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Research Article

The Relationship between Knee Functional Disability and Sleep Quality in Genitourinary Osteoarthritis Patients: A Systematic Literature Review

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Abstract: Knee osteoarthritis is a leading cause of chronic pain and functional disability, particularly among adults and the elderly, and is often accompanied by sleep disturbances. The functional disability of the knee and sleep quality are interrelated, contributing to a decline in patients' quality of life. This systematic literature review aims to examine the relationship between knee functional disability and sleep quality in patients with knee osteoarthritis, evaluating the consistency and strength of this connection based on recent studies. Following PRISMA guidelines, a search of the Scopus, PubMed, Google Scholar, SpringerLink, and ScienceDirect databases was conducted for articles published from 2021 to 2025. Inclusion criteria encompassed studies on knee osteoarthritis patients, addressing knee functional disability and sleep quality through cross-sectional, cohort, or quasi-experimental designs. Ten articles met the inclusion criteria and were analyzed using a descriptive-narrative approach. Results showed a significant association between knee functional disability and poor sleep quality, with pain, stiffness, and activity limitations identified as key contributors. Many studies reported a bidirectional relationship, where sleep disturbances increased pain and worsened functional limitations. About 60% of studies highlighted sleep quality as a predictor of functional decline and knee osteoarthritis progression. These findings emphasize the importance of a rehabilitation approach that includes improving sleep quality to manage knee osteoarthritis effectively.

Keywords: Knee Functional Disability; Knee Osteoarthritis; PRISMA; Sleep Quality; Systematic Literature Review.

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1. Introduction

Knee osteoarthritis (OA genu) is one of the leading causes of chronic pain and functional disability among adult and elderly populations, with a continuously increasing global disease burden. Global Burden of Disease analyses indicate that both the prevalence and absolute number of osteoarthritis cases have increased significantly over recent decades, making OA a major contributor to years lived with disability worldwide (Wang et al., 2024). The knee joint is the most commonly affected site and accounts for the largest proportion of the global osteoarthritis burden. In Indonesia, national clinical guidelines also emphasize that knee OA is one of the most frequently encountered musculoskeletal problems in clinical practice and is expected to continue increasing alongside population aging and lifestyle changes (Indonesian Rheumatology Association, 2023).

Conceptually and biologically, knee OA is no longer viewed solely as a degenerative cartilage disorder, but rather as a whole-joint disease involving the subchondral bone, synovial membrane, ligaments, joint capsule, and periarticular tissues. Progressive degenerative and inflammatory processes lead to pain, stiffness, decreased muscle strength, limited range of

motion, and joint instability, all of which directly impact patients' functional capacity. Recent literature highlights that OA is also associated with systemic factors such as obesity and metabolic disorders, which exacerbate symptoms and accelerate the decline in physical function (Dell'Isola et al., 2025). Therefore, knee functional disability represents a primary clinical manifestation of knee OA with broad implications for patient independence and quality of life.

Within the framework of the International Classification of Functioning, Disability and Health (ICF), functional disability is understood as the result of dynamic interactions between impairments in body functions and structures, activity limitations, participation restrictions, and personal and environmental factors (World Health Organization, 2001). In patients with knee OA, impaired knee function not only limits basic activities such as walking and climbing stairs but also affects social participation and daily roles. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) is widely used in both research and clinical practice, as it comprehensively measures functional disability and aligns with ICF domains, making it a relevant tool for synthesizing scientific evidence across studies (Gur et al., 2022).

In addition to functional disability, knee OA is also closely associated with impaired sleep quality, which is now recognized as an important comorbidity in chronic musculoskeletal conditions. Persistent pain and functional limitations often lead to difficulty initiating sleep, frequent nighttime awakenings, and reduced sleep efficiency. Empirical evidence demonstrates a bidirectional relationship between functional disability and sleep quality, where functional impairment worsens sleep quality, while poor sleep increases pain sensitivity and reduces functional capacity through neurobiological and inflammatory mechanisms. Longitudinal studies have even shown that poor sleep duration and quality are associated with future outcomes in knee OA (Zhou et al., 2024). However, most studies still focus on the relationship between pain and sleep, with heterogeneity in methods and populations, and limited research specifically examining the role of knee functional disability in sleep quality. Therefore, a systematic literature review is necessary to synthesize existing evidence, identify research gaps, and strengthen the scientific basis for holistic and evidence-based physiotherapy approaches in patients with knee OA (Thorlund et al., 2025).

2. Materials and Method

Study design & Participants: sample size, inclusion/exclusion, recruitment

This study employed a Systematic Literature Review (SLR) method following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, which consist of four main stages: identification, screening, eligibility, and inclusion. In the identification stage, a systematic search for articles was conducted across several academic databases, including Scopus, PubMed, Google Scholar, SpringerLink, and ScienceDirect. The keywords used in the search process were "knee osteoarthritis," "functional disability," and "sleep quality." The inclusion criteria for this study were: (1) patients diagnosed with knee osteoarthritis, (2) studies specifically discussing knee functional disability and sleep quality, (3) study designs including cohort studies, cross-sectional studies, and quasi-experimental studies, (4) publication years ranging from 2021 to 2025, and (5) articles published in Indonesian or English. The exclusion criteria were: (1) patients not diagnosed with knee osteoarthritis, (2) studies not addressing knee functional disability and sleep quality, (3) articles with results not relevant to the research topic, (4) studies using systematic review, expert opinion, meta-analysis, or literature review designs, and (5) articles published before 2021 or in languages other than Indonesian and English.

Variables Studied:

In this study, the primary variable examined was knee functional disability in patients with knee osteoarthritis. Knee functional disability is defined as the limitation in an individual's ability to perform daily functional activities involving the knee joint, including walking, ascending and descending stairs, standing up from a seated position, maintaining a standing position, and other functional activities requiring stability, strength, and range of motion of the knee.

Conceptually, knee functional disability is understood as the result of complex interactions between structural joint damage (such as joint space narrowing, osteophyte formation, and subchondral changes), chronic pain, joint stiffness, weakness of periarticular muscles, and psychosocial factors. Within the framework of the International Classification of Functioning, Disability and Health (ICF), knee functional disability reflects impairments in

the domain of body function and structure, which subsequently lead to activity limitations and participation restrictions (Gur et al., 2022).

No therapeutic intervention was administered in this study, as the design was observational. The exposure was measured objectively using standardized and validated instruments, allowing for the evaluation of the degree of functional disability as the primary independent variable. This approach is consistent with previous studies that position functional disability as an important clinical determinant of various outcomes in osteoarthritis patients, including quality of life and sleep quality.

Outcome measures / Instruments

Functional Disability of the Knee

All articles included in this systematic literature review measured functional disability using standardized and validated instruments, with the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) being the most predominantly used tool.

WOMAC was utilized in the majority of studies due to its ability to assess the three main domains of knee osteoarthritis, namely: pain, stiffness, and physical function.

This instrument has consistently been reported to have strong construct validity and high internal reliability (Cronbach's alpha generally >0.80) across populations in Asia, Europe, and the Middle East (Gur et al., 2022; Şah, 2021; Yannis et al., 2025). One study specifically demonstrated that WOMAC has a high level of alignment with the domains of the International Classification of Functioning, Disability and Health (ICF), particularly within the components of body function and activity limitation (Gur et al., 2022).

Several supporting studies used the KOOS or the Lequesne Index; however, all of these instruments measure comparable constructs, namely the degree of limitation in knee functional activities.

Sleep Quality

Sleep quality in the analyzed studies was primarily measured using the Pittsburgh Sleep Quality Index (PSQI). This instrument was consistently used in studies by Şah (2021), Ali et al. (2025), as well as in other cohort and descriptive studies examining sleep disturbances in patients with knee osteoarthritis.

The PSQI assesses subjective sleep quality over the past month and includes components such as sleep latency, sleep duration, sleep efficiency, sleep disturbances, and daytime dysfunction. This instrument has been reported to have good discriminant validity and adequate internal reliability (Cronbach's alpha approximately 0.70–0.83) in populations with chronic musculoskeletal pain.

Thus, the primary outcome in this systematic literature review is conceptually and methodologically aligned with the source studies, namely subjective sleep quality as a clinical response to knee functional disability.

Statistical Analysis

The statistical analyses reported in the reviewed articles demonstrate consistency in the approaches used. Descriptive analysis was employed to describe subject characteristics, WOMAC scores, and PSQI scores. In addition, the relationship tests most commonly used across studies were Pearson or Spearman correlation tests to analyze the association between knee functional disability and sleep quality.

Several studies also applied multivariate analyses, such as linear regression or logistic regression, to identify independent predictors of sleep quality and functional disability. In data processing, the most frequently used statistical software was SPSS, with statistical significance set at $p < 0.05$.

In this systematic literature review, these statistical analysis results were not recalculated but were synthesized narratively and comparatively to assess the consistency in the direction and strength of relationships between variables.

3. Results and Discussion

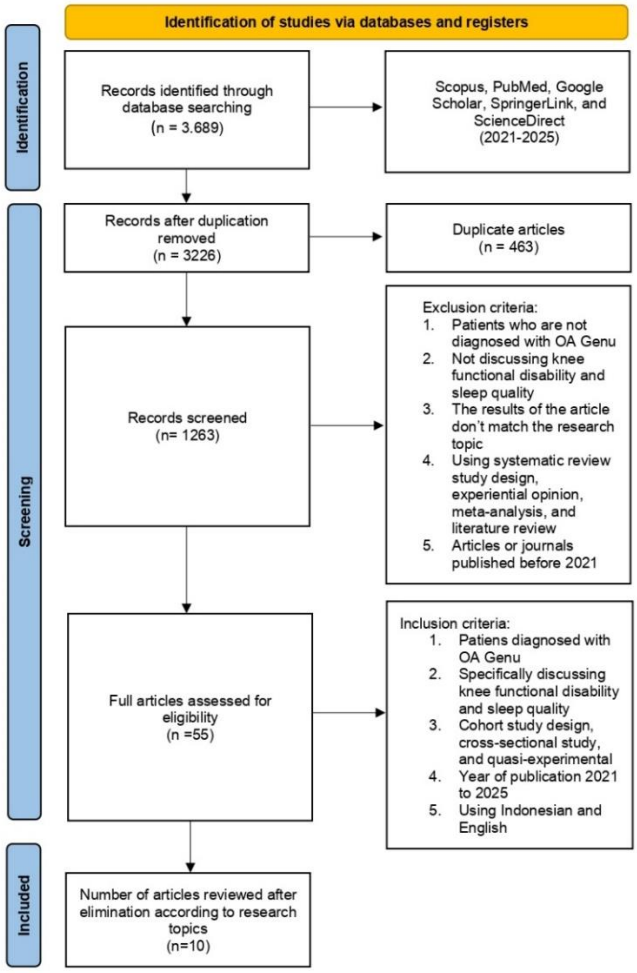

Figure 1. PRISMA Diagram.

Based on the analysis using the PRISMA method in Figure 1, a total of 10 articles were identified as the most relevant to this study and were subsequently selected for further analysis. The distribution of these ten articles is described as follows.

Table 1. Articles included in the reference include author, publisher, and year of publication.

Author & References	Publisher	Year
(Dey et al., 2025)	Student's Journal of Health Research	2025
(Yannis et al., 2025)	Caring: Indonesian Journal of Nursing Science	2025
(Dell'Isola et al., 2025)	Osteoarthritis Research Society International	2025
(Ding et al., 2025)	Journal of Radiation Research and Applied Sciences	2025
(Ali et al., 2025)	Tanta Scientific Nursing Journal	2025
(Pavel et al., 2025)	Multidisciplinary Digital Publishing Institute	2025
(Courties et al., 2024)	Osteoarthritis Research Society International	2024
(Wojcieszek., 2022)	International Journal of Enviromental Research and Public Health	2022
(Gur et al., 2022)	Revista Colombiana de Reumatologia	2022
(Sah Volkan, 2021)	Van Tip Dergisi Medical Journal	2021

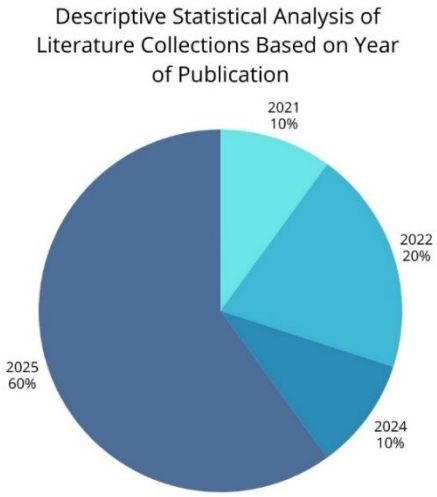

Figure 2. Descriptive Statistical Analysis of Literature Collections Based on Publication Year.

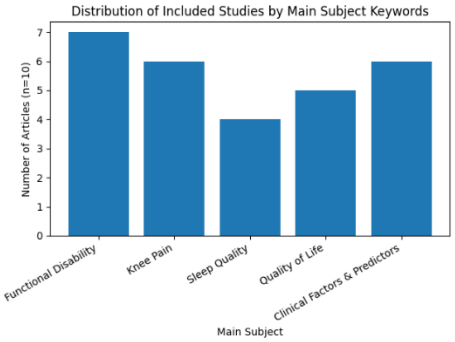

Figure 3. Descriptive Statistical Analysis of Literature Collection Based on Subject Keywords for Review.

The figure above presents the distribution of articles based on publication year and field of study addressing factors related to knee functional disability and its relationship with sleep quality in patients with knee osteoarthritis. The reviewed articles were published between 2021 and 2025, with 2025 being the most dominant year (60%), followed by 2022 (20%), while 2021 and 2024 each contributed 10%.

From the perspective of research fields, functional disability emerged as the most prominent topic, emphasizing its critical role in the focus of the study. Additionally, sleep quality accounted for nearly half of the total articles, indicating that this aspect is also a primary concern in the research. Meanwhile, other topics such as knee pain, quality of life, as well as clinical and predictive factors serve as supporting elements that complement the discussion while remaining closely related to the main issue.

Table 2. Literature Review Research Data and Research Result.

Tittle	Author	Design study	Research subject	Result
Assessment of Pain and Functional Disability in Patients with Knee Osteoarthritis: A Cross-Sectional Study	(Dey et al., 2025)	This study employed a cross-sectional design to evaluate the relationship between pain intensity and functional disability in	The subjects consisted of adult patients with a clinical diagnosis of knee osteoarthritis who were receiving treatment at a tertiary hospital in India.	The results showed a significant positive correlation between pain intensity and the level of functional disability. Increased pain was directly associated with decreased functional ability of the knee, particularly in activities such as walking, standing, and climbing stairs. This study confirms pain as a primary

		patients with knee osteoarthritis.		determinant of functional disability in knee osteoarthritis.
Clinical Predictors of Functional Disability in Knee Osteoarthritis: Risk Stratification Approach as Implications of Nursing Practice	(Yannis et al., 2025)	This was a quantitative study using a cross-sectional analytic design.	The subjects were patients with knee osteoarthritis receiving outpatient care at a teaching hospital in Indonesia.	Pain, advanced age, high body mass index, and disease duration were identified as significant predictors of functional disability. This study emphasizes the importance of risk stratification in nursing practice to prevent the progression of disability.
Osteoarthritis Year in Review 2025: Epidemiology and Therapy	(Dell'Isola et al., 2025)	Narrative review.	International osteoarthritis publications from 2024–2025.	Functional disability and sleep disturbances are increasingly recognized as key clinical outcomes in osteoarthritis. A function-based and quality-of-life–oriented approach is recommended in both research and clinical practice.
A Nomogram for Predicting Total Knee Arthroplasty after Arthroscopy in Knee Osteoarthritis: The Role of Pain, Inflammation, and Sleep	(Ding et al., 2025)	This study employed a retrospective cohort design with a predictive modeling approach through the development of a nomogram.	The subjects were patients with knee osteoarthritis who had previously undergone knee arthroscopy and were followed up to assess the need for total knee arthroplasty (TKA).	Post-arthroscopy pain, systemic inflammatory markers, and poor sleep quality were identified as significant predictors of the need for TKA. The developed nomogram demonstrated good predictive accuracy, confirming that pain and sleep-related factors play an important role in the progression of osteoarthritis.
Sleep Quality and Daily Living for Elderly Patients Diagnosed with Knee Osteoarthritis	(Ali et al., 2023)	Design descriptive correlational.	Elderly individuals diagnosed with knee osteoarthritis in community healthcare settings in Egypt.	Poor sleep quality was significantly associated with reduced daily activity levels. Sleep disturbances exacerbated fatigue, pain, and functional limitations.
Functional Burden and Quality of Life in Hip and Knee Osteoarthritis: A Cross-Sectional Study	(Maria et al., 2025)	Cross-sectional study.	Patients with knee and hip osteoarthritis in Eastern Europe.	Functional disability has a significant impact on both physical and mental quality of life. Patients with knee osteoarthritis exhibit greater limitations in daily activities compared to those with hip osteoarthritis, particularly in the domains of mobility and pain.
Osteoarthritis Year in Review 2024: Epidemiology and Therapy	(Courties et al., 2024)	Narrative review (Year in Review).	International osteoarthritis literature from 2023–2024.	These studies affirm osteoarthritis as a leading cause of global disability. Recent therapeutic approaches emphasize the management of

				pain, functional ability, and quality of life, rather than focusing solely on structural changes.
The Impact of Chronic Pain, Stiffness and Difficulties in Performing Daily Activities on the Quality of Life of Older Patients with Knee Osteoarthritis	(Wojcieszek et al., 2022)	Community-based cross-sectional study.	The subjects were elderly patients with knee osteoarthritis in Poland.	Chronic pain and stiffness were identified as dominant factors contributing to decreased quality of life. Difficulties in daily activities served as the primary mediator between pain and the decline in quality of life.
Comprehensive Health Assessment Based on ICF Components Using the WOMAC Index in Patients with Osteoarthritis	(Gur et al., 2022)	An observational study with a cross-sectional approach based on the International Classification of Functioning, Disability and Health (ICF) framework.	The subjects were patients with knee and hip osteoarthritis who underwent clinical evaluation using the WOMAC Index.	The most affected ICF components were body functions (pain and stiffness) and activity limitations. This study confirms that WOMAC is effective in mapping functional disability in osteoarthritis in accordance with the ICF framework and supports the use of a biopsychosocial approach in rehabilitation.
Relation of Disease Activity with Quality of Life and Sleep Quality in Knee Osteoarthritis	(Şah, 2021)	Cross-sectional study.	The subjects were patients with knee osteoarthritis attending a sports medicine clinic in Turkey.	Higher disease activity was associated with poorer quality of life and sleep quality. This study demonstrates a bidirectional relationship between pain, sleep disturbances, and functional disability.

Discussion

Knee osteoarthritis (KOA) is one of the leading causes of musculoskeletal disability worldwide and shows a significant increasing trend in line with population aging and the rising prevalence of obesity. Recent literature emphasizes that KOA not only affects joint structures but also leads to substantial functional limitations and a decline in patients' quality of life, particularly among the elderly population (Courties et al., 2024; Dell'Isola et al., 2025).

The synthesis of various studies indicates that functional disability is a primary clinical manifestation of KOA. Measurements using standardized instruments such as WOMAC, KOOS, and the Lequesne Index consistently demonstrate limitations in daily activities, particularly in walking, ascending and descending stairs, prolonged standing, and performing household tasks. Moderate to severe levels of disability are commonly found in patients with longer disease duration and higher OA severity (Şah, 2021; Wojcieszek et al., 2022).

Pain has been identified as the dominant factor contributing to functional disability in KOA patients. Nearly all reviewed studies reported a significant positive correlation between pain intensity and decreased physical function. Increased pain is directly associated with reduced mobility and diminished ability to perform basic functional activities, regardless of the degree of structural joint damage observed radiologically (Şah, 2021; Wojcieszek et al., 2022).

In addition to pain, sleep disturbances emerge as a common clinical issue in KOA and play a role in exacerbating functional disability. Studies show that the majority of KOA patients experience poor sleep quality, characterized by prolonged sleep latency, shorter sleep duration, and frequent nighttime awakenings. These sleep disturbances are significantly associated with increased pain and functional limitations (Ali et al., 2025; Şah, 2021).

The relationship between pain, functional disability, and sleep disturbances is bidirectional and mutually reinforcing. Chronic pain can disrupt sleep quality, while poor sleep increases pain sensitivity and fatigue, ultimately worsening limitations in physical activity. This cycle contributes to an overall decline in quality of life, particularly in physical and psychological domains (Courties et al., 2024; Wojcieszek et al., 2022).

Based on the International Classification of Functioning, Disability and Health (ICF) framework, the findings of this review indicate that KOA affects multiple levels, ranging from impairments (pain, stiffness), activity limitations (difficulty walking and performing self-care), to participation restrictions (reduced social involvement and productive activities). Contextual factors such as age, obesity, comorbidities, and psychosocial conditions also influence the level of disability experienced by patients (Dell'Isola et al., 2025).

The clinical implications of these findings emphasize that the management of knee osteoarthritis (KOA) cannot focus solely on joint structural aspects. A comprehensive rehabilitation approach, particularly in physiotherapy, should target pain reduction, improvement of physical function, optimization of sleep quality, and patient education for long-term self-management. Function-based interventions are considered more relevant in preventing the progression of disability (Ali et al., 2025; Courties et al., 2024).

Overall, the results of this systematic literature review indicate that functional disability in patients with knee osteoarthritis is a complex and multidimensional clinical outcome. Pain and sleep disturbances play central roles in exacerbating functional limitations and reducing patients' quality of life. Therefore, a function-based approach integrated with the ICF framework serves as an important foundation for the development of rehabilitation strategies and future research in knee osteoarthritis.

4. Conclusion

This systematic literature review demonstrates that knee osteoarthritis is a chronic musculoskeletal condition that significantly contributes to functional disability and a decline in patients' quality of life. Functional disability emerges as a primary clinical outcome, significantly influenced by pain, disease severity, and the duration of osteoarthritis. In addition, sleep disturbances frequently accompany knee osteoarthritis and play a role in exacerbating physical functional limitations, forming a bidirectional relationship that accelerates the decline in daily activity performance and overall quality of life.

These findings are consistent with the framework of the International Classification of Functioning, Disability and Health (ICF), which emphasizes that knee osteoarthritis simultaneously affects body functions, activities, and participation, along with the influence of contextual factors such as age, obesity, and comorbidities. Therefore, the management approach for knee osteoarthritis should comprehensively focus on functional outcomes through rehabilitation interventions targeting pain control, improvement of physical function, and optimization of sleep quality. This function-based approach is expected to enhance patients' quality of life and serve as an important foundation for clinical practice and future research.

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