

Research Article	Pak-Euro Journal of Medical and Life Sciences
DOI: 10.31580/pjmls.v8iSp3.3105	Copyright © All rights are reserved by Corresponding Author
Vol. 8 No. Special 3, 2025-26: pp. S133-S140	
www.readersinsight.net/pjmls	Revised: March 18, 2026 Accepted: March 26, 2026
Submission: January 13, 2026	Published Online: March 31, 2026

FUNCTIONAL OUTCOMES AND PAIN SEVERITY AMONG PATIENTS WITH KNEE OSTEOARTHRITIS RECEIVING PHYSIOTHERAPY REHABILITATION

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Abstract

Background: Knee osteoarthritis (OA) is a leading cause of pain and disability in older adults, and physiotherapy plays a central role in symptom management and functional improvement. This study assessed pain severity and functional status in knee OA patients after physiotherapy and examined factors associated with functional outcomes.

Methodology: Cross sectional study of 100 knee OA patients on physiotherapy rehabilitation. The demographic and clinical data (age, gender, BMI, duration of the disease and physiotherapy sessions) were obtained via structured questionnaire. Using the Visual Analog Scale (VAS), pain severity was assessed and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was used to assess functional status. Data were analyzed using SPSS with descriptive statistics, analysis of variance (ANOVA), Pearson correlation analysis and multiple linear regression ($p < 0.05$).

Results: The mean VAS pain score was 5.8 ± 1.7 , reflecting that participant's experienced moderate pain. The mean total WOMAC score was 42.9 ± 10.4 and the mean functional outcome score was 68.5 ± 13.2 . Moderate functional outcomes were shown in 54.0% of subject, while 28.0% achieved good recovery. Physiotherapy sessions was significantly associated to functional outcome scores ($F = 18.64$, $p < 0.001$). Severity of pain was negatively correlated with functional outcome ($r = -0.67$, $p < 0.001$) and physiotherapy sessions ($r = 0.59$, $p < 0.001$) were positively correlated. Multiple regression analysis showed that pain severity ($\beta = -0.45$, $p < 0.001$) was the most negative predictor of functional outcomes and physiotherapy participation ($\beta = 0.39$, $p < 0.001$) was the most positive.

Conclusions: Despite continuing rehabilitation, patients with knee OA had moderate pain and functional limitations. Greater physiotherapy use was associated with functional recovery, while more severe pain was correlated with less functional recovery.

Keywords: Cross-sectional study, Functional outcomes, Knee osteoarthritis, Musculoskeletal rehabilitation, Pain severity, Physiotherapy rehabilitation, Visual analog scale

INTRODUCTION

The knee joint is one of the most frequently affected joints in the body and a significant source of pain, disability and diminished quality of life in older people and adults with osteoarthritis (OA) (1). Progressive deterioration of the articular cartilage, narrowing of the joint space, the formation of osteophytes and joint inflammation, which in turn causes a decrease in their mobility and functional capabilities (2,3). Knee OA is a major public health problem as it is projected to continue to increase both in the UK and worldwide as a result of population aging, increasing rates of obesity and sedentary lifestyle (4). People with knee OA often have symptoms of joint pain, stiffness, limited range of motion, weak muscles and trouble with everyday activities (5). The symptoms can lead to reduced mobility, social isolation, and emotional well-being issues (6). Thus, adequate management is essential to alleviate symptoms and preserve independence in function (7).

Physiotherapy rehabilitation is well established as a mainstay of conservative management of knee OA (8, 9). Typical rehabilitation activities are therapeutic exercises, strengthening, flexibility, balance, manual therapy, and education to the patient (10, 11). The purpose of these procedures is to reduce pain, to improve joint movement, to improve mobility and to restore overall physical function. It has been shown in

previous studies that physiotherapy can have a profound impact on the functional capacity and quality of life in people with knee OA (12, 13).

Although the benefits of physiotherapy have been proven, there is still a high rate of variation in response to physiotherapy and factors which could affect the outcome of physiotherapy (such as pain, age, BMI, duration of the disease and adherence to rehabilitation). It is crucial to appreciate the relationship between these factors and functional recovery to plan rehabilitation and to optimize patient care.

So, the current study was designed to evaluate the level of pain and functional status of the patients undergoing physiotherapy treatment for knee osteoarthritis. This study evaluated the independent predictive effects of pain severity, session frequency, age, BMI, and disease duration on functional outcomes through multiple regression analysis. No previous study has combined all these variables in a single predictive model.

METHODOLOGY

STUDY DESIGN

A cross-sectional study design was used to assess pain severity and functional outcome of patients with knee OA undergoing physiotherapy rehabilitation. This study was conducted in the outpatient departments of physiotherapy of selected rehabilitation centers and hospitals. A total of 100 patients with knee osteoarthritis who were undergoing physiotherapy rehabilitation programs were recruited for the study. A convenience sampling technique was used to select participants for this study.

INCLUSION AND EXCLUSION CRITERIA

Patients were eligible for inclusion if they were aged ≥ 45 years or older and had radiologically confirmed knee OA, who were being treated with physiotherapy. Patients who had recently undergone knee surgery, inflammatory joint diseases, neurological diseases that affected mobility, severe cognitive impairment or patients who did not complete the questionnaire were excluded.

DATA COLLECTION

Structured questionnaire was used for collecting data about the demographic and clinical characteristics such as age, gender, BMI, disease duration, physiotherapy sessions attended. The severity of pain was evaluated on a Visual Analog Scale (VAS) with a higher score reflecting more severe pain. Functional status was assessed using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) measuring pain, stiffness and physical function.

Functional outcome scores were classified as poor, moderate or good rehabilitation outcomes, depending on the overall functional performance. The higher the functional outcome scores the better the physical function and rehabilitation success.

The aim of the study was explained to the eligible participants and their informed consent was taken. The questionnaires were filled out during the regular physiotherapy visits, while clinical data were collected via participant interviews and medical records. The frequency of physiotherapy attendance during the preceding 3-month period was recorded. Each session, lasting approximately 45 to 60 minutes, incorporated therapeutic exercise, manual therapy, and patient education. All sessions were supervised by a licensed physiotherapist in an outpatient clinical setting; no home-based exercises were included in the session count.

STATISTICAL ASSESSMENT

The data were analyzed by the Statistical Package for the Social Sciences (SPSS) version 26.0. Summarized data included descriptive statistics such as frequencies, percentages, means and standard deviations. Analysis of variance (ANOVA) was used to compare the functional outcome scores between physiotherapy session groups. Pearson correlation analysis was used to explore correlations among study variables and multiple linear regression analysis to determine the variables that predicted functional outcome. A p-value of < 0.05 was considered statistically significant.



ETHICAL APPROVAL

Ethical approval was obtained from the relevant Institutional Review Board committee. This was a voluntary participation and confidentiality and anonymity of all the participants were maintained throughout the study.

RESULTS

A total of 100 patients with knee osteoarthritis undergoing physiotherapy rehabilitation participated in this study. The results present participants' demographic and clinical characteristics, pain severity, functional outcomes, and factors associated with rehabilitation performance. Descriptive, correlational, and regression analyses were conducted to evaluate the relationships between clinical variables and functional recovery.

A total of 100 patients participated, with females representing 62.0% of the sample. Most patients were aged 55–64 years and were either overweight or obese. Nearly half of the participants had been diagnosed with osteoarthritis for 2–5 years (Table I).

Table I. Demographic and clinical characteristics of participants (n = 100)

Variable	Category	n (%)
Gender	Male	38 (38.0)
	Female	62 (62.0)
Age Group (years)	45–54	22 (22.0)
	55–64	41 (41.0)
	≥65	37 (37.0)
BMI	Normal	18 (18.0)
	Overweight	44 (44.0)
	Obese	38 (38.0)
Duration of OA	<2 years	29 (29.0)
	2–5 years	46 (46.0)
	>5 years	25 (25.0)
Physiotherapy Sessions	<10 sessions	31 (31.0)
	10–20 sessions	45 (45.0)
	>20 sessions	24 (24.0)

Participants reported moderate pain severity with a mean VAS score of 5.8 ± 1.7 . Functional limitations were evident, particularly in physical activities assessed by the WOMAC physical function domain. The average functional outcome score suggested moderate rehabilitation-related functional recovery (Table II).

Table II. Pain severity and functional outcome scores

Variable	Mean $\pm$ SD
VAS Pain Score (0–10)	5.8 ± 1.7
WOMAC Pain Subscale	9.4 ± 3.2
WOMAC Stiffness Subscale	4.8 ± 1.6
WOMAC Physical Function	28.7 ± 8.1
Total WOMAC Score	42.9 ± 10.4
Functional Outcome Score (%)	68.5 ± 13.2

More than half of the participants demonstrated moderate functional outcomes following physiotherapy rehabilitation. Good functional recovery was observed in 28.0% of patients, while 18.0% continued to experience poor functional status (Table III).

Table III. Functional outcome categories among participants

Category	n (%)
Poor Function (<50%)	18 (18.0)
Moderate Function (50–75%)	54 (54.0)
Good Function (>75%)	28 (28.0)

Functional outcome scores increased significantly with greater physiotherapy participation. Patients attending more than 20 sessions achieved the highest functional scores, indicating a positive effect of rehabilitation intensity on recovery (Table IV).

Table IV. Comparison of functional outcome scores by Physiotherapy sessions

Sessions	Mean Functional Score $\pm$ SD
<10 Sessions	58.9 $\pm$ 11.4
10–20 Sessions	69.7 $\pm$ 10.8
>20 Sessions	79.3 $\pm$ 8.6

ANOVA: $F = 18.64$, $p < 0.001$

Pain severity demonstrated a strong negative correlation with functional outcomes, indicating poorer function among patients with greater pain levels. Physiotherapy sessions were positively associated with functional recovery, whereas age and BMI showed significant negative relationships with functional performance (Table V).

Table V. Correlation Analysis Between Clinical Variables

Variable Pair	r	p-value
Pain Severity vs Functional Outcome	-0.67	<0.001
Age vs Functional Outcome	-0.41	<0.001
BMI vs Functional Outcome	-0.34	0.001
Physiotherapy Sessions vs Functional Outcome	0.59	<0.001
Disease Duration vs Pain Severity	0.38	<0.001

Pain severity emerged as the strongest negative predictor of functional outcomes, while physiotherapy participation was the strongest positive predictor. Age and BMI were also independently associated with poorer functional recovery. The model explained 56% of the variance in functional outcome scores (Table VI).

Table VI. Multiple linear regression analysis predicting functional outcomes

Predictor	β	SE	p-value
Pain Severity (VAS)	-0.45	0.08	<0.001
Physiotherapy Sessions	0.39	0.07	<0.001
Age	-0.21	0.06	0.008
BMI	-0.18	0.05	0.015
Disease Duration	-0.11	0.05	0.082

Model Statistics: $R^2 = 0.56$, Adjusted $R^2 = 0.53$, $F = 24.7$, $p < 0.001$

DISCUSSION

The present cross-sectional study assessed the severity of pain, functional outcomes of physiotherapy rehabilitation in patients with knee osteoarthritis (OA), and factors associated with functional recovery. These key findings show that patients remain with moderate pain (5.8 ± 1.7 VAS) and moderate functional limitations (68.5 ± 13.2 functional outcome score) after undergoing rehabilitation. Notably, only 28 % ended up in good function, while >54% in moderate function and 18% in poor function. The results have some important clinical implications. The fact that moderate pain persists despite active rehabilitation indicates, it is likely that many knee OA patients require a more intense and/or patient-specific physiotherapy regime. The data of this study revealed that one-fifth of patients could not be adequately rehabilitated even if they had received rehabilitation, underscoring the need for early identification of these non-responders (15). There is also a significant positive correlation between the doses, physiotherapy session, and the functional outcomes ($r = 0.59$, $p < 0.001$), which highlights the dose-response relationship in rehabilitation (16). This suggests a dose-response relationship, although causality cannot be inferred from cross-sectional data.

Several salient overlaps and differences emerge, when comparing the findings with previous studies. The value of the mean VAS pain score in this study (5.8) is similar to another systematic review, with mean pain scores of 5.2 to 6.4 in group of patients who received physical therapy and were diagnosed with knee OA in the community (17,18). Likewise, the total WOMAC score of 42.9 ± 10.4 in this study is similar to the group reported in a Saudi cohort (41.2–45.6), indicating a pattern of functional limitation profiles that is consistent across all cultures (19). Moreover, the correlation between the level of pain and functional outcome was significantly negative ($r = -0.67$, $p < 0.001$), which is in line with the previous research in a Chinese population ($r = -0.63$) (20,21). The uniformity found in all geographical and ethnic groups suggests that pain is the dominant modifiable constraint of function in knee OA, and should be a key focus of the rehabilitation strategy.

The dose of physiotherapy (more than 20 sessions) was found to be significantly associated with a higher functional score (79.3 ± 8.6) compared to those with fewer than 10 sessions (58.9 ± 11.4), and aligns with the findings of the previous meta-analysis (22). A study found that at least 12–15 full days of supervised physiotherapy are needed to obtain meaningful results in WOMAC physical functioning subscales (23). The results that longer duration of physiotherapy sessions is associated with better functional outcome in the long-term ($\beta = 0.39$, $p < 0.001$) have also been illustrated by the study showing that long-term compliance with exercise therapy, not short-term therapy alone, is predictive of maintaining functional outcomes to 12 months follow-up (24,25).

The factors age ($\beta = -0.21$, $p = 0.008$) and BMI ($\beta = -0.18$, $p = 0.015$) individually were significant yet had smaller effect sizes than the pain and session frequency (26). This is a slight contrast with a study who reported that BMI was the best predictor of functional decline in older people with knee OA. This could be due to the differences in composition of the sample (27). Interestingly, in the present study duration of the disease was not of any significant importance in our regression model ($p = 0.082$); this is contradictory to the observations of a study that long disease duration was correlated with poor functional outcome (28, 29). The lack of significance may reflect participants' structured rehabilitation, which could mitigate effects of chronicity. Alternatively, disease duration may influence functional outcomes less than current pain severity or rehabilitation adherence (30).

There are a number of limitations to be noted. Causal inference is not possible with the cross-sectional design. Longitudinal or randomized controlled studies are required to determine causality in the future. The convenience sampling could allow selection bias, because the samples consisted of patients referred to selected rehabilitation facilities, which may hinder the generalizability to patients in the community setting who did not seek formal physiotherapy. Additionally, we did not include psychological factors, including kinesiophobia, catastrophizing, and self-efficacy, in the model that are increasingly being acknowledged as mediators of pain and function in knee OA.

Further studies should use future prospective cohort designs with repeated measurements to assess changes over time, include validated psychosocial questionnaires, assess home exercise adherence using objective activity monitors, and investigate whether specific physiotherapy modalities have differential outcome in subgroups of patients on basis of severity of pain, obesity, or functional baseline. Moreover, cost-effectiveness analysis would be a valuable tool to assess optimum thresholds of sessions from a health-economics point of view.

CONCLUSION

This study found that moderate pain and functional limitations persisted in most patients with knee OA undergoing physiotherapy, with good functional recovery achieved in only 28%. A greater number of physiotherapy sessions proved to be the strongest positive predictor of functional outcome, whilst pain severity was the strongest negative predictor. These findings highlight the need for rehabilitation protocols that combine aggressive pain management with adequate treatment intensity. To optimize functional improvement, clinicians should provide a minimum of 10–20 supervised sessions, preferably >20. Additional supportive strategies may be necessary for patients with advanced age or elevated BMI.

Longitudinal studies, including studies on psychosocial and adherence variables, are encouraged to further guide individual rehabilitation pathways.

Conflict of interest:

The authors report no conflicts of interest

Author's contributions:

MUS, KA & KR Contributed significantly as per ICMJE roles. All agreed to give final approval of version to be published.

Declaration of generative AI-Assisted Tools:

No AI-assisted tools were used.

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