

Effectiveness of a Learning Package in Reducing Pain and Improving Activities of Daily Living among Patients with Knee Osteoarthritis

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ABSTRACT

Background: Knee osteoarthritis (KOA) is a highly prevalent musculoskeletal disorder and a leading cause of pain and functional disability worldwide. Effective management increasingly emphasizes patient education and self-management strategies to reduce pain and restore mobility and functional independence. **Objectives:** This study aimed to evaluate the effect of a learning package on pain intensity and activities of daily living (ADL) among patients with knee osteoarthritis. **Methods:** A quasi-experimental one-group pre-post design was conducted in the orthopedic departments and outpatient clinics of Mansoura University Hospital, Egypt. A purposive sample of 71 adult patients diagnosed with KOA was selected. Data were collected using a structured interview questionnaire and the Knee Injury and Osteoarthritis Outcome Score (KOOS) questionnaire, with a focus on the pain and ADL subscales. Measurements were obtained at baseline, one month, and two months post-intervention. **Results:** The findings demonstrated a statistically significant improvement in both pain and ADL scores after the implementation of the learning package ($p < 0.001$). Pain scores decreased progressively over time, while functional performance in daily activities improved. **Conclusions:** The structured learning package was effective in reducing pain and enhancing functional ability among patients with KOA. It is recommended that educational and in-service training programs be regularly implemented to enhance patients' knowledge and self-management practices regarding knee osteoarthritis.

Keywords: *Activities of Daily Living; Knee Osteoarthritis; Pain; Patient Education*

INTRODUCTION

Osteoarthritis is the most common form of arthritis worldwide and is a highly prevalent condition associated with significant morbidity and socioeconomic burden (Surmachevska & Rubio, 2023). Knee osteoarthritis (KOA) is the most prevalent type of osteoarthritis and is characterized by progressive joint degeneration (Kouraki *et al.*, 2026). The incidence of knee osteoarthritis is expected to escalate by 74.9% by 2050 (Zhu *et al.*, 2024).

The main symptom of KOA is pain; patients frequently experience various types of pain, including dull or aching pain with varying intensity. Initially associated with physical activity, this pain gradually becomes persistent and is the primary cause of functional impairment (Aw *et al.*, 2022). Approximately 80% of patients with KOA experience limitations in performing daily activities (Jokar *et al.*, 2024). Consequently, patients may experience a significant decline in quality of life, including difficulties with walking, movement, climbing stairs, and sitting; this condition is often associated with quadriceps muscle weakness (Wang *et al.*, 2026).

The primary objectives of knee osteoarthritis management are to alleviate pain and improve or preserve

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mobility and functional independence (Asgarimoghadam *et al.*, 2026). The American College of Rheumatology has assured that non-pharmacological interventions are essential in the management of osteoarthritis, including patient education, weight management, exercise, physical therapy, and occupational therapy (Moetteli-Graf & Niedermann, 2026). Nurses play a crucial role in patient education, promoting treatment adherence, and supporting comprehensive rheumatology care (Harraz *et al.*, 2026).

A structured learning package is fundamental to effective KOA management, as it provides comprehensive health education covering disease etiology, clinical manifestations, risk factors, and potential complications. In addition, it includes medication management, therapeutic exercises (such as stretching, strengthening, range of motion, and balance training), weight management, nutritional guidance, and self-care strategies, including the application of local cold or heat therapy and follow-up adherence (Chan *et al.*, 2026). These structured interventions aim to enhance patient knowledge, improve self-management practices, reduce pain, and enhance patients' daily activities.

Significance of the Study

Knee osteoarthritis is a highly prevalent musculoskeletal disorder and a leading cause of chronic pain and functional disability worldwide (Zhu *et al.*, 2024). In Egypt, the burden of KOA continues to increase, placing substantial demands on healthcare services and negatively affecting patients' quality of life and daily functioning. Statistical records from the orthopedic outpatient clinics of Mansoura University Hospital indicated approximately 2,000 newly diagnosed cases and 2,050 follow-up visits annually in 2024, highlighting the growing clinical significance of this condition.

Current international guidelines emphasize patient education and self-management as essential components of conservative KOA management (Kangeswari & Arulappan, 2022). Within this context, nurses play a pivotal role in empowering patients through education, promoting adherence to treatment recommendations, encouraging healthy lifestyle modifications, and supporting long-term self-management. Despite the growing body of international evidence supporting educational interventions for KOA, evidence from Egyptian and broader Arab healthcare settings remains limited.

While educational interventions for knee osteoarthritis have been extensively investigated internationally, relatively few studies have evaluated culturally and linguistically adapted nurse-led learning packages within routine clinical practice in the Egyptian clinical context (Sinatti *et al.*, 2022). Moreover, limited research has simultaneously examined changes in both pain and the activities of daily living using repeated follow-up assessments to evaluate the sustainability of intervention outcomes over time.

Integrating a structured learning instruction package into nursing practice empowers nurses to deliver patient-centered education and promote self-management among patients with knee osteoarthritis (Lopez *et al.*, 2026). This study is guided by Self-Efficacy Theory, which proposes that individuals' confidence in their ability to manage their health condition influences their health-related behaviors and outcomes. Therefore, the present study contributes context-specific evidence by evaluating the effectiveness of a learning package delivered in a real-world orthopedic setting. By assessing both pain and functional performance at baseline, one month, and two months following the interventions, this study provides a more comprehensive evaluation of patient-centered outcomes and practical evidence to support the integration of structured educational interventions into routine orthopedic nursing care.

Research Hypothesis

Patients with knee osteoarthritis who receive the learning package will experience reduced pain levels and improved daily living activities through enhanced self-management behaviors.

METHODOLOGY

Design

This study was conducted using a quasi-experimental one-group pre-post design, appropriate for

evaluating the effectiveness of an educational intervention in clinical settings (Polit & Beck, 2008).

Setting

The study was conducted in the Orthopedic Departments and outpatient clinics at Mansoura University Hospital, which serves the Delta region.

Subjects

A purposive sample of 71 patients with knee osteoarthritis was selected based on the following criteria (Polit & Beck, 2008; Tajik *et al.*, 2025). This sampling method ensured that eligible participants were selected and were able to engage in educational intervention.

Inclusion Criteria

The study included adult patients aged between 20 and 60 years of both sexes who were able to communicate effectively and were willing to participate in it. Only those who met these eligibility criteria and provided informed consent were enrolled in the research.

Exclusion Criteria

Patients were excluded from the study if they had previously undergone any orthopedic surgical procedure on the affected knee or if they were suffering from any physical disability that could interfere with their participation in the study or influence the assessment outcomes.

The sample size was calculated using a significance level of 5% and a study power of 80% based on the formula

$$n = ((Z\alpha/2 + Z\beta)^2 \times 2(SD)^2)/d^2, \text{ where } SD = \text{standard deviation,}$$

$$Z\alpha/2 = 1.96,$$

$$Z\beta = 0.84, \text{ and } d \text{ is the expected difference.}$$

The calculated sample size was 70.4, which was rounded up to 71 participants by substituting the values ($SD = 1.42$, $d = 0.67$). The sample size was additionally verified using G*Power software, which confirmed the adequacy of the manual calculation.

Data Collection Tools: Two tools were used to collect data for this study

Tool I: A structured interview questionnaire was developed by the researcher after reviewing relevant literature (Jokar *et al.*, 2024), including demographic data (patient's age, gender, marital status, education level, and occupation) and health-related data (medical history, disease duration, affected knee side, comorbidities, family history of the disease, and Body Mass Index (BMI), calculated as weight (kg) divided by height squared (m^2). BMI was categorized as underweight (<18.5), normal ($18.5-24.9$), overweight ($25-29.9$), and obese (≥ 30.0) (Chen *et al.*, 2019).

Tool II: The Knee Injury and Osteoarthritis Outcome Score (KOOS) questionnaire. This tool was adopted by Roos and Lohmander (2003). The English version was translated into Arabic using a forward-backward translation process, followed by an expert review to ensure its validity. The KOOS questionnaire consisted of five dimensions; only two subscales were used: Pain (nine items) and ADL function (seventeen items). Furthermore, symptoms, sport and recreation, and quality of life dimensions were excluded because they were not relevant to the study objectives.

Scoring System: A 5-point Likert scale ranging from 0 (no problems) to 4 (extreme problems) was used, and subscale scores were summed up for analysis. Lower scores indicated better improvement.

Validity and Reliability of Tools

Content validity was assessed by a panel of five medical-surgical nursing experts (one professor and four

assistant professors), and modifications were made (Polit & Beck, 2008). Face validity was confirmed through a pilot study on 10% of the sample (7 patients), who were later excluded. Internal consistency of the research tools was evaluated using Cronbach's alpha coefficient test ($\alpha = 0.832$), indicating good reliability.

The researcher designed a colored booklet in simple Arabic after reviewing recent related literature. It was used to support the explanation of lifestyle modification instructions, including diet management and anti-inflammatory dietary patterns, which should be the main components of knee osteoarthritis management (Lv *et al.*, 2024). Dietary modifications and exercise training, such as aerobic exercises, muscle strengthening, stretching, and range-of-motion exercises, which often involve gentle joint flexion and extension, circular limb movements, resistance, and gravity-based exercises, as well as low-intensity activities such as walking, were used to manage weight (Dai *et al.*, 2024).

Patients were instructed to rest between exercises to allow joint and muscle recovery and to use assistive devices to reduce joint stress, improve mobility, and enhance safety during daily activities (Qureshi *et al.*, 2025). In addition, the application of cold and warm compresses was considered a first-line treatment for knee pain, with proper application methods demonstrated (Ariana *et al.*, 2022).

Fieldwork: The researcher began collecting data after receiving the required approval from September 2024 to April 2025. The study was implemented through three stages: *assessment, implementation, and evaluation*.

Assessment Stage

The participants were presented with information about the researcher and an overview of the study's purpose and activities, and then the researcher obtained their consent before data collection. All study tools were used to assess patients as a pre-test.

Implementation Stage

The learning package was presented over two weekly sessions; each session lasted approximately 30 to 45 minutes, which included discussion and feedback. Patients were encouraged to actively participate by asking questions.

The first session presented the definition, etiology, risk factors, pathophysiology, signs, symptoms, diagnosis, and consequences of knee osteoarthritis. The subsequent session focused on KOA management principles, including pharmaceutical and non-pharmacological therapies, as well as surgical intervention when necessary. Lifestyle modifications aimed at improving knee function and enhancing patient outcomes in knee osteoarthritis were also discussed.

Individual interviews were conducted to gain a profound understanding. Teaching strategies included presentation, discussion, and demonstration, supported by a colored booklet. At the end of each session, the main points were summarized, and patients' questions were addressed to provide necessary information. Patients provided their phone numbers for weekly follow-up via phone calls or WhatsApp messages to monitor their compliance and remind them of the upcoming assessments.

Evaluation Stage

The effect of the learning package on pain and activities of daily living was evaluated using the KOOS questionnaire at two post-intervention time points. The first evaluation was conducted as a post-test one month after implementing the learning package, and the second evaluation was conducted as a follow-up one month after the first evaluation.

Statistical Analysis

SPSS software (Statistical Package for the Social Sciences, version 29, SPSS Inc., Chicago, IL, USA) was used to arrange, tabulate, and statistically analyze the data. The frequency and percentage were used to

summarize the categorical variables. The mean and standard deviation were used to represent continuous variables. The *repeated measures analysis of variance* with Bonferroni post hoc tests is used to compare mean differences across the three time points for the same subjects (pre-test, post-test, and follow-up) (Shin, 2009). Improvement scores were calculated as the difference between baseline and 2-month follow-up scores. Positive values indicated greater improvement. For both KOOS Pain and ADL subscales, lower scores reflect less pain and better functional status; therefore, larger positive difference scores represented greater clinical improvement. These improvement scores were used as dependent variables in the multivariate linear regression analysis to identify predictors of pain and ADL improvements. In addition, 95% confidence intervals were computed for all outcome measures, and a *p*-value of <0.05 was considered statistically significant.

Ethical Considerations

The study was approved by the Research Scientific Ethics Committee of the Faculty of Nursing, Mansoura University, Egypt, with reference number 457 on March 17th 2024. Each patient was informed about the study's nature, risks, benefits, compensation, and alternative therapies before obtaining their written informed consent. Participants were informed that their standard of care would not be influenced by their decision to participate or withdraw from the study and that they were free to withdraw at any stage without any consequences. Throughout the study, strict measures were implemented to ensure confidentiality, privacy, anonymity, and the safety of all participants.

RESULTS

Table 1 illustrates the demographic characteristics of the patients under study. More than half of the participants were aged 41-50 years (52.1%), and females constituted the majority of the sample (69%). Most participants had an intermediate level of education (76.1%). Nearly two-thirds were working (63.4%), and most required physical effort.

Table 1: Demographic Characteristics of the Selected Patients

Characteristics	Frequency (N)	Percentage (%)
Age (years)		
20 – 30	4	5.6
31 – 40	9	12.7
41 – 50	37	52.1
51 – 60	21	29.6
Age (years), range	25 – 59	
Mean ± SD	46.43 ± 7.95	
Gender		
Male	22	31
Female	49	69
Marital Status		
Married	53	74.6
Single/ Widow/ Divorced	18	25.4
Education Level		
Illiterate	13	18.3
Intermediate education	54	76.1
University degree or more	4	5.6
Occupation		
Working	45	63.4
Not working	26	36.6
Employment Requirements		
Requires physical effort	29	40.9
Does not require physical effort	16	22.5

Table 2 presents the baseline health characteristics of patients with knee osteoarthritis. Approximately half of them had been diagnosed for less than five years (49.3%). Additionally, more than half of the patients were classified as overweight (57.7%).

Table 2: Baseline Health Characteristics of Patients with Knee Osteoarthritis

Items	Frequency (N)	Percentage (%)
Duration of Disease		
≤ 5 years	35	49.3
5 – 10 years	27	38
≥ 10 years	9	12.7
Affected Knee Side		
Right knee	28	39.4
Left knee	28	39.4
Both knees	15	21.2
Medical Comorbidities		
No co-existing diseases	37	52.1
Rheumatoid arthritis	7	9.9
Rheumatic fever	5	7
Other chronic diseases	16	22.5
Rheumatoid arthritis	6	8.5
Family History of Knee Osteoarthritis		
Positive family history	19	26.8
Negative family history	52	73.2
Degree of Kinship (Positive History)		
First-degree relative	13	18.3
Second-degree relative	6	8.5
Patient's Body Mass Index		
Underweight	2	2.8
Normal weight	9	12.7
Overweight	41	57.7
Obesity	19	26.8

Table 3 illustrates statistically significant differences in the KOOS subscales (pain and activities of daily living) across repeated measurements at baseline, after 1 month, and after 2 months following the implementation of the learning package among the patients studied ($p < 0.001$).

Table 3: Differences in KOOS Pain and ADL Function Scores Across Repeated Measurements Following Application of the Learning Package

Outcome Variable	Baseline Mean ± SD	1 Month Mean ± SD	2 Months Mean ± SD	F (df1, df2)	p-value	η^2	95% CI for Mean Difference
Pain	24.30 ± 6.06	21.70 ± 6.23	17.92 ± 6.28	F (2,140) =97.90	<0.001	0.73	4.8–6.5
ADL Function	51.69 ± 15.41	39.33 ± 10.81	34.97 ± 9.94	F (2,140) =45.53	<0.001	0.56	12.0–16.5

*Significant if ($p \leq 0.05$). **Highly significant if ($p \leq 0.01$)

**The 95% confidence interval refers to the mean difference between baseline and 2 months after implementation of the learning package

Table 4 presents the multivariate linear regression analysis of predictors of pain improvement. The model was statistically significant ($F = 6.711, p < 0.001$) and explained 42.7% of the variance in pain improvement ($R^2 = 0.427$). ADL emerged as the strongest predictor of pain improvement ($\beta = 0.476, p < 0.001$). Occupation and age were also significant predictors ($\beta = 0.402, p < 0.001$), ($\beta = 0.246, p = 0.004$) respectively.

Table 4: Multivariate linear Regression of Predictors of Pain Improvement

Model	Unstandardized Coefficients		Standardized Coefficients	p-value (Sig.)	95.0% Confidence Interval for B	
	B	Std. Error	β		Lower Bound	Upper Bound
Pain						
Age	-1.309	0.438	-0.246	0.004	-2.183	-0.434
Sex	1.102	0.749	0.119	0.146	-0.395	2.600
Education	-1.427	0.767	-0.158	0.068	-2.960	0.106
Occupation	3.569	0.851	0.402	<0.001	1.868	5.270
Duration of Disease	-0.004	0.018	-0.021	0.807	-0.040	0.031
BMI	0.062	0.094	0.054	0.507	-0.125	0.249
ADL	0.201	0.034	0.476	<0.001	0.134	0.268
R=0.654	R ² =0.427	F (7,63) =6.711	p <0.001			

*Significant if ($p \leq 0.05$) **Highly significant if ($p \leq 0.01$)

B=Unstandardized Coefficients; SE=Standard Error; β =Standardized Coefficients; CI=Confidence Interval.

Table 5 presents the multivariate linear regression analysis of predictors of Activities of Daily Living improvement, which was statistically significant ($F = 16.117, p < 0.001$) and explained 60.2% of the variance in ADL improvement ($R^2 = 0.602$). Pain emerged as the strongest predictor of ADL improvement ($\beta = 0.761, p < 0.001$). Occupation was also a significant predictor ($\beta = -0.310, p = 0.021$), showing a negative association with functional improvement.

Table 5: Multivariate Linear regression of Predictors of Activities of Daily Living (ADL) Improvement

Model	Unstandardized Coefficients		Standardized Coefficients	p-value (Sig.)	95.0% Confidence Interval for B	
	B	Std. Error	β		Lower Bound	Upper Bound
ADL						
Age	0.948	1.395	0.075	0.500	-1.841	3.736
Sex	-0.160	2.282	-0.007	0.944	-4.720	4.400
Education	4.363	2.294	0.204	0.062	-0.222	8.947
Occupation	-6.530	2.763	-0.310	0.021	-12.051	-1.009
Duration of Disease	0.008	0.053	0.017	0.874	-0.098	0.115
BMI	0.224	0.280	0.082	0.425	-0.334	0.783
Pain	1.803	0.301	0.761	<0.001	1.201	2.405
R=0.642	$R^2=0.602$	$F(7,63)=16.117$	$P<0.001$			

$R=0.642, R^2=0.602, F(7,63)=16.117, P<0.001$

* Significant if ($p \leq 0.05$) ** Highly significant if ($p \leq 0.01$)

B=Unstandardized Coefficients; SE=Standard Error; β =Standardized Coefficients; CI=Confidence Interval

DISCUSSION

Knee osteoarthritis is a common orthopedic condition that primarily causes pain and joint stiffness. These symptoms not only worsen the condition but also lead to physical limitations and disability (Zhao *et al.*, 2025). With advances in clinical medicine, more non-pharmacological therapies are increasingly utilized in the management of knee osteoarthritis (Wang *et al.*, 2023), including patient education, weight management, and physical exercise (Veronese *et al.*, 2022). Nurses play a vital role in supporting patients with knee osteoarthritis in managing their condition and facilitating the learning process (Zhang, 2025).

The present study found that approximately half of the participants were between the ages of forty-one and fifty. This finding aligns with the study by Ahmed (2024), which found that nearly half of the participants were aged from forty-five to forty-nine. The prevalence of KOA was higher among women than men, consistent with findings by Tukroni *et al.* (2026), which consistently indicated that women experienced it more frequently than men. According to this study, women were more likely than men to have osteoarthritis. This may be caused by biological factors, such as hormonal and possibly hereditary variables, as well as variations in joint architecture, muscle strength, and lifestyle. According to the current study, more than two-thirds of the patients had completed intermediate education, consistent with Nuradeen and Aliyu (2025), who reported that approximately half of their participants had completed secondary education.

Regarding occupation, nearly two-thirds of patients were employed, most in physically demanding jobs. This aligns with Lee *et al.* (2021), who reported a strong association between occupational physical activity and the incidence of knee osteoarthritis and related symptoms. Regarding Body Mass Index (BMI), more than half of the patients were overweight, followed by one-quarter classified as obese. This finding is consistent with Nuradeen and Aliyu (2025), who reported that overweight and obesity are associated with an increased risk of symptomatic knee osteoarthritis. The high prevalence of overweight and obesity in this study may reflect global trends of sedentary lifestyles and unhealthy diets, as excessive body weight increases mechanical stress on lower extremity joints, contributing to KOA development.

The study demonstrated statistically significant improvements in all pain and ADL dimensions following

the intervention, indicating the positive impact of the learning package on patients' pain levels and functional abilities. These findings are consistent with Logroño-Cepeda *et al.* (2026), who reported short-term improvements in pain and functional outcomes following structured patient education programs. Similarly, Chan *et al.* (2026) found that patient education interventions modestly reduced pain among adult patients with osteoarthritis.

Additional supporting evidence includes Jokar *et al.* (2024), who observed significant reductions in pain scores following self-care education, and Khazaei *et al.* (2024), whose eight-week tele-education program focusing on weight control and exercise therapy improved pain, physical function, and daily activity outcomes. In addition, Khalil *et al.* (2024) reported improvements in ADL performance and reductions in pain following instructional interventions. Furthermore, Sinatti *et al.* (2022) observed positive outcomes in pain and function in eighty-four percent of patients receiving education, while Sasaki *et al.* (2022) reported that combining exercise with educational interventions reduced pain and encouraged activity in patients with KOA.

The study demonstrated a significant association between pain improvement and functional ability measured by the Activities of Daily Living. Improved functional status was associated with greater pain reduction, while lower pain levels were associated with better functional performance, underscoring a close interrelationship between both outcomes. Occupation influenced both pain and functional status, reflecting the impact of occupational demands on disease outcomes. In addition, younger patients tended to experience better pain improvement, suggesting a possible role of age-related physiological resilience in recovery. These findings are consistent with a study conducted by Yan *et al.* (2026), which demonstrated that improvements in physical function are closely associated with reductions in pain among patients with knee osteoarthritis. Overall, the results highlight a closely interconnected relation between pain and functional ability, emphasizing that effective management should simultaneously address both pain reduction and functional improvement to achieve optimal patient outcomes.

The learning package likely enhanced patients' knowledge and understanding of knee osteoarthritis and its self-management strategies, which in turn may have increased their self-efficacy in managing symptoms and performing daily activities. Enhanced self-efficacy may have empowered patients to take a more active role in their care and to adhere more consistently to recommended management strategies. In addition, this intervention may have facilitated positive behavioral changes, including improved adherence to therapeutic exercise, weight management strategies, joint protection techniques, and appropriate activity modification. Exercise therapy is a central component of non-pharmacological management, as it improves physical and physiological function by enhancing muscle strength, particularly of the quadriceps; increasing joint stability; and improving range of motion, thereby reducing mechanical stress on the knee joint. Similarly, weight management reduces the load on weight-bearing joints, leading to reduced pain and improved ability to perform activities. Joint protection techniques enhance ADL by teaching patients to modify movement patterns, including avoiding repetitive strain; using assistive devices, application of contrast therapy that involves the alternating warm and cold modalities; and adherence to proper body mechanics, thereby helping to prevent further joint damage (Chan *et al.*, 2026).

Collectively, improved knowledge, enhanced self-efficacy, and sustained behavioral modification provide a plausible explanation for the observed improvements in pain management and activities of daily living. This finding is consistent with Liu *et al.* (2025), who reported that improved patient knowledge promotes proactive health behaviors and enhances disease management, highlighting the importance of patient education in supporting adherence and self-care engagement.

Although educational interventions for knee osteoarthritis have been widely studied, this research provides context-specific evidence from Egypt regarding the effectiveness of a culturally and linguistically tailored learning package with short-term follow-up to assess outcome stability. This adds value by demonstrating the feasibility and clinical benefits of structured patient education in local clinical settings. The findings also highlight the crucial role of nurses in implementing a structured educational intervention for patients with knee osteoarthritis. Nurses are well-positioned to provide culturally appropriate education, monitor patient adherence, and promote lifestyle modifications that reduce pain and improve ADL.

performance. In addition, structured follow-up strategies, such as regular phone calls or text messages, may further enhance patient compliance and improve clinical outcomes. Overall, these findings support the use of the learning package in routine orthopedic nursing care.

Limitations

The absence of a control group, due to the use of a one-group pre-post design, limits causal inference and the ability to attribute observed changes solely to the interventions. In addition, the relatively small sample size may limit the applicability of the findings to a larger population. Furthermore, the follow-up period was limited to two months to evaluate the short-term effects of the learning package while maintaining participant retention and adherence throughout the study. However, this duration may not be sufficient to assess the long-term sustainability of the intervention effects.

Future scope

Future studies should employ randomized controlled trial designs with appropriate control groups to establish stronger causal relationships between the learning package and observed outcomes. Future research is recommended to replicate these findings using larger randomized control trials to enhance the pertinence of the results. In addition, longer follow-up periods of at least 3-6 months are recommended to evaluate the long-term sustainability of the intervention effects.

Additionally, integrating technology-based educational interventions and exploring their long-term impact on patients' adherence and quality of life would further clarify how to optimize management strategies for knee osteoarthritis. Educational and in-service training programs should be regularly conducted to enhance patients' knowledge and self-management practices regarding knee osteoarthritis. These sessions aim to provide patients with the latest information about the disease, its symptoms, and how to manage it.

CONCLUSION

The study highlights the importance of structured patient education in the management of knee osteoarthritis. The findings demonstrate that the learning package is an effective approach for improving patients' pain levels and activities of daily living, emphasizing the critical role of nursing-led educational interventions in enhancing patient outcomes and self-management. These results have important implications for nursing practice, suggesting that such interventions can be integrated into routine care across different orthopedic and rehabilitation settings to support patient recovery and functional independence. Moreover, the study contributes to the growing body of evidence supporting educational strategies in chronic musculoskeletal conditions.

CRedit Authorship Contribution Statement

A.G.K: Conceptualization, methodology, data collection, data analysis, and writing – original draft. W.I.S: Supervision, writing, reviewing, and editing. A.M.S: supervision, writing, reviewing, and editing. W.S.S: Validation, data analysis, writing, reviewing, and editing. All authors participated in drafting and revising the manuscript and approved the final version for publication.

AI Assistance Declaration

The authors reviewed and validated all scientific content. The authors declared that generative AI tools were used only for grammar and language editing.

Conflict of Interest

The authors declare that they have no competing interests.

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