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RESEARCH ARTICLE

The Correlation Between the Cumulative Illness Rating Scale and the Knee Injury and Osteoarthritis Outcome Score in Knee Osteoarthritis Patients

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ABSTRACT

Objective: This research aimed to explore the correlation between Cumulative Illness Rating Scale (CIRS) and physical disability among individuals suffering from symptomatic knee osteoarthritis (OA).

Materials and Methods: In this cross-sectional study, 89 individuals diagnosed with knee OA were enrolled. The severity of OA was assessed radiologically using the Kellgren–Lawrence staging method. The Knee Injury and OA Outcome Score was utilized to assess pain intensity, symptoms, daily functional capacity, engagement in sports/recreation, and knee-related quality of life (QoL). The CIRS scores for all participants were calculated by the same researcher. Throughout this process, both the Kellgren–Lawrence staging and CIRS calculations were overseen by the same researcher to maintain consistency.

Results: Seventy patients (78.7%) were female. 19 were male (21.3%). The mean age was 56.8 years. The mean body mass index was 30.1kg/m^2. Knee OA was bilateral in 81 patients (91.1%). The radiological severity of knee OA was stage II or III in 73 subjects (82.02 %). The mean Knee Injury and OA Outcome Score pain severity, symptoms, activities of daily living, sport/recreation, and knee-related QoL scores were 55.4, 19.05, 59.8, 34.2, and 54.7, respectively. A significant correlation was observed between CIRS score, and KOOS Symptoms and KOOS QoL ($p<0.05$).

Conclusion: In this study, there was a significant relationship between the number of comorbid diseases of the patients and their knee-related QoL.

Keywords: Comorbidity, functional impairment, knee, osteoarthritis, pain

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INTRODUCTION

Osteoarthritis (OA) is associated with a decline in physical functions and structures, leading to limitations in various activities such as reduced muscle strength, pain, difficulties whereas walking, rising from a chair, and climbing stairs.[1] The knee joint, often burdened with a significant share of body weight, is frequently affected by symptomatic OA.[2] Knee OA, a condition characterized by functional restrictions, disability, and pain, becomes more prevalent after the age of 50. Pain, primarily attributed to joint osteoarthritic changes, is initially experienced during movement due to its mechanical nature, with little to no pain at rest. Over time, as OA becomes chronic, pain can transform into continuous discomfort, sometimes accompanied by neuropathic symptoms.[3] Elderly patients' medication usage corresponds to the frequency of chronic illnesses, compounded by the impact of aging on the pharmacokinetics of drugs. Consequently, drug response becomes a variable influenced by the age of the consumer.[4] Although the exact boundaries of polypharmacy are not precisely defined, it generally refers to the use of multiple medications.[5] Contributing factors to polypharmacy include cognitive and functional impairments, advanced age, visual issues, and low educational levels among patients.[6] The goals of treating individuals with chronic conditions encompass improving physical functions, minimizing symptoms, managing

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and reducing pain, extending life, and mitigating disability to enhance the quality of life (QoL) through secondary prevention measures.[7] The prevalence of chief chronic diseases such as hypertension, OA, heart failure, diabetes, coronary heart disease, osteoporosis, and cerebrovascular accidents in the geriatric population contributes significantly to elevated rates of polypharmacy.[4,5] This study aims to investigate the correlation between the Cumulative Illness Rating Scale (CIRS) and The Knee Injury and OA Outcome Score. In other words, we investigated the relationship between functional disability and comorbidity in patients with knee OA.

MATERIALS and METHODS

This cross-sectional study involved 89 individuals experiencing symptoms of knee OA. The study followed the American College of Rheumatology's standards for inclusion criteria. It was conducted from July 5, 2021, to December 5, 2021, with participants being patients at Istanbul PMR Training Hospital's outpatient clinics. Excluded were non-ambulatory individuals, patients with unrelated lower extremity diseases or neurological conditions affecting walking, those with lower extremity joint replacements, and individuals with cooperation disorders. Data collected included patient demographics, height, weight, body mass index, duration of knee pain, number of painful knees, comorbidities and medications for treating comorbidities, and knee OA, as well as medications for other conditions. The severity of knee OA was assessed radiologically using the Kellgren–Lawrence grading system. The Kellgren–Lawrence Grading System evaluates knee OA through weight-bearing radiographs. The grading ranges from 0 to 4, with Grade 1 indicating possible osteophytic lipping and uncertain joint space narrowing (JSN), Grade 2 showing clear osteophytes and possible JSN, Grade 3 representing multiple osteophytes, definite JSN, potential bony deformity and sclerosis, and Grade 4 involving prominent osteophytes, significant JSN, severe sclerosis, and definite bony deformity. This system is commonly used for assessing knee and hip OA severity.[8] All patients were evaluated using the Knee Injury and Osteoarthritis Outcome Score (KOOS), a 42-item self-assessment questionnaire targeting knee-related conditions like OA. It consists of five domains: Pain severity, other symptoms, activities of daily living (ADL), sports and recreation, and knee-related QoL. Each item is scored from 0 to 4, with a total score ranging from 0 to 100. Lower scores signify more severe knee issues, whereas higher scores indicate better outcomes in pain, symptoms, ADL, sports, recreation, and QoL.[9] The Turkish version of KOOS is a reliable tool for assessing knee OA patients.[10] The CIRS scores were calculated for all participants.

The CIRS was designed to fulfill the need for a concise, comprehensive, and dependable tool for evaluating physical impairment. This instrument has been developed and tested for its effectiveness. The scale's structure encompasses 13 relatively autonomous areas categorized by body systems. Ratings are assigned using a 5-point scale to denote the "degree of severity," spanning from "none" to "extremely severe." Functioning as a comprehensive comorbidity index, the CIRS integrates condition severity through a scoring system that covers 14 anatomical domains: Cardiac, vascular, hematological, respiratory, ophthalmological-ORL, upper gastrointestinal, lower gastrointestinal, hepatic–pancreatic, renal, genitourinary, musculoskeletal–tegumental, neurological, endocrine-metabolic-breast, and psychiatric. The cumulative CIRS score is the summation of the severity scores assigned to each organ domain.[11] This study adhered to the principles of the Helsinki Declaration and obtained approval from Bakirköy Dr. Sadi Konuk Research and Training Hospital Ethics Committee (Approval number 2021/355, dated July 05, 2021). All participants involved in the study provided written informed consent before participation.

Statistical Analysis

To evaluate outliers and data distributions, descriptive statistics were employed. These statistics included mean, standard deviation, median, minimum, maximum, frequency, and ratio values. The Kolmogorov–Smirnov test was utilized to determine the distribution of variables. For correlation analysis, the Spearman correlation method was employed. The analysis was conducted using the IBM Corp. Released 2021. IBM SPSS Statistics for Windows, version 28.0. Armonk, NY: IBM Corp.SPSS 28.0 program.

RESULTS

Demographic and clinical data are summarized in Tables 1-3. Seventy nine percent of the patients were female. The mean body mass index was above 30 kg/m^2. The mean age of the study group was 56.8±11.3. There was a significant correlation between age and CIRS scores ($p<0.05$).

Radiographic knee OA severity and ratios are given in Table 2.

NSAII (52.8%) is the most frequently used drug among the drugs used for pain, and antihypertensive (34.8%) are the most frequently used drugs among systemic diseases.

The CIRS scores of our study group were 7 and below. The CIRS scores KOOS subgroups scores are reported in Table 4.

A significant ($p<0.05$) correlation was observed between the CIRS score and KOOS symptoms and QoL score (Table 5).

Table 1. The demographic and clinical characteristics

	Min–max	Median	Mean±SD	n	%
Age	38.0–81.0	56.0	56.8±11.3		
Gender					
Female				70	78.7
Male				19	21.3
Height	1.43–1.80	1.60	1.61±0.08		
Weight	48.0–120.0	78.0	79.6±15.1		
BMI (kg/m^2)	18.8–44.1	30.1	30.6±5.3		
FAC	3.0–5.0	5.0	5.0±0.3		
FAC					
Support on flat surface				1	1.1
Support on stairs				2	2.2
Independent				86	96.6

BMI: Body mass index; FAC: Functional Ambulation Classification

Table 2. Kelgren–Lawrence scores

Kelgren–Lawrence (KL) scores	n	%
Bilateral knee osteoarthritis		
KL scores		
Bilateral KL score 1	2	2.2
Bilateral KL score 2	25	28.1
Bilateral KL score 3	15	16.9
Bilateral KL score 4	3	3.4
Right 1-Left 2	5	5.6
Right 2-Left 1	4	4.5
Right 2-Left 3	10	11.2
Right 3-Left 2	10	11.2
Right 3-Left 4	5	5.6
Right 4-Left 3	2	2.2
Unilateral knee osteoarthritis		
Right 2	4	4.5
KL Scores		
Right 3	3	3.4
Left 2	1	1.1

Table 3. Medication use of patients

	n	%
NSAIDs	47	52.8
Topical opioids	36	40.4
Analgesics	32	36.0
Antihypertensive	31	34.8
Proton pump inhibitor	27	30.3
Vitamin-D	21	23.6
Diabetics	15	16.9
Calcium	14	15.7
Coumadin and other antiaggregant	11	12.4
Paracetamol	9	10.1
Antidepressant	6	6.7
Steroid Injections	5	5.6
Diuretic	4	4.5
Statin-fibrate	4	4.5
Anti-epileptic	3	3.4
Low molecular weight heparin	2	2.2
Antispasticity	1	1.1
Bifosfonate	1	1.1
Denosumab	1	1.1

DISCUSSION

Knee OA constitutes a significant source of disability, particularly among the elderly population. The factors contributing to this disability are not yet fully elucidated. This study aimed to explore the impact of comorbidity and polypharmacy on the functional abilities of individuals grappling with knee OA. Disability stemming from lower extremity OA holds great significance. Given the widespread prevalence of knee OA, the resultant disability significantly impacts health-care utilization within society. Understanding the contributing factors to this form of disability is of paramount importance. In their research, Creamer et al.[12] emphasized that factors such as pain and obesity exert a more substantial influence on the functionality of individ-

Table 4. CIRS and KOOS scores

CIRS Score	Number	Ratio	
0	1	1.10	
I	35	39.30	
II	15	16.80	
III	12	13.50	
IV	10	11.20	
V	6	6.70	
VI	3	3.37	
VII	7	7.86	
KOOS	**Min-max**	**Median**	**Mean±SD**
Symptoms	6.0–45.0	14.57	19.05±10.37
Stiffness	0.0–100.0	75.0	69.9±26.2
Pain	0.0–97.2	58.3	55.4±21.3
Activities of daily living	5.9–100.0	58.8	59.8±20.8
Sport/recreation	0.0–100.0	30.0	34.2±29.8
Quality of life	6.25–100.0	56.25	54.7±23.95

CIRS: Cumulative Illness Rating Scale; KOOS: Knee Injury and Osteoarthritis Outcome Score; SD: Standard deviation

uals with symptomatic knee OA compared to structural changes in the knee itself. They advocated for increased support toward treatments targeting the emotional aspects of anxiety and helplessness associated with knee OA.

In a cross-sectional study involving 288 patients with hip or knee OA, data were gathered concerning comorbidities, limitations in activity, and pain. The study's findings revealed that nearly all patients exhibited at least one concurrent medical condition. The most prevalent comorbidities included heart diseases, eye, and hearing conditions, as well as endocrine/metabolic disorders. A higher number and greater severity of comorbidities correlated with heightened activity restrictions and increased pain. These results underscored the significance of addressing comorbidities in the rehabilitation of elderly individuals diagnosed with hip or knee OA.[13] The presence of multiple chronic conditions is linked to a lower health-related QoL (HRQoL). Furthermore, the severity of the diseases also impacts HRQoL. Categorizing illnesses and their respective intensities within specific organ systems can facilitate the examination of the intricate relationship between various chronic conditions and HRQoL.

The vascular, upper gastrointestinal, and musculoskeletal systems were observed to possess adverse effects on HRQoL in a study that analyzed the impaired organ areas that most affect HRQoL and their possible interactions in primary care patients with numerous recurring conditions.[14]

Table 5. Correlation between CIRS and KOOS scores

	CIRS score	
	r	**p**
KOOS		
Symptoms	**0.871**	**0.000**
Stiffness	0.021	0.845
Pain	0.032	0.764
Activities of daily living	0.044	0.681
Sport/Recreation	–0.062	0.565
Quality of life	**–0.498**	**0.000**

Spearmen Correlation. CIRS: Cumulative Illness Rating Scale; KOOS: Knee Injury and Osteoarthritis Outcome Score

In a study involving 577 elderly patients diagnosed with knee OA, an assessment was conducted focusing on pain, functional limitations, structural damage, and other symptoms. The study identified the most common comorbidities as osteoporosis, presarcopenia, degenerative spine disease, diabetes, and hypertension. The findings of the study indicated a significant connection between comorbidities, physical function evaluated through both performance-based measures and self-reported accounts, as well as the QoL in patients with advanced knee OA. The study underscored the prevalence of these significant comorbidities among

patients with knee OA who were set for total knee arthroplasty, and how these comorbidities related to the patients' physical function and QoL scores.[15] Contrarily, in the current study, no notable association was observed between comorbidities and function. Notably, the average age of the patients in this study was under 65 years, and none of the patients had a Comprehensive Geriatric Assessment score above a certain threshold. Evident from research is the progressive deterioration of pain and limitations in activities over time. Remarkable disparities exist among individuals in terms of activity restrictions, making the identification of risk factors for declining functionality exceedingly vital. These risk factors encompass specific physical impairments associated with OA, cognitive and visual deficits, comorbidities, obesity, psychological and social elements, health behaviors, and sociodemographic factors.[16] In our study, our objective was to examine the impact of comorbid conditions accompanying knee OA on patient functionality. The outcome of our study did reveal a significant relationship between comorbidities and QoL of patients with knee OA.

In a study of 9,282 participants aged 18 years and older, arthritis was reported by 27.3% and 80.9% also reported at least one other physical or mental disorder. Comorbidity in people with arthritis is the rule rather than the exception. They presented a different perspective, emphasizing that the social burden of arthritis should be understood and managed in the context of these comorbid conditions.[17]

In England and Wales, morbidity was investigated in 11,375 people aged 50 years and older presenting with the diagnosis of OA. Morbidity results were based on a standard clinical classification system. As a result of the study, it was concluded that comorbidity for OA is common with non-musculoskeletal as well as musculoskeletal conditions; age, gender and social class do not explain this comorbidity. It has been said that it remains an important question.[18]

A study that examined the risk factors for physical and social disability in individuals aged over 55 in the US compared those with arthritis to those without. The study investigated challenges related to walking, physical functioning, and self-care. The findings indicated that the likelihood of experiencing disability increased with age for both groups, decreased with higher education levels, and was more prevalent among people of color and individuals who were not married. The number of chronic diseases and disorders was linked to an increased likelihood of disability. Persistent arthritis and recent medical treatment for it were associated with disability. In addition, being overweight (having a BMI of 30 or higher) was identified as a risk factor for disability in individuals with arthritis, whereas this relationship was not observed in those without arthritis.[19]

Mamun et al.[20] delved into the impact of multi-drug therapy employed for chronic conditions on the functionality, pain levels, ADL, and overall QoL in patients dealing with knee OA. Their findings suggested that prolonged and extensive usage of multiple medications heightened the occurrence of drug side effects and interactions due to the underlying pathogenesis of chronic illnesses. On reviewing previous research, it was revealed that among the elderly population, the prevalent chronic conditions included hypertension, OA, diabetes, coronary heart disease, osteoporosis, and cerebrovascular disorders. As a consequence of the elevated prevalence of these conditions in advanced age, the practice of polypharmacy has become more prevalent.

In the study investigating the functional effects of polypharmacy in individuals with knee OA, it was observed that elderly individuals should take more drugs due to chronic diseases, drug interactions increased as the number of drugs taken for other diseases as well as OA increased, and the cognitive level, ADL and QoL decreased in these patients.[21]

The patients included in our study were composed of patients with knee OA who applied to the physical medicine and rehabilitation outpatient clinic. With the aging of the population, an increasing number of older people with OA will need rehabilitation. Elderly patients also need more medication and drug usage, even if the drugs are NSAI. Comorbidity is notably prevalent among elderly patients with knee OA, and prior research has established a link between comorbidity and constraints in daily activities. Nevertheless, comorbidity accounts for only a minor portion of the variance, indicating that it cannot be regarded as the sole substantial factor contributing to activity limitations in the older population. Other facets of aging, including issues related to the locomotor system, cognitive deficits, social interactions, and psychosocial factors, have been identified as significant contributors to limitations in activities and pain experienced by individuals with knee OA.[16]

The weakness of our study is that the mean age of the study group was relatively younger, and therefore, CIRS scores were low. Nevertheless, there was a significant correlation between age and CIRS scores. In our study, although CIRS scores were 7 and below, a significant correlation was found between CIRS scores and symptoms and knee related QoL. More information is needed on the impact of comorbidity factors, and further research should address these aspects in detail.

CONCLUSION

The aim of our study was to determine the importance of comorbidity in the functions of patients with knee OA. Many factors affect the pain and activity limitation of OA. As people get older, the frequency of drug usage, OA and comorbidities increases, and the combination of these affects the QoL of the patients.

Disclosures

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