PHYSICAL FUNCTION EVALUATION IN OLDER PATIENTS WITH KNEE OSTEOARTHRITIS

Vu Thi Diu[1,✉], Nguyen Thi Hoai Thu[2,3], Nguyen Hoang Ha Giang[3]
Tran Viet Luc[2,3], Nguyen Trung Anh[2,3]

[1]19-8 Ministry of Public Security Hospital
[2]National Geriatric Hospital
[3]Hanoi Medical University

Knee osteoarthritis is one of the most common joint disorders of older individuals. It is a painful and disabling disease characterized by pain, stiffness. However, in Vietnam, the number of studies on this issue is still very limited, especially those on physical function. Objective: This study aimed to evaluate physical function in 178 elderly patients with knee OA. A cross-sectional study was utilized. Physical function was assessed by The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Timed up and go test (TUG). Mean total WOMAC scores of older patients with knee OA in the study was: 34.67 (± 15.63). The proportion of older patients with knee OA with impaired mobility (assessed by TUG test) was 64.8%. The mean total WOMAC scores were more likely to be higher in the elderly with knee OA whohave advanced age, living with others (family, caregiver), overweight/obese or underweight, poor nutritional status, no sleep disturbance, more pain, inflammatory pain and had no treatment for knee OA. There was a decrease in physical function in patients with osteoarthritis of the knee. Mobility impairment was associated with the level of pain, and treatment of knee OA or lack of.

Keywords: Physical function, osteoarthritis, OA.

I. INTRODUCTION

Musculoskeletal conditions are a significant public health issue. Between 2010 and 2012, 52.5 million Americans were diagnosed with arthritis, that number corresponds to about 22.7% of adults.[1] According to US population projections, by 2040, the self-reported doctor-diagnosed arthritis rate in the US is predicted to increase by 49%, to 78.4 million (25.9 percent of all adults).[2] The most significant contributor to this is osteoarthritis (OA). Nowadays, in the context of an aging population, it turns into a major public health concern in the general population for its high prevalence among the elderly associated with considerable disability.

The knees are the joints highly affected by osteoarthritis. According to the Centers for Disease Control and Prevention, knee OA, also known as degenerative knee joint, is one of the most common types of osteoarthritis. Knee OA affects more than 14 million Americans. In the US, it is the most prevalent cause of musculoskeletal disability. Symptomatic knee OA affects about 13% of women and 10% of men aged 60 and over.[3]

Knee arthritis develops when the cartilage in the knee breaks down. The origin can be aging, being overweight, or having an injury, among other factors. As knee OA progresses, symptoms generally become more severe. Patients may experience pain that can become constant affecting physical function such as walking, climbing stairs.

Corresponding author: Vu Thi Diu
19-8 Ministry of Public Security Hospital
Email: vudiu198@gmail.com
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It is crucial to weigh up the limitations in physical functioning in knee OA patients. From a social standpoint, accurate measurement aids in determining the impact of disease on function. In terms of research, evaluating the usefulness and effectiveness of new therapeutic approaches necessitates the use of appropriate metrics to assess physical function. Finally, assessing functional limitation is critical from a therapeutic standpoint in order to illustrate the success of one-on-one care and characterize worsening or improvement over time.

There have been several studies on knee OA around the world. However, it is merely carried out in other countries, and the aspect of physical functions remains restricted. In Vietnam, there was not many studies investigating this issue. As a result, to increase public knowledge about the necessity of measuring physical function in elderly with knee OA, as well as to enhance patient quality of life and contribute to the treatment process, the study: "Physical function in older patients with knee osteoarthritis" was conducted to evaluate the physical function in older patients with knee OA.

II. SUBJECT AND METHOD

1. Study subject

Patients at National Geriatric Hospital in age from 60 years old, who have been diagnosed by knee OA at National Geriatric Hospital, volunteered to participate in this research. All were assigned to perform the same task. Informed consent was obtained from all participants.

Inclusion criteria: Patients 60 years of age or older were diagnosed with knee OA according to criteria by the ACR[4] or based on criteria by Kellgren and Lawrence classification system[5] at National Geriatric Hospital.

Exclusion criteria: Patients who did not have the physical and cognitive abilities to do a face-to-face interview

2. Methods

We performed the cross-sectional descriptive study with convenience sampling methods from July to October, 2022.

The sample size is calculated using the formula:

$$n = (Z_{1-\alpha/2})^2 \frac{p.(1-p)}{d^2}$$

n: study sample size;

α: statistical significance level, with α = 0,05; $(Z_{1-\alpha/2}) = 1,96$.

p = 0.44 (Prevalence of impair physical function according to the study of G. Kelley Fitzgerald et al.[6]

d = expected error (d = 0.08). From the formula, the estimated sample size was N= 147 patients.

The number of knee OA patients in our study was 178 patients From the Departmentof National Geriatric Hospital.

Tool and data collection methods: The data were collected by using research question (Appendix) through interview, diagnosis test, laboratory test and medical record at National Geriatric Hospital.

Assess physical function by Timed up and go (TUG) test. Performing: The patient is asked to sit with his/her back to a chair. When instructed to "go", the patient gets up from the chair, walks 3 meters in a comfortable and safe space. The patient then returns to the chair and sits down. Time is counted at the instruction "go" and stops when the patient is seated. Evaluation: Assessment is based on the total time it takes a patient to complete the test, according to the CDC, an older adult who takes ≥12 seconds to complete the TUG is at risk for falling (impaired mobility).

Assess physical function by WOMAC index: Performing: self-administration of the WOMAC is possible, and it takes about 12 minutes to complete. Patients are asked to respond to each question on pain (5 questions), stiffness (2 questions), and physical function (17 questions). Patients must circle a number (from 0 to 4) that best matches the condition of the disease, in which 0 as 'none', 1 as 'mild', 2 as 'moderate', 3 as 'severe', and 4 as 'extreme'. The results from each area are added together to generate pain, stiffness, and physical function subscale scores. Since the scale for scoring the WOMAC goes from best to worst, lower subscale ratings on the WOMAC indicate less pain, less stiffness, or better physical function. Evaluation: the higher the WOMAC score, the more severe the pain and stiffness and the more limited physical function. In the research questionnaires, we evaluated the WOMAC score for each separate knee. However, in the results section, we will choose the higher result (pain, stiffness and physical function scores are all proportional).

Assess characteristics of knee OA: Level of pain: based on VAS score: In the research questionnaires, we evaluated the level of pain for each moment: resting, walking, climbing stairs. However, in the results section, we will choose the climbing stair value as higher result: Mild (0-3.4); Moderate (3.5-7.4); Severe (≥ 7.5). Pain characteristics: 2 types: Mechanical pain; Inflammatory pain. Stage of knee OA: 4 stage based on Kellgren and Lawrence classification system[7]. Treatment of knee OA: 2 types: Treated, Untreated

3. Data processing and data analysis

The process of data coding, entry into Redcap and analysis was done by using Statistical Package for Social Science (SPSS) software (version 26.0). Descriptive statistics were adopted to examine characteristic data: frequency, percentage, mean. Inferential statistics was done to perform comparisons between groups: t-Test, Chi-square, One way Anova. Statistical significance was accepted at the 95% confidence level ($p<0.05$)

4. Ethical consideration

Study subjects were explained clearly about the purpose of the study, and they were willing to participate in the study. Collected data was used for research. The results of the study were proposed for improving the health of the community, not for other purposes.

III. RESULTS

The total number of elderly patients with knee OA in this study is 178. After completing the data analysis, the demographic and baseline characteristics of the participants were shown below:

1. Characteristics of participants

General demographic characteristics

Table 1. General demographic characteristics among study subjects (N=178)

Characteristics	Classification	Frequency (n)	Percentage (%)
Age	60 - 74	99	55.6
	≥ 75	79	44.4
Mean age ± SD		73.22 ± 8.08	

Characteristics	Classification	Frequency (n)	Percentage (%)
Gender	Male	29	16.3
	Female	149	83.7
Living status	With family	163	91.6
	With caregiver	3	1.7
	Alone	12	6.7
Mean BMI ± SD	23.04 ± 3.07		

The mean age of the study participants was 73.22 years (SD=8.26). 99 participants (55.6%) were under 75 years old, the number of people aged 75 and over was 79 people (44.4%). 82% of participants were retired, only 18% of participants were still working. The proportion of men and women was quite different, only 16.3% of the participants were male, the remaining 83.7% were female. 91.6% of participants lived with family, 1.7% lived with a caregiver and 6.7% lived alone. The proportions of patients who had never smoked and drank alcohol were 91.6% and 87.1%, respectively. 7.9% of patients used to smoke, while this figure in patients who used to drink alcohol was 9%. Only 0.6% of patients were currently smokers and 3.9% of patients were still drinking.

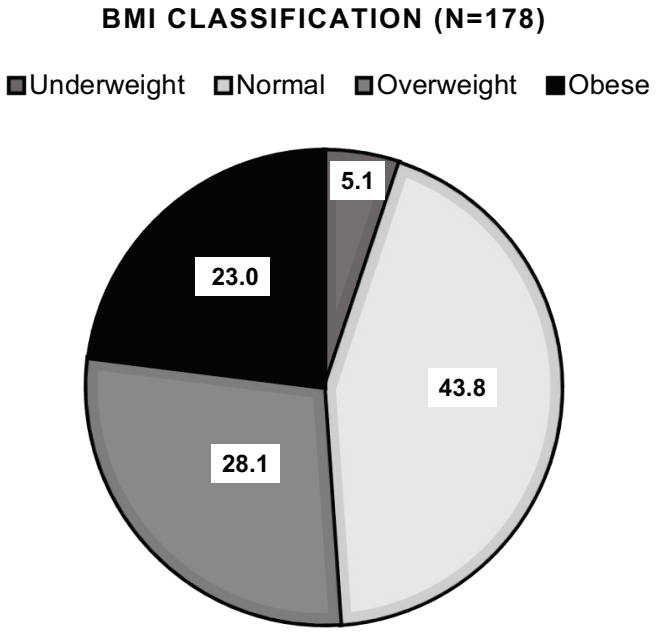

Fig 1. BMI classification among study subjects

The participants' mean BMI was 23.04 ± 3.07, of which only 9 people (5.1%) were underweight, 78 people (43.8%) had a normal BMI, and 50 people (28.1%) were overweight, the number of obese people is 41 (23.0%).

2. Characteristics of knee OA

Table 2. Characteristics of knee OA among study subjects (N=178)

Related factors	Classification	Frequency (n)	Percentage (%)
Level of pain (based on VAS)	Mild (0-3.4)	47	26.4
	Moderate (3.5-7.4)	113	63.5
	Severe (≥ 7.5)	18	10.1
Mean VAS score ± SD		4.66 ± 2.13	
Pain characteristic	Inflammatory	10	5.6
	Mechanical	168	94.4
Stage of knee OA	Stage 1	36	20.2
	Stage 2	77	43.3
	Stage 3	51	28.7
	Stage 4	14	7.8
Treatment of knee OA	Yes	51	28.7
	No	127	71.3
Mean disease duration (years) ± SD		3.43 ± 5.20	

Among 178 participants, 26.4% had mild pain, moderate pain group accounted for the largest proportion with 63.5%, 10.1% had severe knee pain. The average VAS score was 4.66 ± 2.13. 168 participants (94.4%) had mechanical pain (which was increases with movement, decreases with rest), the remaining 10 people (5.6%) had inflammatory pain (pain that persists all day, increases at night). Based on X-rays, the number of people with knee OA in stages 1, 2, 3, 4 respectively: 36 (20.2%), 77 (43.3%), 51 (28.7%), 14 (7.8%). There were 51 patients treated for knee OA, accounting for 28.7%. The remaining 127 patients did not receive any treatment, accounting for 71.3%. The mean duration of knee OA for 184 participants was 3.43 ± 5.20 years.

3. Characteristics of physical function among older patients with knee OA

Physical function based on WOMAC index

Table 3. WOMAC mean scores among the study subjects (N=178)

Dimension	Mean ± SD
Pain	8.41 ± 3.87
Stiffness	2.06 ± 1.86
Physical function	24.21 ± 11.29
Total WOMAC score	34.67 ± 15.63

As shown in table 3.4, mean score regarding pain was 8.41 ± 3.87. In relation to stiffness, mean score was 2.06 ± 1.86. Mean score for physical function was 24.21 ± 11.29. Mean total WOMAC score for 3 dimensions was 34.67 ± 15.63.

Mobility

Table 4. Classification morbidity based on TUG test (N=178)

	Classification	Frequency (n)	Percentage (%)
Mobility based on TUG test	Normal mobility	62	35.2
	Impaired mobility	116	64.8
Mean completed time (second)	Normal mobility	9.85 ± 1.37	
	Impaired mobility	18.71 ± 8.68	
	Total	15.62 ± 8.21	

Of the 178 participants who completed the test, 116 (64.8%) had a high risk of falling due to reduced mobility, and 62 (35.2%) had normal test time results. In the group of patients with normal motor function, the mean time to complete the TUG test was 9.85 seconds (SD=1.37). In the group of patients with motor impairment, the mean time to completion was 18.71 seconds (SD=8.68).

4. Association between WOMAC physical function score with some characteristic of knee OA

Table 5. Association between WOMAC physical function score with some characteristic of knee OA (N=178)

Characteristics	Classification	WOMAC physical function score		p value
		n	Mean ± SD	
Level of pain (based on VAS)	Mild (0-3.4)	47	13.09 ± 9.01	<0.001
	Moderate (3.5-7.4)	113	27.22 ± 8.97	
	Severe (≥ 7.5)	18	34.33 ± 8.11	
Pain characteristic	Inflammatory	10	33.10 ± 4.18	0.01
	Mechanical	168	23.68 ± 11.36	
Stage of knee OA (based on X-rays)	Stage 1	36	22.03 ± 12.62	0.38
	Stage 2	77	23.75 ± 11.03	
	Stage 3	51	26.16 ± 11.28	
	Stage 4	14	25.21 ± 8.68	
Treatment of knee OA	Yes	51	15.33 ± 9.81	<0.001
	No	127	27.77 ± 9.80	

The mild pain group had the lowest mean score with 13.09 (± 9.01), moderate pain group with the mean score of 27.22 ± 8.97. The highest was the severe pain group with 34.33 ± 8.11. There is a statistically significant difference between groups of pain levels in the mean WOMAC physical function score ($p<0.001$). In the group of patients with mechanical pain, the mean WOMAC physical function score was 23.68 (± 11.36). The group of patients with inflammatory pain had a mean score of 33.10 (± 4.18), higher than the group of patients with mechanical pain ($p=0.01<0.05$). Mean WOMAC physical function score was lower in treated patients than in untreated patients. In 51 treated patients, the mean score was 15.33 (± 9.81). In 127 untreated patients, the mean score was 27.77 (± 9.80) $p<0.001$. There was no statistically significant difference in mean WOMAC physical function score between stages of knee OA with $p>0.05$.

IV. DISCUSSION

178 patients were recruited for this study with the mean age of 73.22 years old (±8.08). The number of patients under 75 years of age and the number of patients aged 75 years and older were relatively equal to 55.6% and 44.4%, respectively. When compared with other studies on the same topic on mean age, the results show that the average age of the subjects in this study is higher than the mean age in the study of Brenda W.J.H.Penninx et al., where the mean age was 68.4 years old.[8] The majority of patients live with their families (91.6%). 6.7% of patients lived alone and 1.7% had a caregiver. This statistic can be explained by the Vietnamese tradition, elderly parents live with and being taken care by their children.

The mean of the patient's BMI was 23.04 kg/m (SD=3.07) and nearly half of them had normal status (43.8%). The prevalence of subjects with low BMI (underweight) was 5.1% and high BMI (overweight and obese) was 28.1%, and 23.0%, respectively. Excess body weight, as measured by a higher BMI, is linked to an increased risk of osteoarthritis, particularly in weight-bearing joints. Previous research indicates that obesity is one of the most important risk factors for knee OA.[9]

Pain is divided into 3 levels, mild, moderate, and severe. Most of the patients participating in the study had moderate knee pain, accounting for 63.5%; 26.4% reported that they had mild pain and 10.1% reported that they had very severe pain. The study of Ayodeji Ayodele Fabunmi et al. also gave quite similar results to our study. In their study, the majority of patients had mild to moderate pain, accounting for 92.1%.[10] 168 participants (94.4%) had mechanical pain (which is increases with movement, decreases with rest), the remaining 10 people (5.6%) had inflammatory pain (pain that persists all day, increases at night). The study by Sahli Hana et al with the title "Clinical and Radiographic Features of Knee Osteoarthritis of Elderly Patients" gave similar results with 94.6 % of patients reported mechanical knee pain.[11] Classification of knee osteoarthritis stage is based on Kellgren–Lawrence grades (0–4), the investigation results show that the majority of patients are in stage 2 (43.3%), followed by stage 3 with 28.7%, stage 1 accounted for 20.2%, and stage 4 accounted for only 7.8%. This result is similar to the study of Vu Thi Thanh Huyen and colleagues conducted at the National Geriatric Hospital before with most patients with knee OA at stage 2 and (52.5%) and stage 3 (40.6%).[12]

The mean duration of knee OA for 184 participants was 3.43 ± 5.20 years. When studying the relationship between pain, function

and radiographic findings in osteoarthritis of the knee, Duygu Cubukcu et al. showed that the mean duration of disease in patients participating in their study was 4.14 (± 4.15) years.[13] The differences in two studies were possibly due to the difference in sample size.

The mean score regarding pain was 8.41 (± 3.87). In relation to stiffness, the mean score was 2.06 (± 1.86). Mean score for physical function was 24.21 (± 11.29). Mean total WOMAC score for 3 dimensions was 34.67 (± 15.63). The physical activity and physical function study in older adults with knee OA, the mean WOMAC pain score was 5.8 (± 2.8) and mean WOMAC function score was 22.3 (± 10.5), both lower than our study (77). Another study that assessed the physical function of agricultural workers with knee OA in the rural population show that the average scores for pain, stiffness and mobility were: 10.4 (± 2.6), 3.3 (± 1.3), 47.8 (± 7.9), respectively. This result is much higher than ours, especially in the physical average[14].

The total time of the TUG test ranged from 6.55 to 70 seconds with the mean of 15.62 seconds (± 8.21). In 178 patient's performance, the greatest distribution was generated by 64.8 % of patients who had an increased TUG test time while 62 patients (35.2%) carried out normally The result of our study is comparable with Ayodeji Ayodele Fabunmi study (mean time is 13.01 ± 3.07).[17] According to a research done by Dos Santos WT, knee pain that is brought on by movement is linked to decreased physical function.[15] We also found similar results that there was a statistically significant difference in the mean WOMAC physical function score between groups of patients with different pain levels. The mean score for the group of patients with inflammatory pain was 33.10 (± 4.18), which was higher than the mean score for the group of patients with mechanical pain. Impaired physical function is thought to be related to the presence of inflammatory factors, one of the features found in patients with inflammatory pain.

In comparison to untreated patients, treated patients had a lower mean WOMAC physical function score. Knee osteoarthritis treatments can help patients reduce symptoms such as pain, stiffness and improve the mobility of the knee joint. Therefore, the physical function of the group without treatment of knee osteoarthritis was lower than the group that received treatment for knee osteoarthritis.

V. CONCLUSION

In summary, the proportion of elderly patients with knee osteoarthritis with impaired mobility was 64.8%. Impaired mobility is related to pain level and treatment of knee osteoarthritis. Early detection of physical function decline in elderly knee osteoarthritis patients using self-reported and performance-based tests such as WOMAC index, timed up and go test is beneficial to have appropriate prevention for improvement of patient's physical function and reduction of fall risk as well as enhancement of the patient's quality of life.

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