Sarcopenia among Older Adults with Knee Osteoarthritis: A Cross-Sectional Study of Prevalence and Its Associated Factors

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Abstract: Sarcopenia is a common health problem in older adults associated with age-related loss of muscle mass and strength. Sarcopenia can cause low activity of daily living, increased risk of falls, and low quality of life. This cross-sectional study investigated the prevalence of sarcopenia and the association among personal factors, health factors, and sarcopenia in older adults with knee osteoarthritis. Data were collected in 180 older adults with knee osteoarthritis in a tertiary care hospital in Bangkok using the demographic questionnaire, the Thai version of the 15-item Geriatric Depression Scale, the Knee and Osteoarthritis Outcome Score-Activities of Daily Living Thai version, and the Strength, Assistance with walking, Rising from a chair, Climbing stairs, and Falls questionnaire. Data were analyzed using descriptive statistics and logistic regression.

Results revealed that the prevalence of sarcopenia in older adults with knee osteoarthritis was relatively high (41.7%). The univariate logistic regression indicated that age, depression, physical ability, and body mass index (BMI) were significantly associated with sarcopenia. After controlling other factors, the multivariate analysis demonstrated that depression, poor physical ability, and increased BMI significantly predicted sarcopenia; these three variables together explained 56.2% of the total variance in sarcopenia. Gerontological nurse practitioners and other healthcare professionals should focus on early screening and evaluating sarcopenia in older adults with knee osteoarthritis. An intervention is imperative to manage, prevent, and minimize sarcopenia and knee osteoarthritis severity by promoting physical activity, managing depressive symptoms, and controlling body weight.

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Introduction

The conundrums of degenerative musculoskeletal conditions have grown to be public health concerns in global aging.[1] Promoting active, healthy aging and independent living, a new geriatric giant—sarcopenia—has become more interested in providing risks reduction

of geriatric care.[2,3] Sarcopenia is defined as skeletal muscle disorders due to aging processes[4] leading to decreased muscle strength, increased functional impairment and disability, raised mortality, and lessened quality of life.[2,3,5] Sarcopenia also impacts musculoskeletal conditions considerably; a high prevalence of sarcopenia has been reported in the osteoarthritis (OA) population, particularly knee OA.[6,7] Recent evidence revealed that sarcopenia not only influences knee OA progression but also accelerates dependency or disability.[4,6,7,8] While knee surgery may enable, it does not fully regain physical function.[9,10] In older adults with sarcopenia and knee OA, effective management seems far beyond advanced surgery.[6] Undeniably, the sarcopenia and knee OA entanglement will be more complex than required for better understanding of comprehensive preventive care.[5]

The pathophysiologic nexus of sarcopenia and osteoarthritis is documented on inflammaging and age-related degeneration, lessening bone and skeletal muscle health.[2,3,5,6] Moreover, evidence revealed that sarcopenia in obese persons, called "sarcopenic obesity," plays a significant role in intensifying disease progression, pain, and joints loading resulting in fall-related injuries that increases the conundrum of knee OA on physical and mental health in older adults.[10-12] As people age, the prevalence and impact of knee OA combined with sarcopenia continue to broaden; thus, the burden and costs of care will continue to increase.[5,10] Fortunately, sarcopenia is a potentially modifiable risk factor in preventing poor health outcomes.[2,10] Many lines of evidence emphasized that the most effective method is early detection of sarcopenia for diminishing the development of disease and muscle weakness.[1,6]

Identifying sarcopenia in knee OA has become more prevalent in geriatric care; unfortunately, the care gaps have remained. Also, sarcopenia screening instruments may be limited as these require advanced equipment and clinical training for administration.[2,7,13] Notably, studies regarding sarcopenia were primarily conducted in Western countries.[7,13-15] To date, there has not been any study or publication regarding the prevalence or factors related to sarcopenia in older adults with knee OA, particularly in Thailand. A better understanding of sarcopenia and related factors in this population is essential in enhancing geriatric care. Thus, this study aimed to determine the prevalence and predictors of sarcopenia among older adults with the expectation to early detection and prevent or minimize progressive deterioration of muscle loss as primary prevention to address the risk of sarcopenia in older adults with knee OA.

Review of Literature

A new geriatric giant, sarcopenia, is a progressive loss of musculoskeletal conditions or skeletal muscle disorders due to aging processes.[2-5] As people age, muscle mass rapidly decreases about 1.5% up to 3% per year at 60 and older.[14] Evidence revealed that sarcopenia has dramatically impacted musculoskeletal conditions; moreover, sarcopenia has significantly increased in the aging population, particularly knee OA.[5-8] Although the prevalence of sarcopenia varies depending on different geographical locations, some studies indicated that sarcopenia is prevalent, as likely more than 30% of the knee OA population.[2,3,5] In Thai older adults, the prevalence of sarcopenia in community dwellers was 30.5%,[14] and 10%[16] in urban settings. Moreover, the impact of sarcopenia on health outcomes in people with knee OA is phenomenal regarding decreased muscle strength, increased functional impairment and disability, raised mortality, and reduced quality of life.[2,3,5] Some evidence emphasized that sarcopenia influences knee OA progression and accelerates dependency or disability.[6-8,15] Effective prevention is of concern for enhancing health outcomes and quality of life; however, the nexus of sarcopenia and knee OA is sophisticated.

Regarding factors related to sarcopenia, previous evidence suggested that personal factors and health factors are significant in predicting sarcopenia in older adults with knee OA. For personal factors, an inflamm-

aging (a state of innate immunity activating resulting chronic progressive low-grade inflammation that develops with advanced age) and age-related degeneration due to advanced age and gender differences have become significant factors in predicting sarcopenia.[2,3,5,7] Recent evidence illustrated that increasing age contributes to muscle and bone mass degeneration and gradually decreases muscle health, leading to sarcopenia.[2,3,17,18] Regarding gender differences, pathophysiological stances indicated that the quantity of muscle mass is entirely dissimilar between males and females. The inequality of muscle mass depends on hormones level: estrogen, testosterone, androgen, and growth hormone; these hormones are vital in muscle mass formation, but it also alters as people aged.[19] Undoubtedly, the prevalence of sarcopenia is primarily reported in the female older adult population, such as a study on sarcopenia among older adults in England; the findings demonstrated that females tended to have sarcopenia around 1.2 times higher than males.[20]

For health factors, many studies underlined that body mass index (BMI), physical ability, number of comorbidities, depression, and history of falls were associated with sarcopenia. Regarding BMI, many studies demonstrated that either low[14,21] or high levels[22,23] of BMI correlated with sarcopenia in older adults. Low BMI or low body weight are at risk of being malnourished, and more likely to develop sarcopenia.[14,21] In older adults, poor nutrition is related to degenerative conditions, aging processes, and multiple-medication involvement leading to malabsorption, digestive disorder, and loss of appetite that potentially causes sarcopenia.[14,21] Being overweight or high BMI is similarly associated with sarcopenia, called "sarcopenic obesity."[7,8,11] Further based on biological consideration, increasing body weight induced C-reactive protein (CRP) and cytokine releasing that stimulate muscle breakdown, resulting in sarcopenia.[22,23] Thus, sarcopenic obesity plays a prominent role in intensifying knee OA progression, pain, and joints loading resulting in fall-related injuries that increase knee OA's conundrum on physical and mental health in older adults.[11,12,24] Regarding physical ability, older adults with knee OA usually suffer from pain resulting in physical inactivity and less muscle contraction, which is prone to develop sarcopenia.[21,25-27] Moreover, the number of comorbidities might impact physical ability more severely, leading to poor physical performances in older adults; recent research has revealed that multiple comorbidities have a detrimental effect on physical ability and increased the risk of sarcopenia.[28,29] Due to knee OA pathology and tremendous suffering from disease, physical inactivity could lead to less movement and ultimately develop sarcopenia.[22,28] Suffering from physical inactivity and knee OA severity significantly impacts mental status, particularly late-life depression.[17,19,22,24] The previous study emphasized that older adults with depression are prone to release inflammation makers—Interleukin-6 (IL-6), tumor necrosis factor (TNF-α), and C-reactive protein (CRP)—that is responsible for muscle breakdown resulting in an increased risk of sarcopenia development.[17,19,22,24] The other important factor related to sarcopenia is falls; older adults with knee OA usually suffer from joint stiffness and gait disturbance, leading to falls.[27,28,29] Experiencing falls or having a history of falls also increases fear of fall[18,30] and physical inactivity exerting risk for developing sarcopenia. Recent studies demonstrated that one who experienced falls could have risks for developing sarcopenia 1.6 times higher than those who did not.[31] Importantly, nearly one-fifth (18.6%) of older adults with previous falls lately developed sarcopenia.[32] As previous studies mentioned earlier, the mechanisms that underpin sarcopenia and its related factors are not fully understood; however, sarcopenia is modifiable. Therefore, early sarcopenia identification may have the edge in promoting health and risk stratifications that promote healthy active aging.

Effective sarcopenia prevention and risk reduction are of concern in geriatric care. Recently, researchers have shown an increased interest in identifying sarcopenia in knee OA; unfortunately, the gaps of care have remained regarding practical instrument limitation

and exploring sarcopenia across populations.[2,3,4] Extensive research has been carried out on prevalence and factors related to sarcopenia, mainly in Western countries[4,5]; unfortunately, no published study focuses on early identifying sarcopenia in Thai older adults with knee OA. Hence, this study aims to contribute to this growing research area by exploring the prevalence of sarcopenia and its associated factors in this population.

Study Aim

This study aimed to explore the prevalence and associated factors of sarcopenia and predictability of personal factors (age and gender), health factors (physical ability, BMI, number of comorbidities, depression, and history of falls), and sarcopenia in Thai older adults with knee osteoarthritis.

Methods

Design: A cross-sectional study design was employed and is reported here using the observational studies in epidemiology—STROBE guideline checklists.[33]

Sample and Setting: The sample was older adults aged 60 years and over diagnosed with knee OA and received treatment at the orthopedics outpatient unit at a tertiary care hospital, Bangkok, Thailand. A convenient sampling technique was used to recruit the prospective sample. Inclusion criteria were: 1) having no cognitive impairment evaluated by using the 6-item Cognitive Impairment Test-Thai version with a score of 7 or lower, and 2) being able to communicate in Thai. Prospective participants who had a history of knee arthroplasty, hip arthroplasty, or hand/wrist surgery within one year were excluded.

The sample size calculation, guided by Burmeister and Aitken[34] regression analysis, set an expectation of 20 participants per factor. In this study, there were eight predicting factors; thus, the sample should be 160 participants. To accommodate missing data or participant withdrawal, an additional 10% of the sample was added, and with rounding up, 180 participants were then required.

Ethical Considerations: This study was approved by the Institutional Review Board of the Faculty of Medicine Ramathibodi Hospital (COA. MURA2020/1375). Informed consent was obtained from all participants after study objectives, risks and benefits, and participant rights were explained. The data collection process started after the participants reported their willingness and signed the informed consent. All information provided was kept confidential and de-identified and was to be used for educational purposes only.

Instruments: Data were collected by five instruments:

The demographic data questionnaire was developed from a literature review; this instrument consisted of 10 items which covered age, gender, history of falls, comorbidities, body mass index (BMI), marital status, educational level, duration of knee OA, history of a knee injury, and knee OA severity diagnosed by orthopaedists classified by Kellgren-Lawrence grading scale. The questions were both multiple-choice and open-ended questions.

The 6-item Cognitive Impairment Test-Thai version (6CIT)[35] was used to screen the cognition of older adults. It comprises seven items, namely 1) surrounding circumstance perception (3 items), 2) attention (2 items), and 3) memory (1 item). The total score ranges from 0 to 28 points. The scores higher than 7 points indicate a higher tendency to have a cognitive impairment. Comparing with the Mini-Cog, the construct and concurrent validity were acceptable ($r_s = -.44$, $p < .001$) and the test-retest reliability was .64

Thai Geriatric Depression Scale-15 (TGDS-15) was translated into Thai by Wongpakaran and colleagues.[36] The TGDS-15, a short-form version, consists of 15 items, divided into five positive and ten negative items. Each item ranges from 0 (no) to 1(yes) for negative items; the reverse score is assigned for the positive items. The total scores range from 0-15 points. The TGDS-15 total score is classified

into three levels: no depression (0-4 points), indicated depression (5-10 points), and demonstrated depression (11-15 points). The TGDS-15 is a reliable clinical instrument with a sensitivity of .86, specificity of .91, and Cronbach's alpha of .82. In the present study, the Kuder-Richardson (KR-20) reliability test in 180 older adults was .76

Knee and Osteoarthritis Outcome Score-Activity of Daily Living (KOOS-ADL) was translated into Thai by Chipinyo.[37] This present study used the activity of daily living subscale to assess physical ability, which consists of 17 items, for example, "For the following Activities - Descending stairs- please indicate the degree of difficulty you have experienced in the last week due to your knee." Perceived difficulty with activities is inquired using a 5-point Likert scale rating from "0 = no difficulty" to "4 = extreme difficulty." For interpretation, all scores are collected, multiplied by 100, and divided by 68. The total possible scores range from 0-100. A higher score indicates more capability to perform physical ability. Initially, the KOOS-ADL, Thai version, was used to test for reliability in 25 older adults; Cronbach's alpha coefficient was .90. [37] In this study, Cronbach's alpha coefficient was .77.

The Strength, Assistance with walking, Rising from a chair, Climbing stairs, and Falls (SARC-F) questionnaire[38] was used to screen sarcopenia, translated into Thai by the co-authors with permission from the original developer. The SARC-F consists of 5 items, including muscle strength, chair stain test, walk upstairs, and fall. The 2-choices, "0 = not difficult" and "2 = difficult," were used to rate items in the subscales of muscle strength, walking, chair stand, and upstairs. In fall subscales, fall frequency was assessed: never fall (0 points), and ≥ 4 times (2 points). The SARC-F total possible score ranges from 0 to 10; a score of ≥ 4 indicates sarcopenia. A scoping review showed that SARC-F demonstrated good sarcopenia diagnosis in the elderly population (Area under the curve = 0.89; 95% CI 0.86-0.92).[39] After translation with cognitive interview methods,[40] the SARC-F was piloted with 20 older adults; the reliability testing by Cronbach's alpha coefficient was .85. For the present study, the reliability of Cronbach's alpha coefficient value was .75

Data Collection: This was carried out from September to December 2020. The PI and two research assistants, gerontological nurse practitioner graduate students trained primarily for respective data collectors, started recruiting eligible participants. Personal and health information was collected via the Electronic Medical Record (EMR) and interviews. The mandatory protection of infection and transmission precautions, social distancing recommendations, and COVID-19 screening were meticulously performed during data collection. Structured interviews lasting 15-20 minutes were conducted to complete the demographic questionnaire, the TGDS-15, the KOOS-ADL, and the SARC-F questionnaire.

Data Analysis: Demographic data were analyzed using descriptive statistics. Univariate logistic regression was used to examine associations of personal factors (age and gender), health factors (physical ability, BMI, number of comorbidities, depression, and history of falls), and sarcopenia in older adults with knee OA. Multiple logistic regression was used to examine the predictability of personal factors and health factors.

Results

The participants were 180 older adults with knee OA. Most were female (85.6%) with an average age of 70.5 years (SD = 6.35; range 60-85 years). More than three quarters of the participants (76.1%) had underlying diseases—dyslipidemia (54.4%), hypertension (52.8%), and type 2 diabetes mellitus (27.2%), respectively. Considering the knee OA severity grading by Kellgren Lawrence grading (KL), most participants experienced mild (KL level 2 = 37.8%) and moderate (KL level 3 = 37.2%). For health factors (falls, depression, physical ability, and BMI), the details are presented in **Table 1**.

Table 1 Description of study variables (n = 180)

Variables	Mean ± SD	n (%)
Age (years)	70.50 ± 6.35	
60 – 69		82 (45.6)
70 – 79		83 (46.1)
≥ 80 – 85		15 (8.3)
Gender		
Female		154 (85.6)
Male		26 (14.4)
Severity of knee OA*		
KL-1 (Doubtful)		12 (6.7)
KL-2 (Mild)		68 (37.8)
KL-3 (Moderate)		67 (37.2)
KL-4 (Severe)		33 (18.3)
Underlying diseases		
No		43 (23.9)
Yes **		137 (76.1)
Dyslipidemia		98 (54.4)
Hypertension		95 (52.8)
Diabetes		49 (27.2)
Cardiovascular diseases		30 (16.7)
Others		8 (4.4)
Number of comorbidities	1.56 ± 1.15	
< 3 diseases		139 (77.2)
≥ 3 diseases		41 (22.8)
History of falls		
Never		143 (79.4)
Yes		37 (20.6)
Depression	2.76 ± 2.43	
No		154 (85.6)
Yes		26 (14.4)
Physical ability	22.90 ± 7.84	
BMI (kg/m^2) ***	26.35 ± 4.46	
< 18.5 (Underweight)		5 (2.8)
18.5–22.9 (Normal)		39 (21.7)
23.0–24.9 (Overweight)		31 (17.2)
25.0–29.9 (Obese I)		73 (40.6)
≥ 30.0 (Obese II)		32 (17.8)
Sarcopenia	3.41 ± 1.48	
No		105 (58.3)
Yes		75 (41.7)

* KL = Kellgren Lawrence; ** More than a single disease;

*** BMI = Body mass index with Asian criteria classification

The prevalence of sarcopenia (41.7%) shows the upward trend of sarcopenia prevalence increased with age in both genders. Classified by age and gender, the prevalence of sarcopenia for males were 33.3% (60-69 years old), 46.2% (70-79 years old), and 100% (over 80 years old), respectively. For females, the prevalence of sarcopenia was 30.1% (60-69 years old), 42.9% (70-79 years old), and 90.9% (over 80 years old), respectively (**Figure 1**). In addition, the SARC-F Questionnaire used to determine the accuracy testing of the prediction equation for sarcopenia reveals 72% sensitivity, 85.7% specificity, 80% predictability.

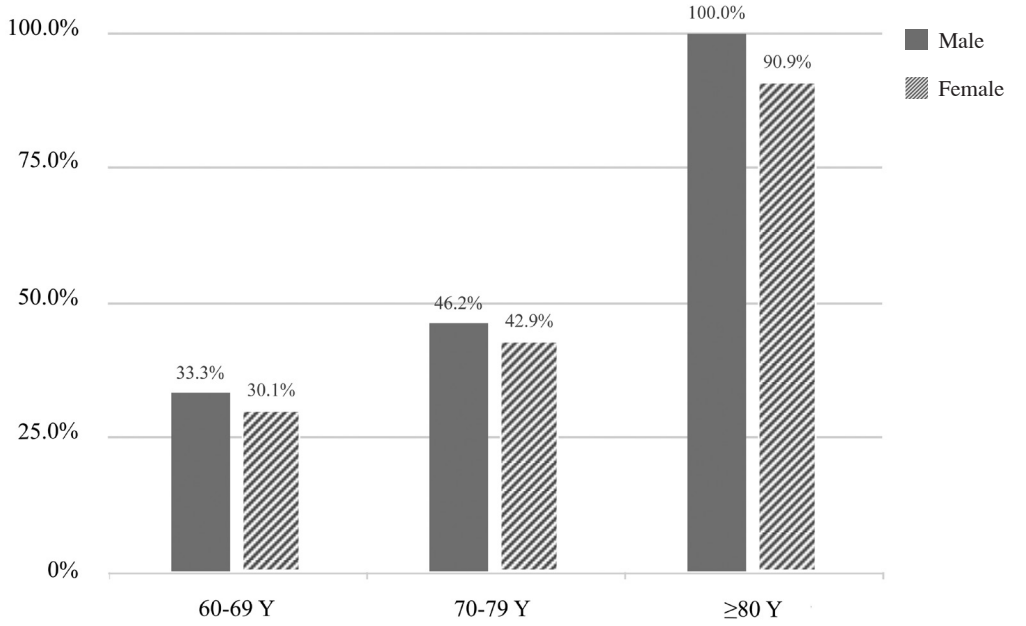

Figure 1. The prevalence of sarcopenia stratified by age and gender

Table 2 illustrates univariate logistic regression. The findings revealed that only age, depression, physical ability, and BMI were significantly associated with sarcopenia. In the multivariate analysis (**Table 3**), the findings demonstrated that all variables explained 56.2% of the variance of sarcopenia with three significant predictors: depression, physical ability, and BMI. After controlling other predictor variables in the model, an older adult with knee OA, who had depression, had low physical ability and was obese, was 1.69 times, 7.63 times, and 5.28 times more likely to develop sarcopenia.

Table 2 Univariate logistic regression of personal factors, health factors, and sarcopenia (n = 180)

Variables	Sarcopenia		B	Crude ORs (95%CI)	p-value
	Yes (n = 75) n (%)	No (n = 105) n (%)			
Age			.054	1.056 (1.007-1.108)	.026
Number of comorbidities (≥ 3)			.023	1.023 (.791-1.324)	.861
History of falls (yes)			.494	1.640 (.793-3.392)	.182
Mean depression scores (2.76 ± 2.43)			.626	1.870 (1.339-2.613)	< .001
Mean physical ability scores (22.90 ± 7.84)			2.131	8.430 (4.346-16.351)	< .001

Table 2 Univariate logistic regression of personal factors, health factors, and sarcopenia (n = 180) (Cont.)

Variables	Sarcopenia Yes (n = 75) n (%)	Sarcopenia No (n = 105) n (%)	B	Crude ORs (95%CI)	p-value
Gender					
Male	13 (17.3)	13 (12.4)		Reference	
Female	62 (82.7)	92 (87.6)	.394	1.484 (.645-3.415)	.353
BMI					
Normal	8 (10.7)	31 (29.5)		Reference	
Underweight	1 (1.3)	4 (3.8)	-.032	.969 (.095-9.908)	.979
Overweight	9 (12.0)	22 (21.0)	.461	1.585 (.529-4.753)	.411
Obesity I	37 (49.3)	36 (34.3)	1.382	3.983 (1.615-9.821)	.003
Obesity II	20 (26.7)	12 (11.4)	1.865	6.458 (2.245-18.577)	.001

Abbreviations: ORs= Odds ratios; CI= Confidence interval

Table 3 Multivariate logistic regression of personal factors, health factors, and sarcopenia (n = 180)

Variables	Sarcopenia Yes (n = 75) n (%)	Sarcopenia No (n = 105) n (%)	B	Adjusted ORs (95%CI)	p-value
Age			.038	1.039 (.965-1.118)	.312
Number of comorbidities (≥ 3)			-.108	.898 (.623-1.294)	.564
History of falls (yes)			.686	1.985 (.679-5.802)	.210
Mean depression scores (2.76 ± 2.43)			.527	1.694 (1.064-2.697)	.026
Mean physical ability scores (22.90 ± 7.84)			2.003	7.637 (3.772-15.465)	< .001
Gender					
Male	13 (17.3)	13 (12.4)		Reference	
Female	62 (82.7)	92 (87.6)	.173	1.189 (.338-4.185)	.788
BMI					
Normal	8 (10.7)	31 (29.5)		Reference	
Underweight	1 (1.3)	4 (3.8)	-.337	.714 (.018-27.858)	.857
Overweight	9 (12.0)	22 (21.0)	1.366	3.919 (.835-18.385)	.083
Obesity I	37 (49.3)	36 (34.3)	1.666	5.289 (1.312-21.322)	.019
Obesity II	20 (26.7)	12 (11.4)	1.535	4.639 (.887-24.276)	.069

-2LL= 147.194; Nagelkerke R^2 = .562; Abbreviations: ORs= Odds ratios; CI= Confidence interval

Discussion

This cross-sectional study explored the prevalence of sarcopenia and the relationship between personal factors, health factors, and sarcopenia in older adults with knee OA. One interesting finding is the high prevalence of sarcopenia (41.7%) in older adults with knee OA mutually shared both males and females, and was higher than previous studies conducted in Thai older adults.[14,15] The findings were contrary to previous studies, possibly because advancing age, comorbidity, and a high BMI could increase the chance

of developing sarcopenia.[7,19,20] Also, the sarcopenia assessment tool used in this study is different from others.[14,15] In the present study, the SARC-F questionnaire demonstrated reliable, practical administration with time-efficient in completing sarcopenia screening. Although the SARC-F questionnaire is a simple screening tool, its reliability, validity, and accuracy indicated exceptional value in identifying sarcopenia in this study (72% sensitivity, 85.7% specificity, 80% predictability). The evidence from the study suggests that the SARC-F questionnaire might be a plausible assessment for routinely early sarcopenia detection, which takes 1-2 minutes to complete, but to evaluate this tool with an objective measure such as bioelectrical impedance analysis (BIA) is needed for clinical diagnosis. However, applying practical sarcopenia assessment strengthens the professional role of gerontological nurse practitioners and other healthcare teams in daily assessing and early sarcopenia screening for promoting health and serves global plans for improving measuring and monitoring health and well-being in this population.

Poor physical ability, increased BMI, and depression are significantly associated with sarcopenia. This finding was supported by prior evidence on factors predicting sarcopenia.[12,14,21,25-27] Our findings emphasized that poor physical ability predicts sarcopenia, which furthers support the idea of biological aspects underpinning interconnections in that inactivity plus aging-related decline impacts the musculoskeletal system resulting in lessening motor neurons and muscle fibers, increasing loss of muscle strength, and decreasing muscle enzymes, which extends muscular systems dysfunction.[16] Evidently, sedentary older adults potentially decrease muscle strength by around 10-15% per week,[21] which intensifies the mechanism of sarcopenia-related activity resulting in poor health outcomes.[7] Notably, most of the participants in the present study had mild-moderate knee OA severity 1 (Kellgren Lawrence level 2 and 3) and weight-bearing deficits, most likely increased knee joint pain, stiffness, and loss of joint function resulting in physical inactivity and poor functional ability in daily living.[5,17,26,27] Thus, the more inactivity, the worst muscle mass and strength lead to decline, and significant physical consequences increase the risk of developing sarcopenia.[17]

An increased BMI—obesity level I (BMI = 25.0-29.9 kg/m^2) was significantly associated with sarcopenia. Our findings concur with the existing literature[12,23] regarding being overweight or obese can increase the risk of sarcopenia. From pathological standpoints, increased body weight affects glucose metabolism and insulin resistance, increases C-reactive protein (CRP), and stimulates cytokine production, inducing muscle breakdown resulting in sarcopenic obesity.[23] From a clinical perspective, the more increased body weight, the more exceeded loading of knee joints and increased pain; later, pain-induced physical limitation accelerating muscle loosening and weakness, which are more prone to develop disability and sarcopenia.[21] Perspectives on aging in early years, sarcopenia and obesity seems unrelated; actually, sarcopenia occurring with obesity—sarcopenic obesity—mutually reinforces musculoskeletal decline, increasing morbidity and mortality.[12,23,25] As knee OA is more prevalent in obesity, more research on sarcopenic obesity is required in this population. Notably, several questions about being underweight and sarcopenia remain unanswered at present.

For depression, the study findings demonstrated that depression is strongly associated with sarcopenia; these findings are in line with previous studies.[5,22,40] As knee OA symptoms fluctuate over disease trajectory, struggle with feelings on physical and psychosocial suffering may trigger depression in older adults.[2,16,22,41] Depression might lead to mood disorder, anorexia, and decreased food and low protein intake, contributing to a low level of muscle mass and a greater tendency to develop sarcopenia in older adults.[22,41] On physical aspects, depression not only triggers fatigue, physical inactivity, and decreased muscular strength in older adults, but its combination also stimulates sarcopenia.[25] In addition, increased inflammation biomarkers due

to depression—Interleukin-6 (IL-6), tumor necrosis factor (TNF-α), and C-reactive protein (CRP)—play a vital role in influencing the process of muscle loss that leads to sarcopenia.[22] For older adults with chronic illness, late-life depression on physical limitation has been well-documented, yet underdiagnosis seems more prevalent. Notably, our findings here may shed light on shared coexisting risk factors between depression and sarcopenia—physical inactivity, increased inflammation biomarkers, and age-related conditions—in older adults with knee OA.

While most outcomes were promising, a finding in the multivariate analysis model was unexpected and suggested that age, gender, number of comorbidities, and history of falls are not significantly associated with sarcopenia. Generally, increased age is related to musculoskeletal decline and sarcopenia[14,15]; what is surprising is that no association between age and sarcopenia was identified in the adjusted model. This rather contradictory result may be due to other factors that might dominate the impact of age on sarcopenia; thus, considering only a chronological age in predicting sarcopenia needs to be interpreted with caution. Recent evidence revealed that nutrition status and inflammaging (biological aging) might involve age-related musculoskeletal decline in older adults.[2,3,5,6] Although malnutrition was not found in the present study, being overweight with chronic degeneration due to knee OA might induce inflammaging processes, activate insulin resistance, and decrease physical ability leading to sarcopenia.[2-4,7,8] Although findings seem less persuasive, it has highlighted a non-linear association between sarcopenia and chronological age. Thus, an increasing sample focusing on biological aging in heterogeneous groups, particularly in overweight people, is needed for entirely further exploration.

On the question of gender and sarcopenia, surprisingly, no evidence of the significant association between gender and sarcopenia was detected. It seems possible that sarcopenia is sophisticated; thus, only gender seems incapable of explaining this phenomenon. Recent evidence indicated that the risk factors for sarcopenia might depend on both advanced age and being gender-specific.[2,3,5,6] Decreasing muscle mass strength and quality in older adults, the hormone alteration—estrogen, testosterone, androgen, and growth hormone—has changed over time due to aging processes, but these changes have not altered only because of being gender-specific.[2,3,5,21] Concerning gender differences in developing sarcopenia, females generally have less muscle mass[2,3,5,14,15,21] and a higher prevalence of sarcopenia than males[14,15]; however, these differences might be influenced mainly by age. Notably, most participants in the present study were female; these data might be insufficient to support gender-specific aspects. A higher prevalence of sarcopenia in females found in this study may not necessarily imply causality; hence, the association between gender and sarcopenia need to be interpreted with caution. Exploring coexisting factors of sarcopenia focusing on gender-specific is required in this population.

Regarding a number of comorbidities and history of falls, the findings demonstrated no associations with sarcopenia, which were inconsistent with the previous studies.[7,17,26,28-31] For the number of comorbidities, previous evidence underlined that the metabolic syndromes inducing insulin resistance and malnutrition, increasing cytokine relating muscle breakdown, and decreasing muscle mass and strength lead to sarcopenia.[21] What we found, very surprisingly, is that metabolic syndromes were common, yet no association was identified between the number of comorbidities and sarcopenia. This result may be explained because sarcopenia progression might depend on age-related change, muscle quality/quantity, malnutrition, and poor physical activity rather than the number of comorbidities. Thus, well-control health conditions in older adults with knee OA seem beneficial. Remarkably, all participants visited the orthopedic outpatient department for health check-ups assuming that their health conditions had been well-controlled. Therefore, it remains unclear to which degree of health conditions or metabolic syndromes

can be attributed to sarcopenia. For the history of falls, the findings of the present study were contrary to previous studies. A possible explanation is that no report of fall history might depend on a self-report fall assessment, which might cause misunderstanding of the definition of falls. Thus, no falling information obtained from that assessment might be an under report, leading to incongruence with previous studies.

Despite being a cross-sectional design, this study offers some insight into sarcopenia screening, the prevalence, and related factors in older adults with knee OA. As mentioned, sarcopenia is widespread and significantly impacts musculoskeletal systems leading to dependency and disability in older adults with knee OA. Hence, providing effective prevention is of necessity. Early identification of sarcopenia improves geriatric care quality and strengthens nurses' professional roles in promoting healthy, active aging in this population.

Limitations

Most of the participants were female older adults with knee OA; thus, the findings might not be generalized to male older adults. As a single-site study in an urban area, generalizability to other settings may be limited. Sarcopenia and knee OA nexus are complex; another limitation may be the lack of information on influenced variables or effect modification factors testing.

Conclusions and Implications for Nursing Practice and Research

This study has underlined a practical sarcopenia screening and a high prevalence of sarcopenia in older adults with knee OA. Our study reinforces the evidence of depression, physical ability, and BMI in predicting sarcopenia. As sarcopenia is potentially reversible, early identifying sarcopenia is essential. The contribution of this study has been to suggest the roles of geriatric nurses in early screening of sarcopenia to improve risk stratification and design better management in delaying the knee OA severity and preventing its related consequences. Notably, further study is needed to fully understand sarcopenia and its impact on various knee OA severities, either with or without surgical treatments. Considerably more work will need to be done to investigate sarcopenia in large sample sizes, and diverse settings (nursing home residents or hospital settings) and locations (urban and rural areas). Future research also needs to examine more closely the biological link of sarcopenic obesity, knee OA, and its consequences for translation into practice and enhancing care quality in this population. In addition, the instrument to measure sarcopenia—the SARC-F Questionnaire—needs further testing for construct validity with an objective measure such as bioelectrical impedance analysis (BIA) before using it in clinical diagnosis.

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ภาวะมวลกล้ามเนื้อน้อยในผู้สูงอายุโรคข้อเข่าเสื่อม: การศึกษาภาคตัดขวางความชุกและปัจจัยที่เกี่ยวข้อง

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บทคัดย่อ: ภาวะมวลกล้ามเนื้อน้อยเป็นปัญหาสุขภาพที่พบได้บ่อยในผู้สูงอายุ ซึ่งเกี่ยวข้องกับการสูญเสียมวลกล้ามเนื้อ และความแข็งแรงของกล้ามเนื้ออย่างต่อเนื่อง ส่งผลให้ความสามารถในการทำกิจวัตรประจำวันลดลง เพิ่มความเสี่ยงในการหกล้ม และคุณภาพชีวิตลดลง การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อศึกษาความชุกของภาวะมวลกล้ามเนื้อน้อยในผู้สูงอายุโรคข้อเข่าเสื่อม และศึกษาความสัมพันธ์ของปัจจัยส่วนบุคคลและปัจจัยด้านสุขภาพกับการเกิดภาวะมวลกล้ามเนื้อน้อยในผู้สูงอายุโรคข้อเข่าเสื่อม เก็บรวบรวมข้อมูลผู้สูงอายุโรคข้อเข่าเสื่อม ณ โรงพยาบาลระดับตติยภูมิในเขตกรุงเทพมหานคร จำนวน 180 ราย ด้วยแบบสอบถามข้อมูลส่วนบุคคล แบบวัดภาวะซึมเศร้าในผู้สูงอายุของไทย 15 ข้อ แบบประเมินข้อเข่าด้านการเคลื่อนไหวในกิจวัตรประจำวันฉบับภาษาไทย และแบบสอบถามคัดกรองภาวะมวลกล้ามเนื้อน้อย วิเคราะห์ข้อมูลโดยใช้สถิติบรรยาย และสถิติการวิเคราะห์ถดถอยโลจิสติกทวิ

ผลการวิจัยพบว่า กลุ่มตัวอย่างมีอุบัติการณ์ภาวะมวลกล้ามเนื้อน้อยค่อนข้างสูงถึงร้อยละ 41.7 โดยพบว่า ปัจจัยเดี่ยวในด้านอายุ ภาวะซึมเศร้า ดัชนีมวลกาย และความสามารถในการทำกิจกรรมทางกายมีความสัมพันธ์กับภาวะมวลกล้ามเนื้อน้อยอย่างมีนัยสำคัญทางสถิติ สำหรับการวิเคราะห์ถดถอยโลจิสติกเชิงพหุพบว่า ภาวะซึมเศร้า ดัชนีมวลกายที่เพิ่มขึ้น และความสามารถในการทำกิจกรรมทางกายน้อย สามารถร่วมอธิบายความแปรปรวนของการเกิดภาวะมวลกล้ามเนื้อน้อยในผู้สูงอายุโรคข้อเข่าเสื่อมได้ถูกต้องร้อยละ 56.2 อย่างมีนัยสำคัญทางสถิติ จากผลการศึกษาครั้งนี้ พยาบาลเวชปฏิบัติผู้สูงอายุและทีมสุขภาพควรให้ความสำคัญในการตรวจคัดกรองและประเมินภาวะมวลกล้ามเนื้อน้อยในกลุ่มผู้สูงอายุโรคข้อเข่าเสื่อมเพื่อวางแผนจัดการและป้องกัน ภาวะมวลกล้ามเนื้อน้อย/ลดความรุนแรงของโรคข้อเข่าเสื่อม โดยการส่งเสริมการทำกิจกรรมทางกาย การจัดการภาวะซึมเศร้า และการควบคุมน้ำหนักให้อยู่ในเกณฑ์ที่เหมาะสม

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คำสำคัญ: ภาวะซึมเศร้า การหกล้ม การพยาบาลผู้สูงอายุ โรคกล้ามเนื้อ กระดูก และข้อ อ้วน ผู้สูงอายุ ข้อเข่าเสื่อม มวลกล้ามเนื้อน้อย การคัดกรอง

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