

Application and effects of a self-management program for patients with knee osteoarthritis

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This study examined the effects of a self-management program (exercise therapy, dietary education, and aromatherapy) on physical symptoms (pain, daily living function, exercise function), quality of life, and sleep disturbances in knee osteoarthritis patients at a clinic in Andong city. A total of 66 patients (33 experimental, 33 control) with stage 2 or higher knee osteoarthritis participated. Data were analyzed using a statistical program, including descriptive statistics, frequencies, percentages, means, χ^2 test, *t*-test, and Fisher exact test and Bonferroni, and analysis of variance to examine the research objectives and measurement variables. Significant improvements were observed in the experimental group for pain, daily living functions, exercise functions, and quality of life ($F=62.73$, $P<0.001$; $F=22.68$, $P<0.001$; $F=8.19$, $P=0.006$; $F=14.02$, $P<0.001$, respectively). Additionally, significant interactions

between time points and group effects were found, indicating differences in the patterns of change in physical symptoms, daily living functions, exercise functions, and quality of life between the groups ($F=34.56$, $P<0.001$; $F=15.42$, $P<0.001$; $F=5.82$, $P=0.019$; $F=11.77$, $P=0.001$). For sleep disturbances improved in the experimental group ($F=16.79$, $P<0.001$), but no significant group-time interactions were found ($F=0.01$, $P=0.920$). These findings suggest that self-management program effectively reduce pain and enhance physical function, quality of life, and sleep, emphasizing the need for structured, ongoing educational interventions for knee osteoarthritis patients.

Keywords: Activities of daily living, Aromatherapy, Health status, Pain, Sleep disturbances, Quality of life


INTRODUCTION

Knee osteoarthritis (OA) is a degenerative disease caused by cartilage damage and deterioration in the knee joint. It leads to pain, joint stiffness, and movement restrictions, which, over time, can result in gait impairment, reduced physical function, increased economic burden, and decreased quality of life (Bannuru et al., 2019; Salaffi et al., 2005). Persistent pain associated with this condition can also lead to mental health issues such as depression, fatigue, and sleep disorders, further worsening the patient's overall health status (Hunter and Bierma-Zeinstra, 2019). Given the rising incidence of knee OA due to aging and increasing obesity rates, proper management of the disease is essential (Dantas et al., 2021).

The primary goals of knee OA treatment are to alleviate pain and inflammation while improving physical function (Bannuru et

al., 2019; Salaffi et al., 2005). To achieve these goals, it is necessary to apply multiple treatment strategies together. Self-management programs can effectively manage knee OA by combining various approaches such as exercise, weight management, pain management, and medication. In particular, nonpharmacological treatments, including exercise, weight loss, and education, are essential for managing chronic conditions. According to the study by Patten et al. (2022), which analyzed multiple study, an integrated approaches is necessary to alleviate symptoms and enhance patient autonomy.

Several treatment strategies should be implemented to achieve these goals. First, patient education is crucial to help individuals understand that knee OA is a manageable condition and that regular exercise, dietary modifications, and physical therapy can help alleviate symptoms (French et al., 2015; Murray et al., 2019). Second, low-intensity exercises are recommended for knee OA patients

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as they reduce weight-bearing stress and fall risks while strengthening muscles (Kolasinski et al., 2020; Roddy et al., 2005). Third, physical therapy interventions, such as ultrasound therapy and electrical stimulation, can help relieve pain and promote tissue healing (Bannuru et al., 2019). Fourth, dietary interventions aimed at weight reduction can alleviate joint stress and pain, while a balanced diet contributes to overall health maintenance (Kolasinski et al., 2020). Fifth, aromatherapy has been shown to promote dopamine hormone secretion, which helps relieve pain, improve mood, and alleviate sleep disorders (Pehlivan and Karadakovan, 2019; Rafii et al., 2020).

Interventions for pain relief in knee OA patients include self-management interventions, psychosocial interventions, pharmacological treatments, dietary modifications, physical therapy, and surgical procedures (Kloppenburg and Berenbaum, 2020; Skou and Roos, 2017). However, less than 40% of patients actively utilize therapeutic approaches, with most relying on pharmacological treatments, such as nonsteroidal anti-inflammatory drugs or hyaluronic acid injections (Kloppenburg and Berenbaum, 2020; Skou and Roos, 2017). While medication provides short-term relief, long-term use can lead to severe side effects (Kloppenburg and Berenbaum, 2020). Additionally, the financial burden of treatment and time and location constraints for hospital visits pose challenges for patients. Therefore, a self-management program that is cost-effective, free of side effects, and flexible in terms of time and location is necessary.

Nonpharmacological treatments, including exercise, weight loss, and education, are essential for chronic conditions such as knee OA (Bannuru et al., 2019). Since chronic diseases are more effectively managed when patients take an active role in their care, self-management strategies are highly suitable. Self-management programs promote patient independence and contribute to improved quality of life. International studies have shown that self-management programs incorporating exercise, weight management, pain management, and medication adherence are effective for knee OA patients (Ganji, 2019; Gay et al., 2020; Hatefi et al., 2019). Similarly, in South Korea, self-management programs combining physical therapy, exercise classes, and dietary interventions have had positive effects on patients (Ganji, 2019). These interventions have been shown to significantly reduce pain and physical symptoms (Gay et al., 2016) while improving quality of life and alleviating sleep disorders (Pehlivan and Karadakovan, 2019).

Therefore, implementing a self-management program that integrates exercise therapy, dietary changes, and aromatherapy is essential for the management of knee OA. This approach may help

to alleviate pain and physical symptoms while improving quality of life and sleep disturbance. Although such programs are expected to have positive effects, there is a lack of sufficient research on the combined application of these interventions for the management of knee OA. Therefore, further research is needed to verify their effectiveness. Previous studies have mainly focused on the individual effects of exercise therapy, dietary changes, and aromatherapy. However, this study provides a comprehensive intervention by integrating these methods. In addition, while previous studies often relied on hospital visits or specific time constraints, this study introduces an application-based program that allows patients to practice self-management anytime and anywhere without restrictions. This approach allows for more flexible and continuous management, providing a cost-effective and side-effect-free treatment option.

This study aimed to evaluate the effects of a self-management program that integrated exercise therapy, dietary modification, and aromatherapy on pain, physical symptoms, quality of life, and sleep disturbance in patients with knee OA. The program develops and implements a structured self-management system that can be easily applied regardless of time and place. This intervention can be made more flexible and accessible by utilizing an application, allowing patients to manage self-management anytime, anywhere.

MATERIALS AND METHODS

Participant

This study approved by the Institutional Review Board (IRB) of Andong National University (IRB No: 1040191-202408-HR-022-01). The study participants were selected from patients diagnosed with knee OA who visited a clinic in Andong city, Gyeongsangbuk-do, between June 1, 2024, and August 31, 2024, using a convenience sampling method. The participants were chosen from adults (male and female) diagnosed with stage 2 or higher knee OA (physician-diagnosed). Before participation, all participants were informed about the study's purpose, process, and procedures, and their consent to participate was obtained.

The sample size was determined using the G*Power 3.1 program with a significance level of 0.05, an effect size of 0.15, and a power of 0.85. The minimum required sample size was calculated to be 72 participants. Considering the potential dropout rate, a total of 80 participants were initially recruited, with 40 assigned to the experimental group and 40 to the control group. However, during the study, 14 participants (seven from the experimental

group and seven from the control group) dropped out, resulting in a final sample of 66 participants (33 in the experimental group and 33 in the control group).

Research instruments

The Knee Injury and Osteoarthritis Outcome Score (KOOS), originally developed by Roos et al. (1998) and validated by Seo et al. (2006), was used to measure both physical symptoms and quality of life in this study.

Physical symptoms

Physical symptoms—defined as pain, daily living function, and exercise function—were measured using the Knee Injury and Osteoarthritis Outcome Score (KOOS), originally developed by Roos et al. (1998) and validated by Seo et al. (2006).

Pain

Nine items from the KOOS questionnaire were used to assess pain. The total score ranges from 0 to 36, with higher scores indicating greater pain severity in OA. Responses are rated on a scale from 0 (“never”) to a maximum score (“always”). The reliability of this tool was reported to have a Cronbach’s α of 0.80 in a study by Seo et al. (2006).

Daily living function

Seventeen items from the KOOS questionnaire were used to evaluate daily living function. The total scores ranged from 0 (no difficulty) to 68 (impossible), with higher scores indicating greater impairment in daily life due to knee OA. The reliability of this tool was reported to have a Cronbach α of 0.80 in a study by Seo et al. (2006).

Exercise function

Five items on the KOOS questionnaire were used to assess exercise function. The total scores ranged from 0 (no difficulty) to 20 (impossible), with higher scores indicating greater difficulty in performing physical activities. The reliability of this tool was reported to have a Cronbach α of 0.79 in a study by Seo et al. (2006), and Cronbach α was 0.92 in this study.

Quality of life

Quality of life was measured using the Quality of Life Subscale (4 items) by Seo et al. (2006). This tool has scores ranging from 0 to 16, with responses rated from 0 (not at all) to 4 (impossible). Higher scores indicate a lower quality of life due to knee OA. The

reliability of this tool was reported to have a Cronbach α of 0.81 in a study by Seo et al. (2006), and Cronbach α was 0.82 in this study.

Sleep disturbances

Sleep disturbances were assessed using a Korean-adapted sleep scale, which was revised and supplemented by Oh et al. (1998) with the author’s permission. This tool consists of a total of 15 items, categorized into four sections: sleep evaluation (four items), sleep patterns (eight items), sleep outcomes (one item), and sleep inhibitors (two items). Responses are measured on a four-point scale, with total scores ranging from 15 to 60. Higher scores indicate a greater severity of sleep disorders. The reliability of this tool was reported to have a Cronbach α of 0.75 at the time of its development, and Cronbach’s α was 0.89 in this study.

Data collection and research progress

The data collection period for this study was from June 1 to August 31, 2024. The experimental group participated in the self-management program for eight weeks following the preliminary survey, while the control group maintained their usual daily activities. Both groups completed additional assessments at the 4-week and 8-week marks. The research procedures follow.

Preinvestigation

Among the participants who agreed to participate in the research, the experimental group and control group were assigned from knee OA patients (40 in the experimental group and 40 in the control group) who were suitable for the research purposes. Both groups were asked to complete a preliminary questionnaire that assessed general characteristics, physical functions, quality of life, and sleep disturbance before the self-management program was applied.

Self-management program

This study administered a self-management program over eight weeks. Before the intervention, the participants were provided with a leaflet outlining exercise therapy, diet, aromatherapy, and management methods, followed by demonstrations. The experimental group participated in the program 5 days a week, performing knee-strengthening exercises for 10 minutes each in the morning and evening. In the evening, aromatherapy massage was applied by rolling aroma oil on the knee for 20 minutes, using four methods: stroking, rubbing, tapping, and kneading (Table 1).

The effectiveness of the program was monitored by asking the participants to complete a checklist of exercise therapy and diet. A weekly phone call was made to ensure that the self-management

Table 1. Composition of the self-management program

Week	Category	Time (min)	Intervention content	Effect
Before intervention	Self-management program education (hospital education)	30 Min	<ul style="list-style-type: none">• Understanding knee osteoarthritis• Management methods for knee osteoarthritis (exercise, diet, and aromatherapy massage)• How to implement the self-management program• How to use checklists for exercise, diet, and aromatherapy massage	
Intervention: week 1—week 8	Self-management program implementation	10 Min × 2	Knee-strengthening exercises (morning and evening)	Muscle stretching and strengthening
		20 Min	Aromatherapy massage (self-administered in the evening)	Pain reduction
			Dietary management	Reducing knee load
	Total daily duration	40 Min		

**Fig. 1.** Exercises to strengthen muscles and improve stretching.

program was being properly followed. If a participant had difficulty implementing the program, they were provided with encouragement and a practice plan to help maintain the program's sustainability. After 8 weeks of the self-management program, feedback from participants was collected to assess their involvement. The self-management program was designed to test its effects on physical function, quality of life, and sleep disorders in patients with knee OA.

Exercise

The exercise therapy in this study consisted of muscle-strengthening exercises and stretching exercises (Fig. 1). The exercises were taught and demonstrated individually by the researcher, and the

participants were encouraged to perform the exercises for 10 minutes each morning and evening, 5 days a week.

Diet education

The dietary education in this study aimed to help knee OA patients maintain a healthy lifestyle and improve their eating habits and overall health. The participants were educated about dietary information beneficial for knee OA via a leaflet before the intervention. They were also asked to keep a food diary checklist to track their daily food intake.

Aromatherapy

Aromatherapy was applied to the experimental group, using a

blend of lavender, peppermint, and rosemary oils in a 2:3:4 ratio, known for their pain-relieving effects on musculoskeletal disorders. In this study, jojoba oil was chosen as the carrier oil, and the essential oil blend was diluted to a 10% concentration. The blended oils were applied by massage to provide direct pain relief and muscle relaxation effects. The participants were individually trained on the massage techniques before the intervention and were instructed to massage their knees for 20 min every evening after a shower.

Postinvestigation

Postinvestigations were conducted twice, at the 4th and 8th weeks of the self-management program intervention. Questionnaires on pain, physical function, quality of life, and sleep disorders were distributed and collected from both the experimental and control groups, excluding the general characteristics questionnaire.

Data analysis

Data were analyzed using the SPSS/WIN 27.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics including frequencies, percentages, and means, were used to examine the research objectives and measurement variables. The homogeneity test for the general characteristics and measurement variables of the experimental and control groups was conducted using the χ^2 test, t -test, and Fisher exact test and Bonferroni. The effects on the measurement variables were analyzed using repeated measures analysis of variance (ANOVA).

RESULTS

Homogeneity test of general characteristics

The gender distribution consisted of 48.5% males and 51.5% females, with a slightly higher proportion of females. The average age was 59.6 years, with the highest percentage (39.4%) falling within the 50–64 age range. Among the participants, 41.5% reported having no religious affiliation. Regarding education level, the largest group had a high school diploma (43.9%), followed by those with a college degree or higher (33.3%) and those with a middle school education or lower (22.8%). In terms of marital status, the majority were married (75.8%). Additionally, 77.3% were employed. Monthly income was most commonly in the range of 1.51–3 million Korean won (39.4%). Regarding cohabitation, 45.5% lived with a spouse, 39.4% lived with both a spouse and children, and 15.2% lived alone. In terms of health status, 44.0%

Table 2. Homogeneity test of general characteristics (N = 66)

Variable	EG (n = 33)	CG (n = 33)	χ^2 or t (P-value)
Gender			0.24 (0.806)
Male	15 (22.7)	17 (25.8)	
Female	18 (27.3)	16 (24.2)	
Age (yr)			1.62 (0.446)
≤ 49	11 (16.7)	7 (10.6)	
50–64	13 (19.7)	13 (19.7)	
≥ 65	9 (13.6)	13 (19.7)	
Religion			0.42 (0.617)
Yes	18 (27.7)	20 (30.8)	
No	15 (23.1)	12 (18.5)	
Education			1.02 (0.600)
≥ Middle school	7 (10.8)	7 (10.8)	
High school	13 (20.0)	16 (24.6)	
≤ College graduate	13 (20.0)	9 (13.8)	
Marital status [†]			0.25 (0.881)
Married	25 (37.9)	25 (37.9)	
Bereavement	4 (6.1)	5 (7.6)	
Other (divorced, single)	4 (6.1)	3 (4.5)	
Job			0.09 (0.500)
Yes	25 (37.9)	26 (39.4)	
No	8 (12.1)	7 (10.6)	
Monthly income (10,000 KRW)			1.42 (0.493)
≤ 150	12 (18.2)	8 (12.1)	
151–300	11 (16.7)	15 (22.7)	
≥ 301	10 (15.2)	10 (15.2)	
Partner [†]			2.32 (0.314)
Living with spouse	13 (19.7)	17 (25.8)	
Living alone	4 (6.1)	6 (9.1)	
Living with children	16 (24.2)	10 (15.2)	
Health status [†]			1.18 (0.555)
Healthy	15 (22.7)	14 (21.2)	
Normal	15 (22.7)	13 (19.7)	
Unhealthy	3 (4.5)	6 (9.1)	
Body mass index [†]			2.28 (0.516)
Low	2 (3.0)	1 (1.5)	
Normal	6 (9.1)	8 (12.1)	
Preobesity	8 (12.1)	12 (18.2)	
Obesity	17 (25.8)	12 (18.2)	

Values are presented as number (%).

EG, experimental group; CG, control group; KRW, Korean won.

[†]Fisher exact test.

reported being in good health. Regarding body mass index (BMI), 43.9% were classified as obese, 30.3% were in the pre-obese stage, 21.2% had a normal BMI, and 4.5% were underweight (Table 2).

Homogeneity testing of gender, age, religion, education level, marital status, employment, monthly income, cohabitation status, health status, and BMI showed no statistically significant differ-

ences between the two groups. Therefore, the experimental and control groups were considered homogeneous (Table 2).

Pretest homogeneity test of dependent variables

The results of the pretest homogeneity test for the dependent variables showed no statistically significant differences between the experimental and control groups in terms of physical symptoms, quality of life, or sleep disorders. Therefore, the groups were considered homogeneous (Table 3).

Table 3. Pretest of homogeneity for the dependent variable (N = 66)

Variable	EG (n = 33)	CG (n = 33)	t (P-value)
Physical symptoms			
Pain	10.64 ± 4.27	10.67 ± 5.07	24.04 (0.194)
DLF	14.58 ± 6.81	13.00 ± 8.11	34.44 (0.044)
Exercise function	9.18 ± 3.62	9.88 ± 4.19	18.97 (0.166)
QoL	7.55 ± 1.68	7.64 ± 2.10	8.71 (0.465)
Sleep disturbances	41.00 ± 7.56	41.55 ± 9.87	34.20 (0.130)

Values are presented as mean ± standard deviation.

EG, experimental group; CG, control group; DLF, daily living function; QoL, quality of life.

Table 4. Effects of the self-management programs (N = 66)

Variable	Pretest ^a	Posttest (4 wk) ^b	Posttest (8 wk) ^c		F	P-value
Physical symptoms						
Pain						
EG (n = 33)	10.64 ± 4.27	9.21 ± 3.24	5.88 ± 2.45	T	62.73	<0.001
CG (n = 33)	10.67 ± 5.07	10.48 ± 4.51	9.97 ± 4.50	T × G	34.56	<0.001
		F = 88.38, P < 0.001 (a > b > c) [†]		G	3.45	0.068
DLF						
EG (n = 33)	14.58 ± 6.81	12.00 ± 4.69	7.94 ± 3.19	T	22.68	<0.001
CG (n = 33)	13.00 ± 8.11	12.15 ± 6.28	12.27 ± 6.14	T × G	15.42	<0.001
		F = 26.04, P < 0.001 (a, b > c) [†]		G	0.51	0.447
Exercise function						
EG (n = 33)	9.18 ± 3.62	8.64 ± 3.13	7.30 ± 2.90	T	8.19	0.006
CG (n = 33)	9.88 ± 4.19	9.52 ± 4.12	9.64 ± 4.08	T × G	5.82	0.019
		F = 14.98, P < 0.001 (a, b > c) [†]		G	2.29	0.135
QoL						
EG (n = 33)	7.55 ± 1.68	7.12 ± 1.41	6.06 ± 1.34	T	14.02	<0.001
CG (n = 33)	7.64 ± 2.10	7.52 ± 1.77	7.55 ± 1.82	T × G	11.77	<0.001
		F = 34.90, P < 0.001 (a > b > c) [†]		G	2.95	0.091
Sleep disturbances						
EG (n = 33)	41.00 ± 7.56	33.48 ± 6.84	32.58 ± 5.75	T	16.79	<0.001
CG (n = 33)	41.55 ± 9.87	33.61 ± 9.14	33.06 ± 7.54	T × G	0.01	0.92
		F = 11.38, P < 0.001 (a > b > c) [†]		G	0.50	0.484

Values are presented as mean ± standard deviation.

EG, experimental group; CG, control group; T, time; G, group.

[†]Bonferroni test.

Physical symptoms

The experimental group that participated in the self-management program showed significant improvements in physical symptoms (pain, daily living function, exercise function) compared to the control group, as shown in Table 4.

The experimental group experienced a reduction in pain caused by knee OA compared to the control group. Repeated measures ANOVA results indicated a statistically significant improvement over time in the experimental group ($F = 62.73$, $P < 0.001$), with a significant interaction between time and group ($F = 34.56$, $P < 0.001$).

Additionally, the experimental group experienced a reduction in difficulties with daily living function due to knee OA compared to the control group. Repeated measures ANOVA results showed a statistically significant improvement over time in the experimental group ($F = 22.68$, $P < 0.001$), with a significant interaction between time and group ($F = 15.42$, $P < 0.001$). Furthermore, the experimental group showed a reduction in exercise function impairment due to knee OA compared to the control group. Repeated measures ANOVA results demonstrated a statistically significant

cant improvement over time in the experimental group ($F = 8.19$, $P < 0.01$), with a significant interaction between time and group ($F = 5.82$, $P < 0.05$).

Quality of life

The experimental group participating in the self-management program showed a significant improvement in quality of life due to knee OA compared to the control group, as shown in Table 4. Repeated measures ANOVA results revealed a statistically significant improvement over time in the experimental group compared to the control group ($F = 14.02$, $P < 0.001$), with a significant interaction between time and group ($F = 11.77$, $P < 0.001$).

Sleep disturbances

The experimental group that participated in the self-management program showed a significant reduction in sleep disturbances compared to the control group, as shown in Table 4. Repeated measures ANOVA results indicated a statistically significant improvement over time in the experimental group compared to the control group ($F = 16.79$, $P < 0.001$). However, the interaction between time and group showed no statistically significant difference ($F = 0.01$, $P = 0.920$).

DISCUSSION

This study aimed to apply a self-management program to patients with knee OA to examine its effects on physical symptoms (pain, daily living function, and exercise function), quality of life, and sleep disturbances. Additionally, it sought to provide foundational data for developing nursing interventions for self-care in knee OA patients. Knee OA is known to be more prevalent women and the elderly (Hame and Alexander, 2013; Patten et al., 2022). In this study, the proportion of female participants was 51.5%, higher than that of male participants at 48.5%. Additionally, the majority of participants were in their 50s and 60s, supporting the finding of Hame and Alexander (2013) and Patten et al. (2022).

The experimental group that participated in the self-management program showed significant improvements in physical function (pain, daily living function, and exercise function) compared to the control group. The interaction effect between time points and groups was also statistically significant. Although few previous studies exist for direct comparison, Khachian et al. (2020) similarly found that a self-management mobile app for OA patients reduced postintervention pain and improved daily living function. The results of this study align with previous research indicating

that aerobic walking and quadriceps strengthening exercises improve pain levels and reduce physical function disabilities (Roddy et al., 2005). Other studies also support that joint-strengthening and stretching exercises enhance mobility, improve stability, and reduce pain, thereby enhancing physical function (Baker and McAlindon, 2000).

Dietary adjustments contributed to these improvements by reducing the load on the knee joint and alleviating pain (Kolasinski et al., 2020). By promoting weight loss, these adjustments decrease joint stress, helping to reduce inflammation and pain. Additionally, the use of essential oils (lavender, peppermint, and rosemary) through massage in this study demonstrated anti-inflammatory and analgesic effects through skin absorption, further improving physical function (Pehlivan and Karadakovan, 2019; Rafii et al., 2020). Exercise therapy strengthens the muscles surrounding the knee joint, enhancing joint stability and reducing weight-bearing stress, which alleviates pain (Kolasinski et al., 2020; Roddy et al., 2005). Aromatherapy helps stabilize the nervous system and reduce pain perception by providing anti-inflammatory and analgesic effects. Thus, the self-management program, which integrated exercise therapy, dietary adjustments, and aromatherapy, effectively alleviated pain and improved physical symptoms, confirming its efficacy as a nursing intervention. The synergy of these three methods enhanced their effectiveness, making the program more successful in alleviating knee OA pain than any single intervention alone.

The experimental group showed statistically significant improvements in quality of life compared to the control group, with a significant interaction effect between time and group. These findings are consistent with previous studies on knee OA patients (Bunsanong and Chaimongkol, 2021; Khachian et al., 2020). The self-management program contributed to pain reduction, improved physical function, and ultimately enhanced quality of life. Aromatherapy's anti-inflammatory and circulation-improving effects, combined with weight management through dietary adjustments, reduced discomfort in daily activities and contributed to an overall improvement in quality of life (Martin et al., 2001; Messier et al., 2000). Furthermore, continuous emotional support and encouragement played a key role. Weekly phone monitoring helped participants adhere to the self-management program, providing psychological stability and positively influencing their quality of life.

The individualized approach of the self-management program and the ongoing emotional support provided to participants were critical factors in improving quality of life. These findings under-

score the importance of personalized care for addressing pain and physical symptoms in knee OA patients. Systematic implementation of self-management programs is essential for further improving patient outcomes. Although the experimental group experienced a greater reduction in sleep disorder scores compared to the control group, the difference was not statistically significant. Sleep disorder scores decreased from 41.00 to 32.58 in the experimental group and from 41.55 to 33.06 in the control group, with only a 0.49% greater decrease in the experimental group.

These findings align with previous research demonstrating that aromatherapy (lavender oil) reduces sleep disorders in adult and elderly patients with knee OA (Her and Cho, 2021). Similarly, Mohammadi et al. (2022) found that foot massage three times per week for 6 weeks significantly improved sleep quality in elderly women. Lavender essential oil, which affects both the sympathetic and parasympathetic nervous systems, induces psychological stability and promotes better sleep (Sattayakhom et al., 2023). Additionally, reductions in knee OA pain may have contributed to improved sleep quality, consistent with previous studies (Feda et al., 2023). However, the lack of statistical significance in sleep disorder outcomes may be attributed to nerve block injections received by all participants to alleviate knee OA symptoms. As both groups received this treatment, the experimental group did not show a significant advantage over the control group. Other potential factors, such as pre-existing sleep habits, stress levels, environmental influences, and negative perceptions of pain, may have also impacted the results (Smith and Haythornthwaite, 2004). These factors likely affected both groups equally, explaining the observed improvements in sleep disorder scores in the control group as well.

The self-management program was effective for the following reasons: The exercise regimen incorporated quadriceps strengthening exercises such as leg extensions and squats designed to strengthen the muscles while minimizing the load on the knee joint. The dietary intervention recommended a low-carbohydrate, high-protein diet to promote weight loss and reduce inflammation. The aromatherapy instructed patients to perform a 20-min massage to ensure consistent and effective implementation. These structured instructions helped patients adhere to the program and improved study outcomes.

Several limitations should be considered. The relatively short duration and intensity of the intervention may have influenced the results. Future studies should implement longer and more intensive programs to better assess the effectiveness of the program. Study participants were recruited from a single medical institution, which

may limit the generalizability of the results. Future studies should validate the efficacy of the program in a variety of populations, including different patient groups and settings. Additional studies should analyze individual responses to aromatherapy to optimize effectiveness. Additional studies are needed to assess the long-term effectiveness of self-management programs and to develop tailored interventions based on the specific characteristics of patients with knee OA.

This study confirms that a multidimensional self-management program combining exercise therapy, dietary modification, and aromatherapy is an effective nursing intervention to reduce pain, improve physical function, and enhance quality of life in patients with knee OA. Although the effect on sleep disturbance was not statistically significant, the program contributed to overall patient well-being. Future research should focus on extending the intervention period, diversifying the participant population, and improving the individualized approach to maximize the effectiveness of self-management programs for patients with knee OA.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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