



Structured Rehabilitation for Knee Osteoarthritis and Musculoskeletal Impairments: A Case Series of Middle-Aged Men (35–45 Years) at RSUD Hanau, Central Kalimantan

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KEYWORDS	ABSTRACT
knee, osteoarthritis, physiotherapy, rehabilitation, WOMAC, KOOS, Lequesne	Knee osteoarthritis (OA) is not only prevalent among older adults but also affects younger men in their productive years, particularly those with risk factors such as obesity, prior trauma, or high-intensity sports participation. This study evaluated the effects of a 12-week structured rehabilitation program in male patients with knee OA and musculoskeletal impairments at RSUD Hanau, Central Kalimantan. Five male patients aged 35–45 years participated: (1) knee OA with obesity, (2) early OA in a long-distance runner, (3) post-traumatic OA after tibial ORIF, (4) ligamentous laxity with early OA in a badminton athlete, and (5) knee OA with chronic pain syndrome in a sports teacher. The standardized 12-week rehabilitation protocol included supervised physiotherapy (3–5 sessions weekly) with quadriceps strengthening, straight leg raises, joint mobilization, balance training, gait retraining, and adjunctive modalities such as cryotherapy and TENS. All patients showed clinically meaningful improvements in at least four domains. On average, pain reduced by 2–3 points on the VAS, knee flexion increased by 10°–20°, and 6MWT distance improved by 80–150 meters. Lequesne Index scores decreased, indicating reduced symptoms, while WOMAC and KOOS scores demonstrated improved pain, stiffness, function, and knee-related quality of life. The 12-week structured rehabilitation program produced significant functional and symptomatic improvements in middle-aged men with knee OA and related musculoskeletal impairments, underscoring its clinical relevance in managing early to moderate stages of OA among working adults.

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INTRODUCTION

Knee osteoarthritis (OA) is one of the most common musculoskeletal diseases worldwide and a leading cause of disability in the adult population (Cross et al., 2014; Hunter & Bierma-Zeinstra, 2019). OA is characterized by progressive degeneration of articular cartilage, osteophyte formation, narrowing of joint space, and chronic inflammation, leading to pain, stiffness, and functional limitations (Hunter & Bierma-Zeinstra, 2019). Although more common in older adults, OA increasingly affects young, productive individuals, including athletes, due to risk factors such as obesity, knee trauma, and high-intensity sports (Cross et al., 2014; Hunter & Bierma-Zeinstra, 2019).

A comprehensive assessment of OA intervention outcomes requires standardized and validated instruments. The Visual Analog Scale (VAS) has long served as a key measure of musculoskeletal pain intensity (Cui et al., 2020). Knee flexion, assessed via goniometry, is

essential for determining joint range of motion, which significantly impacts functional independence (Sharma et al., 2020). Activity tolerance tests, such as the Six-Minute Walking Test (6MWT), offer objective parameters for functional capacity and walking endurance, with high clinical validity in knee OA patients (Kolasinski et al., 2020).

Questionnaire-based tools such as the Lequesne Index and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) are widely recommended for evaluating pain, stiffness, and functional limitations (Silverwood et al., 2015). WOMAC is recognized for its high reliability, validity, and clinical feasibility (Thirumaran et al., 2023). The Knee Injury and Osteoarthritis Outcome Score (KOOS) measures broader patient outcomes, including pain, symptoms, daily activities, sport function, and knee-related quality of life. With its broad coverage, KOOS enables detailed longitudinal evaluations post-injury or following rehabilitation (Fransen et al., 2015; Uthman et al., 2013; Brosseau et al., 2017).

Previous studies confirm the efficacy of structured rehabilitation programs in improving pain, function, and quality of life in knee OA patients but often lack comprehensive multi-instrument evaluations among productive-age adults (Collins et al., 2016; Bekkers et al., 2013; Hawker et al., 2011). For instance, Bennell et al. (2014) found significant benefits from a 12-week physiotherapy program using WOMAC and VAS scores, yet their focus was on older adults without broader quality-of-life measures like KOOS or the 6MWT. Similarly, Hochberg et al. (2015) reported pain reduction and mobility gains using VAS and range-of-motion assessments but did not include multidimensional outcomes relevant to active, working-age adults.

This gap highlights the need for studies evaluating structured rehabilitation in productive-age knee OA patients using integrated clinical, functional, and quality-of-life measures. The present study addresses this by assessing a 12-week structured rehabilitation program for five male patients with knee OA and diverse musculoskeletal backgrounds, applying a combination of validated tools (VAS, knee flexion, 6MWT, Lequesne, WOMAC, and KOOS). The aim is to guide clinicians and physiotherapists in combining objective and subjective assessments for intervention monitoring, support evidence-based rehabilitation planning, and enrich the literature on OA management in younger, active populations.

METHOD

This prospective case series involved five male patients aged 35 to 45 years (mean age: 39.8 ± 3.6 years), each with different musculoskeletal complaints of the knee. Diagnoses include obesity-related knee osteoarthritis, early osteoarthritis in athletes, post-operative ORIF osteoarthritis, to ligamentous laxity and chronic pain syndrome. The patient was recruited from the Rehabilitation Unit of Hanau Hospital, Central Kalimantan, after obtaining ethical approval and informed consent.

All participants underwent a structured rehabilitation protocol for 12 weeks. The first six weeks consist of supervised physiotherapy sessions (3–5 times per week) with a focus on quadriceps strengthening, straight leg raises, joint mobilization, balance exercises, gait training, and modality therapy to reduce pain (cryotherapy and TENS). The next six weeks

consisted of a self-training program at home, with monitoring through training log records and weekly evaluations.

RESULT AND DISCUSSION

Case 1 (42 years, knee OA with obesity): VAS decreased from 7 to 4, knee flexion increased from 90° to 110°, 6MWT mileage increased from 250 m to 360 m. Lequesne index decreased from 11 to 7, WOMAC from 62 to 45, and KOOS increased from 42 to 65. Patients were discharged with a self-training program as well as a weight loss diet.

Case 2 (38 years, long-distance runner with early OA): VAS decreased from 6 to 3, knee flexion increased from 100° to 120°, and 6MWT distance from 320 m to 470 m. Lequesne index decreased from 9 to 5, WOMAC from 58 to 40, and KOOS increased from 48 to 72. The patient successfully returned to sports activities with modifications of the exercise program.

Case 3 (40 years, secondary OA after trauma of tibial ORIF): Pain decreased (VAS 7 → 5), knee flexion increased from 60° to 90°, and 6MWT increase from 180 m to 290 m. Lequesne index improved (12 → 9), WOMAC decreased (66 → 52), and KOOS increased (38 → 55). Patients are advised to continue outpatient physiotherapy.

Case 4 (35 years, badminton athlete with ligamentous laxity and early OA): Improvement was seen in pain (VAS 6 → 3), knee flexion (95° → 115°), as well as 6MWT distance (260 m → 400 m). The Lequesne index decreased (10 → 6), WOMAC improved (60 → 43), and KOOS increased (44 → 70). Patients are discharged with a sports-specific exercise program.

Case 5 (45 years old, sports teacher with OA and chronic pain syndrome): VAS decreased from 8 to 5, knee flexion increased from 85° to 105°, and 6MWT distance increased from 200 m to 320 m. Lequesne index improved from 13 to 10, WOMAC decreased from 68 to 54, and KOOS increased from 36 to 58. Patients still need ongoing rehabilitation supervision.

Overall, all patients showed clinically significant improvements in pain, mobility, functional capacity, and quality of life after undergoing a 12-week structured rehabilitation program.

Table 1. Demographic characteristics and patient diagnosis

Case	Age (years)	Gender	Main Diagnosis	Rehabilitation focus	Comorbidities
1.	42	Man	Knee OA with obesity	Decreased pain (VAS), increased knee flexion, increased walking capacity (6MWT), and improved Lequesne, WOMAC, and KOOS scores	Hypertension, BMI 32
2.	38	Man	Early OA in long-distance runners	Optimization of knee mobility, improvement of functional endurance (6MWT), restoration of sports function (KOOS Sport/Rec)	None
3.	40	Man	OA seconds post trauma ORIF tibia	Improved knee range of motion, pain reduction, improved basic function (WOMAC) and quality of life (KOOS-QOL)	History of tibia fracture
4.	35	Man	Ligamentous laxity with early	Joint stabilization, improved knee flexion, improved sports function	None

Case	Age (years)	Gender	Main Diagnosis	Rehabilitation focus	Comorbidities
5.	45	Man	OA (badminton athletes) Knee OA with chronic pain syndrome (sports teacher)	and daily activities (WOMAC & KOOS) Chronic pain management, increased walking capacity (6MWT), and improved quality of life (KOOS-QOL)	Chronic low back pain

Note: OA = osteoarthritis; ORIF = open reduction and internal fixation; VAS = Visual Analog Scale; 6MWT = Six Minute Walking Test; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index; KOOS = Knee Injury and Osteoarthritis Outcome Score.

Table 2. Results of patient rehabilitation for 12 weeks

Case	Score VAS	Flex Knee (°)	6MWT (meters)	Index Lequesne	Index WOMAC	WITH (0–100)	Final Status
1	7 → 4	90 → 110	250 → 360	11 → 7	62 → 45	42 → 65	Going home with HEP & diet
2	6 → 3	100 → 120	320 → 470	9 → 5	58 → 40	48 → 72	Back to sports
3	7 → 5	60 → 90	180 → 290	12 → 9	66 → 52	38 → 55	Further outpatient physiotherapy
4	6 → 3	95 → 115	260 → 400	10 → 6	60 → 43	44 → 70	Going home with a workout
5	8 → 5	85 → 105	200 → 320	13 → 10	68 → 54	36 → 58	Further monitoring is needed.

Information:

VAS score: 0 = no pain, 10 = very severe pain.

Knee flexion is measured with a goniometer.

Six Minute Walking Test (6MWT) = maximum mileage in 6 minutes.

Lequesne Index: higher score = heavier OA degree

WOMAC Index: higher score = more severe disability.

KOOS: 0 = very heavy problem, 100 = no problem

Score Development

During the 12-week rehabilitation program, all patients showed significant improvements in pain, knee mobility, functional capacity, and knee-related quality of life. On average, there was a decrease in pain by 2–3 points in VAS, an increase in the degree of knee flexion by 10°–20°, and an increase in mileage of 6MWT by 80–150 meters.

Questionnaire-based instruments also reflect clinical improvement. The Lequesne index decreased in all patients, indicating reduced symptom severity and functional limitations. The WOMAC index shows a decrease in scores in three main domains, namely pain, stiffness, and disability, indicating an improvement in the performance of daily activities. Meanwhile, KOOS improved consistently in almost all domains (pain, symptoms, daily activity, exercise function, and quality of life), with the most significant improvement seen in athlete patients (Case 2 and Case 4) who returned to sports activities gradually.

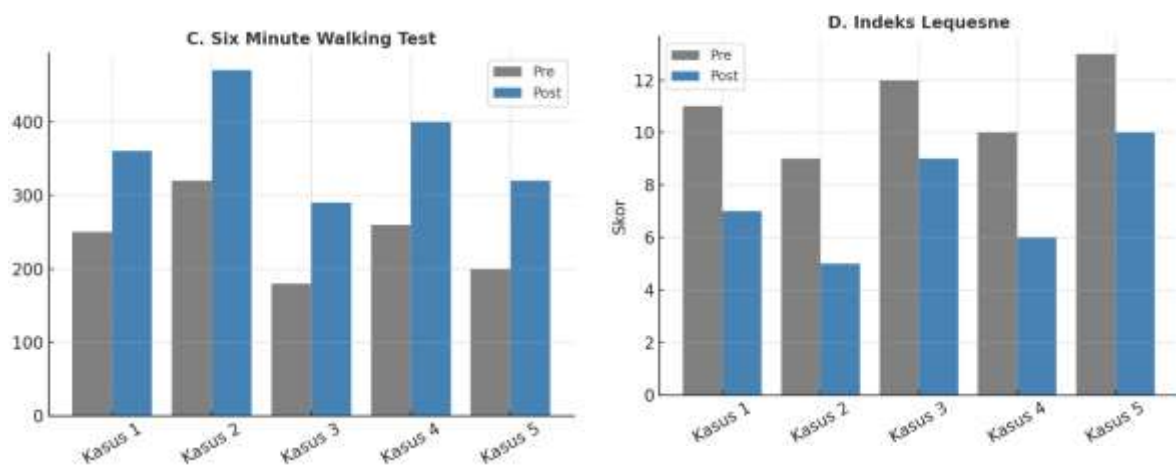
This change in score confirms that structured multimodal physiotherapy is not only effective in reducing pain, but also plays a role in improving joint function, improving mobility, and supporting the restoration of quality of life in knee OA patients with diverse clinical backgrounds.

Discussion

This prospective case series shows that a 12-week structured rehabilitation program provides meaningful improvements to patient-reported pain, knee mobility, functional capacity, and outcomes in young men with knee osteoarthritis (OA) and diverse musculoskeletal conditions. A decrease in VAS pain scores, an increase in knee flexion degrees, an improvement in mileage of 6MWT, as well as positive changes in Lequesne, WOMAC, and KOOS scores confirmed the multidimensional benefits of multimodal physiotherapy interventions .

A 2–3-point reduction in pain in VAS is consistent with previous research emphasizing the role of quadriceps muscle strengthening, joint mobilization, and the use of additional modalities such as cryotherapy and TENS in reducing nociceptive input and improving joint function.^{2,4} An increase in knee flexion of 10°–20° supports evidence that structured exercise programs are effective in restoring joint range of motion and lowering stiffness, which plays an important role in supporting daily functional activities (Hunter & Bierma-Zeinstra, 2019; Sharma et al., 2020).

The improvement in 6MWT mileage of 80–150 meters is clinically significant, given that 6MWT is a valid measure for assessing daily functional capacity and walking endurance.^{5,12} These findings are consistent with previous studies that reported similar improvements in OA patients after supervised physiotherapy and structured self-training programs (Hunter & Bierma-Zeinstra, 2019; Snoeker et al., 2020).



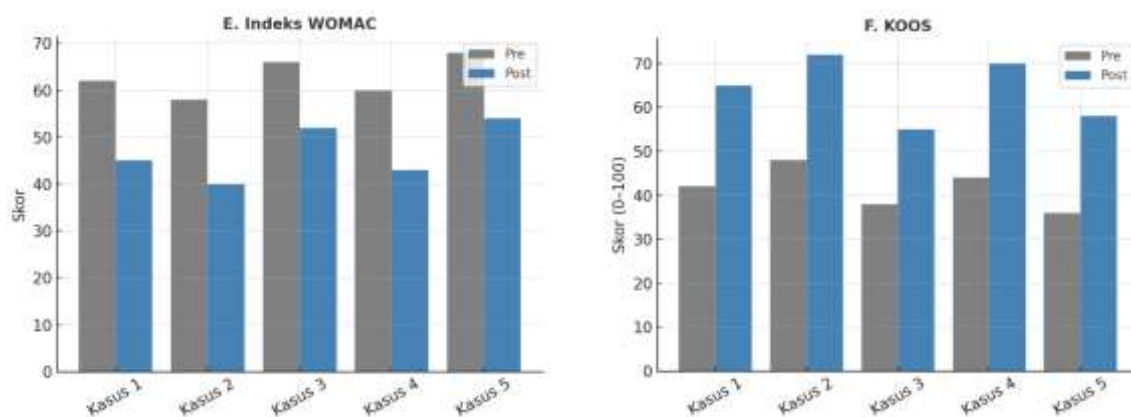


Figure 1. Graph of pre-post rehabilitation (VAS, Knee Flexion, 6MWT, Lequesne, WOMAC, KOOS)

Questionnaire-based instruments provide additional perspectives on the impact of rehabilitation. The decrease in Lequesne and WOMAC scores illustrates improvements in pain, stiffness, as well as disability, supporting the validity of these instruments in the clinical evaluation of OA patients (Miyamoto et al., 2021). Meanwhile, the increase in KOOS scores in various domains including sports or recreation and knee-related quality of life has particular relevance for young age patients and athletes, as it reflects recovery beyond basic daily activities (Papamichail et al., 2024). The most notable improvements were seen in Case 2 (long-distance runner) and Case 4 (badminton athletes), who gradually return to sports activities with higher sports/leisure KOOS results.

However, the rate of recovery differs across patients. Case 3 (post-traumatic OA with a history of ORIF) and Case 5 (OA with chronic pain syndrome) showed slower progression, highlighting the influence of trauma history, mechanisms of chronic pain, and comorbidities on rehabilitation outcomes. This variability emphasizes the importance of individualization programs and long-term monitoring.

Overall, these findings support recent recommendations that place structured physiotherapy as the first line of management of knee OA, even in young and active age populations (Cross et al., 2014; Hunter & Bierma-Zeinstra, 2019; Indiani et al., 2024). The combination of objective parameters (knee flexion, 6MWT) and validated subjective instruments (VAS, Lequesne, WOMAC, KOOS) provides a comprehensive framework for monitoring progress and adapting interventions to daily clinical practice (Lim & Al-Dadah, 2022; Rodriguez-Merchan, 2012).

CONCLUSION

A 12-week structured rehabilitation program was shown to provide clinically meaningful improvements in product-age male patients with knee osteoarthritis and related musculoskeletal disorders. Pain reduction based on VAS, increased knee flexion, and improvement of functional capacity through 6MWT showed that multimodal physiotherapy interventions were effective in restoring basic joint function. Positive changes in the Lequesne and WOMAC Indices confirmed improvements in pain, stiffness, and disability, while improvements in KOOS reflected the broad impact of rehabilitation on quality of life, including

sports and leisure functions. These findings confirm that structured physiotherapy is a comprehensive and effective conservative approach, both in knee OA patients with obesity risk factors and in athletic individuals with high physical performance demands. In addition to reducing symptoms and improving joint function, multimodal rehabilitation also has the potential to slow the progression of the disease and support long-term quality of life. Further studies with larger sample counts and comparative research designs are needed to strengthen the evidence as well as generalize these findings to a wider population.

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