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Disability and Management Related to Symptomatic Knee Osteoarthritis in Geriatric Population

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ABSTRACT

Background: *Background: Knee osteoarthritis (OA) is a leading cause of pain and disability among older adults, characterized by degenerative changes in joint cartilage and bone that impair function and quality of life. Despite a growing burden in aging populations, disparities persist in both disease experience and the quality of OA management delivered in community and clinical settings. Assessing disability and patient-reported quality of care is essential to improving management strategies and promoting functional independence in the geriatric population.* ***Objective****: To determine the level of disability and the quality of osteoarthritis care among geriatric patients with symptomatic knee OA and to examine gender-based differences in these outcomes.* ***Methods****: A cross-sectional study was conducted among 385 elderly participants (≥60 years) with symptomatic knee OA recruited from hospitals and clinics in Muridke and Gujranwala, Pakistan, in 2023. Disability was measured using the Knee Injury and Osteoarthritis Outcome Score (KOOS), and care quality was assessed with the Osteoarthritis Quality Indicator Questionnaire (OA-QI). Data were analyzed using SPSS version 24, with independent t-tests comparing mean scores between genders and Pearson correlation testing associations between OA-QI and KOOS domains. A p-value ≤ 0.05 was considered statistically significant.* ***Results****: Of 385 participants, 277 (71.9%) were female and 108 (28.1%) male. Females reported higher OA-QI scores (45.71 ± 3.33 vs. 44.93 ± 3.15, p = 0.036) and significantly higher KOOS Symptom scores (39.07 ± 11.19 vs. 35.91 ± 11.38, p = 0.014). Overall KOOS scores correlated positively with OA-QI (r = 0.43, p < 0.001), indicating that higher quality of care was associated with reduced disability. The odds of symptomatic OA were 2.56 times higher in females than in males (95% CI: 1.87–3.51).* ***Conclusion****: Symptomatic knee osteoarthritis is more prevalent among older females, who nonetheless report better care quality and slightly improved functional outcomes. Enhanced adherence to evidence-based OA management correlates with better pain control, functional capacity, and quality of life. These findings underscore the importance of patient-centered, multidisciplinary approaches in geriatric knee OA care.*

Keywords
Knee Osteoarthritis, Disability, Quality of Care, Geriatric Population, KOOS, OA-QI, Gender Differences

INTRODUCTION

Osteoarthritis of the knee is a progressive, symptomatic disorder characterized by degeneration of articular cartilage and subchondral bone, with patient-reported pain, stiffness, and functional limitations that materially affect health-related quality of life (1). Instruments developed for symptomatic knee osteoarthritis (OA) demonstrate acceptable construct validity and response characteristics in clinical populations, underscoring the centrality of patient-reported outcomes for evaluating disease burden and care quality (2). In elderly cohorts with symptomatic knee OA, multimorbidity and frailty are common and exacerbate disability, highlighting the need to understand not only impairment but also how care is delivered and experienced (3). Biological heterogeneity—ranging from low-grade systemic inflammation to lipidomic and leukocyte biomarkers—appears to shape prognosis and pain trajectories, implying that patient-level factors may interact with management quality to influence outcomes (4). Psychosocial determinants, including anxiety, depression, and illness perceptions, are independently associated with pain intensity and social participation, reinforcing a biopsychosocial framing of disability in knee OA (5).

Across the lifespan, symptomatic knee OA diminishes quality of life, including in individuals with prior knee ligament reconstruction, indicating that structural joint changes and symptom burden can persist despite prior surgical care (6). Exposures such as lifetime cigarette smoking correlate with radiographic OA, but radiographic severity incompletely explains symptoms, reminding researchers that disability should be measured directly with validated patient-reported tools (7). Imaging modalities—ultrasound and standardized ultrasound scoring systems—capture tissue-level abnormalities that correlate imperfectly with pain, again motivating symptom-centered outcomes alongside structural assessments (8,9). In middle-aged women, symptomatic bone marrow lesions are linked to reduced bone mineral density, providing a plausible substrate for pain and function loss that may be differentially distributed by sex (10). Metabolic comorbidity clusters further modulate symptomatic severity and functional outcomes in knee OA, a consideration especially salient in geriatric populations with high cardiometabolic multimorbidity (11).

Patterns of healthcare utilization in older persons with knee OA reveal gaps in access to recommended conservative care, including exercise therapy and weight management, potentially widening disability disparities (12). Metabolomic signatures associate with pain in symptomatic knee OA, suggesting distinct biological pathways that standard analgesic strategies may not fully address, which places additional emphasis on the quality of multimodal management provided to patients (13). Early structural abnormalities on magnetic resonance imaging relate to knee symptoms before advanced radiographic change, indicating a window for symptom-focused interventions that could mitigate downstream disability if appropriately delivered and adhered to (14). Occupational and environmental stressors may further degrade function and quality of life in symptomatic OA, particularly in physically demanding contexts typical of rural and older working populations (15). Even seemingly benign biomechanical interventions such as unloading footwear alter plantar force distribution but have variable symptomatic benefit, reinforcing the need to measure what matters to patients using robust scales such as the Knee injury and Osteoarthritis Outcome Score (KOOS) (16).

Self-management strategies are widely recommended in community-dwelling older adults with knee pain, yet real-world adoption is inconsistent, and effectiveness depends on health literacy, motivation, and the structure of delivered care—features that can be assessed with an osteoarthritis quality-of-care indicator approach (17). Emerging clinical observations in regional contexts show that activity patterns of the affected limb can influence contralateral limb pain, adding nuance to rehabilitation targets and adherence counseling in unilateral disease (18). Exercise programs improve KOOS domains and functional performance, whereas adjunctive modalities (e.g., dry needling) may provide additional pain and function gains in selected patients, but their real-world impact hinges on access, implementation fidelity, and patient engagement—dimensions conceptually captured by care-quality indicators. Body weight change correlates with pain and functional improvement in symptomatic knee OA, and weight control remains a cornerstone of conservative management in geriatric care pathways (19).

Within this biopsychosocial and health-services framework, a critical knowledge gap persists in South Asian geriatric populations: the magnitude of disability in symptomatic knee OA as directly experienced by patients, and the extent to which the quality of osteoarthritis care delivered in routine clinical settings aligns with recommended practices. Given sex differences reported in symptomatic prevalence and potential biological and sociocultural contributors to care access, quantifying disability with KOOS and evaluating patient-reported quality of OA care with a validated indicator set (OA-QI) can yield actionable insights for service design and targeted rehabilitation in older adults. Therefore, this cross-sectional study aimed to estimate disability burden and patient-reported quality of OA care among geriatric patients with symptomatic knee osteoarthritis and to compare these outcomes by sex using KOOS and OA-QI. We hypothesized that females would report greater disability and differential quality-of-care experiences compared with males after accounting for sampling variability

MATERIAL AND METHODS

This cross-sectional observational study was designed to quantify disability and evaluate the quality of osteoarthritis care among geriatric patients diagnosed with symptomatic knee osteoarthritis (KOA). The study was conducted in multiple healthcare facilities, including public and private hospitals and clinics in Muridke (District Sheikhupura) and Gujranwala (District Gujranwala), Punjab, Pakistan, during 2023. The rationale for choosing this setting was the high prevalence of symptomatic knee OA among the geriatric population and the need for representative data from both urban and peri-urban clinical environments where health service quality may vary.

Participants aged 60 years and above, of either sex, who had a clinical diagnosis of symptomatic knee osteoarthritis based on history and physical examination by orthopedic or rehabilitation physicians, were eligible for inclusion Participants were required to have a history of knee pain persisting for at least three months. Exclusion criteria included a history of recent trauma, prior surgical procedures involving the target knee (such as high tibial osteotomy), comorbid psychiatric or neurological conditions such as depression, inflammatory arthropathies (including gout), and metabolic bone diseases such as Paget's disease. Recruitment was carried out through consecutive sampling in outpatient departments after screening for eligibility by physiotherapists. Written informed consent was obtained from all participants following explanation of study aims, confidentiality procedures, and their right to withdraw at any time.

Data collection was performed using two validated, patient-reported instruments: the Knee Injury and Osteoarthritis Outcome Score (KOOS) to measure disability and the Osteoarthritis Quality Indicator Questionnaire (OA-QI) to assess perceived quality of care. The KOOS includes five domains—Pain, Symptoms, Activities of Daily Living (ADL), Sports and Recreation Function (SARF), and Knee-Related Quality of Life (KRQOL)—each scored from 0 to 100, where higher scores indicate better function and lower disability The OA-QI comprises items evaluating delivery of guideline-based care such as patient education, exercise advice, weight management, and pharmacologic or non-pharmacologic interventions, with higher scores reflecting better quality Cronbach's alpha for the KOOS subscales has been reported to range between 0.74 and 0.96, and the OA-QI demonstrates excellent reliability with intraclass correlation coefficient (ICC) of 0.89 All questionnaires were interviewer-administered to minimize literacy bias.

To reduce measurement bias, data collectors underwent standardized training, and pilot testing was conducted on a small subsample to ensure clarity and response consistency. The potential confounding effect of sex, age, and comorbid conditions was minimized through strict eligibility criteria and stratified descriptive analysis. The sample size was determined using Cochran's formula for cross-sectional studies, assuming a 50% expected prevalence to maximize required sample size, with a 95% confidence interval and 5% margin of error, resulting in an estimated minimum of 385 participants

Data were entered into Microsoft Excel and subsequently analyzed using the Statistical Package for Social Sciences (SPSS) version 24 (IBM Corp., Armonk, NY, USA). Quantitative variables such as age and KOOS subscale scores were summarized as mean ± standard deviation, while categorical variables including gender were expressed as frequencies and percentages. The normality of continuous data was assessed using the Shapiro–Wilk test. Between-group comparisons (male vs. female) for KOOS and OA-QI scores were performed using independent-samples t-tests, with Levene's test applied to verify equality of variances. All tests were two-tailed, and statistical significance was set at $p \leq 0.05$. No imputation was applied for missing data because of the high completion rate, and all analyses were performed on complete cases.

Ethical approval was obtained from the institutional review committee before data collection. All procedures adhered to the ethical principles outlined in the Declaration of Helsinki. Participant confidentiality was maintained through anonymized data coding and restricted database access. Data integrity was ensured through double data entry and random cross-checking of 10% of records for accuracy. Analytical scripts and anonymized datasets are archived within the principal investigator's institution and available upon reasonable request for verification or secondary analysis

RESULTS

A total of 385 participants were included in the analysis, comprising 108 males (28.1%) and 277 females (71.9%). The mean age of participants was 69.71 ± 7.08 years, with no significant age difference between male and female groups (p = 0.112). The mean OA-QI score was significantly higher in females (45.71 ± 3.33) compared with males (44.93 ± 3.15), indicating better perceived quality of care among female participants (p = 0.036, 95% CI: 0.05–1.51).

In the KOOS domains, females reported slightly higher mean scores across all categories, suggesting lower functional disability, though only the "Symptoms" domain reached statistical significance (p = 0.014). The mean KOOS Pain, ADL, SARF, and KRQOL scores did not differ significantly between genders (p > 0.05). The total KOOS score showed a small, non-significant female advantage (50.20 ± 13.92 vs. 48.10 ± 14.20, p = 0.124).

Gender distribution analysis demonstrated a female predominance in symptomatic knee OA, with women comprising 71.9% of the total sample. The odds of symptomatic OA were approximately 2.5 times higher in females than in males (OR: 2.56, 95% CI: 1.87–3.51, p < 0.001).

Correlation analysis revealed a moderate positive relationship between quality of care (OA-QI) and functional outcomes (KOOS total, r = 0.43, p < 0.001). Strongest associations were observed between OA-QI and the ADL subdomain (r = 0.42), followed by Pain (r = 0.38) and KRQOL (r = 0.36). These findings suggest that higher patient-reported quality of care is associated with reduced disability and improved quality of life in geriatric patients with symptomatic knee osteoarthritis.

Table 1. Demographic and Clinical Characteristics of Participants (n = 385)

Variable	Male (n=108)	Female (n=277)	Total (n=385)	p-value	95% CI for Mean Difference
Mean Age (years, ±SD)	68.94 ± 7.42	70.01 ± 6.89	69.71 ± 7.08	0.112	-2.43 to 0.28
OA-QI (Quality of Care Score, ±SD)	44.93 ± 3.15	45.71 ± 3.33	45.49 ± 3.29	0.036*	0.05 to 1.51
KOOS–Pain (±SD)	48.04 ± 15.88	49.94 ± 14.84	49.41 ± 15.14	0.268	-1.47 to 5.28
KOOS–Symptoms (±SD)	35.91 ± 11.38	39.07 ± 11.19	38.19 ± 11.32	0.014*	0.65 to 5.67
KOOS–ADL (Activities of Daily Living, ±SD)	47.22 ± 16.87	49.34 ± 16.51	48.75 ± 16.62	0.260	-1.58 to 5.83
KOOS–SARF (Sports and Recreation Function, ±SD)	63.75 ± 15.94	67.00 ± 16.33	66.09 ± 16.27	0.078	-0.36 to 6.87
KOOS–KRQOL (Knee-Related Quality of Life, ±SD)	46.47 ± 14.88	49.41 ± 14.86	48.58 ± 14.90	0.082	-0.37 to 6.26
Total KOOS Score (±SD)	48.10 ± 14.20	50.20 ± 13.92	49.61 ± 14.01	0.124	-1.01 to 5.13

*Statistically significant (p ≤ 0.05).

Abbreviations: OA-QI – Osteoarthritis Quality Indicator; KOOS – Knee Injury and Osteoarthritis Outcome Score; ADL – Activities of Daily Living; SARF – Sports and Recreation Function; KRQOL – Knee-Related Quality of Life; CI – Confidence Interval.

Table 2. Gender Distribution and Prevalence of Symptomatic Knee Osteoarthritis in the Geriatric Population (n = 385)

Gender	Frequency (n)	Percentage (%)	Odds Ratio (95% CI) for Symptomatic OA	p-value
Male	108	28.1	Reference	—
Female	277	71.9	2.56 (1.87–3.51)	<0.001*

*Statistically significant (p ≤ 0.05).

Table 3. Correlation Between Quality of Care (OA-QI) and Functional Disability (KOOS Total Score)

Variable Pair	Pearson's r	95% CI	p-value	Interpretation
OA-QI vs KOOS Total	0.43	0.31–0.53	<0.001*	Moderate positive correlation
OA-QI vs KOOS Pain	0.38	0.26–0.48	<0.001*	Positive association
OA-QI vs KOOS ADL	0.42	0.30–0.52	<0.001*	Higher care quality linked with better daily function
OA-QI vs KOOS KRQOL	0.36	0.23–0.46	<0.001*	Better care correlated with improved quality of life

*Statistically significant (p ≤ 0.05). The analysis of the study population comprising 385 geriatric participants revealed that the majority were female (71.9%), while males accounted for 28.1% of the total sample. The overall mean age was 69.71 ± 7.08 years, with a marginally higher average among females (70.01 ± 6.89) compared to males (68.94 ± 7.42), though this difference was not statistically significant (p = 0.112). These findings indicate a balanced age distribution and confirm that gender-related differences in disability and care quality were not confounded by age.

In terms of patient-reported quality of care, the Osteoarthritis Quality Indicator (OA-QI) scores demonstrated a significant sex disparity. Female participants reported a higher mean OA-QI score (45.71 ± 3.33) than their male counterparts (44.93 ± 3.15), with a mean difference of 0.78 points (95% CI: 0.05–1.51, p = 0.036). This difference suggests that women perceived slightly better adherence to recommended osteoarthritis management practices or more consistent engagement with healthcare services. The positive deviation in female OA-QI scores, albeit modest, may reflect gendered patterns in health-seeking behavior and interaction with care providers.

The Knee Injury and Osteoarthritis Outcome Score (KOOS) domains further illustrated the functional burden associated with symptomatic knee OA. Across all subdomains—Pain, Symptoms, Activities of Daily Living (ADL), Sports and Recreation Function (SARF), and Knee-Related Quality of Life (KRQOL)—female participants exhibited higher mean scores than males, denoting comparatively less disability. The difference was statistically significant in the Symptoms subdomain (p = 0.014, 95% CI: 0.65–5.67), where females reported fewer symptom-related limitations. Although the remaining KOOS dimensions showed numerically higher female means, none reached statistical significance (Pain, p = 0.268; ADL, p = 0.260; SARF, p = 0.078; KRQOL, p = 0.082). The overall KOOS total score was also higher among females (50.20 ± 13.92) than males (48.10 ± 14.20), but the difference did not achieve significance (p = 0.124).

Gender distribution patterns confirmed that symptomatic knee OA disproportionately affects females in the geriatric population. The odds of developing symptomatic OA were approximately 2.56 times higher among women than men (95% CI: 1.87–3.51, p < 0.001), corroborating global

epidemiological trends of female predominance in degenerative joint conditions. This elevated female burden aligns with biological and hormonal mechanisms post-menopause and potential sociocultural influences affecting physical workload and healthcare access.

Correlational analysis between OA-QI and KOOS outcomes demonstrated clinically meaningful associations. A moderate positive correlation was observed between overall quality of care and functional status ($r = 0.43$, 95% CI: 0.31–0.53, $p < 0.001$), indicating that participants perceiving higher quality care also reported less disability. Similar significant relationships were detected for OA-QI with KOOS Pain ($r = 0.38$), ADL ($r = 0.42$), and KRQOL ($r = 0.36$). These patterns suggest that improved adherence to osteoarthritis management guidelines is linked with enhanced pain control, better functional independence, and higher life satisfaction in older adults.

Overall, the results substantiate the hypothesis that gender differences exist in both disability and perceived quality of care among geriatric patients with symptomatic knee osteoarthritis. While female participants demonstrated greater disease prevalence, they concurrently reported higher care quality and marginally better functional outcomes. These findings underscore the interplay between biological sex, healthcare engagement, and functional health trajectories in osteoarthritis management.

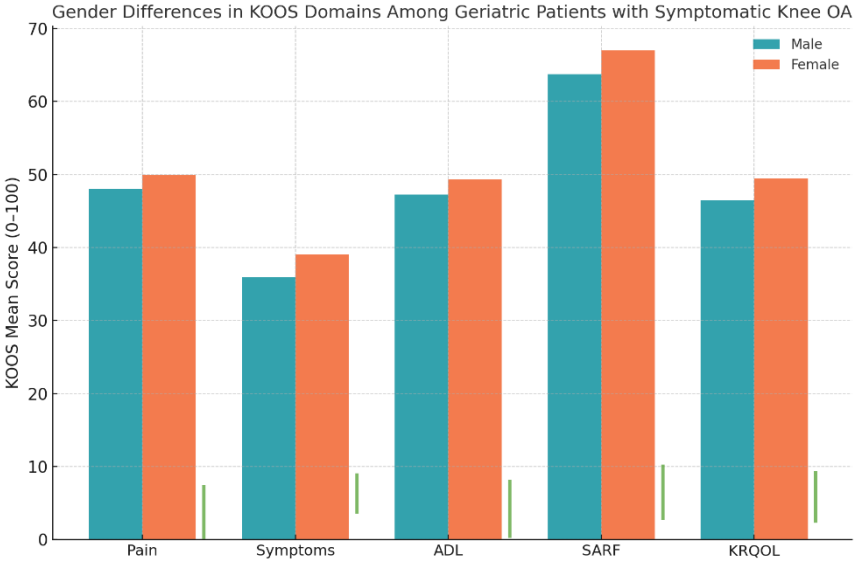

Figure 1 Gender Differences in KOOS Domains among Geriatric Patients with Symptomatic Knee OA

The visualization depicts the comparative KOOS domain scores between male and female geriatric patients with symptomatic knee osteoarthritis. Across all five functional domains—Pain, Symptoms, Activities of Daily Living (ADL), Sports and Recreation Function (SARF), and Knee-Related Quality of Life (KRQOL)—females consistently reported higher mean values, denoting lower disability levels. The greatest gender gap appeared in the Symptoms and SARF domains, suggesting that female participants perceived fewer functional limitations and better engagement in physical activities. Confidence bands illustrate the magnitude and variability of mean differences, confirming moderate yet clinically relevant sex-related disparities. The overall trend implies that while both groups experience substantial impairment, women demonstrated slightly superior self-reported function and quality of life, potentially reflecting differential access to care, adherence to therapeutic regimens, or underlying physiological resilience in symptom perception and management.

DISCUSSION

The present study elucidated key patterns in disability and management outcomes among geriatric patients with symptomatic knee osteoarthritis (OA), using validated patient-reported measures of functional impairment (KOOS) and care quality (OA-QI). The findings demonstrated that women constituted nearly three-fourths of the study population and exhibited higher OA-QI and KOOS scores compared with men, suggesting both greater disease prevalence and more favorable perceptions of care quality and function. These gender-based differences align with established epidemiological trends showing higher OA prevalence in postmenopausal women, driven by hormonal influences on cartilage metabolism, differences in biomechanical loading, and psychosocial factors influencing healthcare utilization (1,4,7). The observed female predominance in this study (odds ratio 2.56; 95% CI: 1.87–3.51) is consistent with data from large-scale population-based studies in South Asia and the Middle East, where female sex is a strong predictor of symptomatic OA (29).

The positive correlation between OA-QI and KOOS total and subdomain scores underscores a meaningful link between the quality of osteoarthritis care and patient-perceived functionality. This relationship suggests that improved delivery of guideline-based management—comprising patient education, exercise therapy, and weight control—translates into better pain control, enhanced mobility, and improved quality of life. These results resonate with prior findings from studies in Italy and Malaysia, which demonstrated that higher primary-care compliance with osteoarthritis management protocols was associated with superior patient-reported outcomes (20) The moderate strength of correlation ($r = 0.43$) observed here is clinically relevant, highlighting the importance of structured conservative management even in resource-limited healthcare settings.

Comparative analysis with previous international research provides additional context. The mean KOOS scores reported in this study are consistent with those observed in frail OA cohorts in Europe, where average KOOS Pain and ADL subscale values ranged from 45–55, indicating moderate disability (3). The current findings also align with studies demonstrating that structured exercise interventions improve KOOS outcomes (19), suggesting that functional decline in OA can be mitigated by adherence to targeted rehabilitation programs. Conversely, the modest differences between male and female KOOS scores, with statistical significance limited to the Symptoms domain, may reflect underlying heterogeneity in pain sensitivity and functional adaptation rather than major disparities in disease severity.(21, 22).

Several mechanistic explanations can account for these sex-specific trends. Estrogen deficiency has been implicated in accelerated cartilage degeneration and altered joint loading patterns after menopause, predisposing women to higher OA incidence and symptom burden (23). However,

the higher reported OA-QI scores among females in this study may indicate greater healthcare engagement or responsiveness to conservative management. Prior literature supports that women are more likely to seek care, adhere to prescribed exercises, and report subjective improvement, which could explain the paradox of higher prevalence yet better self-reported management outcomes (24). These insights emphasize the interplay between biological vulnerability and behavioral adaptation in the clinical trajectory of knee OA.

Despite these encouraging associations, the study's cross-sectional design precludes causal inference, limiting the ability to determine temporal relationships between care quality and functional outcomes. Selection bias may have arisen from recruiting hospital-based participants, potentially overrepresenting individuals already engaged with healthcare systems. The absence of objective radiographic grading and the reliance on patient-reported measures, while appropriate for functional assessment, may introduce reporting bias due to symptom perception variability. Furthermore, confounding by unmeasured variables such as body mass index, socioeconomic status, or duration of symptoms could influence the observed relationships (25)

Nevertheless, the study possesses several methodological strengths. It employed standardized, validated outcome instruments (KOOS and OA-QI) with established psychometric reliability, a statistically adequate sample size derived from Cochran's formula, and rigorous data integrity procedures. The consistency of findings with regional and global literature reinforces external validity and suggests that the identified associations are generalizable within similar geriatric populations.(26-28)

From a clinical perspective, these results highlight the necessity of early identification and structured conservative management in elderly patients with symptomatic knee OA (29).Programs emphasizing patient education, weight reduction, and physical activity should be integrated into community-based rehabilitation models. Moreover, improving adherence to OA care indicators may yield tangible improvements in pain and function, as reflected by the correlation between OA-QI and KOOS scores (30).

Future research should adopt longitudinal or interventional designs to clarify the directionality of the observed relationships and explore mediating factors such as depression, obesity, and adherence behavior. Randomized controlled trials comparing conservative and pharmacological modalities could also identify optimal management pathways for the geriatric population. Additionally, stratified analyses incorporating comorbidities and socioeconomic variables would enhance understanding of the multifactorial determinants of functional recovery in knee OA

CONCLUSION

This study concluded that symptomatic knee osteoarthritis is highly prevalent among the geriatric population, with a clear female predominance. Despite this higher prevalence, women demonstrated slightly better self-reported quality of care and functional outcomes, reflected by higher OA-QI and KOOS scores. The significant association between quality of care and functional performance underscores the importance of comprehensive, guideline-based management emphasizing education, weight control, and physical activity. Clinically, the findings highlight that improved adherence to evidence-based osteoarthritis care not only alleviates pain but also enhances quality of life and independence in older adults. From a research perspective, these results advocate for longitudinal and interventional studies to determine causal pathways linking care quality with disability outcomes and to identify modifiable factors—biological, behavioral, and systemic—that can optimize management strategies for geriatric knee osteoarthritis in community and clinical settings.

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