, $p<0.001$), and higher MNA scores (NH: 25.6 ± 2.7, AIP: 22.4 ± 5.5, $p<0.001$). NH group had lower PFES scores, indicating reduced physical fitness compared to AIP participants (NH: 67.3 ± 6.3, AIP: 74.7 ± 7.7, $p<0.001$). Nutrient intake analysis revealed that NH residents consumed more daily water, protein, and micronutrients than AIP participants, with statistically significant differences in protein, MUFA, and SFA intake ($p<0.001$). A significant relationship between MNA and QoL total score in NH ($r=0.157$, $p=0.027$) and AIP ($r=0.619$, $p<0.001$) was found.

Conclusion The findings of this study revealed the potential influence of nutritional status on QoL, in enhancing QoL outcomes.

Keywords Nutrition status, Nursing homes, Aging in place

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Introduction

People all over the world are living longer and the ratio of older adults (OA) in the population is growing in every country [1]. The global population aged over 60 is projected to nearly double, increasing from 12% in 2015 to 22% by 2050 [2]. Turkiye is facing a rapid expansion in the proportion of OAs in its total population, anticipated to rise to 9.9% in 2022, with projections suggesting it will reach 12.9% by 2030 [3]. According to that report, at least one OA lives in 24.1% of households [3].

OAs are among the most vulnerable populations, with many having poor physical health due to insufficient physical activity, inadequate nutrition, and low skeletal muscle mass. These factors contribute to the development of chronic diseases and a range of acute health issues [4]. OAs living in Europe represent a population at risk of malnutrition and have a high prevalence of chronic non-communicable diseases [5]. Maintaining a balanced life is crucial for the quality of life (QoL) of OA.

The concept of QoL is inherently complex and multifaceted, encompassing several interrelated components [6, 7]. Among the numerous determinants of QoL, poor dietary habits and insufficient physical activity are particularly significant due to their potential for modification. Improving these factors through targeted interventions can lead to substantial enhancements in overall health and well-being [8].

An essential measure of how OAs perceive their overall QoL is the concept of QoL itself. This holistic assessment encompasses various dimensions of well-being, including physical health, mental health, social relationships, and functional capabilities, providing a comprehensive understanding of their life satisfaction and well-being. According to the World Health Organization, QoL is defined as "the perception of one's life situation within the context of cultural conditions, value systems, and in relation to one's goals, norms, and interests." [9]. Factors such as age, gender, health status, and cultural background significantly influence an individual's perception of their QoL.

Although QoL generally declines with age, it is important to consider other contributing elements. OAs often have chronic conditions that require continuous treatment, which can negatively affect their QoL [10]. Implementing a healthy and balanced nutritional regimen has been shown to improve QoL by preventing nutritional deficiency diseases and alleviating or preventing secondary malnutrition associated with other health conditions [11].

It is recommended that health professionals periodically evaluate the nutritional status, dietary pattern adherence and diet quality (DQ) of the OA. The European Food Safety Authority recommends using the 24-hour dietary recall method for studies assessing the nutritional status of the older adult population [12]. Additionally, the incidence of malnutrition in older adults can be assessed using various tools, including the Mini Nutritional Assessment (MNA) Form. The complete MNA is used for comprehensive nutritional evaluation [13].

Studies around the world showed prevalence of malnutrition among OA ranging from 13 to 54% [14, 15]. Existing data reveal significant variability in the prevalence of malnutrition, likely due to the use of non-standardized criteria. Nevertheless, most literature indicates an approximate prevalence of malnutrition ranging from 20 to 30%, with a 40–50% risk of malnutrition [16]. Malnutrition is more prevalent among older women and OAs with Alzheimer's disease who live alone [17]. It can be reasonably deduced that the QoL and nutritional status of OAs is also affected by their place of residence and the company they keep. The act of eating with others can facilitate increased social interaction, which in turn can lead to an improvement in the older person's nutritional status [18]. Individuals with obesity and arthritis who live alone are frequently observed to exhibit suboptimal dietary practices and nutritional status [19]. Consequently, they are at elevated risk of malnutrition and demonstrate a markedly lower body mass index in comparison to those who reside with their families [20]. Conversely, malnutrition is a major concern among nursing home residents. A thorough analysis identified several key risk factors influencing their nutritional risk, including room style, muscle mass, self-care status, dietary diversity, diet, and protein intake [21].

The primary objective of this study was to assess nutritional status, QoL, and physical activity levels in OA from a descriptive epidemiological perspective. Second, we goal to compare the results of OA living in nursing home and aging in place. Third we target to make recommendations for OA who are living nursing home or aging in place.

Methods

Study design, participants and setting

This cross-sectional study enrolled a total of 400 voluntary participants aged 65 and older, selected using a basic randomization method. The research was conducted in Izmir, Turkey, from May 2023 to December 2023. Based on the estimated number of older adults residing in Izmir and using Cochran's formula, the minimum required sample size was calculated to be 384, with an error margin of 0.05% [3].

Half of the participations living in the Narlıdere Nursing Home and Aged Care Rehabilitation Centre and the others were aging in place OAs. The OA were staying in the Narlıdere nursing home on their own accord. They queue up to stay here and can stay when their turn comes after an average of at least 1 year. To reach older adults aging in place (AIP), public locations in the city, such as mosques, parks, and weekly markets, were selected.

Questionnaires were administered through face-to-face interviews, and participants were assured that their responses would be kept confidential. The inclusion criteria required participants to be over 65 years of age, with the ability to read, write, recall their dietary intake from the previous day, and respond to the study questions. Participants with medically prescribed diets for conditions such as obesity, chronic kidney disease, or other health-related dietary restrictions were excluded to ensure sample homogeneity. Additional exclusion criteria included refusal to provide consent, inability to mobilize, and daily energy intake outside the range of 800 to 4200 kcal.

During basic randomization for the OA living in NH, we wrote their NH numbers on paper, folded them, threw them into the bag and selected the numbers from the bag and we included the OA whose number selected if he/she gives consent. However, we could not use the same sample randomization that we used for NH residents. To reach older adults AIP, we selected public places, and we included people who were willing to participate in the study and met the inclusion criteria.

Data collection

Data was collected using a questionnaire developed by the researchers, based on recent literature, and comprised six sections.

The first section covered demographic and anthropometric measurements, including gender, birth date, education level, average daily sleep duration, and any chronic illnesses, along with their names if applicable. The second section focused on anthropometric measurements, with body weight and height recorded by the researchers.

The third section included the full form of the Mini Nutritional Assessment (MNA). The fourth section utilized the Older People's Quality of Life - Brief (OPQOL-brief) form to assess quality of life. The fifth section employed the Physical Fitness and Exercise Activity Levels of Older Adults Scale (PFES) to evaluate physical fitness and activity levels.

The final section involved a 24-Hour Dietary Recall to document dietary intake. Body mass index (BMI) was calculated using the formula weight (kg) / height^2 (m^2) and categorized into underweight (BMI < 23 kg/m^2), normal/overweight (23 ≤ BMI < 29 kg/m^2), or obese (BMI ≥ 30 kg/m^2) [22].

MNA (mini nutrition assessment)

The Mini Nutritional Assessment (MNA) has been recently developed and validated as a swift, comprehensive tool for evaluating nutritional status across various healthcare settings, including clinics, hospitals, and nursing homes [23, 24]. A substantial body of evidence from both retrospective and prospective studies supports the MNA as the gold standard for screening and assessing malnutrition in OA [25].

The MNA's primary aim is to identify malnutrition risk and enable timely nutritional interventions when necessary. The MNA score categorizes patients into three groups: (1) those with adequate nutritional status (MNA ≥ 24); (2) those with protein-calorie malnutrition (MNA < 17); and (3) those at risk of malnutrition (MNA between 17 and 23.5). The MNA demonstrates high sensitivity (96%), specificity (98%), and predictive value (97%) [26] and both the MNA long form and MNA-short form are suitable for screening malnutrition in Turkish OA [27].

Older people's quality of life-brief (OPQOL-brief)

The Older People Quality of Life (OPQOL-brief) scale was used to assess the QoL among older individuals. Developed by Bowling and colleagues, this scale is a condensed version of the original 35-item OPQOL questionnaire, specifically designed for evaluating QoL in the geriatric population.

The OPQOL-brief includes one initial item on overall QoL, and twelve additional items focused on various aspects of QoL. It is scored on a five-point scale, with total scores ranging from 13 to 65, where higher scores indicate a better QoL. The scale has demonstrated validity and reliability scores of 0.60 and 0.85, respectively [28].

In our country, Çalışkan et al. [29], evaluated the validity and reliability of this tool and confirmed its suitability for use.

Physical fitness and exercise activity levels of older adults scale (PFES)

The Physical Fitness and Exercise Activity Levels of Older Adults Scale (PFES), developed by Melillo et al. (1997), is designed to assess the physical fitness levels of older adults (OAs), along with their perceived motivators and barriers to exercise, as well as the frequency of their exercise [30].

The Turkish version of the PFES consists of four subscales: physical fitness, perceived barriers, perceived motivators, and exercise frequency. The physical fitness subscale includes eight items with scores ranging from 8 to 32, where a higher score indicates lower physical fitness. The perceived barriers subscale comprises ten items with scores ranging from 10 to 40, where a higher score reflects a greater number of perceived barriers to exercise.

The perceived motivators subscale contains eight items with scores ranging from 8 to 32, with a higher score indicating fewer perceived motivators for physical activity. The exercise frequency subscale consists of eight items, with scores ranging from 7 to 28.

The overall content validity index for the scale is 0.91. This subscale evaluates the frequency of older adults' participation in physical activities using a four-point Likert scale (1 = Never, 2 = Once a week, 3 = 2–3 times a week, 4 = Daily).

The PFES subscales includes items including physical fitness (Q9-10, Q16-19, Q25-26), barriers (Q11-13, Q15, Q21, Q30-34), motivators (Q14, Q20, Q22-24, Q27-29), and exercise frequency (Q1-8) [31].

24-hour dietary recall

The 24-hour dietary recall (24 h) is a structured interview method designed to gather comprehensive information about the respondent's food and beverage intake from midnight to midnight of the previous day. A key feature of the 24 h is its open-ended format, which encourages respondents to provide thorough details beyond their initial reports. This approach prompts individuals to include detailed information, such as the time of consumption, source of food, and portion sizes [32].

Food intake was assessed through 24-hour dietary recall records kept for one day, utilizing a photographic a food catalog to determine portions accurately [32]. Energy and nutrient intakes were calculated separately for each meal—breakfast, lunch, dinner, and snacks—as well as for the total daily intake, using food composition tables and a computer program [33]. The results were then compared with the recommended daily allowances (RDAs) for each age and gender group [34].

Nutrient intakes below 67% of the recommended daily allowance (RDA) were considered inadequate. According to the literature, nutritional adequacy is categorized as follows: high adequacy at 1.5 times the RDA or above, medium adequacy between 1.33 and 1.5 times the RDA, and low adequacy at or below 1.0 times the RDA [35]. Micronutrient intake was quantified per 1000 kilocalories (kcal) of dietary intake. This approach ensures a standardized assessment of nutrient density, allowing for accurate comparisons across different dietary patterns and energy intakes.

Healthy eating index for older adults (HEI-OA)

The HEI-2015 tool includes thirteen dietary components, as detailed in Table 1 [36]. It features nine adequacy components, which are recommended for inclusion in a healthy diet: Total Fruits, Whole Fruits, Total Vegetables, Greens and Beans, Whole Grains, Dairy, Total Protein Foods, Seafood and Plant Proteins, and Fatty Acids. Additionally, there are four moderation components that should be consumed in moderation: refined grains, sodium, added sugars, and saturated fats [37].

The HEI-2015 differs from the HEI-2010 in that it removes the empty calories component and reintroduces saturated fats, a component from the 2005 index [38–40]. The HEI-2020 maintains the thirteen components and scoring standards of the HEI-2015 but is renamed to align with the latest 2020–2025 dietary guidelines. The scoring system ranges from 0 to 100, with a score of 100 indicating optimal diet quality (DQ) and lower scores reflecting greater deviations from recommended intakes. The DQ indices are categorized into three levels: 'poor' for scores of 50 or less, 'needs improvement' for scores between 51 and 80, and 'good' for scores above 80 [41].

Table 1 Healthy eating Index-2015[1] portions and score by components and adaptation of portion and score for the healthy eating index for OA (HEI-OA) [36]

Component	MP	Standard for maximum score	Standard for minimum score of zero
Adequacy			
Total Fruits[2]	5	≥ 1.5 servings (105 kcal)/1000 kcal	No fruit
Whole Fruits[3]	5	≥ 1 serving (70 kcal)/ 1000 kcal	No whole fruit
Total Vegetables[4]	5	≥ 1.5 servings (22.5 kcal)/1000 kcal	No vegetables
Greens and Beans	5	≥ 0.5 serving (27.5 kcal/1000 kcal	Without legumes, seeds and oilseeds
Whole Grains	10	≥ 0.5 serving (60 kcal)/1000 kcal	No whole grains
Dairy[5]	10	≥ 1.4 servings (90 kcal)/1000 kcal	No dairy
Foods with total protein	5	≥ 1.5 servings (45 g)/ 1000 kcal	≤ 0.93 serving (28 g)/ 1000 kcal
Seafood	5	≥ 1 serving (100 g)	No seafood
Fatty Acids[6]	10	(g PUFAs + g MUFAs)/g SFAs ≥ 2.5	(g PUFAs + g MUFAs)/g SFAs ≤ 1.2
Moderation			
Refined Grains	10	≤ 2.5 servings (300 kcal)/1000 kcal	≥ 4.33 servings (650 kcal)/1000 kcal
Sodium	10	≤ 650 mg/1000 kcal	≥ 1000 mg/1000 kcal
Added Sugars	10	≤ 5% of TEI	≥ 10% of TEI
Saturated Fats	10	≤ 5% of TEI	> 10% of TEI

[1] Entries between the minimum and maximum standards are scored proportionately; [2] Includes 100% fruit juice; [3] Includes all forms except juice; [4] Includes vegetables (vegetables and legumes); [5] Includes all milk products, such as fluid milk, yogurt, and cheese; [6] Ratio of poly- and monounsaturated fatty acids (PUFAs and MUFAs) to saturated fatty acids (SFAs); TEI: Total energy intake; MP: Maximum point

To address these points, the data was stratified based on the Healthy Eating Index (HEI) cut-off into categories of "poor" and "needs improvement." This stratification is essential to capture the differences in how varying levels of dietary quality, as stratified by adherence to healthy eating guidelines, affect each variable. By segmenting the data into these groups, the study can more accurately identify specific trends, patterns, or associations within each dietary quality category. This approach provides a descriptive analysis of the results, highlighting key outcomes within strata of high and low dietary quality. By examining these strata, the findings offer insights into how health indicators differ across varying levels of dietary adherence.

Statistical analysis

All statistical analyses were performed using IBM SPSS Statistics (version 25). Descriptive statistics were computed for demographic, anthropometric, and clinical characteristics of the participants, with data presented as mean ± standard deviation (SD) for continuous variables and as frequencies and percentages for categorical variables. The normality of data distribution was assessed using the Shapiro-Wilk test. Comparisons between groups NH and AIP) for continuous variables were conducted using independent samples t-tests for normally distributed data and the Mann-Whitney U test for non-normally distributed data. Categorical variables were compared using the chi-square test where appropriate. The relationship between the MNA total score and the QoL total score for older adults in AIP or NH settings was analyzed using Spearman's rank correlation, a non-parametric method for assessing statistical dependence between the two variables. A scatter plot was created to visualize this relationship, with each point representing an individual participant's MNA and QoL scores. Correlation coefficients were interpreted as follows: 0.00–0.19 as very weak, 0.20–0.39 as weak, 0.40–0.59 as moderate, 0.60–0.79 as strong, and 0.80–1.00 as very strong. A p-value of < 0.05 was considered statistically significant for all analyses.

Results

Comparing nutritional status, QoL and physical fitness between ageing in place (i.e. living in one's own home or community) and nursing home residents requires an examination of several factors that influence the well-being of OAs. The Table 2 summarizes the characteristics and anthropometric measurements of participants overall and according to their dwelling status [nursing home (NH), aging in place (AIP)], and DQ [(poor diet quality (PDQ) and Needs Improvement (NI)]. There is a near equal split between men and women with 43.5% men and 56.5% women. Less than half (44%) of the participants had under 12 years of education, while more than half (56%) had 12 years and above. Less than a quarter (20.3%) of the participants slept less than 5 h, while over half (66%) slept 5–8 h, and a little under a quarter (13.7%) slept 9 h and higher. Nearly half (42.8%) of the participants reported having no NCDs. The average ± standart deviation of age, height, weight and BMI of the participants is 77.8 ± 6.5 years, 164.1 ± 9.1 cm, 69.7 ± 12.6 kg and 25.8 ± 3.9 kg/m^2. The average BMI of OA falls within the normal range. There were no association in BMI classification, or any other anthropometric measurements ($p > 0.05$ for all). However, there were associations in education status, sleep duration, and age between the groups. NH residences were older than AIP residence for all DQ (PQD $p < 0.001$; NI $p < 0.001$). The number of OA who slept 5–8 h a day was significantly higher in the others sleep under 5 h or over 9 h.

Table 3 shows scores of OAs on various measures, including HEI-OA, QoL, PFES, and MNA and their subdimensions. HEI stands for the Healthy Eating Index, a metric used to assess DQ. Table 3 shows that the HEI score does not differ between NH and AIP groups ($p = 0.542$). However, according to DQ classification PDQ, OAs who were living in NH (40.4 ± 5.9) had higher HEI than OA who were AIP (37.5 ± 7.9) ($p < 0.001$). The NH group has the highest average QoL score (54.8 ± 7.8), followed by the AIP group (47.6 ± 10.4) ($p < 0.001$). According to QoL evaluation NI group had higher score than AIP group ($p < 0.001$). Table 3 shows that the NH group has the lower average PFES score (67.3 ± 6.3) than the AIP group (74.7 ± 7.7) ($p < 0.001$). According to DQ categorization, NI group had lower PFES score than AIP groups ($p < 0.001$ for PDQ and $p = 0.002$ for NI). The NH group has a higher average MNA score (25.6 ± 2.7), than the AIP group (22.4 ± 5.5) ($p < 0.001$).

OA who had PDQ in NH had a higher MNA score than AIP who had PDQ ($p < 0.001$), but for OA who was in the NI group, there was no difference between MNA scores in NH and AIP ($p = 0.261$). The MNA classification refers to how the participants were classified based on their MNA scores. Of most participants, 65.3% were normal, 25.5% had a malnutrition risk, and 9.2% were under malnutrition. OA, who were living in the AIP group, had a lower MNA score than OA living in NH for PDQ ($p < 0.001$) and NI ($p = 0.118$).

Table 4 presents a comprehensive analysis of nutrient intake categorized by living conditions— NH or AIP— and HEI classification, specifically PDQ and NI. The analysis reveals that daily water consumption per 1000 kcal is significantly higher in NH compared to AIP across all diet quality groups ($p < 0.001$). Additionally, no significant differences were noted in the percentage of energy derived from dietary carbohydrates, lipids, and SFA between NH and AIP groups ($p > 0.05$). Notably, protein intake was

Table 2 The characteristics and anthropometric measurements of OA

Variables	Overall ($n=400$)	NH ($n=200$)			AIP ($n=200$)			Classification of DQ according to HEI		
		Classification of DQ according to HEI		Total ($n=200$)	Classification of DQ according to HEI		Total ($n=200$)			
		PDQ ($n=169$)	NI ($n=31$)		PDQ ($n=151$)	NI ($n=49$)		p-value$_{(PDQ)}$	p-value$_{(NI)}$	p-value$_{(Total)}$
Gender *n* (%)										
Men	174 (43.5)	69 (34.5)	10 (5.0)	*79 (39.5)*	71 (35.5)	24 (12.0)	*95 (47.5)*	0.158 ¥	0.107 ¥	*0.065*¥
Women	226 (56.5)	100 (50.0)	21 (10.5)	*121 (60.5)*	80 (40)	25 (12.5)	*105 (52.5)*			
Education status *n* (%)										
Under 12 years	224 (56.0)	56 (28)	12 (6)	*68 (34)*^{y}	117 (77.5)	39 (79.6)	*156 (78)*^{z}	**< 0.001**¥	**< 0.001**¥	***< 0.001***¥
12 years and above	176 (44.0)	113 (56.5)	19 (9.5)	*132 (66)*^{y}	34 (22.5)	10 (20.4)	*44 (22)*^{z}			
Sleep Duration *n* (%)										
< 5 h	81 (20.3)	21 (10.5)	4 (2)	*25 (12.5)*^{h}	39 (19.5)	17 (8.5)	*56 (28.0)*^{g}	**0.002¥**	**0.046¥**	***< 0.001¥***
5–8 h	264 (66.0)	115 (57.5)	24 (12)	*139 (69.5)*^{h}	96 (48.0)	29 (14.5)	*125 (62.5)*^{h}			
9 h and higher	55 (13.7)	33 (16.5)	3 (1.5)	*36 (18)*^{h}	16 (8.0)	3 (1.5)	*19 (9.5)*^{g}			
Non communicable CD *n* (%)										
No	171 (42.8)	77 (38.5)	10 (10.5)	*87 (43.5)*	64 (32.0)	20 (10.0)	*84 (42)*	0.323 ¥	0.298 ¥	*0.420*¥
Yes	229 (57.3)	92 (46.0)	21 (15.5)	*113 (56.5)*	87 (43.5)	29 (14.5)	*116 (58)*			
Age (year) X ± SD	75.6 ± 6.4	77.8 ± 6.5	77.9 ± 5.2	*77.7 ± 6.3*	73.5 ± 5.9	73.1 ± 5.0	*73.4 ± 5.6*	**< 0.001***	**< 0.001***	***< 0.001****
Anthropometric measurements										
Body Height (cm) X ± SD	163.5 ± 8.5	164.1 ± 9.1	161.4 ± 7.7	*163.7 ± 8.9*	163.2 ± 7.9	163.3 ± 8.9	*163.3 ± 8.1*	0.517*	0.467*	*0.728**
Body Weight (kg) X ± SD	68.9 ± 12.7	69.7 ± 12.6	69.7 ± 11.8	*69.7 ± 12.5*	67.0 ± 12.7	71.4 ± 13.5	*68.1 ± 12.8*	0.091*	0.299*	*0.330**
BMI (kg/m2) X ± SD	25.7 ± 4.1	25.8 ± 3.9	26.8 ± 4.2	*25.7 ± 3.9*	25.1 ± 4.1	26.9 ± 4.5	*25.5 ± 4.3*	0.137*	0.801*	*0.329**
BMI classification *n* (%)										
< 23 kg/m2	96 (24)	38 (19)	4 (2)	*42 (21.0)*	43 (21.5)	11 (5.5)	*54 (27)*	0.524¥	0.136¥	*0.253*¥
23–30 kg/m2	237 (59.2)	101 (50.5)	19 (9.5)	*120 (60)*	92 (46.0)	25 (12.5)	*117 (58.5)*			
30 kg/m^2 and over	67 (16.8)	30 (15)	8 (4)	*38 (19)*	16 (8.0)	13 (6.5)	*29 (14.5)*			

NH: Nursing Home Dwelling Older adults; AIP: Aging in place; PDQ: poor diet quality; NI: Needs Improvement; *Mann-Whitney U analysis ($p < 0.05$); ¥ Pearson Chi-square analysis ($p < 0.05$). Each subscript letter denotes a subset of dwelling categories whose column proportions do not differ significantly from each other at the 0.05 level. Underweight: < 23 kg/m^2; Normal: 23–30 kg/m^2; overweight: 30 kg/m^2 and over significantly lower in the AIP group compared to the NH group ($p < 0.001$). Furthermore, the intake of MUFA was higher among older adults residing in NH compared to those in AIP ($p < 0.001$). Conversely, the intake of PUFA was lower in the AIP group compared to the NH group ($p < 0.001$).

There were no significant differences in the intake of vitamin A, thiamine, niacin, pyridoxine, folate, vitamin C, and iron between the NH and AIP groups ($p > 0.05$). Vitamin E and magnesium intake was higher in AIP group than NH group (respectively, $p < 0.001$ and $p = 0.028$). Vitamin B2 ($p < 0.001$), Vitamin B12 ($p < 0.001$), calcium ($p < 0.001$), sodium ($p < 0.001$), and zinc ($p < 0.001$) intake lower in AIP group than NH group.

Figure 1a and b illustrate the relationship between the MNA and the QoL among OA living in NH and AIP settings. A scatter plot is used to depict this relationship, where each point represents an individual participant's MNA and QoL scores. In Fig. 1a, a positive but relatively weak correlation was observed between the MNA and QoL in NH residents, ($r = 0.157$, $p = 0.027$). This suggests a statistically significant, albeit modest, relationship between nutritional status and QoL e in this population. The scatter plot includes a trendline to illustrate the association, which demonstrates a slight upward trend, indicating that better nutritional status (higher MNA scores) is linked with higher QoL scores. In contrast, Fig. 1b shows a stronger positive correlation between the MNA and QoL in OA living in the AIP, ($r = 0.619$, $p < 0.001$). This result indicates that higher nutritional status is more strongly associated with better QoL outcomes in this group, too. The scatter plot for this group includes a fitted trendline that slopes upwards, clearly reflecting the stronger positive relationship between these variables.

Discussions

These findings underscore the variations in nutrient intake based on living conditions and highlight the importance of dietary monitoring and interventions tailored to specific living environments.

In the present study, we assessed whether a variation in nutritional status, QoL, and physical activity level existed between OAs living in NH and those AIP. In our study, aging in place OAs were living with relatives. The elderly living alone were excluded to ensure comparable groups. OAs were also accommodated in two-person rooms at NH. The aim of this study was to assess the DQ and malnutrition risk of OAs living in NH or AIP. We found that malnutrition risk was higher among participants living in NH than those in AIP. According to the HEI-OA evaluation, most OAs, irrespective of their living place, had PDQ, with AIP residents having the lowest DQ.

Nutritional assessment for OAs can be performed with 24 h dietary recall data [12]. Self-reported dietary recalls and records may underestimate actual intake [42]. The estimated mean HEI score (42.5 ± 9.6 points) is nearly identical to the estimate for OAs based on nationally representative data from Koksal et al. (41.5 ± 13.7 points) [43]. In this study, the DQ of participants was found to be low according to the HEI. Furthermore, the DQ of AIP residents was observed to be lower than that of the NH group.

Former studies have consistently stated a negative correlation between DQ and low educational attainment and income [44, 45]. In our study, most NH residents have a higher education level, while most AIP residents have a lower education level. When stratifying data by diet quality, a greater proportion of highly educated NH residents had poor diet quality, whereas a greater proportion of less educated AIP residents had poor diet quality.

Sleep duration may possibly affect QoL [46]. In our study, OAs had a sleep duration of 5–8 h, aligning with typical recommendations of 7–8 h per night. A study demonstrated that the mean ordinary sleep duration for women was 7.9 h, while for men it was 8.2 ± 2.1 h [47]. Overall, most OAs in this study are achieving sleep durations that align with recommendations. Balanced and healthy diet interventions may improve sleep patterns, which in turn could enhance their QoL. Research indicates that dietary patterns rich in fruits, vegetables, and whole grains are associated with better sleep quality [48, 49].

The QoL of OAs is a significant concern, as it tends to decline with age. The factors influencing QoL vary depending on the living environment. A study revealed that among community-dwelling OAs, optimal nutritional status and beneficial physical activity behaviors were pivotal for enhanced QoL. Conversely, in NH residents, chronic conditions emerged as the primary determinants of QoL [50]. In our cross-sectional study, we found that the elderly living in NH had better life quality than OAs living in AIP, while AIP residents had better physical fitness levels. This difference could be due to more barriers and less motivation for exercise in NH. However, exercise frequency did not differ between groups.

Despite the low physical activity levels observed in NH residents, high QoL may be attributed to engagement in purposeful activities. Engaging in meaningful activities significantly improves both physical and psychological health outcomes in older adults, including those aged 80 and above [51]. This suggests that promoting physical activity and engagement in meaningful pursuits could enhance QoL. However, it is important to consider reverse causation: individuals with physical impairments may find it challenging to live independently, leading them to reside in NH. Therefore, the observed associations between physical activity, meaningful engagement,

Table 3 QoL, PFES and MNA measurements of OA living in NH or AIP

Variables (X ± SD) M [IQR]	Overall ($n=400$)	NH ($n=200$)			AIP ($n=200$)					
		Classification of DQ according to HEI		Total ($n=200$)	Classification of DQ according to HEI		Total ($n=200$)	Classification of DQ according to HEI		
		PDQ ($n=169$)	NI ($n=31$)		PDQ ($n=151$)	NI ($n=49$)		p-value$_{(PDQ)}$	p-value$_{(NI)}$	p-value$_{(Total)}$
HEI Score	42.5 ± 9.6 42.1 [12.28]	40.4 ± 5.9 41 [8.6]	55.7 ± 6.4 53.6 [6.4]	*42.8 ± 8.1* *41.6 [14.6]*	37.5 ± 7.9 37.7 [12.7]	56.5 ± 5.3 56 [7.8]	*42.2 ± 11.0* *42.3 [10.3]*	**< 0.001***	0.210*	*0.542**
QoL Score	51.2 ± 9.8 54 [15]	55.2 ± 7.7 57 [9]	52.8 ± 8.7 55 [12]	*54.8 ± 7.8* *56 [9.7]*	47.7 ± 10.6 48 [17]	48.3 ± 10.0 50 [15.5]	*47.6 ± 10.4* *48.5 [17.0]*	**< 0.001***	**0.048***	***< 0.001****
PFES	71.0 ± 7.9 71 [10]	66.9 ± 6.3 68 [8.5]	68.9 ± 6.0 69 [7]	*67.3 ± 6.3* *68 [9]*	74.8 ± 7.4 74 [9]	74.7 ± 8.8 75 [12]	*74.7 ± 7.7* *74 [11]*	**< 0.001****	**0.002****	***< 0.001****
PFES Subscales										
Physical fitness	17.11 ± 5.6 16 [7]	14.6 ± 3.6 15 [5]	15.4 ± 3.1 15 [4]	*14.8 ± 3.5* *15 [5]*	19.5 ± 6.2 19 [9]	19.3 ± 6.6 19 [9]	*19.4 ± 6.3* *19 [9]*	**< 0.001***	**0.005***	***< 0.001****
Barriers	24.3 ± 5.03 24 [8]	25.3 ± 4.6 25 [6]	24.0 ± 5.1 23 [6]	*25.1 ± 4.7* *24 [6]*	23.5 ± 5.1 23 [7]	23.3 ± 5.6 22 [10]	*23.4 ± 5.2* *22.5 [8]*	**0.002***	0.572*	***< 0.001****
Motivators	18.4 ± 5.2 18 [7.7]	15.9 ± 4.5 17 [6.5]	17.4 ± 3.4 17 [3]	*16.2 ± 4.4* *17 [6]*	20.5 ± 5.1 21 [7]	20.9 ± 5.4 21 [8.5]	*20.6 ± 5.2* *21 [7]*	**< 0.001***	**< 0.001***	***< 0.001****
Exercise frequency	11.25 ± 2.9 11 [4]	11.0 ± 2.8 11.0 [3]	12.0 ± 3.4 12 [4]	*11.2 ± 2.9* *11.0 [4]*	11.3 ± 2.9 11.0 [4]	11.2 ± 3.5 11 [3.5]	*11.3 ± 3.0* *11.0 [4]*	0.214*	0.188*	*0.558**
MNA	24.0 ± 4.6 25.2 [4.5]	25.7 ± 2.8 26 [4]	25.5 ± 2.4 26.5 [3]	*25.6 ± 2.7* *26 [3.5]*	21.9 ± 5.6 23.5 [8.5]	23.9 ± 4.9 25 [4]	*22.4 ± 5.5* *24.2 [7.5]*	**< 0.001***	0.261*	***< 0.001****
MNA classification n (%)										
Normal	261 (65.3)	128 (75.7)	25 (80.6)	*153 (76.5)*	75 (49.7)	33 (67.3)	*108 (54)*	**< 0.001¥**	**0.118¥**	***< 0.001¥***
Malnutrition risk	102 (25.5)	39 (23.1)	6 (19.4)	*56 (22.5)*	47 (31.1)	10 (20.4)	*57 (28.5)*			
Malnutrition	37 (9.2)	2 (1.2)	0	*2 (1.0)*	29 (19.2)	6 (12.2)	*35 (17.5)*			

NH: Nursing Home Dwelling Older adults; AIP: Aging in place; PDQ: poor diet quality; NI: Needs Improvement; ¥Pearson Chi square Test ($p < 0.05$); *Mann-Whitney U analysis ($p < 0.05$); **Independent Samples T Test ($p < 0.05$); QoL: Quality of Life; PFES: Physical Fitness and Exercise Activity Levels of Older Adults Scale; Mini nutritional Assessment (MNA) classification: 24–30 points shows Normal nutritional status; 17-23.5 points shows risk of malnutrition; less than 17 points shows malnutrition. Each subscript letter denotes a subset of Living categories (NH & AIP) whose column proportions do not differ significantly from each other at the 0.05 level

Table 4 Daily macro (% of TEI) and micronutrients (per 1000 kcal of dietary intake) of NH and AIP OA

Variables	Total (*n* = 400)	NH (*n* = 200)			AIP (*n* = 200)					
		Classification of DQ according to HEI		Total (*n* = 200)	Classification of DQ according to HEI		Total (*n* = 200)			
		PDQ (*n* = 169)	NI (*n* = 31)		PDQ (*n* = 151)	NI (*n* = 49)		*p-value$_{(PDQ)}$	*p-value$_{(NI)}$	p-value$_{(Total)}$
Water Consumption (g/day/ 1000 kcal)	801.3 ± 203.1 802.9 [274.6]	847.9 ± 184.4 846.6 [255.7]	1011.9 ± 176.2 1046.4 [262.7]	***873.3 ± 192.5*** ***862.0 [266.6]***	724.8 ± 182.3 724.9 [251.6]	743.2 ± 204.5 735.15 [293.3]	**729.4 ± *187.6*** ***726.5 [264.3]***	**< 0.001**	**0.014**	***< 0.001***
TEI (kcal/day)	1552.3 ± 469.1 1512.9 [637.6]	1750.4 ± 478.4 1711.1 [602.1]	1604.3 ± 474.25 1603.9 [640.8]	*1727.8 ± 470.6* *1701.8 [581.4]*	1380.5 ± 392.82 1337.2 [594.4]	1365.6 ± 414.8 1337.9 [618.5]	*1376.9 ± 397.3* *1337.6 [592.1]*	**< 0.001**	**< 0.001**	***< 0.001***
Macronutrients (% of TEI) (X ± SD) M [IQR]										
Carbohydrates	42.4 ± 7.5 42 [9.8]	42.0 ± 6.9 42 [10]	41.7 ± 6.13 42 [7]	*41.9 ± 6.8* *42 [10]*	42.6 ± 8.3 42.0 [9]	43.7 ± 8.0 45 [9]	*42.8 ± 8.2* *43 [9.75]*	0.530	0.054	*0.145*
Protein	17.7 ± 3.6 18 [5]	18.2 ± 3.2 18 [4]	17.9 ± 3.1 18 [3]	*18.1 ± 3.1* *18 [4]*	16.9 ± 3.9 17 [5]	18.1 ± 4.4 19 [6]	*17.3 ± 4.1* *17 [6]*	**< 0.001**	0.519	***0.014***
Lipids	39.7 ± 7.2 40 [9]	39.8 ± 8.50 39 [8.5]	40.4 ± 5.55 41 [9]	39.5 ± 6.5 40 [8]	40.5 ± 7.6 41 [10]	37.9 ± 7.9 37 [10]	*39.7 ± 7.8* *39 [11]*	0.329	0.064	*0.955*
MUFA	16.9 ± 8.2 15.6 [9.5]	17.6 ± 7.5 16.4 [8.4]	19.1 ± 7.6 18.2 [9.6]	*17.9 ± 2.4* *16.7 [8.6]*	16.2 ± 8.7 14.9 [9.9]	14.9 ± 8.9 12 [10.4]	*15.9 ± 8.8* *14.5 [10.2]*	**0.024**	**0.006**	***< 0.001***
PUFA	6.0 ± 2.9 5.1 [3.2]	5.3 ± 2.3 4.8 [2.1]	6.6 ± 3.0 6 [3.4]	*5.5 ± 2.4* *4.9 [2.3]*	6.4 ± 3.2 5.2 [3.7]	6.8 ± 3.6 5.5 [4.4]	*6.5 ± 3.3* *5.6 [3.6]*	**0.004**	0.910	***0.005***
SFA	15.6 ± 7.3 14.6 [8.8]	14.7 ± 6.2 14.2 [7.1]	15.9 ± 5.9 15 [8.1]	14.9 ± *6.1* *14.3 [7.2]*	16.5 ± 8.5 15.3 [10]	15.7 ± 7.5 13.5 [12.6]	*16.3 ± 8.3* *14.8 [10.4]*	0.186	0.696	*0.283*
Micronutrients per 1000 kcal of dietary intake (X ± SD) M [IQR]										
Vitamin A-Retinol (µg)	704.0 ± 515.5 596.1 [303.6]	683.3 ± 274.9 613.9 [250.8]	725.4 ± 431.9 586.9 [431.9]	*689.9 ± 303.1* *612.2 [265.5]*	690.9 ± 721.29 562.6 [329.2]	801.6 ± 437.4 722.9 [705.1]	*718.1 ± 663.8* *575.7 [402.1]*	**0.009**	0.371	*0.104*
Vitamin E (mg)	7.1 ± 3.5 6.3 [4.7]	6.0 ± 2.8 5.4 [3.5]	8.0 ± 3.5 7.6 [5.1]	*6.4 ± 3.0* *5.7 [3.8]*	7.6 ± 4.0 6.8 [5.5]	8.3 ± 3.3 7.8 [4.1]	*7.7 ± 3.9* *7.1 [5.2]*	**0.001**	0.646	***< 0.001***
Vitamin B1-Thiamin (mg)	0.5 ± 0.1 0.5 [0.2]	0.5 ± 0.1 0.5 [0.1]	0.6 ± 0.1 0.6 [0.1]	*0.5 ± 0.1* *0.5 [0.1]*	0.5 ± 0.1 0.5 [0.1]	0.7 ± 0.2 0.6 [0.3]	*0.5 ± 0.1* *0.5 [0.2]*	**0.038**	0.208	*0.704*
Vitamin B2-Riboflavin (mg)	0.9 ± 0.2 0.9 [0.3]	1.0 ± 0.2 0.9 [0.2]	1.0 ± 0.2 1.0 [0.3]	*1.0 ± 0.2* *1.0 [0.2]*	0.9 ± 0.2 0.8 [0.3]	0.9 ± 0.3 0.9 [0.5]	*0.9 ± 0.3* *0.9 [0.4]*	**< 0.001**	0.102	***< 0.001***
Vitamin B3-Niacin (mg)	8.4 ± 4.8 7.4 [5.1]	8.1 ± 4.2 7.2 [4.3]	10.0 ± 4.3 9.2 [5.3]	*8.4 ± 4.3* *7.4 [4.5]*	8.3 ± 4.8 7.5 [5.7]	8.6 ± 6.2 7.0 [5.9]	*8.4 ± 5.2* *7.4 [5.8]*	0.984	**0.031**	*0.399*
Vitamin B6-Pyridoxin (mg)	0.8 ± 0.2 0.8 [0.3]	0.8 ± 0.2 0.9 [0.2]	0.9 ± 0.2 0.9 [0.2]	*0.8 ± 0.2* *0.8 [0.2]*	0.7 ± 0.2 0.6 [0.3]	1.0 ± 0.2 0.9 [0.3]	*0.8 ± 0.3* *0.7 [0.3]*	**0.002**	0.544	*0.096*
Vitamin B9-Folate (µg)	198.6 ± 65.8 187.6 [73.8]	187.7 ± 42.4 183.3 [57.2]	229.9 ± 66.2 231.4 [75.0]	*194.3 ± 49.1* *187.1 [64.6]*	193.1 ± 75.3 180.5 [89.2]	233.6 ± 82.3 213.6 [93.4]	*203.0 ± 78.9* *190.2 [94.6]*	0.639	0.925	*0.758*
Vitamin B12 (µg)	2.9 ± 2.5 2.6 [2.3]	3.9 ± 1.5 3.4 [2.1]	3.2 ± 1.5 2.9 [2]	*3.3 ± 1.5* *3.0 [2]*	2.5 ± 3.3 1.7 [2.6]	2.8 ± 2.0 2.6 [1.6]	*2.6 ± 3.0* *2.1 [2.3]*	**< 0.001**	**< 0.001**	***< 0.001***
Vitamin C-Ascorbic Acid (mg)	69.8 ± 33.7 63.1 [45.2]	65.5 ± 27.1 60.9 [42.7]	71.6 ± 31.8 64.4 [40.3]	*66.4 ± 27.9* *61.7 [41.7]*	67.2 ± 34.6 62.7 [44.3]	91.8 ± 43.8 85.0 [69.6]	*73.3 ± 38.5* *66.4 [45.3]*	0.901	**0.042**	*0.176*

Table 4 (continued)

Variables	Total (*n* = 400)	NH (*n* = 200) Classification of DQ according to HEI PDQ (*n* = 169)	NH NI (*n* = 31)	NH Total (*n* = 200)	AIP (*n* = 200) Classification of DQ according to HEI PDQ (*n* = 151)	AIP NI (*n* = 49)	AIP Total (*n* = 200)	**p*-value$_{(PDQ)}$	**p*-value$_{(NI)}$	*p*-value$_{(Total)}$
Calcium (mg)	494.7 ± 134.0 492.6 [183.5]	530.9 ± 115.9 531.4 [165.9]	533.3 ± 150.0 529.5 [169.1]	*531.3 ± 121.4* *530.7 [167.5]*	452.5 ± 120.9 450.3 [159.3]	475.9 ± 176.1 415.8 [293.5]	*458.2 ± 136.4* *438.8 [172.8]*	**< 0.001**	**0.030**	***< 0.001***
Iron (mg)	6.1 ± 1.5 6.0 [1.7]	5.9 ± 1.4 5.7 [1.4]	6.8 ± 1.6 6.8 [1.3]	*6.1 ± 1.4* *6.0 [1.7]*	5.9 ± 1.5 5.8 [1.8]	7.2 ± 2.0 7.0 [1.9]	*6.2 ± 1.7* *6.0 [1.9]*	0.955	0.194	*0.254*
Magnesium (mg)	204.7 ± 125.2 166.7 [67.5]	163.1 ± 35.7 158.9 [40.5]	194.6 ± 41.0 203.7 [62.0]	*168.0 ± 38.2* *163.1 [47.3]*	223.3 ± 156.2 160.6 [98.9]	297.3 ± 180.4 215.3 [201.9]	*241.5 ± 165.1* *174.0 [156.8]*	0.697	**0.029**	***0.028***
Sodium (mg)	2250.1 ± 723.9 2206.9 [984.9]	2421.5 ± 608.9 2450.8 [869.7]	2086.7 ± 579.0 2108.5 [854.4]	*2369.6 ± 615.0* *2384.1 [921.3]*	2231.2 ± 767.1 2111.1 [919.4]	1820.5 ± 836.4 1700.3 [832.9]	*2130.5 ± 802.3* *1990.6 [996.0]*	**0.001**	**0.016**	***< 0.001***
Zinc (mg)	6.3 ± 1.8 6.3 [2.3]	6.6 ± 1.2 6.5 [1.6]	7.1 ± 1.8 6.8 [2.0]	*6.7 ± 1.4* *6.6 [1.7]*	5.8 ± 2.8 5.6 [2.8]	6.1 ± 2.3 5.6 [3.1]	*5.9 ± 2.0* *5.6 [2.9]*	**< 0.001**	**0.008**	***< 0.001***

NH: Nursing Home Dwelling Older adults; AIP: Aging in place; PDQ: poor diet quality; NI: Needs Improvement; HEI: Healthy Eating Index; M: median; IQR: Inter quartile range; X: Mean; SD: Standard Deviation; Mann-Whitney U Test ($p < 0.05$); PDQ: Poor Diet Quality; NI: Needs Improvement; TEI: Total energy intake (kcal)

and QoL may partly reflect that those with better health and functional status are more likely to engage in these activities and live independently.

A study stated that mean scores of QoL in all domains were significantly higher for OAs living with families compared to NH residents [52]. Another study in Indonesia reported that 64.1% of NH residents had a fair level of QoL [53]. Our cross-sectional study found that elderly living in NH had better life quality than those living in AIP. This indicates that QoL is affected by various factors, including cultural, social, and institutional support systems, which may vary between regions or specific living arrangements.

The evaluation of nutritional status in OA using the MNA provides important insights into their overall health [54]. In this cross-sectional study, we found that OAs living in NH had better MNA scores than those living in AIP environments, suggesting that the structured and monitored care in NH may contribute to better nutrition. This emphasizes the importance of nutritional care and support for OAs. Moreover, the positive relationship between MNA and QoL suggests that nutritional interventions may positively affect both groups, though the strength of this relationship varies across settings.

Detailed nutrient content analysis showed lower levels of total energy intake, water consumption, MUFA, and several vitamins and minerals (B1, B2, B3, B6, folate, B12, calcium, zinc) in AIP residents, aligning with broader concerns of inadequate nutrition among OAs in unsupervised settings. The association between DQ and QoL, as shown by Milte et al. [55], supports the idea that improving the DQ of OA, particularly in AIP environments, could enhance their overall well-being. This study highlights the potential benefits of targeted nutritional interventions, especially for OAs in AIP settings, where structured support may be limited. However, it is important to note that this study is cross-sectional, and the statistical analyses were conducted without adjusting for various confounding factors. Therefore, while the findings suggest a potential benefit, further research with more rigorous methodologies is needed to establish causal relationships and confirm these results.

Tailored policies and community programs offering meal preparation assistance, nutritional counseling, and social support could mitigate the risks associated with poor nutritional intake and contribute to better health outcomes for OAs.

The strengths of our study include the examination of multiple aspects of well-being: diet, QoL, and physical activity. Additionally, we consider DQ (HEI score) in addition to specific nutrient intakes, providing a nuanced picture of dietary patterns. However, the limitations of our study are notable. The observational design means that causality cannot be established. Factors such as

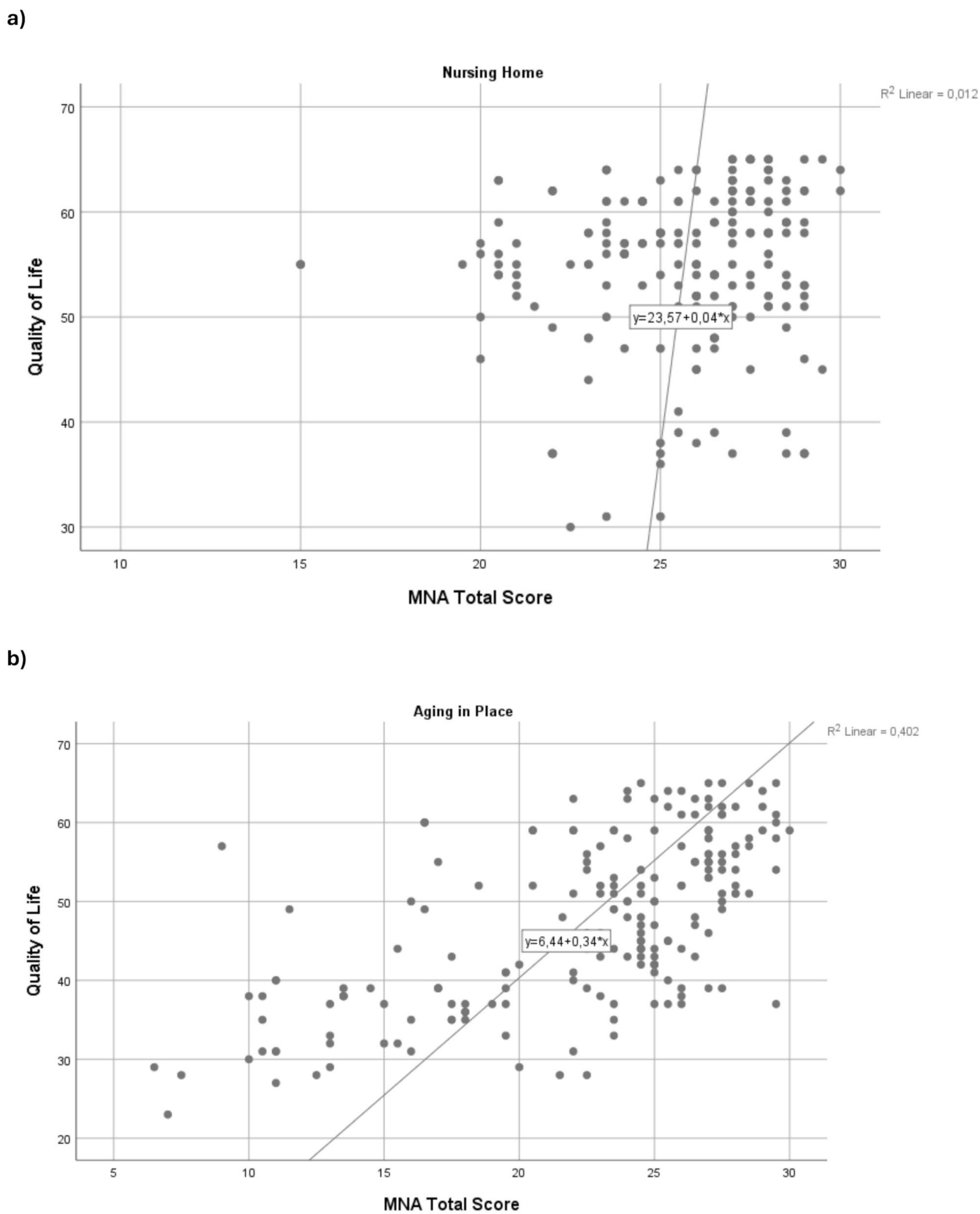

Fig. 1 (**a**) The correlation between MNA total score and QoL total score in the Nursing Home Dwelling Older adults. Spearman's rank correlation: NH ($r = 0.157$, $p = 0.027$). (b) The correlation between MNA total score and QoL total score in the Aging in place dwelling older adults. Spearman's rank correlation: AIP ($r = 0.619$, $p < 0.001$)

access to different foods, meal preparation assistance, or dietary counseling in NH settings cannot be fully explored in this study. And the other potential limitation of this study is the utilization of univariate analysis, which may not account for potential confounding factors. These unaddressed variables could affect the observed relationships, so the findings should be approached with caution.

Conclusion

There was a significant difference between NH and AIP in terms of dietary intake and nutritional status of older adults, even for those with similar overall DQ scores (HEI). NH residents seem to have higher water consumption and intakes of certain nutrients (protein, MUFA, SFA) compared to AIP residents, regardless of DQ.

Acknowledgements
We would like to thank all participants and the staff of Narlıdere Nursing Home and Elderly Care Rehabilitation Centre.

Author contributions
SÇ: Conceptualization, Investigation, Methodology, Formal analysis, Writing– original draft, Writing– review & editing. ME: Conceptualization, Investigation, Methodology, Writing– original draft.

Funding
This research received no specific grant from any funding agency for research publication and dissemination purposes.

Data availability
The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethical Statement
Approval from the İzmir Democracy University Non-Interventional Clinical Research Ethics Committee, decision number 2023/03–13, was secured prior to initiating the study, ensuring adherence to ethical standards. Prospective participants were duly informed about the study, and those who voluntarily elected to participate were asked to provide explicit written consent, aligning with the principles delineated in the Declaration of Helsinki. Permission to conduct this study was obtained from the Ministry of Family, Labour and Social Services of the Republic of Turkey, decision number and date E-84459573-605.01[605.01]-7152009 and 2023/04–28.

Conflict of interest
The authors declare no conflict of interest.

Patient Consent Statement
Complete written informed consent was obtained from the participants for the publication of this study.

Clinical trial number
not applicable.

Received: 17 September 2024 / Accepted: 3 February 2025
Published online: 15 February 2025

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