ASSOCIATION BETWEEN SARCOPENIA AND HEALTH-RELATED QUALITY OF LIFE AMONG OLDER DIABETIC PATIENTS

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ABSTRACT

Background: Sarcopenia is a common geriatric syndrome characterized by the progressive loss of skeletal muscle mass and function. It frequently coexists with type 2 diabetes mellitus (T2DM) in older adults and may contribute to poor health outcomes, including reduced quality of life. Despite its growing clinical relevance, limited data are available on the burden of sarcopenia and its impact on health-related quality of life (HRQoL) among older patients with T2DM in Vietnam. **Objective**: To examine the association between sarcopenia and HRQoL among older adults with T2DM and identify key factors contributing to reduced HRQoL in this population. **Methods**: A cross-sectional study was conducted among 402 patients aged ≥ 60 years with T2DM at the National Geriatric Hospital in Hanoi. Sarcopenia was diagnosed according to the 2019 Asian Working Group for Sarcopenia criteria. HRQoL was assessed using the EQ-5D-5L questionnaire. Group comparisons were performed using t-tests and chi-square tests. Multivariate linear regression was used to evaluate associations between sarcopenia and HRQoL while adjusting for potential confounders. **Results**: Among 402 older diabetic patients, the mean age was 73.9 ± 7.1 years old and 63.9% was female. The proportion of sarcopenic patients present in 33.8% of participants. Compared with non-sarcopenic individuals, those with sarcopenia had significantly lower EQ-5D-5L index scores (0.76 ± 0.16 vs. 0.81 ± 0.17, $p < 0.01$) and reported a higher prevalence of problems in the mobility, self-care, and usual activities domains. In multivariate analysis, five independent factors were significantly associated with reduced HRQoL: low handgrip strength, instrumental activities of daily living (IADL) disability, malnutrition, urinary incontinence, and high risk of fall. **Conclusion**: Sarcopenia is significantly associated with impaired HRQoL in older diabetic patients. Clinical attention to muscle strength, fall risk, nutritional status, urinary incontinence, and functional independence may help improve quality of life in this vulnerable group. Routine screening and multidisciplinary management are recommended.

Keywords: *Sarcopenia, health-related quality of life, diabetes mellitus, older adults.*

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1. INTRODUCTION

Sarcopenia, a progressive loss of skeletal muscle mass, strength, and function, is increasingly recognized as a major public

health concern in aging populations [1]. Globally, its prevalence ranges from 5% to 13% among adults aged 60 years and older and may reach up to 50% in those over 80 years [2]. In individuals with T2DM, sarcopenia occurs two to three times more frequently, affecting approximately 15 – 40% of older diabetic adults [3]. The coexistence of these two conditions leads to greater frailty, disability, hospitalization, and mortality, as well as a marked decline in health-related quality of life.

Health-related quality of life (HRQoL) is a multidimensional concept encompassing physical, mental, and social well-being. It is increasingly recognized as an important outcome measure in geriatric care and chronic disease management. In older patients with T2DM, sarcopenia further worsens mobility limitation, fatigue, and depressive symptoms, leading to functional dependence and reduced life satisfaction [4]. However, evidence from Asian countries, especially Vietnam, remains scarce.

Most prior studies on sarcopenia in diabetes have relied on Western-based diagnostic criteria (EWGSOP) that may not suit Asian population [5]. The Asian Working Group for Sarcopenia (AWGS) 2019 update introduced region-specific cut-off values and emphasized early detection [1], but few studies have applied these criteria to older diabetic populations. Furthermore, earlier HRQoL assessments have often used generic tools without detailed analysis of affected domains and failing to account for combined geriatric syndromes. The present study addresses these gaps by focusing on two main objectives: (1) to evaluate HRQoL among older Vietnamese patients with T2DM and sarcopenia, and (2) to determine related factors associated with HRQoL in this population. The findings aim to provide evidence-based guidance for targeted strategies to preserve function and improve quality of life in this vulnerable group.

2. SUBJECTS AND METHODS

2.1 Subjects

This study enrolled 402 older diabetic patients who attended the outpatient clinic of the National Geriatric Hospital between October 2023 and March 2024.

Inclusion criteria were:

- Age ≥ 60 years old;
- Confirmed diagnosis of T2DM according to the 2022 American Diabetes Association (ADA) criteria [6];
- Ability to participate in functional assessments.

Exclusion criteria included:

- Acute illness at the time of assessment;
- Severe cognitive impairment;
- Contraindications to bioelectrical impedance analysis (BIA) (e.g., metallic implants, edema);
- Major physical disability that interfered with the performance of study assessments.

2.2 Study Design

This was a cross-sectional descriptive study using a convenience sampling approach.

2.3 Study Variables

Participant data were obtained through structured interviews and review of medical records, using a standardized questionnaire.

Diagnosis of sarcopenia followed the 2019 criteria of the Asian Working Group for Sarcopenia (AWGS 2019) [1]. Sarcopenia was defined by the presence of low skeletal muscle mass (criterion 1) plus either low muscle strength (criterion 2) or poor physical performance (criterion 3):

1. **Low skeletal muscle mass** – assessed by BIA (InBody 770, Korea) and defined as skeletal muscle mass index (SMI) < 7.0 kg/m^2 for men and < 5.7 kg/m^2 for women [1].

2. **Low muscle strength** – assessed by handgrip strength using a Jamar dynamometer;

defined as < 28 kg for men and < 18 kg for women [1].

3. **Poor physical performance** – defined as a Short Physical Performance Battery (SPPB) score < 9 or a five-time chair stand test (5CST) duration ≥ 12 seconds.

Additional variables included:

- **Demographic characteristics**: age, sex, marital status, educational attainment, body mass index (BMI).
- **Diabetes-related characteristics**: presence of chronic complications, HbA1c value.
- **Health-related quality of life**: assessed using the EQ-5D-5L questionnaire and EQ visual analogue scale (EQ-VAS).
- **Geriatric characteristics**: Malnutrition (Mini Nutritional Assessment–Short Form, *MNA-SF* ≤ 7, frailty (Clinical Frailty Scale, *CFS* ≥ 5, depressive symptoms (15-item Geriatric Depression Scale, *GDS-15* ≥ 5), urinary incontinence, dementia (Mini Mental State Examination, *MMSE* < 26), dependency in activities of daily living (*ADL* < 6) and instrumental activities of daily living (*IADL* < 8), High risk of fall (Fall Risk Index 21, *FRI-21* ≥ 9).

2.4 Data Collection Procedures

Data were collected by trained research staff through face-to-face interviews, standardized functional tests, and review of medical records.

- **Muscle mass**: measured using BIA (InBody 770).
- **Handgrip strength**: measured with a Jamar dynamometer.
- **Physical performance**: assessed using the 5CST and SPPB.
- **HRQoL**: measured using the EQ-5D-5L and EQ-VAS.
- Other geriatric assessments: conducted using the validated instruments listed above.

2.5 Data Management and Statistical Analysis

All data were entered into REDCap and analyzed using SPSS version 26.0. Descriptive statistics were used to summarize patient characteristics, expressed as mean ± standard deviation (SD) for continuous variables and frequency (percentage) for categorical variables. Multivariate linear regression analysis was performed to examine the association between sarcopenia and HRQoL, adjusting for potential confounding factors. A p-value < 0.05 was considered statistically significant.

3. RESULTS

3.1 General Characteristics of the Study Population

Table 1 Socio-demographic characteristics among participants (n=402)

Characteristic		Frequency (n)	Percentage (%)
Age (year)	60-69	118	29.4
	70-79	189	47.0
	≥80	95	23.6
Gender	Male	145	36.1
	Female	257	63.9
Marital status	Married	342	85.1
	Single/Widow	60	14.9
Educational level	Secondary school and below	128	31.8
	High school	98	24.4
	University/college and postgraduate	176	43.8

BMI (kg/m^2)	< 18.5	10	2.5
	18.5-22.9	154	38.3
	≥23	238	59.2
		Mean ± SD	
Age (year)		73.9 ± 7.1	
BMI (kg/m^2)		23.7 ± 2.9	

A total of 453 older adults with T2DM were initially screened at the outpatient clinic. Of these, 402 were included in the final analysis (participation rate 88.7%). In total, 51 were excluded: 21 declined participants, 12 had physical disabilities, 11 had an acute condition, and the remainder had contraindications to assessment (e.g., edema). The analyzed cohort had a mean age of 73.9 ± 7.1 years (Table 1). The largest age group was 70–79 years, accounting for nearly half of the participants (47.0%), followed by those aged ≥80 years (23.6%), and 60–69 years (29.4%).

Females comprised the majority of the sample (63.9%), while males accounted for 36.1%. Most participants were married (85.1%), with 14.9% being single or widowed. Regarding educational attainment, 43.8% had completed university or higher education, 24.4% had completed high school, and 31.8% had education at secondary school level or below.

The mean body mass index (BMI) was 23.7 ± 2.9 kg/m^2. According to BMI categories, more than half of the participants (59.2%) were overweight or obese (≥23 kg/m^2), while 38.3% had a BMI in the normal range (18.5–22.9 kg/m^2), and only 2.5% were underweight (<18.5 kg/m^2). These findings indicate that excess body weight was prevalent in this cohort of older adults with diabetes, particularly among those aged 70–79 years.

3.2 Comparison of Characteristics Between Sarcopenia and Non-Sarcopenia Groups

Among the 402 participants, 136 individuals (33.8%) were diagnosed with sarcopenia. Table 2 summarizes the comparison of socio-demographic, clinical, and geriatric characteristics between participants with and without sarcopenia.

Table 2 Comparison of characteristics between sarcopenia and non-sarcopenia participants

Characteristic	Sarcopenia Group (n = 136)	Non-Sarcopenia Group (n=266)	P-value
Age (years)	77.1 (6.4)	72.3 (6.9)	<0.01
Female (n, %)	83 (61.0)	174 (65.4)	0.39
Single/Widow (n, %)	34 (25.0)	26 (9.8)	<0.01
Low education (n, %)	47 (34.6)	81 (30.5)	0.4
BMI (kg/m^2)	22.0 (2.2)	24.5 (2.8)	<0.01
HbA1c level (%)	7.4 (1.8)	7.4 (1.4)	0.86
Complication of DM (n, %)	102 (75.0)	186 (69.9)	0.29
SMI (kg/m^2)	5.6 (0.7)	6.7 (0.9)	<0.01
Handgrip strength (kg)	15.0 (5.7)	18.0 (6.7)	<0.01
SPPB (points)	7.7 (3.3)	8.9 (2.9)	<0.01

Frailty (n, %)	39 (28.7)	33 (12.4)	<0.01
Malnutrition (n, %)	11 (8.1)	2 (0.8)	<0.01
Urinary incontinence (n, %)	27 (19.9)	36 (13.5)	0.099
Depression (n, %)	49 (36.0)	59 (22.2)	<0.01
Dementia (n, %)	80 (58.8)	110 (41.4)	<0.01
High risk of fall (n, %)	79 (58.1)	106 (39.8)	<0.01
ADL dependency (n, %)	17 (12.5)	18 (6.8)	0.054
IADL dependency (n, %)	83 (61.0)	104 (39.1)	<0.01

Participants with sarcopenia were older than those without the condition (77.1 ± 6.4 vs. 72.3 ± 6.9 years, $p < 0.01$) and more likely to be single or widowed (25.0% vs. 9.8%, $p < 0.01$). They had lower BMI (22.0 ± 2.2 vs. 24.5 ± 2.8 kg/m^2, $p < 0.01$), reduced skeletal muscle index (5.6 ± 0.7 vs. 6.7 ± 0.9 kg/m^2, $p < 0.01$), weaker handgrip strength (15.0 ± 5.7 vs. 18.0 ± 6.7 kg, $p < 0.01$), and poorer SPPB scores (7.7 ± 3.3 vs. 8.9 ± 2.9, $p < 0.01$). Among sarcopenic patients, geriatric syndromes were more prevalent, including frailty (28.7% vs. 12.4%, $p < 0.01$), malnutrition (8.1% vs. 0.8%, $p < 0.01$), depressive symptoms (36.0% vs. 22.2%, $p < 0.01$), dementia (58.8% vs. 41.4%, $p < 0.01$), high fall risk (58.1% vs. 39.8%, $p < 0.01$), and IADL disability (61.0% vs. 39.1%, $p < 0.01$). Differences in ADL disability ($p = 0.054$) and urinary incontinence ($p = 0.099$) were not statistically significant. No significant differences were found in diabetes-related characteristics, including HbA1c, or chronic complications.

3.3 Evaluation of Health-Related Quality of Life Domains Between Sarcopenia and Non-Sarcopenia Groups

Table 3 presents the comparison of HRQoL between participants with and without sarcopenia, assessed using the EQ-5D-5L instrument and EQ-VAS scores. Overall, the sarcopenia group reported significantly lower EQ-5D-5L index scores (0.76 ± 0.16) compared to the non-sarcopenia group (0.81 ± 0.17, $p < 0.01$).

Table 3 Evaluation of health-related quality of life (HRQoL) domains between participants with and without sarcopenia.

Domain		**Sarcopenia Group (n=136)***	**Non-Sarcopenia Group (n=266)***	**P-value**
Mobility	No/Minor problem	91 (66.9)	215 (80.8)	<0.01
	Moderate/Severe problem	45 (33.1)	51 (19.2)	
Selfcare	No/Minor problem	119 (87.5)	248 (93.2)	0.05
	Moderate/Severe problem	17 (12.5)	18 (6.8)	
Usual activities	No/Minor problem	100 (73.5)	232 (87.2)	<0.01
	Moderate/Severe problem	36 (26.5)	34 (12.8)	
Pain or discomfort	No/Minor problem	110 (80.9)	221 (83.1)	0.58
	Moderate/Severe problem	26 (19.1)	45 (16.9)	

Anxiety or depression	No/Minor problem	120 (88.2)	245 (92.1)	0.2
	Moderate/Severe problem	16 (11.8)	21 (7.9)	
EQ-5D-5L index		0.76±0.16	0.81±0.17	<0.01
EQ-VAS		59.7±14.7	63.0±17.0	0.05

: Values are presented as number (percentage).

Participants with sarcopenia reported higher rates of problems across EQ-5D-5L domains. Across individual EQ-5D-5L domains, participants with sarcopenia were more likely to report moderate to severe problem in mobility (33.1% vs. 19.2%, $p < 0.01$) and usual activities (26.5% vs. 12.8%, $p < 0.01$). The difference in selfcare reached borderline statistical significance ($p = 0.05$), with a higher proportion of problems in the sarcopenia group. No significant differences were observed in pain/discomfort or anxiety/depression domains. The mean EQ-VAS score was also lower among sarcopenic patients (59.7 ± 14.7) compared to those without sarcopenia (63.0 ± 17.0), with borderline significance ($p = 0.05$).

3.4 Factors Associated with Reduced HRQoL in Older Diabetic Patients with Sarcopenia

Table 4 presents the correlation coefficients and multivariate linear regression results for factors influencing HRQoL, measured by the EQ-5D-5L index, among participants with sarcopenia. In unadjusted analysis, multiple variables were significantly correlated with EQ-5D-5L scores, including muscle strength, physical performance, functional and nutritional status, depressive symptoms, frailty, urinary incontinence, fall risk, and cognitive function. In the multivariate model, five factors remained independently associated with lower EQ-5D-5L index scores: handgrip strength ($B = 0.005$, 95% CI: 0.0 to 0.010, $p < 0.05$), IADL disability ($B = -0.060$, 95% CI: -0.111 to -0.009, $p < 0.05$), urinary incontinence ($B = -0.093$, 95% CI: -0.150 to -0.035, $p < 0.05$), high fall risk ($B = -0.074$, 95% CI: -0.123 to -0.025, $p < 0.05$), and malnutrition ($B = -0.094$, 95% CI: -0.176 to -0.012, $p < 0.05$). These findings indicate that muscle weakness, functional dependency, continence problems, fall risk, and poor nutrition are key determinants of reduced quality of life in this population.

Table 4 Spearman correlation coefficients and multivariate linear regression analysis of factors associated with reduced HRQoL among participants with sarcopenia.

Characteristic	Spearman correlation	Multivariate linear regression	
		B	95% CI
Age (years)	-0.12	0.0	-0.004 – 0.004
Female (yes)	-0.17†	0.020	-0.070 – 0.083
Complication of DM (yes)	-0.12	0.041	-0.010 – 0.095
HbA1C (%)	-0.03	-0.003	-0.015 – 0.009
SMI (kg/m^2)	0.21†	-0.001	-0.049 – 0.046
Handgrip strength (kg)	0.31‡	0.005†	0.000 – 0.010
SPPB score	0.45‡	0.008	-0.001 – 0.017
ADL dependency	-0.30‡	-0.019	-0.091 – 0.054
IADL dependency	-0.46‡	-0.060†	-0.111 – -0.009

Low physical activity level	-0.29‡	-0.034	-0.082 – 0.015
Depressive symptoms	-0.48‡	-0.026	-0.080 – 0.028
Frailty (CFS)	-0.47‡	-0.056	-0.120 – 0.008
Dementia	-0.20†	0.027	-0.019 – 0.075
Urinary incontinence (yes)	-0.40‡	-0.093†	-0.150 – -0.035
High risk of fall	-0.55‡	-0.074†	-0.123 – -0.025
Malnutrition	-0.26‡	-0.094†	-0.176 – -0.012

†: *statistically significant at p <0.05;* ‡: *statistically significant at p <0.01.*

4 DISCUSSION

Our study was conducted on 402 patients who came from the National Geriatric Hospital, the mean age of participants was 73.9 ± 7.1 years, reflecting an elderly diabetic cohort in which nearly half were aged 70–79 years and almost one-quarter were aged 80 years or older. Females constituted the majority (63.9%), and most participants were married (85.1%). The age and sex distribution in our cohort is broadly consistent with study of Vu Thi Thanh Huyen [7] on older adults with T2DM in Nghe An province, which also report a predominance of women and the average age was 72.8 ± 5.9 years. The slightly higher mean age compared with community-based Asian cohort study by Ngiap Chuan Tan [8] likely reflects the hospital-based setting, which tends to include more complex and older cases. Marital status patterns differ from many Western studies, where widowhood and living alone are more common. In our cohort, the high proportion of married individuals may provide protective social and emotional support, potentially buffering against functional decline and psychological distress. Nonetheless, the smaller subset of single or widowed participants may be at greater risk for nutritional inadequacy, physical inactivity, and consequently sarcopenia.

The high prevalence of overweight and obesity, even among older adults, aligns with trends observed in urban Asian populations and may indicate a growing burden of sarcopenic obesity [9]. This phenotype, characterised by excess fat mass and reduced muscle mass or strength, is clinically important because it compounds the risks of disability, falls, and poor metabolic outcomes in T2DM. The coexistence of higher educational attainment and substantial overweight prevalence in this cohort suggests that health literacy alone may not offset the influence of socio-cultural and lifestyle factors on body composition.

In this study, older adults with T2DM and sarcopenia reported significantly lower HRQoL compared with their non-sarcopenic counterparts, as reflected by the EQ-5D-5L index and EQ-VAS scores. The largest differences were observed in the mobility and usual activities domains, where sarcopenic participants were more likely to report moderate to severe problems. These findings align with previous studies in East Asian populations showing that sarcopenia primarily compromises physical functioning and independence [10]. Reduced muscle strength and performance likely limit walking, transferring, and participation in daily activities, directly contributing to poorer scores in these domains.

A borderline difference was also observed in the self-care domain, suggesting that difficulties with personal care tasks may develop as sarcopenia progresses. While many older adults in our cohort live with family members who can provide assistance, the gradual loss of independence in basic

activities such as bathing and dressing remains a critical concern. Similar patterns have been reported in other geriatric populations, where self-care limitations often follow declines in mobility and usual activities.

In the multivariate analysis, five variables remained independently associated with lower EQ-5D-5L index scores among participants with sarcopenia: low handgrip strength, IADL disability, urinary incontinence, high risk of fall, and malnutrition (Table 4). The association between low handgrip strength and reduced HRQoL is consistent with prior studies in both diabetic and general geriatric populations, where handgrip strength is regarded as a robust biomarker of overall muscle function and a predictor of disability, hospitalization, and mortality [11]. Similarly, IADL disability has been repeatedly linked to lower HRQoL, as loss of independence in instrumental activities often precedes and predicts further functional decline [12]. Our findings also identified urinary incontinence as an independent predictor, which aligns with literature showing its negative psychosocial and physical consequences in older adults, including embarrassment, social withdrawal, and reduced participation in community activities [13]. The significant association between high fall risk and lower HRQoL is supported by previous evidence that fear of falling and fall-related injuries contribute to mobility restriction, reduced physical activity, and increased dependency [14]. Malnutrition was another independent predictor, highlighting the importance of adequate nutritional status in maintaining muscle mass, functional performance, and resilience against disability [15]. Mechanistically, malnutrition may accelerate muscle loss and exacerbate weakness, creating a vicious cycle of inactivity and dependency. Notably, while depressive symptoms and low physical activity showed significant correlations in univariate analysis, they were no longer significant after adjustment, suggesting that their effects on HRQoL may be mediated through functional limitations, nutritional status, and mobility impairments. Taking together, these results emphasize the multifactorial nature of HRQoL impairment in sarcopenia and the need for comprehensive, multidisciplinary interventions to address the diverse determinants identified in this study.

Generalizability is limited by our hospital-based, convenience sample. Because participants were recruited at a national tertiary geriatric center, they likely had greater clinical complexity and multimorbidity than community-dwelling older adults. This selection bias may overestimate the prevalence of sarcopenia and the magnitude of HRQoL deficits reported here. In addition, the cross-sectional design precludes causal inference. Future multicenter, community-based studies using probabilistic sampling are needed to validate and extend these findings.

5. CONCLUSION

Our study highlights that sarcopenia is prevalent among older Vietnamese patients with type 2 diabetes and independently contributes to reduced quality of life, emphasizing the importance of early detection and comprehensive interventions focused on muscle strength, nutrition, functional independence, and fall prevention.

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