Prevalence and determinants of sarcopenia risk among older people: evidence from a cross-sectional study

Prevalencia y determinantes del riesgo de sarcopenia en personas mayores: evidencia de un estudio transversal

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Abstract

Background/Objectives: Sarcopenia is associated with multiple negative consequences. This study aims to explore the prevalence of sarcopenia risk and its possible associated factors among older adults in Hungary.

Methods: A total of 310 older adults were included in this cross-sectional study. The study protocol was registered on clinicaltrials.gov under the identifier NCT05313360 on 28 March 2022. The participants filled a questionnaire that included demographics, medical history, nutritional status, physical activity level, health-related quality of life, and general health status. SARC-F questionnaire was used to screen for sarcopenia risk among the study participants.

Results: Our results showed that the prevalence of sarcopenia risk was 26.8%. The predictors in the univariate regression model included age ($p < .001$), number of medications ($p < .001$), number of diseases ($p < .001$), number of outpatient physician visits($p = .001$), MNA-SF score ($p < .001$), and GPAQ score ($p < .001$). After controlling for age in Block 1 ($R^2 = .295$), our multivariate linear hierarchical regression model (Block 2, $R^2 = .483$) demonstrated that the number of medications ($p = .013$), number of diseases ($p = .007$), MNA-SF score ($p < .001$), and total GPAQ score ($p = .004$) significantly were significant independent predictors of a greater sarcopenia risk.

Conclusion: the number of medications, the number of diseases, MNA-SF, and total GPAQ scores significantly predicted sarcopenia risk. Further longitudinal studies are recommended to examine the development of sarcopenia over timewith

Keywords

Sarcopenia; risk factors; prevalence; predictors; older adults; cross-sectional.

Resumen

Antecedentes/Objetivos: La sarcopenia se asocia con múltiples consecuencias negativas. El objetivo de este estudio fue explorar la prevalencia del riesgo de sarcopenia y sus posibles factores asociados en adultos mayores en Hungría.

Métodos: Un total de 310 adultos mayores participaron en este estudio transversal. El protocolo del estudio fue registrado en clinicaltrials.gov bajo el identificador NCT05313360 el 28 de marzo de 2022. Los participantes completaron un cuestionario que incluía datos demográficos, antecedentes médicos, estado nutricional, nivel de actividad física, calidad de vida relacionada con la salud y estado general de salud. El cuestionario SARC-F se utilizó para evaluar el riesgo de sarcopenia entre los participantes.

Resultados: Los resultados mostraron que la prevalencia del riesgo de sarcopenia fue del 26.8%. Los predictores en el modelo de regresión univariado incluyeron la edad ($p < .001$), el número de medicamentos ($p < .001$), el número de enfermedades ($p < .001$), el número de visitas médicas ambulatorias ($p = .001$), la puntuación del MNA-SF ($p < .001$) y la puntuación del GPAQ ($p < .001$). Tras controlar la edad en el Bloque 1 ($R^2 = .295$), el modelo de regresión lineal jerárquica multivariado (Bloque 2, $R^2 = .483$) mostró que el número de medicamentos ($p = .013$), el número de enfermedades ($p = .007$), la puntuación del MNA-SF ($p < .001$) y la puntuación total del GPAQ ($p = .004$) fueron predictores independientes significativos de un mayor riesgo de sarcopenia.

Conclusión: El número de medicamentos, el número de enfermedades, el MNA-SF y las puntuaciones totales del GPAQ predijeron de manera significativa el riesgo de sarcopenia. Se recomiendan estudios longitudinales adicionales para examinar el desarrollo de la sarcopenia a lo largo del tiempo.

Palabras clave

Sarcopenia; factores de riesgo; prevalencia; predictores; adultos mayores; estudio transversal.

Introduction

Sarcopenia is a geriatric condition defined in 2010 by the European Working Group on Sarcopenia in Older People (EWGSOP) as "the presence of low muscle mass and low muscle function (low strength or low physical performance)" (Cruz-Jentoft et al., 2010), The EWGSOP recommended that a handgrip strength <27 kg for men and <16 kg for women indicates low muscle strength, and a gait speed of ≤ 0.8 m/s as the threshold for low physical performance. In 2018, the group revised the preceding definition by highlighting low muscle strength as the primary measure for diagnosing sarcopenia" (Cruz-Jentoft, Bahat, Bauer, Boirie, Bruyère, Cederholm, Cooper, Landi, Rolland, Sayer, Schneider, Sieber, Topinkova, Vandewoude, Visser, & Zamboni, 2019). The diagnosis is further confirmed when low muscle quantity or quality.

Sarcopenia is associated with multiple negative consequences, such as postoperative infection, hospitalisation, osteoporosis, falls, fractures, functional decline, diabetes, non-alcoholic liver disease, liver fibrosis, hypertension, depression, and mortality. Even though these associations were based on rigorous evidence, the causal relationship remains unclear due to confounding factors and measurement error. Moreover, these results differ across different definitions of sarcopenia (Sadaqa et al., 2024; Yuan & Larsson, 2023). Furthermore, it is well established in the literature that health-related quality of life (HRQoL) is significantly decreased among sarcopenic individuals compared to non-sarcopenic individuals (Beaudart et al., 2023).

Compared to the consequences of sarcopenia, studies exploring the risk factors of sarcopenia is comparatively scarce (Yuan & Larsson, 2023). For instance, overweight and obesity, measured by body mass index, were inversely associated with the risk of sarcopenia (Liu et al., 2023). Additionally, reduced physical activity and malnutrition, smoking, diabetes, osteoporosis, heart diseases, and respiratory diseases are also considered risk factors for sarcopenia. However, the causal relationship between these risk factors and sarcopenia is still not clear in the current evidence (Gao et al., 2021).

Exercise has been proposed as an effective intervention against multiple negative outcomes of sarcopenia as it promotes muscle strength, growth, and improved muscle function (Sadaqa et al., 2023, 2024). For instance a previous systematic review suggested that that resistance exercise intervention can improve body composition and functional capacity among older people with sarcopenia (Debes et al., 2024).

The prevalence of sarcopenia showed noticeable variations among different populations and across countries (Petermann-Rocha et al., 2022).In Hungary, various studies were conducted to establish and validate the fundamental tools for sarcopenia diagnosis, including SARC-F screening questionnaire (Gasparik et al., 2020a), and the SarQoL quality of life instrument (Geerinck et al., 2022).

Additionally, a previous study has investigated the prevalence of sarcopenia(Pap et al., 2022), revealing that from one hundred post-menopausal women enrolled in this study, around 31% of them have been reported as sarcopenic. Moreover, it was suggested that weight, hand grip strength and gait speed as independent predictors of appendicular skeletal muscle mass, yet they did not use the full definition of sarcopenia

However, to the best of our knowledge, there is a lack of community-based studies that screen for sarcopenia risk prevalence and possible risk factors of sarcopenia risk among older adults in Hungary. Therefore, this study aims to explore the prevalence of sarcopenia risk and its associated risk factors among older adults in Hungary.

Method

Participants

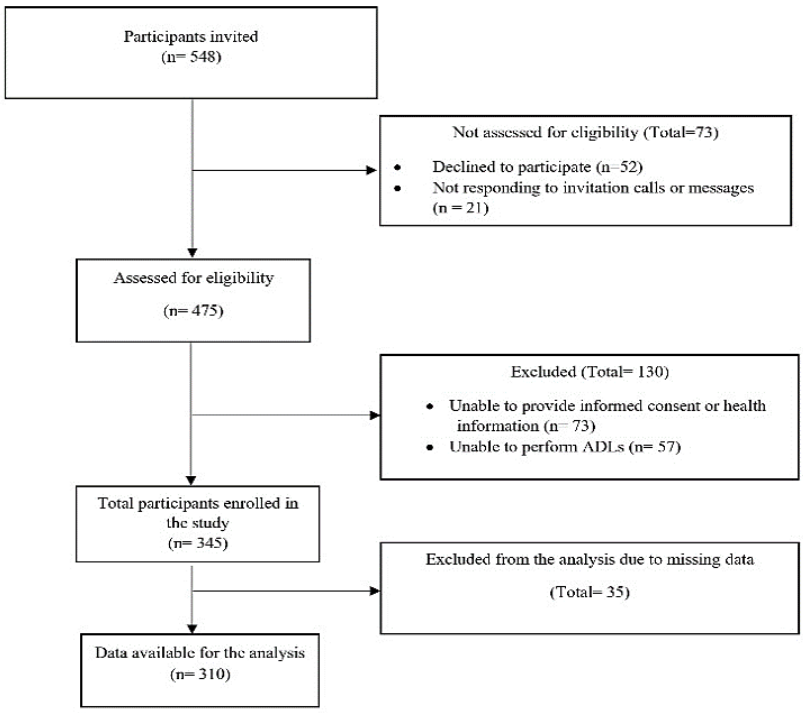
This cross-sectional investigation included 310 participants aged ≥50 years old. This convenient sample was recruited from both community-dwelling and nursing homes in Hungary. The data collection process continued for 16 months from January 2022 until May 2023.

Procedure

We conducted paper-based questionnaires, and the participants filled these questionnaires in the presence of qualified physiotherapists and nurses to facilitate the data collection process and explain any unclear questions. The data collectors checked each survey for any missing responses; subsequently, any questionnaire with missing data was excluded from the analysis. Before starting the data-collection process, multiple seminars were held by the researchers for the nurses and the physiotherapists who helped with the data collection to demonstrate the main components of the questionnaire. The study protocol was registered on clinicaltrials.gov on 28 March 2022, under the identifier NCT05313360.

Participants were included in the study if they were aged 50 years or older and accepted voluntary participation in the study. We excluded participants who were unable to perform activities of daily living (ADL) independently. Additionally, we excluded individuals who were unable to provide reliable health information or understand the questions, as well as if whose mental capacity prevented them from providing informed consent. This study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology Statement (STROBE) checklist for cross-sectional studies to report the findings (Elm et al., 2007). Participants' selections is shown in Figure 1.

Figure 1: Flow diagram of participant selection



Instruments

The questionnaire included demographic information, medical history and questions related to the general health status of the participants. In addition, we used the Global Physical Activity Questionnaire (GPAQ), Mini Nutritional Assessment Short-Form (MNA-SF), SARC-F, and Sarcopenia Quality of Life questionnaire (SarQol).

In order to screen sarcopenia risk we utilised SARC-F. SARC-F is a questionnaire composed of 5 main components including strength, assistance walking, rising from a chair, climbing stairs, and falls. Each question of them is measured on a scale from zero to two with a total score from zero to ten. A cut-off point of ≥4 indicates a risk of sarcopenia, with higher scores suggesting an increased risk of sarcopenia (Malmstrom & Morley, 2013). We used the Hungarian version of SARC-F, which has been validated and tested for psychometric properties(Gasparik et al., 2020b).

GPAQ is an instrument developed by the World Health Organisation (WHO). It is baisically a modified version of the International Physical Activity Questionnaire (IPAQ) (de, 2020). GPAQ is considered

a reliable, valid, and reproducible tool to assess physical activity level. The GPAQ questions are contains three domains: occupational, transport-related, and leisure-time PA (Bull et al., 2009). In addition, GPAQ can assess sedentary behaviour by measuring the minutes spent per week in sedentary activities (Aguilar-Farias & Leppe Zamora, 2017). In this study, physical activity (PA) level is introduced as metabolic equivalents (MET-min/week) which indicates the amount of energy (calories) used per minute of PA (Trinh et al., 2008). The the Hungarian version of GPAQ was conducted, which was validated and adapted for the Hungarian population (Ács et al., 2020).

MNA-SF was used to assess nutritional status; this tool contains six items, and it showed good sensitivity, specificity, and diagnostic accuracy (Rubenstein et al., 2001). The questions in this tool include decrease in food intake, weight loss, mobility, stress, neurophysiological problems, and BMI or Calf circumference (CC). Afterwards, the total score is calculated with a maximum score of 14 points; with higher scores indicating a better nutritional status (Rubenstein et al., 2001; Soós et al., 2024).

Moreover, to assess the quality of life SarQoL, which is considered the only validated tool to assess health-related quality of life (HRQoL) specifically designed for individuals with sarcopenia. It includes 55 items distributed across 22 questions. It has seven domains: physical and mental health, mobility, body composition, functionality, activities of daily living, leisure activities, and fears. It is scored on a total score from 0 to 100, with higher scores indicating a better quality of life. We used the Hungarian-validated version of the questionnaire, the Hungarian version of the questionnaire showed high validity and reliability (Geerinck et al., 2022).

Data analysis

Descriptive data were presented in this study as means and standard deviations (SD) for continuous variables, and percentages were used to express categorical variables. We conducted a Kolmogorov-Smirnov test to assess the normality of the data, and the chi-squared test was conducted as a cross-tabulation to assess the difference between categorical data. According to the normality test results, we ran a Mann-Whitney U test to measure the difference between means. Subsequently, we conducted univariate linear regression, and significant results were entered into a multivariate linear regression model. The hierarchical regression model was utilised to control for age as the first block contained only age, and the second model included the rest of the predictors. An alpha level of $\leq$05 was considered statistically significant. All statistical analyses were performed using IBM SPSS Statistics for Windows, version 27.0 (IBM SPSS, Armonk, NY: IBM Corp). An a priori sample size calculation was conducted using G*Power software (version 3.1.9.7; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany). With a medium effect size (0.15), a significance level of 0.05, and a statistical power of 0.95. Based on these assumptions, 146 participants were needed. Thus, 310 participants who were recruited in our study were considered adequate.

Results

Sociodemographic and Health Profile of Study Participants

Among the 310 participants who enrolled in the data collection and completed the questionnaire, the prevalence of sarcopenia risk was 26.8%, 95 were males (30.6%), and 215 were females (69.4%). The mean age of the total sample was 67.4, ranging from 50 to 97. Among the total sample, 26.8% of the participants were considered at high risk of sarcopenia. About 62% of the participants were overweight or obese. Well over half of the participants were 65 years old or more (56.1%). Most participants were non-smokers (81.9%). Moreover, almost two-thirds of the study participants were retired (64.5%). Table 1 shows detailed information on the general characteristics of our sample.

Table 1. General Characteristics of Study Participants (Mann–Whitney U and Chi-square tests)

Variable	Total (n=310)	Low risk of sarcopenia (n=227)	High risk of sarcopenia (n=83)	*p*-value
Age	67.46 (11.39)	64.14 (9.80)	76.55(10.48)	<.001 * [a]
Gender				
Males	95 (30.6%)	76 (33.48%)	19 (22.89%)	.073 [b]
Females	215 (69.4%)	151(66.51%)	64 (77.10%)	
BMI	27.4 (5.2)	27.2 (4.83)	27.9 (6.07)	.365 [a]

Smoking				
Yes	56 (18.1%)	46 (20.3%)	10(12.0%)	.096 [b]
No	254 (81.9%)	181 (79.7%)	73 (88.0%)	
Education				
Primary	63(20.3%)	32 (14.1%)	31 (37.3%)	<.001 * [b]
High school or Technical College	155(50%)	116 (51.1%)	39 (47.0%)	
University	92(29.7%)	79 (34.8%)	13 (15.7%)	
Retirement				
Yes	200 (64.5%)	126 (55.50%)	74 (89.15%)	< .001 * [b]
No	110 (35.5%)	101 (44.50%)	9 (10.84%)	
Marital status				
Married	156 (50.3%)	140 (61.7%)	16 (19.3%)	< .001 * [b]
Not married	154 (49.7%)	87 (38.3%)	67 (80.7%)	
Polypharmacy				
Yes	44 (14.2%)	17 (7.5%)	27 (32.5%)	< .001 * [b]
No	266 (85.8%)	210 (92.5%)	56 (67.5%)	

[a] Mann-Whitney U test
[b] Chi-square test

Health Characteristics of Study Participants

Table 2 shows detailed information regarding the health profile of the participants. Significant associations were found for number of medications (p<.001), number of diseases (p<.001), number of outpatient physician visits in the past year (p=.001), cardiovascular disease (CVD) (p < .001), arthritis (p < .001), diabetes (p = .001), neurological diseases (p < .001), MNA-SF score (p< .001), and GPAQ score (p< .001). The significant variables were included in further analyses using univariate linear regression.

Table 2. Health Characteristics of Study Participants (Mann–Whitney U and Chi-square tests).

Variable	Total (n=310)	Low risk of sarcopenia (n=227)	High risk of sarcopenia (n=83)	p-value
Number of medications	1.80 (1.52)	1.41(1.27)	2.86 (1.63)	<.001 * [a]
Number of Diseases	1.88 (1.70)	1.46 (1.46)	3.06 (1.77)	<.001 * [a]
Number of outpatient physician visits (past year) 0 1 2 or more	240 (77.4 %) 55 (17.3%) 15 (4.8%)	186 (81.93%) 35 (15.41%) 6 (2.64%)	54 (65.10%) 20 (24.10%) 9 (10.84%)	.001 * [a]
CVD Yes No	178 132	116 (51.10%) 111 (48.9%%)	62 (74.7%) 21 (25.3%)	< .001* [b]
Arthritis Yes No	102 (32.9%) 208 (67.1%)	53 (23.3%) 174 (76.7%)	49 (59.0%) 34 (41.0%)	< .001 * [b]
Respiratory Diseases Yes No	24 (7.7%) 286 (92.3%)	17 (7.5%) 210 (92.5%)	7 (8.4%) 76 (91.6%)	.783 [b]
Diabetes Yes No	52 (16.8%) 258 (83.2%)	28 (12.3%) 199 (87.7%)	24 (28.9%) 59 (71.1%)	.001 * [b]
Hypertension Yes No	168 (54.2%) 142 (45.8%)	109 (48.0%) 118 (52.0%)	59 (71.1%) 24 (28.9%)	< .001 * [b]
Neurological diseases Yes No	52 (16.8%) 258 (83.2%)	21 (9.3%) 206 (90.7%)	31 (37.3% 52 (62.7%)	< .001* [b]
Nutritional status	12.15 (2.29)	12.65 (1.88)	10.78 (2.75)	< .001 * [a]
GPAQ	5753 (8060)	7336 (8617)	1425 (3773)	< .001 * [a]
SarQol	68.58 (22.03)	68.85 (21.89)	67.85 (22.53)	.740 [a]

[a] Mann-Whitney U test
[b] Chi-square test

Univariate linear regression

Our results show that all of the variables included in the univariate linear regression were significant predictors of sarcopenia risk. Advanced age, higher number of medications, higher number of diseases,

and higher number the outpatient visits showed an increased score of SARC-F, suggesting an increased risk of sarcopenia, while higher scores of MNA-SF and GPAQ predicted a decreased score of SARC-F, suggesting reduced sarcopenia risk. Detailed results of univariate linear regression are shown in Table 3.

Table 1. Univariate linear regression analysis of potential predictors of sarcopenia risk among older adults (n = 310).

Predictor	β [a]	SE [b]	95% CI [c]	*p*-value
Age	.543	.012	.114- .162	< .001
Number of medications	.463	.096	.692, 1.069	< .001
Number of diseases	.458	.086	.608, .946	< .001
Number of outpatient physician visits (past year)	.194	.223	.333, 1.210	.001
MNA-SF	-.425	.065	-.663, -.407	< .001
GPAQ	-.339	.000	-.000, - .000	< .001

[a] Standardized coefficient
[b] Standard Error
[c] Confidence Interval

Multivariate linear hierarchical regression

All of the significant predictors of the univariate linear regression model were entered into a multivariate linear hierarchical regression; block 2 contains all of the predictors after controlling the age. Our multivariate regression model demonstrated that the number of medications, number of diseases, MNA-SF, and GPAQ scores were significantly associated with sarcopenia risk. Both a higher number of medications and diseases were associated with an increased risk of sarcopenia, while higher MNA-SF and GPAQ scores predicted a decreased risk of sarcopenia. Between block 1 and block 2, the R2 value changed from .295 to .483, suggesting an increase of approximately 19% in the prediction in the regression model. Detailed results of the multivariate linear hierarchical regression model are shown in Table 4.

Table 2. Multivariate hierarchical linear regression analysis predicting sarcopenia risk among older adults (n = 310).

Variable	Block 1				Block 2			
	β [a]	SE [b]	95%CI [c]	*p*-value	β [a]	SE [b]	95%CI [c]	*p*-value
Age	.543	.012	.114- .162	.000	.333	.012	.061-.108	.000
Number of medications	-	-	-	-	.146	.111	.060- .497	.013
Number of diseases	-	-	-	-	.161	.100	.076-.469	.007
Number of outpatient physician visits (past year)	-	-	-	-	.048	.176	-.152- .539	.272
MNA-SF	-	-	-	-	-.255	.056	-.431- -.210	.000
GPAQ	-	-	-	-	-.127	.000	.000- .000	.004
R2			.295				.483	
Adjusted r2			.292				.472	
F value			.000				.000	

[a] Standardized coefficient
[b] Standard Error
[c] Confidence Interval

Discussion

This study aimed to examine the prevalence of sarcopenia risk and its associated factors among 50 years or older in Hungary. The predictors in the univariate regression model included age, number of medications, number of diseases, number of outpatient physician visits , and MNA-SF and GPAQ scores. More importantly, after controlling for age, our multivariate linear regression model suggested that the number of medications, number of diseases, MNA-SF, and total GPAQ scores significantly predicted sarcopenia risk in this sample.

The prevalence of sarcopenia risk in our sample was 26.8%, this is comparable to previous literature. In Hungary, a study aimed to explore sarcopenia among women 50 years or older women reported a prevalence of 31% (Pap et al., 2022). Moroever, similar results were found in a study conducted in

Poland, with a prevalence of 32.0% of suspected sarcopenia cases (Gajda et al., 2024), However, different results were concluded from a Poland by showing a lower prevalence of sarcopenia risk of 18.6% (Milewska et al., 2022), even though the researchers used the same screening tool (SARC-F). These differences might be due to the inclusion criteria, participants' characteristics, and study design.

Additionally, a global meta-analysis explored the prevalence of sarcopenia by analysing 263 studies, suggesting overall prevalence with a range from 8% to 36% among individuals aged less than 60 years, Furthermore, a prevalence ranging from10% to 27% were reported among individuals aged 60 years or older (Petermann-Rocha et al., 2022). However, a recent meta-analysis that included older adults aged 60 years and older in China showed a prevalence of 20.7% (Meng et al., 2024). One interpretation for these variations might be using of a different definitions and the cut-off values to assess sarcopenia, also different diet habits,and environmental and cultural factors among different countries and regions, addition to ethnicity-related genetic variations.

Older age is the main reason of primary sarcopenia caused by deterioration in muscle quantity and quality (Cruz-Jentoft et al., 2019). Comparably, in our findings, older participants had a higher risk of sarcopenia. Consequently, this study mainly focused on studying the other predictors of sarcopenia risk after controlling for age.

Another finding of this study is that a higher self-reported PA level was a protective factor against sarcopenia risk; comparable results were found in previous literature (Arisanti et al., 2026; Fernández et al., 2025; Hämäläinen et al., 2024; Hoang et al., 2023; Tzeng et al., 2020). Reductionin PA affects protein synthesis pathways, triggering an imbalance in protein metabolism and loss of muscle mass and function (Riuzzi et al., 2018; Tournadre et al., 2019). The recommendations in the literature is to meet (≥150 min/week) of PA and limit the sitting time to (<7 h/day), following these recommendations is a major factor to decrease the risk of developing sarcopenia (Tzeng et al., 2020). In the same context, resistance exercise has a critical role as it's the most favourable type of PA to delay muscle loss, this occurs by stimulating muscle protein synthesis during ageing. Additionally, resistance exercise has shown to have positive effect in increasing life expectancy and improving QoL among older adults with sarcopenia (Nasso et al., 2024).

Another predictor of sarcopenia risk in our findings was the number of medication intake; similar results were suggested by the literature (Concha-Cisternas et al., 2026; König et al., 2018). Additionally, a previous review suggested that increased risk of sarcopenia was linked with the number of medications in community-dwelling older adults but not among nursing home residents (Pana et al., 2022), however, our study included individuals from both settings. Increased medication intake is correlated with multiple physiological changes, including decreased hepatic clearance and reduced glomerular filtration, which could cause an increased risk of adverse drug effects (Bernabei et al., 2012; Jensen et al., 2014). Moreover, the effect of the medication would also depend on the type of medications, not only the number of medications, as particular types of medications might affect the body composition directly or indirectly by causing eating disorders, such as anorexia, nausea, and vomiting (Pana et al., 2022). A previous review by Masafumi Kuzuya, suggested that in addition to polypharmacy and inappropriate medication prescription, specific medications were linked to cause sarcopenia for instance; loop diuretics, can cause sarcopenia by inhibiting Na+-K+-2Cl− cotransporter 1 (NKCC1) activity and disrupting myoblast fusion into myotubes, while iron chelators can affect mitochondrial function and promote muscle atrophy, additionally, Interferon (IFN) was associated with inhibition of myoblast differentiation and increasing muscle protein catabolism (Kuzuya, 2024).

Moreover, a previous cohort study has found that polypharmacy alone was not associated with an increased risk of new onset of sarcopenia; however, the combined effect of polypharmacy with potentially inappropriate medications (PIMs). Therefore, reducing polypharmacy and ensuring the prescription of appropriate medications may contribute to the prevention of sarcopenia (Tanaka et al., 2023).

The effect of medications as a sarcopenia risk factor cannot be studied separately from comorbidities, as they often coexist. A previous study has suggested that individuals with 4–5 chronic diseases were at 1.80 times higher risk of developing sarcopenia compared to individuals who suffer from 2–3 chronic diseases. Additionally, the risk of sarcopenia in individuals who have ≥ 6 chronic diseases was 5.11 times higher than those diagnosed with 2–3 chronic diseases (Xia et al., 2024). Consistent findings have also

been reported in other studies (Pacifico et al., 2021; Vanitcharoenkul et al., 2024); this aligns with our results, which demonstrated that an increased number of diseases predicted higher SARC-F.

Comorbidities are linked to sarcopenia in different manners, for example, it is known that Insulin resistance obstructs results in the breaking down of skeletal muscle proteins and accelerating muscle atrophy (Mesinovic et al., 2019), in addition, osteoarthritis patients usually suffer from joint pain, which results in limitation of physical activities consequently leading to muscle atrophy and loss of function (Gao et al., 2021). Moreover, CVD is suggested to cause prolonged bedridden, eventually reducing PA, consequently, leading to muscle wasting (Gao et al., 2021). However, in our study, we only analysed the number of diseases in the multivariate linear regression model due to the small number of separate diseases reported by participants to avoid misinterpretations or biased results.

Previous studies suggested that sarcopenic individuals were associated with an increased incidence of institutionalisation, regardless of the presence of multimorbidity (Hirani et al., 2015; Pacifico et al., 2021). This suggests that even if sarcopenia presents with other low-severity diseases, it is still considered a risk factor for institutionalisation and hospital visits. Moreover, a recent meta-analysis for cohort studies concluded that older people with sarcopenia were at an increased risk of hospitalisation among different populations (community-dwelling and hospitalised) and across different definitions used to diagnose sarcopenia (Zhang et al., 2018). Another longitudinal study conducted in community-dwelling older people in Taiwan has suggested that sarcopenic individuals are at higher risk of visiting the emergency department, institutionalisation, and hospitalisation (Tang et al., 2018). These findings from the literature were similar to our results. However, our study didn't include a detailed analysis of hospital visit types such as regular medical consultation, emergency department visit, or long-term hospitalisation. The relationship between hospitalisation and sarcopenia might be explained by increased serum inflammatory parameters, such as elevated C-reactive protein levels among sarcopenic individuals (Bano et al., 2017).

Additionally, our findings suggest that a better nutritional status of the participants was among the preventivefactors aganistwsarcopenia risk; previous studies have reported similar results (Meng et al., 2024; Tzeng et al., 2020). Healthy nutrition, particularly a protein-rich diet, is considered a well-established factor in promoting healthy ageing among older adults (Azzolina et al., 2020; Papadopoulou, 2020).
In this study, the difference between the risk of sarcopenia in smokers and non-smokers was non-significant, which contradicts previous findings (Locquet et al., 2021; Meng et al., 2024), a study conducted by Locquet et al. in Belgium concluded that the risk of sarcopenia in older smokers is 2.36 times higher than in non-smokers (Locquet et al., 2021). The relationship between smoking and sarcopenia could be attributed to the negative effect of smoking on muscle metabolism, increased inflammation and oxidative stress, and growth in the overexpression of genes associated with muscle atrophy. Additionally, smoking has indirect effects through the development of respiratory and cardiovascular diseases, which leads to reduced PA levels and, ultimately, muscle atrophy (Kim et al., 2020). Our results might be different due to the relatively small percentage of smokers in our sample, or because the participants in our study were relatively younger than those in the aforementioned studies.

In this study, health-related quality of life was assessed using the total score of the SarQol tool. We didn't observe any significant difference between individuals with low risk and high risk of sarcopenia, which contradicts findings in the existing literature (Beaudart et al., 2018; Fonfría-Vivas et al., 2023). A previous study conducted in Europe suggested that SarQol could differentiate between sarcopenic and non-sarcopenic individuals concerning their QoL, regardless of the 6 distinct definitions used to diagnose sarcopenia in their cohort (Beaudart et al., 2018). One possible explanation of the non-significant association is the use of SARC-F screening tools instead of objective diagnostic measures such as dual-energy X-ray absorptiometry (DXA), handgrip strength, or gait speed. Since SARC-F is a screening tool designed to identify individuals at risk of sarcopenia rather than to confirm its presence, this might result in including participants with mild or moderate decline in muscle quality and quantity or no decline at all. In other words, the included participants probably might not have experienced an advanced degree of muscle loss or functional limitation that substantially affects their quality of life.

This study had several strengths, including the broad inclusion criteria, involving a wide range of age

groups and diverse population settings from both community-dwelling and nursing home residents. We believe that this diversity enhances the generalisability of our findings. Furthermore, this study examined multiple modifiable predictors of sarcopenia to offer a holistic evaluation of factors that influence sarcopenia risk and emphasise possible practical targets for public health interventions aiming to prevent and reduce the risk of sarcopenia. Finally, our findings highlight the importance of a multidisciplinary approach of managing sarcopenia, due to its multifaceted and complex risk factors which directly impact healthcare policies and clinical guidelines.

Despite the strengths of our study, the results should be interpreted with caution. Although SARC-F is a reliable screening tool for assessing sarcopenia risk, it is insufficient for definitively identifying sarcopenic cases more objective measure for muscle strength, muscle mass quality and quantity in addition to physical performance, is needed to confirm sarcopenia diagnosis.

Another limitation for this study might be the absence of detailed subgroup analysis distinguishing community-dwelling and institutionalised participants, which limits subgroup comparisons. Additionally, women who were included in this study based solely on age without specifically considering their menopausal status might have influenced our findings, as menopause is characterised by an accelerated decline in estrogen levels, leading to a decrease in bone density, muscle mass, and muscle strength (Messier et al., 2011). Consequently, the inclusion of both pre- and post-menopausal women might have led to an underestimation of sarcopenia risk. Finally, the cross-sectional design and the use of the convenience sampling method limits the ability to establish causal relationships. Additionally, the possibility of recall bias should also be considered when interpreting the findings. Therefore, our findings should be understood as indicative, underscoring the need for longitudinal studies that follow the participants over time to identify the progression of sarcopenia and establish causality.

Conclusions

This study investigated the prevalence of sarcopenia risk and its associated factors among individuals aged 50 years or older in Hungary. In this study, the prevalence of sarcopenia risk was 26.8% and our multivariate linear regression model showed that the number of medications, number of diseases, MNA-SF and total GPAQ scores significantly predicted sarcopenia risk. Further longitudinal studies are recommended to examine the development of sarcopenia over time, in addition to comparative studies between community-dwelling and institutionalised older adults.

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The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of the of the University of Pécs Clinical Centre (No. 9080 - PTE 2021).

Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

There are no linked research data sets for this paper. Data, a full version of the questionnaire, and scoring will be made available on request from the corresponding author.

Conflicts of Interest

The authors declare no conflict of interest.

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