Prevalence and risk factors of sarcopenia among older adults with knee osteoarthritis in a Suburban Thai community

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Abstract

Background and aims: Thailand is rapidly aging, with knee osteoarthritis (KOA) affecting over 16% of its older population. Sarcopenia, a critical issue for older adults, often co-occurs with KOA, leading to worsened functional decline, increased fall risk, and reduced quality of life. Although high prevalences of sarcopenia have been reported in urban Thai hospitals (e.g., 68.04% and 41.70% in separate studies), data from community settings remain limited. This study aimed to investigate the prevalence and associated factors of sarcopenia among older adults with KOA in Ratchaburi Province, Thailand.

Materials and methods: A descriptive quantitative study was conducted with 120 adults aged ≥ 60 years with physician-confirmed KOA, recruited from Ban Pong Hospital and affiliated primary care units. Sarcopenia risk was assessed using the Modified Mini Sarcopenia Risk Assessment-5 (MSRA-5). Additional instruments included the Barthel Index, Frail Scale, and Mini Nutritional Assessment (MNA). Data were analysed using descriptive and inferential statistics, including chi-square tests, t-tests, and logistic regression.

Results: Participants had a mean age of 69.4 ± 6.8 years, and 63.3% were female. The prevalence of sarcopenia risk was 67.5% (n=81). In univariable analyses, significant associations were observed with comorbidities, lower Barthel Index scores, frailty, and malnutrition/risk of malnutrition. In multivariable regression, lower Body Mass Index (Adjusted OR = 0.80, 95% CI: 0.67-0.87, $p < 0.001$) and advancing age (Adjusted OR = 1.14, 95% CI: 1.12–1.24, $p = 0.02$) remained independently associated with sarcopenia risk.

Conclusion: Sarcopenia risk was highly prevalent among older adults with KOA in this community setting. Lower BMI and increasing age were independent risk factors. These findings highlight the importance of early screening, nutritional intervention, and targeted muscle health strategies as part of comprehensive geriatric care. Integration of sarcopenia screening into primary care may improve outcomes.

Keywords: Prevalence, Risk factors of sarcopenia, Older adults, Knee osteoarthritis, Community

Introduction

Thailand is rapidly progressing towards becoming a complete aged society, characterized by a declining birth rate and an increasing dependency ratio[1]. This demographic transformation presents significant challenges, profoundly impacting national health, social structures, and economic growth[2]. Importantly, Thailand is not alone in facing this issue.

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Across Southeast Asia and globally, the demographic shift toward population ageing has placed unprecedented demands on healthcare systems, long-term care policies, and rehabilitation services, making musculoskeletal health a critical area of concern[3].

Within this evolving context, knee osteoarthritis (KOA) represents a major public health concern, affecting over 16% of the Thai population[4]. Beyond the direct burden of KOA, sarcopenia—a progressive, generalized skeletal muscle disorder—is a critical yet often underdiagnosed issue among older adults[5]. Sarcopenia is associated with reduced muscle strength and physical performance, leading to adverse outcomes such as increased pain, impaired balance, reduced activity, heightened fall risk, longer hospitalizations, diminished quality of life, and increased mortality[6,7].

The coexistence of sarcopenia and KOA is particularly alarming. Studies in Thailand have reported high prevalences of sarcopenia among older adults with KOA, with figures reaching 68.04% at the Rehabilitation Medicine Department of Siriraj Hospital[8] and 41.70% at a district hospital in Bangkok[9]. These findings underscore the heightened vulnerability of this population, suggesting a synergistic relationship where each condition exacerbates the other[10]. Multiple factors contribute to sarcopenia in individuals with KOA, including lifestyle, dietary habits (e.g., inadequate protein intake), comorbidities, chronic inflammation, and reduced physical activity due to pain[11,12]. Furthermore, insufficient awareness among healthcare professionals and the public delays prevention and management. Effective strategies therefore require comprehensive screening, targeted exercise, nutritional interventions, and cognitive health maintenance, as cognitive impairment and malnutrition may impede adherence to care[13,14].

Despite evidence from urban hospitals, little is known about suburban community-dwelling older adults. Research from these settings is essential, as healthcare access, socioeconomic conditions, and environmental factors may substantially influence sarcopenia risk. For instance, a five-year longitudinal study (2020–2024) at Ban Pong Hospital in Ratchaburi Province found that 11.6% of healthcare users were older adults, highlighting the demographic importance of this community.

This study aimed to determine the prevalence and associated factors of sarcopenia among older adults with KOA in a suburban Thai community.

Materials and methods

Study design and setting

This study employed a mixed-methods approach, combining a descriptive quantitative study with in-depth qualitative interviews[15,16]. Although the study adopted the International Classification of Functioning, Disability and Health (ICF) framework to conceptually illustrate the multidimensional aspects of sarcopenia among older adults with knee osteoarthritis, no qualitative data were analyzed or reported in this manuscript. The present paper focuses solely on the quantitative findings. The research was conducted at Ban Pong Hospital and its affiliated primary care units in Ratchaburi Province, Thailand. While the quantitative component is described in detail, the qualitative interviews were used to complement these findings by exploring participants' experiences of functional decline and daily living limitations. As qualitative results are not fully presented here, this is acknowledged as a methodological limitation[16].

Participants and sampling

According to 2021 hospital records, approximately 962 older adults were diagnosed with KOA at Ban Pong Hospital. A prior study in the same year indicated that 9.4% of KOA patients also exhibited low muscle mass. Using the standard formula for population proportion estimation with a 5% margin of error and a 95% confidence level, the required sample size was calculated as 120 participants[17].

A purposive sampling strategy was employed to ensure representation of community-dwelling older adults with physician-confirmed KOA. Inclusion criteria were: (1) aged 60 years or older, (2) diagnosis of KOA by a physician, and (3) ability to provide informed consent.

Instruments and Data Collection. Quantitative data were collected using validated instruments[18]:

1) The Modified Mini Sarcopenia Risk Assessment-5 (MSRA-5) was selected for this study because it is a brief and validated screening tool that assesses multiple risk domains, providing a broader perspective on sarcopenia risk than the SARC-F, which primarily focuses on physical function. The MSRA-5 has also demonstrated good sensitivity for detecting sarcopenia risk among community-dwelling older adults in Asian populations. In contrast, the "possible sarcopenia" criteria proposed by the Asian Working Group for Sarcopenia require objective measurements of muscle strength and physical performance, which were not feasible in this community-based study due to resource and equipment limitations. Therefore, the MSRA-5 was adopted as a practical and reliable screening instrument to identify individuals at risk of sarcopenia within the primary care setting. Modified Mini Sarcopenia Risk Assessment-5 (Modified MSRA-5): A brief screening tool to assess the risk of sarcopenia. Scores ≤ 30 indicate a high risk of sarcopenia, whereas scores > 30 suggest low risk.

2) Barthel Index: Used to evaluate independence in basic activities of daily living (ADL). Scores range from 0 to 20, where 0-4 indicates low initial score, total dependence, 5-11 intermediate initial score, moderate to severe dependence, 12-20 intermediate high, mildly serves dependence, consideration of discharging home.

3) Frail Scale: A 5-item questionnaire assessing fatigue, resistance, ambulation, illnesses, and weight loss. A score of 0 indicates robustness, 1–2 pre-frailty, and ≥ 3 frailty.

4) Mini Nutritional Assessment (MNA): Evaluates nutritional status; total scores ≥ 24 indicate normal nutrition, 17-23.5 risk of malnutrition, and < 17 malnutrition.

5) Mini-Mental State Examination (MMSE): Screens for cognitive impairment. Scores of 24-30 indicate normal cognition, 19–23 mild impairment, and < 19 moderate-to-severe impairment.

Prior to formal data collection, instrument reliability was assessed through a test-retest procedure in a subset of participants (n=30) over a two-week interval. The Intraclass Correlation Coefficient (ICC (3,1)) indicated good to excellent reliability across instruments, with values ranging from 0.82 to 0.91.

Qualitative data were obtained through in-depth interviews, analyzed using content analysis, and interpreted within the framework of the International Classification of Functioning, Disability and Health (ICF)[15,16]. Interviews explored domains such as mobility, daily activity limitations, and social participation.

Ethical considerations

This research received approval from the Institutional Review Board of Ban Pong Hospital (COA No. 001/2024). Written informed consent was obtained from all participants following a clear explanation of the study objectives, potential risks and benefits, and participant rights. Confidentiality was strictly maintained, with all data de-identified for research purposes.

Statistical analysis

Data were analyzed using descriptive statistics to summarize participant characteristics, including frequencies, percentages, means, and standard deviations. Inferential statistics included chi-square tests, independent t-tests, and both univariable and multivariable logistic regression analyses to examine associations between risk factors and sarcopenia. Associations between independent variables and sarcopenia risk were

first examined using univariable logistic regression. Variables with a p-value < 0.20 in the univariable analysis were subsequently included in the multivariable logistic regression model to identify independent predictors of sarcopenia risk. Multicollinearity among variables was assessed before model entry. Adjusted odds ratios and 95% confidence intervals were reported, with a p-value < 0.05 considered statistically significant.

Results

Demographic and clinical characteristics

A total of 120 older adults with physician-diagnosed KOA were included. The mean age was 69.4 ± 6.8 years (95% CI: 68.2–70.6), with most participants aged 60–69 years (80.8%). Only two participants (1.7%) were aged ≥ 80 years. Females comprised a larger proportion (63.3%) than males (36.7%).

Nearly half of the participants (47.5%) had secondary education, while 35.0% had primary education and 17.5% had higher education. The mean BMI was 23.6 ± 3.9 kg/m² (95% CI: 22.9–24.3), with the majority classified as having a healthy weight (65.0%). However, 13.3% were underweight, and a combined 21.7% were overweight or obese.

Comorbidities were frequent, with hypertension (44.2%) and diabetes (22.5%) most common. One-quarter (25.0%) of participants were at risk of cognitive impairment. Functional independence, assessed by the Barthel Index, was high (mean = 98.6 ± 4.2), with 91.7% classified as independent. Nonetheless, 13.3% of participants were identified as frail. Nutritional screening revealed that 27.5% of participants were either at risk of malnutrition or malnourished.

Prevalence of sarcopenia risk

Based on the Modified MSRA-5, 67.5% (n=81) of participants were identified as being at risk of sarcopenia, underscoring its high prevalence in this community-dwelling KOA population.

Factors associated with sarcopenia risk

Univariable logistic regression revealed several significant associations. Older adults with lower BMI were more likely to be at risk of sarcopenia (Crude OR = 0.82, 95% CI: 0.69–0.88, p < 0.001), indicating a protective effect of higher BMI. Participants aged >80 years demonstrated markedly higher odds of sarcopenia compared with those aged 60–69 years (Crude OR = 6.80, 95% CI: 0.85–33.63, p = 0.04).

Additionally, functional dependency (Barthel Index; Crude OR = 2.63, 95% CI: 1.09–5.88, p = 0.03), presence of comorbidities (Crude OR = 3.03, 95% CI: 1.14–5.26, p = 0.02), frailty (Crude OR = 3.33, 95% CI: 1.12–6.67, p = 0.02), and poor nutritional status (malnutrition; Crude OR = 3.03, 95% CI: 1.20–6.67, p = 0.01) were also significantly associated with an increased risk of sarcopenia.

In multivariable logistic regression analysis, two independent predictors remained statistically significant: lower BMI (Adjusted OR = 0.80, 95% CI: 0.67–0.87, p < 0.001) and advancing age (Adjusted OR = 1.14, 95% CI: 1.12–1.24, p = 0.02). Other factors, including comorbidities, frailty, and nutritional status, did not retain statistical significance after adjustment, suggesting that their effects may be mediated through BMI and age.

Quantitative data were collected using validated instruments: the Modified Mini Sarcopenia Risk Assessment-5 (MSRA-5), Barthel Index, Frail Scale, Mini Nutritional Assessment (MNA), and Mini-Mental State Examination (MMSE). All instruments demonstrated acceptable reliability in a pilot test (n = 30), with ICC (3,1) values ranging from 0.82 to 0.91.

Table 1 Demographic characteristics of study population (n = 120)

Characteristics	n (%)	Mean ± SD	95% CI
Age group (years)		69.4 ± 6.8	68.2-70.6
60- 69	97 (80.8)		
70– 79	21 (17.5)		
≥ 80	2 (1.7)		
Sex			
Male	44 (36.7)		
Female	76 (63.3)		
Education			
Primary	42 (35.0)		
Secondary	57 (47.5)		
Higher	21 (17.5)		
Body Mass Index (kg/m^2)		23.6 ± 3.9	22.9-24.3
< 18.5 (Underweight)	16 (13.3)		
18.5 – 24.9 (Healthy weight)	78 (65.0)		
25.0 – 29.9 (Overweight)	14 (11.7)		
≥ 30 (Obese)	12 (10.0)		
Comorbidities			
None	42 (35.0)		
Hypertension	53 (44.2)		
Diabetes	27 (22.5)		
Dyslipidemia	21 (17.5)		
Other	12 (10.0)		
Cognitive function (MMSE)			
No impairment	90 (75.0)		
At risk of impairment	30 (25.0)		
Functional status (Barthel Index)		98.6 ± 4.2	97.8-99.4
Independent (social-bound)	110 (91.7)		
Limited (home-bound)	10 (8.3)		
Bed-ridden	0 (0.0)		
Frailty (Frail Scale)			
Robust	104 (86.7)		
Frail	16 (13.3)		
Nutritional status (MNA)			
Well-nourished	87 (72.5)		
At risk of malnutrition	29 (24.2)		
Malnutrition	4 (3.3)		
Risk of sarcopenia (Modified MSRA-5)			
At risk	81 (67.5)		
Not at risk	39 (32.5)		

Table 2 Associated factors of sarcopenia among older adults with knee osteoarthritis in Ban Pong hospital, a suburban community (n = 120)

Factors	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Age (per year increase)	1.02 (0.98–1.14)	0.07	1.14 (1.12–1.24)	0.02*
Age group ≥ 80 years	6.80 (0.85–33.63)	0.04*	–	–
Female sex	0.79 (0.32–1.23)	0.21	–	–
Secondary education or higher	0.80 (0.35–1.83)	0.60	–	–
Body Mass Index (per kg/m²)	0.82 (0.69–0.88)	<0.001*	0.80 (0.67–0.87)	<0.001*
Presence of comorbidities	3.03 (1.14–5.26)	0.02*	–	–
Functional dependency (Barthel Index)	2.63 (1.09–5.88)	0.03*	–	–
Frailty	3.33 (1.12–6.67)	0.02*	–	–
Nutritional status				
– At risk of malnutrition	2.56 (1.37–6.15)	0.03*	–	–
– Malnourished	3.03 (1.20–6.67)	0.01*	–	–
Cognitive impairment	1.18 (0.48–2.68)	0.79	1.23 (0.51–2.87)	0.80

OR = Odds Ratio; CI = Confidence Interval.

The qualitative component of this study was guided by the International Classification of Functioning, Disability and Health (ICF) framework to elucidate the multidimensional consequences of sarcopenia coexisting with knee osteoarthritis among community-dwelling older adults at Ban Pong Hospital, Ratchaburi Province, Thailand, as illustrated in Figure 1.

Body functions and structures: Chronic knee pain, reduced muscle mass and strength, impaired balance, and joint instability contribute to fear of falling.

Activity limitations: Difficulties in sit-to-stand transitions, walking, stair climbing, gardening, performing household chores, and driving.

Participation restrictions: Reduced engagement in family, community, and religious activities, leading to social isolation and diminished quality of life.

Personal factors: Sedentary lifestyle, chronic diseases, and depressive symptoms may exacerbate decline, whereas health-conscious attitudes and interest in exercise may mitigate it.

Environmental factors: Barriers include unsafe home environments (e.g., stairs, squat toilets, and limited space), while facilitators include caregiver support, single-storey housing, and accessible bathroom modifications.

This ICF-based framework emphasizes the interaction between physical, psychological, and environmental factors and underscores the importance of integrated, person-centred care to support ageing in place among older adults with knee osteoarthritis and sarcopenia.

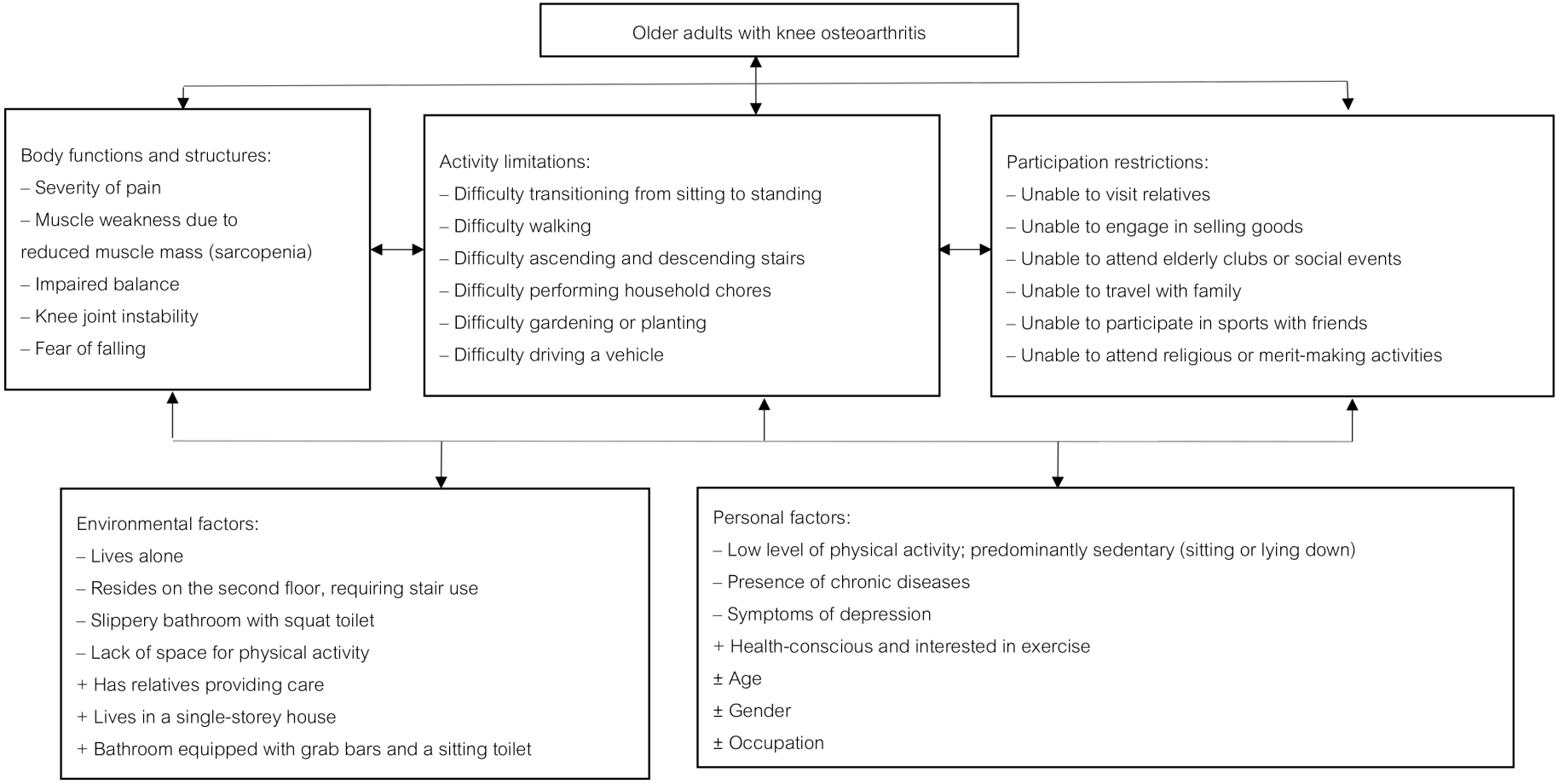

Figure 1 International Classification of Functioning, Disability and Health (ICF) framework for sarcopenia in community-dwelling older adults with knee osteoarthritis, Ban Pong Hospital, Ratchaburi Province, Thailand

Discussion

This study revealed a notably high prevalence of sarcopenia risk (67.5%) among older adults with knee osteoarthritis (KOA) in a suburban Thai community. This prevalence is considerably higher than the 9.4% reported previously at the same hospital, which may reflect differences in diagnostic tools, study populations, or contextual factors. The findings of this study are consistent with the ICF framework, which emphasizes the interaction between physical function, activity limitations, and participation restrictions in older adults with chronic musculoskeletal conditions.

The coexistence of sarcopenia and KOA is clinically important, as both conditions interact to worsen pain, physical function, and quality of life. International evidence also supports this "vicious cycle," where reduced physical activity, inflammation, and metabolic dysregulation reinforce functional decline[10,19].

Demographic and clinical correlates

Consistent with global literature, advancing age emerged as a strong independent predictor of sarcopenia (Adjusted OR = 1.14), reflecting the progressive decline in muscle mass and strength with ageing[6,10,20]. Older adults aged ≥ 80 years had the highest odds, highlighting the vulnerability of the oldest-old. Higher BMI was protective (Adjusted OR = 0.80), underscoring the importance of maintaining adequate body weight and muscle reserves, even as sarcopenic obesity remains a clinical concern[20,21]. These findings align with international evidence, including meta-analyses showing a rising prevalence of sarcopenia worldwide and its impact on healthy ageing[22].

In this study, both advancing age and lower BMI were significantly associated with an increased risk of sarcopenia, consistent with previous evidence showing that muscle mass and strength decline progressively with age and low body weight[23,24]. When BMI was examined categorically, underweight older adults had the highest prevalence of sarcopenia risk, while overweight and obese participants showed a lower apparent risk[25]. Nevertheless, obesity may coexist with reduced muscle mass, a condition known as **sarcopenic obesity**, which has been linked to functional impairment, metabolic complications, and increased mortality[26-28]. Although BMI alone cannot differentiate fat from lean mass, our findings highlight the importance of maintaining an optimal body composition avoiding both undernutrition and excessive adiposity to preserve muscle function and reduce sarcopenia risk in older adults with knee osteoarthritis[25,27].

Although nutritional status was significantly associated with sarcopenia risk in the univariable analysis, this association was not retained after adjustment for other factors. Beyond age and BMI, additional clinical variables were also examined. This finding suggests that the influence of nutrition may be mediated through age and BMI, which are closely linked to overall body composition and metabolic reserve. Nevertheless, adequate nutrition remains clinically important, as poor dietary intake can accelerate muscle loss and functional decline among older adults[13,23].

Similarly, associations with comorbidities, frailty, and reduced functional independence were observed in univariable analyses but did not remain significant in the multivariable model. These findings are consistent with prior studies showing that multimorbidity and dependency can exacerbate sarcopenia through chronic inflammation and physical inactivity[12,19]. Sarcopenia and frailty also share overlapping clinical features such as weakness, fatigue, and unintentional weight loss[12,20]. Although these factors were not independent predictors in the present study, they remain clinically relevant and should be considered in comprehensive geriatric assessments[25].

Clinical implications

These findings highlight the urgent need for routine sarcopenia screening and nutritional counselling in community hospitals, particularly in suburban and rural areas where healthcare access may be limited. Integrating sarcopenia assessment into KOA management could enable early intervention, combining nutritional support and structured exercise programs. Resistance training has consistently been shown to improve muscle strength and delay sarcopenia progression in older adults[29]. Together with dietary interventions, these strategies can improve muscle health, independence, and quality of life[29].

Strengths and limitations

A major strength of this study is the use of validated assessment tools and reliability testing. However, several limitations must be acknowledged. First, the cross-sectional design precludes causal inference. Second, the Modified MSRA-5 is a screening tool rather than a diagnostic gold standard; definitive diagnosis requires measures of muscle mass, strength, and performance as recommended by EWGSOP2 and AWGS [5–7]. Third, the relatively small subgroup of participants aged ≥ 80 years limits precision. Finally, generalisability is restricted to suburban Thai settings, and further longitudinal studies across diverse populations are warranted[22].

Conclusion

Sarcopenia risk was highly prevalent among suburban Thai older adults with KOA. Advancing age and lower BMI were independent risk factors. Early identification and intervention are essential. Integrating sarcopenia screening and preventive strategies into primary care, including nutrition and resistance exercise, may help mitigate functional decline and improve quality of life[19,29-32].

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