

Effectiveness of mobile-based educational interventions on quality of life among osteoarthritis patients: A quasi-experimental study

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ABSTRACT

Introduction: Osteoarthritis (OA) is a chronic musculoskeletal disorder that substantially reduces physical function, mobility, and psychosocial well-being among older adults. Limited health literacy and restricted access to continuous education often hinder effective self-management and worsen quality of life. Mobile-based health education has emerged as a practical approach to improve patient engagement and self-care behaviors. This study aimed to evaluate the effectiveness of a mobile-based educational intervention in improving the quality of life among patients with osteoarthritis in the working area of the Baki Health Center, Sukoharjo.

Research Methodology: This study employed a quasi-experimental pretest–posttest control group design. A total of 50 osteoarthritis patients were recruited using purposive sampling and divided equally into intervention (n=25) and control (n=25) groups. The intervention group received mobile-based education for 4 weeks, including osteoarthritis management materials, pain assessment, physical activity guidance, nutrition monitoring, reminders, and chatbot support, while the control group received standard care. Quality of life was measured using the validated SF-36 questionnaire before and after the intervention. Data were analyzed using paired sample t-tests with significance set at $p < 0.05$.

Results: The intervention group demonstrated a significant improvement in quality-of-life scores from pretest to posttest (37.60 ± 14.95 vs. 70.20 ± 10.79 ; $t = -10.373$; $p < 0.001$) with a very large effect size (Cohen's $d = -2.075$). In contrast, the control group showed no statistically significant change (36.00 ± 9.87 vs. 36.12 ± 10.24 ; $t = -0.486$; $p = 0.632$; Cohen's $d = -0.097$).

Conclusion: Mobile-based educational interventions were effective in improving the quality of life of patients with osteoarthritis. Integrating mobile health education into primary healthcare services may strengthen self-management, increase patient independence, and support long-term chronic disease management among older adults.

Keywords: health education; mobile health; osteoarthritis; quality of life; self-management.



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INTRODUCTION

Osteoarthritis (OA) is still a major health problem in the world, as it is the leading cause of disability in the elderly age group. The World Health Organization (WHO) reports that more than 500 million people in the world are living with OA, and this number continues to increase as life expectancy and less physically active lifestyles increase. OA is known to be the main cause of impaired movement function, physical limitations, and decreased quality of life, especially in the elderly population (Anilwaranon & Sathiyamas, 2026).

In Indonesia, the prevalence of joint disorders leading to osteoarthritis reaches 7.3%, with more than 40% of cases occurring in the age group ≥ 45 years or pre-elderly age. This condition is in line with data in the Baki Sukoharjo Health Center Working Area, which shows an increase in the number of OA cases every year. Internal data from the Baki Health Center indicated that in the period from January to June 2024, more than 50 patients had osteoarthritis, indicating the high burden of OA at the primary health service level (Roux & Ferrero, 2024).

The increased prevalence of osteoarthritis has a significant impact on the decline in mobility, quality of life, and individual well-being, as well as on healthcare costs and the overall economy. The increasing elderly population, lifestyle factors, and obesity are the main risk factors that accelerate the progression of OA (Sharma et al., 2024). In fact, osteoarthritis is predicted to become the most common musculoskeletal chronic disease globally by 2040 (Bryce et al., 2026).

Osteoarthritis not only impacts physical aspects such as limited movement, joint stiffness, and chronic pain, but can also affect psychosocial aspects, including depression, sleep disorders, and increased dependence on daily activities (Cioeta et al., 2025). Around 80% of OA patients have mobility limitations, and 25% of them need the help of others in carrying out daily activities (Dieter et al., 2025). This condition is exacerbated by low health literacy and limited access to information about OA self-management, which causes delays in treatment and has an impact on a decrease in quality of life (Fiedler et al., 2024).

Given these conditions, comprehensive intervention efforts are needed to strengthen family-based care and health education programs regarding OA (Fjeldstad et al., 2026). However, in practice, there are still many families who do not have adequate skills and knowledge in caring for family members with OA. Patients' dependence on others is known to hurt quality of life, especially in psychological and social aspects (Hinman et al., 2026). In addition, limited mobility and increased disabilities often hinder patients from accessing health services directly and obtaining ongoing monitoring.

Digital technology-based approaches are considered more flexible and practical in supporting the monitoring and education of patients with chronic diseases, including OA (Holopainen et al., 2026). Some studies have shown that patients who receive tablet-based interventions or mobile devices, such as iPads, have better recovery scores and higher levels of care satisfaction than patients who receive conventional care (Hong et al., 2024). In addition, the use of technology is tailored to users' needs.

One effective approach in increasing public knowledge and awareness of OA is through digital media. Media plays an important role in conveying health information, shaping attitudes, and encouraging healthier behavior changes (Long et al., 2025). The World Health Organization defines mHealth (mobile health) as a healthcare practice supported by mobile devices, including smartphones, tablets, and digital health monitoring devices (Ma et al., 2026).

The use of mobile technology allows for the delivery of health interventions that are more interactive, sustainable, and accessible to patients. In addition, social media is also widely used as a means of health education and has been proven effective in facilitating changes in health behavior in individuals and groups (Maher et al., 2022). Based on this phenomenon, researchers are interested in researching the effectiveness of mobile-based education in improving the quality of life of osteoarthritis patients in the Baki Sukoharjo Health Center Area.

RESEARCH METHODOLOGY

Study Design

This study uses the quasi-experimental method with a control group. This design was used to measure the effect of mobile app interventions on the quality of life of osteoarthritis patients. Quality of life was assessed before and after to identify differences in both the intervention and control groups. The intervention group received a mobile application for 4 weeks, while the control group only received therapy from the Health Center.

Population and Sample

The population in this study consists of older adults with osteoarthritis in the working area of the Baki Sukoharjo Health Center. Sampling was conducted using purposive sampling, with 50 respondents per intervention group (25) and a control group of 25. The inclusion criteria in this study are osteoarthritis patients in the age range of 45-65 years who do not have vision or hearing limitations and can access smartphones. The exclusion criteria included patients who did not have knee replacement surgery after osteoarthritis, stroke patients, patients who refused, and patients with other conditions. The researcher also set the dropout criteria: participants who could not participate in the intervention for 2 consecutive times and withdrew before the intervention was completed. Data obtained from these participants could not be included in the analysis due to insufficient information.

Intervention

In this study in the intervention group was given a mobile application once a week for 4 weeks. The mobile application contains OA education, Pain Assessment, OA Physical Activity, Nutrition & Lifestyle Monitoring, Reminder Time, and Chatbot.

Instrument

The instrument is an SF-36 used to measure pre-test and post-test scores. This instrument has been validated and declared reliable.

Data Analysis

The data is processed using SPSS version 21.0 for Windows. The analysis consisted of univariate analyses to describe the demographic characteristics and quality of life of respondents, and bivariate analyses to test differences between pre-test and post-test quality scores. If the data are normally distributed, a Paired Sample T-test is applied. The Wilcoxon Signed-Rank test is used when the data are not normally distributed.

Ethical Considerations

This research received ethical approval from the ethics committee of the Brahmanda Lantern Chakra Institute (number 057/06/X/EC/KEP/LCBL/2025) before data collection. All research procedures are carried out in accordance with established ethical standards, ensuring the protection of participants' rights, safety, and confidentiality.

RESULT**Table 1.** Distribution of Respondent Frequency by Age, Sex, Education, Occupation, Length of Suffering in *Osteoarthritis Patients* in the Intervention and Control Group (n=50)

Characteristic	Group			
	Intervention		Control	
	Quantity (n)	Percentage (%)	Quantity (n)	Percentage (%)
Age				
46-55 Year	10	40	4	16
56-65 Year	14	56	18	72
66-77 Year	1	4	3	12
Total	25	100	25	100
Gender				
Male	8	32	10	40
Women	17	68	15	60
Total	25	100	25	100
Education				
No School	3	12	4	16
Elementary School	9	36	10	40
Junior High School	6	24	5	20
High School	7	28	6	24
Total	25	100	25	100
Long Suffering				
≤ 1 year	5	20	5	20
2-3 years	14	56	13	52
>3 years	6	24	7	28
	25	100	25	100
Jobs				
Labor	3	12	5	20
IRT	12	48	10	40
Self-employed	2	8	4	12
PNS	5	20	4	12
Private	3	12	2	8
Total	25	100	25	100

Based on Table 1, the characteristics of respondents based on age in the intervention group showed that the majority of older people were in the range of 56–65 years (56%), followed by the age of 46–55 years (40%), and at least 66–77 years old (4%). Meanwhile, in the control group, the majority of older people were in the age range of 56–65 years (72%). Based on gender, most respondents in the intervention group were female (17, 68%), and in the control group, 15 (60%). Based on education level, respondents in the intervention group were dominated by elementary school (9, 36%), followed by high school (28%), junior high school (24%), and non-school (12%). Meanwhile, in the control group, the highest proportion was observed among the 10 respondents with elementary school education (40%), followed by non-school (16%), junior high (20%), and high school (24%).

Table 2. Distribution of respondent frequency by quality of life in *osteoarthritis patients* in the intervention and control group (n=50)

Group	Min-Max	Mean $\pm$ SD
Intervention		
Pretest	20-80	37.60 $\pm$ 14.95
Posttest	50-85	70.20 $\pm$ 10.79
Control		
Pretest	20-67	36.00 $\pm$ 9.87
Posttest	20-68	36.12 $\pm$ 10.24

Based on Table 2, the distribution of respondents is shown by quality of life in the intervention and control groups. The intervention group had an average quality of life pretest score of 37.60 and a posttest score of 70.20. Meanwhile, in the control group, the average value of quality-of-life pretest was 36.00 dan posttest 36.12.

Table 3. Results of Data Analysis on the Influence of Mobile-Based Educational Media to Improve Quality of Life in Osteoarthritis Patients (n=50)

Group	Mean Pre	Mean Post	t	df	Sig.	Effect Size
Intervention	37.60	70.20	-10.373	24	0.001	-2.075
Control	36.00	36.12	-0.486	24	0.63	-0.097

The results of the analysis in Table 3 show that in the intervention group, there was a very significant difference in quality-of-life scores before and after the intervention ($t = -10.373$; $p < 0.001$). Meanwhile, based on Cohen's effect size ($d = -2.075$), it can be concluded that mobile-based educational interventions have a very large effect on the quality of life of people with OA. In contrast, in the control group, no significant difference was found between pretest and posttest scores ($p = 0.632$) with a very small effect size ($d = -0.097$), suggesting that no meaningful change in quality of life occurred without intervention.

DISCUSSION

From the results of the characteristic data table 1, it was concluded that most respondents were in the age range of 56-65 years. Physiologically, in this age range, there is a decrease in cartilage elasticity, a decrease in synovial fluid, and a decrease in the strength of the joint-supporting muscles, which are at risk of osteoarthritis (Öztoprak & Sayar, 2025). While gender was not controlled, most respondents were female in both the intervention and control groups. The dominance of female respondents in this study is in line with epidemiological evidence showing that osteoarthritis is more common in women, especially after menopause. Hormonal changes, particularly decreases in estrogen, play a role in accelerating cartilage degradation and increasing joint inflammation (Pasqualotto et al., 2025). Based on education level, respondents in the intervention and control groups were predominantly at the last level of education, elementary school. Based on the respondents' characteristics by education level, most respondents have a basic level of education, which has implications for their limited understanding of chronic disease management. Low levels of education are often associated with low health literacy, which has an impact on patients' ability to perform optimal self-care management (Plavoukou et al., 2025). This condition underscores the importance of educational interventions delivered with a simple, easy-to-understand approach, including through mobile-based media.

Based on OA duration, most respondents in both groups were in the 2- to 3-year category. The length of time suffering from OA, dominated by categories 2 to 3 years, indicates that the respondents have been in a phase of chronic disease that requires a long-term management strategy. Patients with a longer duration of illness tend to experience limited physical function and a decrease in quality of life if not accompanied by adequate self-care management (Sharma et al., 2024). The job characteristics indicated that the majority of respondents worked as housewives (IRT). The majority of respondents who work as housewives indicate that repetitive physical activity, such as standing for a long time, lifting weights, and unergonomic working positions, has the potential to worsen OA symptoms. These findings are in line with previous research that stated that daily physical workload contributes to joint pain and functional limitations in osteoarthritis patients (Thornton et al., 2025). Overall, the characteristics of the respondents in this study reflect the population of OA patients at the Baki Sukoharjo Health Center, thus supporting the relevance and generalization of the research results, especially in the development of mobile-based education for the elderly.

The results of the analysis in Table 3 show that in the intervention group, the quality-of-life score improved significantly from before to after the intervention ($t = -10.373$; $p < 0.001$). Meanwhile, based on Cohen's effect size ($d = -2.075$), it can be concluded that mobile-based educational interventions have a very large effect on the quality of life of people with OA. In contrast, in the control group, no significant difference was found between pretest and posttest scores ($p = 0.632$) with a very small effect size ($d = -0.097$), suggesting that no meaningful change in quality of life occurred without intervention. The results of the paired-samples t-test showed that mobile-based education significantly improved the quality of life of osteoarthritis patients in the intervention group. The statistically significant increase in quality-of-life scores indicates that the interventions provided improve the patient's ability to manage their condition independently across physical, psychological, and social aspects (Miller et al., 2022). These findings are in line with the concept of self-care, which emphasizes individuals' empowerment in controlling symptoms, maintaining function, and improving well-being in chronic diseases (H.-N. Wang et al., 2024).

The large effect size suggests that the intervention is not only statistically significant but also has strong clinical significance (Eka Mayasari et al., 2025). The large effect size indicates that the changes observed are felt in the patient's daily life, such as reduced pain, increased mobility, and the ability to perform daily activities more independently (D. Zhu et al., 2025). These results reinforce the evidence that mobile technology-based interventions have great potential in the management of osteoarthritis, especially in elderly populations that require a sustainable and accessible educational approach (Z.-R. Wang et al., 2025).

In contrast, the absence of significant differences in the control group suggests that, without structured educational interventions, the quality of life of osteoarthritis patients is unlikely to improve (B. Zhu et al., 2025). Osteoarthritis is a progressive degenerative disease, so without adequate self-care strategies, patients are at risk of experiencing a decline in physical function and quality of life (Yuan et al., 2025). The very small effect size in the control group indicated that the changes were minimal and clinically meaningless.

The results of this study are consistent with previous studies reporting that mobile-based educational interventions (mHealth) significantly improved patients' quality of life, self-efficacy, and adherence to exercise programs and pain management in OA (Zhang et al., 2025). Mobile media allows patients to access information at any time, repeat material as needed, and increase

active involvement in the self-care process without waiting for medical personnel to provide education (S. J. Zhu et al., 2025).

In addition, mobile-based education also supports the principles of comprehensive care, especially for patients with reduced mobility. OA patients often face barriers to accessing health services directly, so a digital approach is an effective way to provide education and continuous monitoring. Thus, the results of this study strengthen the evidence that mobile-based education is an effective and relevant nursing intervention in improving the quality of life of patients. In addition, this mobile-based education can reduce dependence on pharmacological therapy.

CONCLUSION

This study demonstrated that mobile-based educational interventions were effective in improving the quality of life among patients with osteoarthritis in the working area of the Baki Health Center, Sukoharjo. Patients who received the four-week mobile education program experienced substantial improvements in quality-of-life scores compared with the control group, which showed no meaningful change. These findings indicate that mobile health education can strengthen patient self-management, increase adherence to recommended lifestyle modifications, and improve physical and psychosocial well-being among individuals with chronic musculoskeletal conditions. The intervention was particularly relevant for older adults with limited mobility and restricted access to continuous face-to-face education. Features such as pain assessment, activity guidance, reminders, and educational content delivered through mobile applications enabled more flexible and sustainable patient engagement. The large effect size observed in this study also suggests that the intervention has important clinical relevance beyond statistical significance.

Based on these findings, integrating mobile-based education into primary healthcare services should be considered as an evidence-based strategy to support osteoarthritis management. Health policymakers and healthcare providers are encouraged to expand digital health interventions, strengthen digital literacy programs, and improve accessibility of mobile health technologies for elderly populations in community settings.

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Conflict of Interest

The authors declare that there are no financial, professional, or personal conflicts of interest that could have influenced the design, implementation, analysis, or reporting of this study.

Authors' Contributions (CRediT Taxonomy)

Agung Widiastuti: Conceptualization, Methodology, Investigation, Data Curation, Writing – Original Draft.

Purwido Purwido: Supervision, Validation, Formal Analysis, Writing – Review & Editing.

Ady Irawan. AM: Software, Resources, Data Analysis, Visualization, Investigation.

Carissa Putri Maharani: Literature Review, Data Collection, Project Administration, Writing – Review & Editing.

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Declaration of Generative AI Use

The authors declare that generative artificial intelligence tools were used only to assist with language refinement, grammar checking, and manuscript organization. All research activities, including study design, data collection, data analysis, interpretation of findings, and final scientific conclusions, were conducted independently by the authors. The authors take full responsibility for the originality, accuracy, and integrity of the manuscript content.

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