RESEARCH PAPER

Functional Limitation, Mobility Performance and Health-Related Quality of Life in Adults with Chronic Knee Pain: A Community-Based Cross-Sectional Analysis Using WOMAC, SF-12 and the Timed Up and Go Test

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ABSTRACT

Background: Chronic knee pain is usually quantified by prevalence, yet its public health importance derives from what it does to function, mobility and quality of life. Communitylevel Indian data combining a disease-specific functional index, a generic quality-of-life instrument and an objective performance measure within a single cohort are scarce.

Objectives: To characterise the functional, psychosocial and objective mobility consequences of chronic knee pain among community-dwelling adults in Uttar Pradesh, and to determine whether subjective disability corresponds to measured performance.

Methods: A community-based cross-sectional study was conducted among 500 adults aged 30–65 years selected by multistage stratified random sampling from rural and urban districts of Uttar Pradesh, of whom 214 (42.8 %) had chronic knee pain. Pain intensity was graded by the Visual Analogue Scale (VAS), pain-related disability by the WOMAC Index, health-related quality of life by the SF-12 Health Survey (physical and mental component summaries), and objective mobility by the Timed Up and Go (TUG) test. Associations were analysed by chisquare test and Pearson correlation, with $p < 0.05$ considered significant.

Results: Among symptomatic participants, moderate WOMAC pain (50.5 %) and moderate functional limitation (54.2 %) predominated, and severe grades affected approximately one quarter on each subscale. Difficulty was reported most often with squatting (85.0 %) and stair climbing (78.5 %). Across the whole cohort, 32.0 % showed severe SF-12 physical impairment and 24.0 % severe emotional distress. Pain severity was strongly associated with physical quality of life: poor physical component scores were recorded in 13.8 % of participants with mild pain versus 74.1 % of those with severe pain ($\chi^2 = 48.62$, $p < 0.001$). Objectively, 80.4 % of participants with knee pain had an impaired TUG time compared with 59.4 % of those without ($\chi^2 = 25.38$, $p < 0.001$), and WOMAC score correlated strongly and positively with TUG duration (*$r = +0.68$, $p < 0.001$). *Overall, 38.8 %** of the cohort demonstrated moderate-to-severe functional limitation.

Conclusion: Chronic knee pain in this population produced concordant impairment across subjective, psychosocial and objectively measured domains. The strong WOMAC–TUG correlation indicates that self-reported disability reflects genuine performance loss rather than reporting bias, and supports the use of brief, equipment-free tools such as the TUG test for community-level identification of adults at risk of mobility decline and falls.

Keywords: Knee pain; Physical function; WOMAC; SF-12; Timed Up and Go test; Quality of life; Mobility limitation; India

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1. INTRODUCTION

Chronic knee pain is among the commonest causes of activity limitation in adult populations worldwide, and its impact extends well beyond the joint itself [1,2]. The clinically meaningful outcome of knee disease is not the presence of pain but the erosion of physical function, independence and participation that follows. Individuals with persistent knee pain progressively withdraw from walking, stair use, occupational tasks and social activity; the resulting deconditioning weakens the quadriceps, destabilises the joint and accelerates the very degeneration that initiated the cycle [3,4].

Because of this, contemporary assessment of knee disorders relies on multidimensional measurement rather than pain scores alone. The WOMAC Index provides a disease-specific account of pain, stiffness and difficulty with daily activities and has been extensively validated in osteoarthritis populations [5,6]. The SF-12 Health Survey captures generic health-related quality of life across physical and mental domains, permitting comparison with other chronic conditions [7,8]. The Timed Up and Go (TUG) test contributes what neither questionnaire can — an objective, observer-timed measure of functional mobility, originally developed for frail elderly populations and subsequently validated as a predictor of falls and mobility decline [9,10].

These instruments measure related but non-identical constructs, and the degree to which they agree is itself informative. Self-reported disability is shaped by pain catastrophising, fearavoidance beliefs, mood, education and cultural expectations of ageing [11,12]. Where questionnaire-based disability and objective performance diverge, psychological and contextual mediators dominate; where they converge, the reported limitation reflects genuine physical capacity loss. Establishing which pattern prevails in a given population has direct implications for whether screening should rely on questionnaires, performance tests, or both.

In India, evidence on the functional consequences of knee pain remains fragmentary. Most studies report either a questionnaire outcome or a performance outcome, rarely both, and are usually conducted in hospital settings where the sample is already selected for severity and care-seeking [13,14]. This leaves an important gap: the extent of functional loss among community adults who have never presented for care is largely unquantified. This matters particularly in settings such as Uttar Pradesh, where prolonged squatting and floor-level activity are embedded in domestic and occupational routine, so that even moderate knee dysfunction carries disproportionate consequences for daily living [15].

A further consideration concerns the psychosocial dimension. Chronic musculoskeletal pain is consistently associated with sleep disturbance, low mood, reduced social participation and loss of confidence in movement [16,17]. Where knee pain is culturally normalised as an inevitable feature of ageing, this emotional burden frequently goes unrecognised and untreated.

The present study therefore aimed to: (i) quantify pain-related functional limitation using the WOMAC Index; (ii) determine the specific activities of daily living most affected; (iii) assess the impact on physical and mental health-related quality of life using SF-12; (iv) measure objective mobility performance using the TUG test; and (v) examine the correlation between self-reported disability and objectively measured mobility.

2. MATERIALS AND METHODS

2.1 Study design, setting and participants

This community-based cross-sectional observational study was conducted among adults aged 30–65 years resident in selected rural and urban communities of Uttar Pradesh, India, over a total study period of 24 months. Participants were recruited through door-to-door household screening and organised community health assessment camps conducted with the support of local health workers and community representatives.

A multistage stratified random sampling technique was used. Districts were selected on the basis of feasibility and population diversity, stratified into rural and urban segments, and villages and urban wards were then randomly selected from each stratum before householdlevel enumeration. A total of 500 participants were enrolled, of whom 214 reported chronic knee pain and formed the symptomatic subgroup for disease-specific analyses.

Adults of either sex aged 30–65 years who were resident in the selected communities, able to comprehend the study instruments and willing to give written informed consent were eligible. Participants were excluded if they had sustained a major lower-limb fracture within the previous six months, had undergone knee surgery or arthroplasty, had a neurological disorder affecting mobility, were unable to walk independently, had severe cognitive or psychiatric impairment, or had a congenital lower-limb deformity. A pilot study on approximately 10 % of the projected sample preceded the main survey to standardise procedures and assess interobserver variability; pilot participants were excluded from the final analysis.

2.2 Outcome measures

2.2.1 Visual Analogue Scale (VAS)

Pain intensity was recorded on a 10 cm Visual Analogue Scale anchored at 'no pain' and 'worst imaginable pain', and graded as mild (1–3), moderate (4–6) or severe (7–10).

2.2.2 WOMAC Index

The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) was administered by interview to all symptomatic participants. The instrument assesses pain, stiffness and difficulty with physical function; the pain and physical function subscales were analysed separately and each classified as mild, moderate or severe. WOMAC has demonstrated good reliability, validity and responsiveness in osteoarthritis populations including Indian cohorts [5,6]. Activity-specific difficulty was additionally recorded for five functionally critical tasks: stair climbing, squatting, prolonged standing, walking long distances and rising from a chair.

2.2.3 SF-12 Health Survey

Health-related quality of life was assessed in all 500 participants using the SF-12 Health Survey, yielding a Physical Component Summary (PCS) and a Mental Component Summary (MCS). PCS results were classified as good physical health, moderate impairment or severe impairment; MCS results as good mental health, moderate emotional distress or severe emotional distress. The SF-12 has been validated for musculoskeletal assessment in Indian populations [8, 18].

2.2.4 Timed Up and Go test

Objective mobility was assessed using the Timed Up and Go (TUG) test. Participants rose from a standard armchair, walked 3 metres at a comfortable pace, turned, returned and sat down; the time taken was recorded with a stopwatch. Performance was categorised as normal mobility (< 10 s), mild impairment (10–19 s), moderate limitation (20–29 s) and severe limitation (≥ 30 s) in accordance with established interpretive thresholds [9,10]. For dichotomous analysis, times of ≥ 10 s were classified as impaired. Assessments were conducted on a level, non-slip surface with usual footwear and customary walking aids, and one practice trial preceded the recorded attempt.

2.2.5 Composite functional outcome

An overall functional outcome was assigned to each participant by integrating WOMAC functional grade, SF-12 physical component classification and TUG category, yielding four strata: good function, mild limitation, moderate limitation and severe limitation.

2.3 Statistical analysis

Categorical variables are expressed as frequencies and percentages. Associations between categorical variables were tested using the chi-square test. The relationship between WOMAC score and TUG duration was examined using the Pearson correlation coefficient (r), with the strength of association interpreted conventionally ($r \geq 0.6$ denoting a strong relationship). A two-tailed p value < 0.05 was considered statistically significant. Analyses were performed using standard statistical software.

2.4 Ethical considerations

The protocol was approved by the Institutional Ethics Committee [approval number and date to be inserted]. Written informed consent was obtained from every participant, with verbal explanation in the preferred language and witnessed consent for participants unable to read. Confidentiality was maintained through anonymised identification codes, and participants found to have significant functional limitation were counselled and referred for physiotherapy assessment.

3. RESULTS

Of the 500 participants assessed, 214 (42.8 %) reported chronic knee pain and 286 (57.2 %) were asymptomatic. All participants completed WOMAC assessment where applicable, SF-12 evaluation and TUG testing, with no missing outcome data. Results are presented as: painrelated functional limitation; activity-specific difficulty; health-related quality of life; objective mobility performance; the relationship between reported disability and measured performance; and the composite functional outcome.

3.1 Pain-related functional limitation (WOMAC)

Table 1 summarises WOMAC subscale distributions among the 214 symptomatic participants. Both subscales showed a similar shape, with moderate grades predominating — 50.5 % on the pain subscale and 54.2 % on the physical function subscale — and severe grades affecting approximately one quarter (25.2 % and 23.4 % respectively).

The near-identical distribution of the two subscales is itself notable: it indicates that in this community sample, pain and functional limitation moved together rather than diverging, as would be expected if a substantial subgroup were maintaining function despite pain or, conversely, reporting disproportionate disability relative to symptom intensity.

Table 1. Distribution of WOMAC pain and physical function subscale grades among symptomatic participants (n = 214)

Severity grade	WOMAC pain n	WOMAC pain %	WOMAC function n	WOMAC function %
Mild	52	24.3	48	22.4
Moderate	108	50.5	116	54.2
Severe	54	25.2	50	23.4
Total	**214**	**100.0**	**214**	**100.0**

WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index. Percentages are calculated on the 214 symptomatic participants.

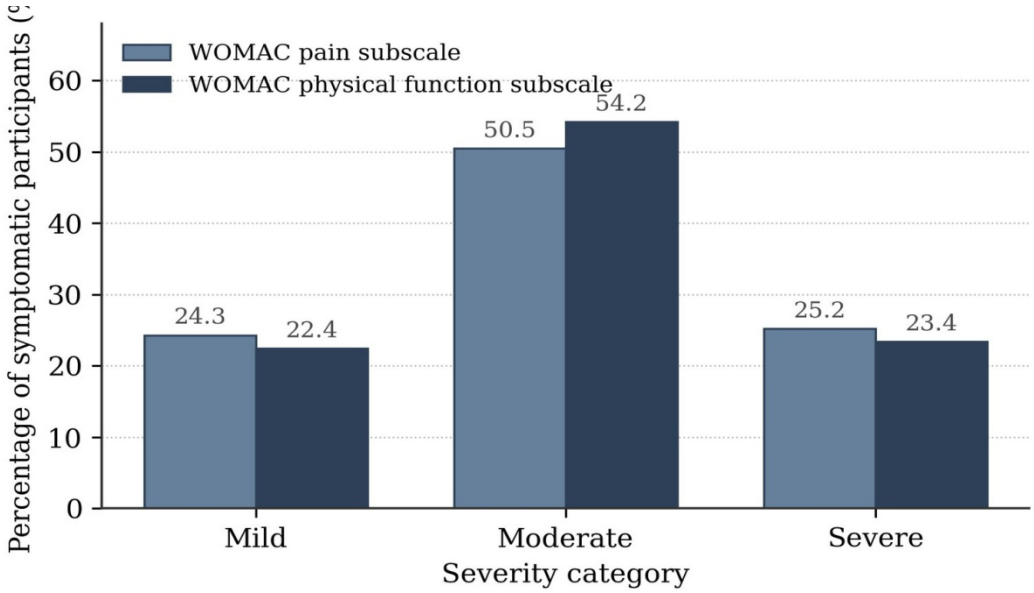


Figure 1. Comparison of WOMAC pain and physical function subscale grades among symptomatic participants. The closely parallel distributions indicate concordance between reported pain intensity and reported functional limitation.

3.2 Activity-specific difficulty in activities of daily living

Table 2 shows the proportion of symptomatic participants reporting difficulty with each of five functionally critical tasks. Squatting was the most severely affected activity (85.0 %), followed by stair climbing (78.5 %), prolonged standing (72.0 %), walking long distances (66.4 %) and rising from a chair (59.8 %).

This ordering is clinically coherent and culturally significant. The two most affected tasks are those imposing the greatest tibiofemoral and patellofemoral flexion loads, and both are embedded in routine domestic, sanitary and occupational activity in this setting. Difficulty with squatting therefore translates into functional restriction of a substantially greater magnitude than the same limitation would carry in populations where floor-level activity is uncommon.

Table 2. Activity-specific difficulty reported by symptomatic participants (n = 214)

Activity of daily living	Difficulty n	Difficulty %	Rank
Squatting	182	85.0	1
Stair climbing	168	78.5	2
Prolonged standing	154	72.0	3
Walking long distance	142	66.4	4
Rising from chair	128	59.8	5

Categories are not mutually exclusive; participants could report difficulty with more than one activity. Percentages are calculated on the 214 symptomatic participants.

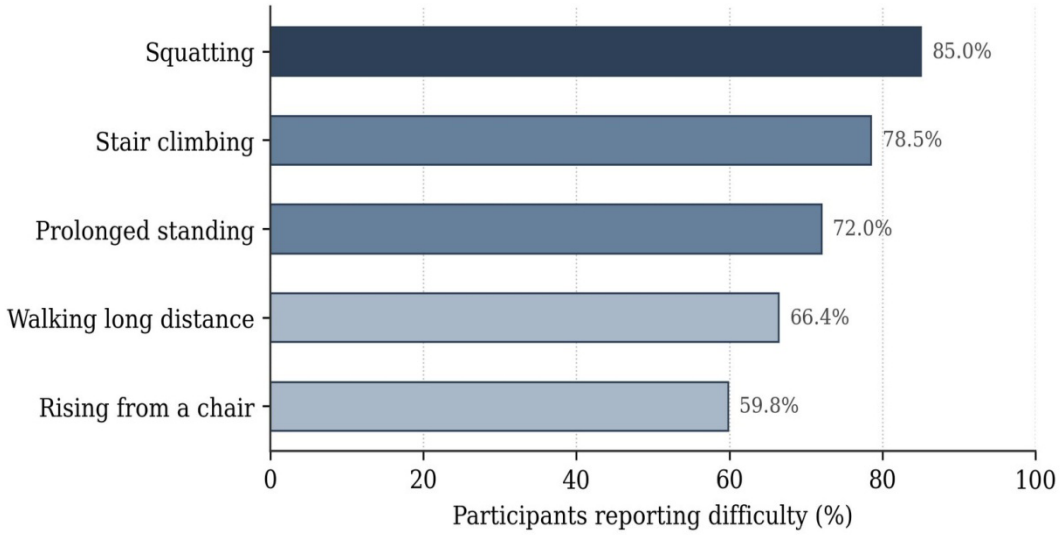


Figure 2. Proportion of symptomatic participants reporting difficulty with each activity of daily living. Tasks demanding deep knee flexion — squatting and stair climbing — were the most severely affected.

3.3 Health-related quality of life (SF-12)

SF-12 outcomes for the whole cohort are presented in Table 3. On the Physical Component Summary, only 25.2 % of participants recorded good physical health, while 42.8 % showed moderate impairment and 32.0 % severe impairment. On the Mental Component Summary, 34.4 % recorded good mental health, 41.6 % moderate emotional distress and 24.0 % severe emotional distress.

That nearly a quarter of a general adult community sample demonstrated severe emotional distress underscores that the burden of chronic knee pain is not confined to the physical domain. Physical impairment nevertheless exceeded mental impairment at every severity level, consistent with the expected pattern for a primarily musculoskeletal exposure.

Table 3. SF-12 Physical and Mental Component Summary classification of study participants (n = 500)

Classification	PCS n	PCS %	MCS n	MCS %
Good health	126	25.2	172	34.4
Moderate impairment / distress	214	42.8	208	41.6
Severe impairment / distress	160	32.0	120	24.0
Total	**500**	**100.0**	**500**	**100.0**

PCS = Physical Component Summary; MCS = Mental Component Summary of the SF-12 Health Survey.

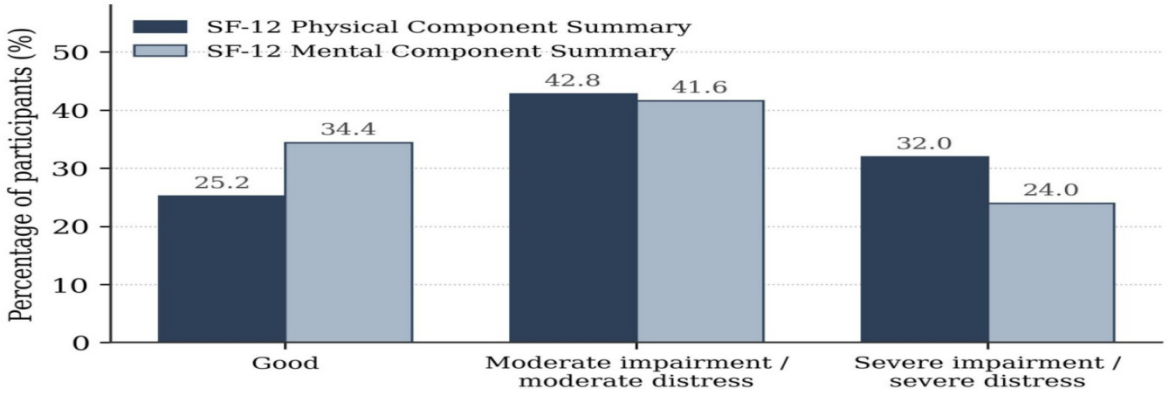


Figure 3. Distribution of SF-12 Physical and Mental Component Summary classifications across the whole cohort (n = 500). Physical impairment exceeded mental impairment at every severity grade, but emotional distress was nonetheless present in two-thirds of participants.

Table 4 examines the relationship between pain intensity and physical quality of life within the symptomatic subgroup, revealing a steep and highly significant gradient. Poor PCS scores were recorded in 13.8 % of participants with mild pain, 45.1 % of those with moderate pain and 74.1 % of those with severe pain, while good PCS scores fell correspondingly from 48.3 % to 3.7 % ($\chi^2 = 48.62$, $p < 0.001$).

Table 4. Association between VAS pain severity and SF-12 Physical Component Summary among symptomatic participants (n = 214)

VAS severity	Poor PCS n (%)	Moderate PCS n (%)	Good PCS n (%)	χ^2 / p
Mild (1–3), n = 58	8 (13.8)	22 (37.9)	28 (48.3)	χ^2 = 48.62
Moderate (4–6), n = 102	46 (45.1)	42 (41.2)	14 (13.7)	df = 4
Severe (7–10), n = 54	40 (74.1)	12 (22.2)	2 (3.7)	p < 0.001

Row percentages are shown. VAS = Visual Analogue Scale; PCS = Physical Component Summary.

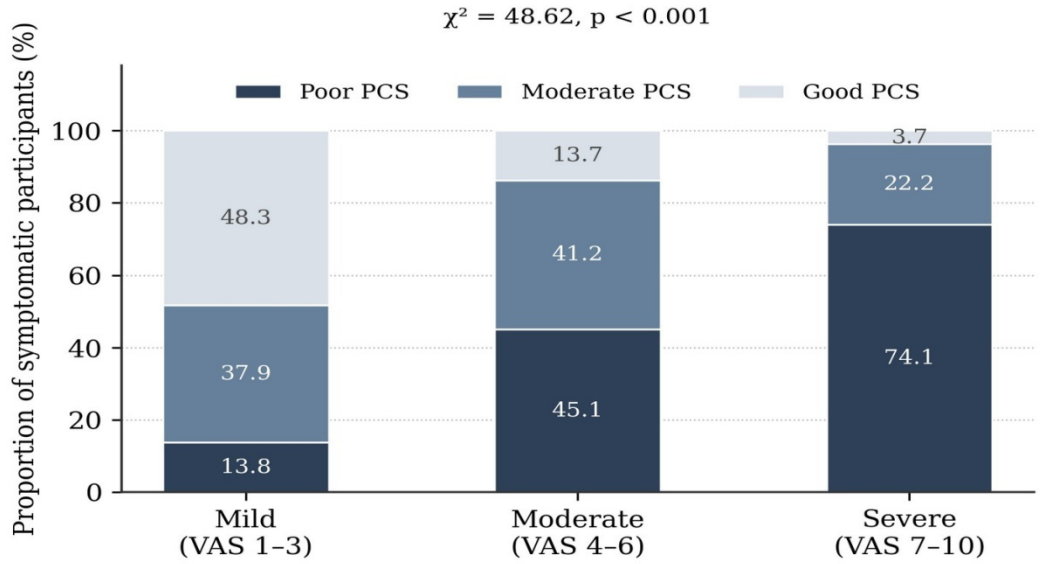


Figure 4. Distribution of SF-12 Physical Component Summary categories across increasing Visual Analogue Scale pain severity. The proportion with poor physical quality of life rose more than fivefold from the mild to the severe pain stratum.

3.4 Objective mobility performance (TUG)

TUG results for the whole cohort are shown in Table 5. Only 31.6 % of participants achieved a normal time of under 10 seconds. Mild impairment (10–19 s) was the commonest finding at 45.6 %, while 17.6 % demonstrated moderate limitation and 5.2 % severe limitation — meaning that 22.8 % of the entire community sample fell into a mobility band associated with elevated fall risk and functional dependency.

The association with knee pain status was strong. Among participants with knee pain, 80.4 % recorded an impaired TUG time, compared with 59.4 % of asymptomatic participants ($\chi^2 = 25.38$, $p < 0.001$). Notably, the substantial proportion of impaired times among asymptomatic participants indicates that mobility limitation in this population is not attributable to knee pain alone, and that ageing, obesity and general deconditioning contribute independently.

Table 5. Timed Up and Go performance in the whole cohort and by knee pain status

Parameter	Category	n	%	χ^2 / p
TUG category (n = 500)	Normal (< 10 s)	158	31.6	
	Mild impairment (10–19 s)	228	45.6	
	Moderate limitation	88	17.6	

	(20–29 s)			
	Severe limitation (≥ 30 s)	26	5.2	
Knee pain present (n = 214)	Normal TUG	42	19.6	$\chi^2 = 25.38$
	Impaired TUG	172	80.4	df = 1
Knee pain absent (n = 286)	Normal TUG	116	40.6	$p < 0.001$

Parameter	**Category**	**n**	**%**	**χ^2 / p**
	Impaired TUG	170	59.4	

TUG = Timed Up and Go test. Impaired TUG was defined as a completion time of ≥ 10 seconds.

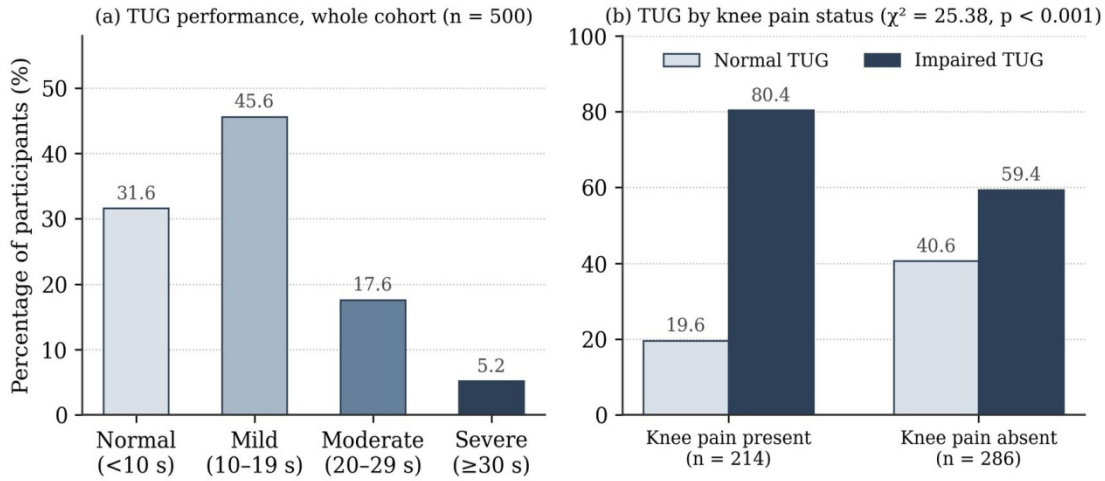


Figure 5. Objective mobility performance: (a) distribution of Timed Up and Go categories across the whole cohort; (b) proportion of normal and impaired TUG times stratified by knee pain status. Participants with knee pain were substantially more likely to record an impaired time.

3.5 Relationship between reported disability and measured performance

Table 6 presents the correlation between WOMAC score and TUG duration. A strong, positive and highly significant correlation was observed (*$r = +0.68$, $p < 0.001$*), indicating that higher self-reported disability corresponded closely to longer objectively measured mobility times.

This finding is central to the interpretation of the study. Because WOMAC is a questionnaire and TUG is an observer-timed performance test, the two are susceptible to entirely different sources of error. Their strong agreement therefore provides convergent validity: the functional limitation reported by participants reflects genuine loss of physical capacity rather than pain catastrophising, cultural expectation or reporting bias. Approximately 46 % of the variance in TUG time was shared with WOMAC score, leaving the remainder attributable to factors such as age, body mass, balance, comorbidity and lower-limb strength.

Table 6. Correlation between WOMAC functional score and Timed Up and Go duration

Variables correlated	**Pearson r**	**Interpretation**	**p value**
WOMAC score vs TUG duration	+0.68	Strong positive correlation	< 0.001

WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index; TUG = Timed Up and Go test. Correlation computed across symptomatic participants.

3.6 Composite functional outcome

Table 7 presents the integrated functional classification for the whole cohort. Only 26.4 % of participants were classified as having good function; 34.8 % had mild limitation, 25.6 % moderate limitation and 13.2 % severe limitation. In aggregate, 38.8 % of the community sample demonstrated

moderate-to-severe functional limitation, and nearly three-quarters showed some degree of measurable impairment.

Table 7. Composite functional outcome classification of study participants (n = 500)

Functional outcome	Frequency (n)	Percentage (%)	Cumulative (%)
Good function	132	26.4	26.4
Mild limitation	174	34.8	61.2
Moderate limitation	128	25.6	86.8
Severe limitation	66	13.2	100.0
Total	**500**	**100.0**	**—**

The composite outcome integrates WOMAC functional grade, SF-12 physical component classification and TUG category.

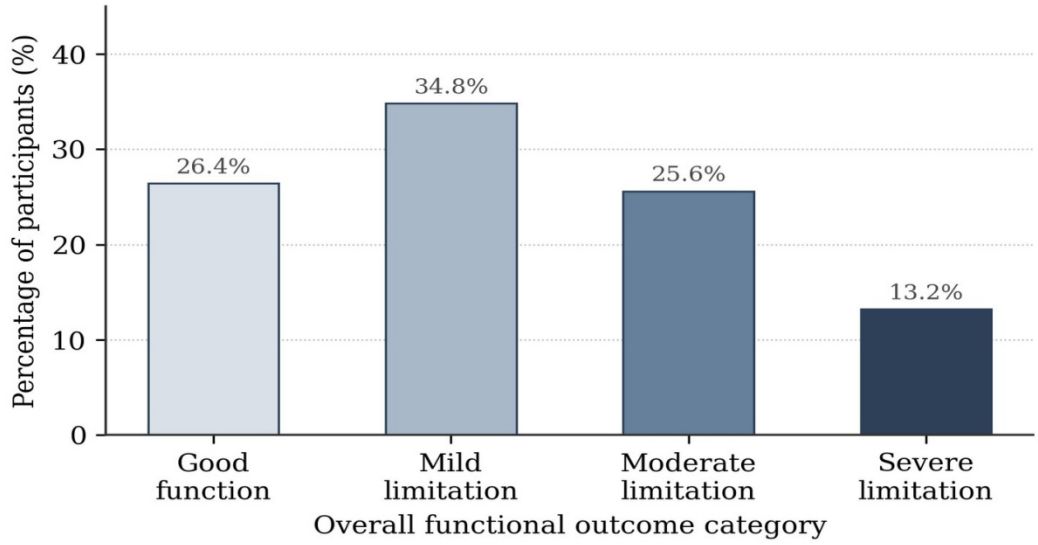


Figure 6. Composite functional outcome classification across the whole cohort. Fewer than one participant in four was free of measurable functional limitation.

4. DISCUSSION

This community-based study demonstrates that chronic knee pain in adults of Uttar Pradesh is accompanied by substantial and mutually consistent impairment across self-reported function, health-related quality of life and objectively measured mobility. The central finding — a strong positive correlation between WOMAC score and TUG duration (r = +0.68) — establishes that the disability reported by these community adults is externally corroborated by measured performance.

4.1 Concordance between subjective and objective measures

The convergence of questionnaire and performance measures is the most methodologically important result of this study. Self-reported disability in chronic musculoskeletal pain is well recognised to be modulated by fear-avoidance beliefs, catastrophising, mood and educational background [11,12], and in settings where knee pain is culturally normalised as an inevitable consequence of ageing, under-reporting is at least as plausible as over-reporting. The strong WOMAC–TUG correlation observed here indicates that neither distortion dominated: reported limitation tracked measured limitation closely, in line with previous work demonstrating that performance-based measures and self-report capture overlapping but complementary aspects of function in advanced knee and hip osteoarthritis [19,20].

The practical consequence is important for resource-limited settings. Where either instrument can be relied upon to identify affected individuals, screening can be built around whichever is more feasible — and the TUG test, requiring only a chair, three metres of floor and a stopwatch, is well suited to community health-worker delivery [9,10].

4.2 The pattern of functional loss

The activity-specific findings deserve particular emphasis. Squatting (85.0 %) and stair climbing (78.5 %) were the most affected tasks, consistent with the high patellofemoral and tibiofemoral compressive loads generated during deep knee flexion [21,22]. In Western cohorts, difficulty with squatting is a relatively minor functional concern. In this population it is not: squatting is integral to sanitation, food preparation, floor-

level domestic work and agricultural activity. The same measured impairment therefore carries substantially greater functional consequence in this context, a consideration that argues against the uncritical transfer of Western disability thresholds to Indian community settings.

The parallel distributions of WOMAC pain and function subscales further indicate that in this cohort, pain and disability were not dissociated. This is consistent with a predominantly mechanical and load-related mechanism, in which function is limited primarily by symptom provocation during weight-bearing rather than by structural deformity or contracture.

4.3 Quality-of-life impact

The steep gradient linking pain severity to SF-12 physical scores — poor PCS in 13.8 % of the mild-pain stratum rising to 74.1 % in the severe-pain stratum — corresponds with the established relationship between symptom intensity and physical health-related quality of life in osteoarthritis [23,24]. The mental health findings are equally consequential: severe emotional distress affected 24.0 % of the cohort, echoing evidence that persistent musculoskeletal pain disturbs sleep, mood, confidence in movement and social participation [16,17,25].

This bidirectional relationship has therapeutic implications. Pain restricts activity, restriction erodes mood and confidence, and low mood in turn amplifies pain perception and reduces adherence to exercise therapy [26]. Rehabilitation programmes that address only the biomechanical component are therefore likely to underperform, and the incorporation of education, activity pacing and reassurance regarding the safety of movement is supported by international guidance [27,28].

4.4 Mobility impairment beyond the symptomatic group

An unanticipated but instructive finding was that 59.4 % of asymptomatic participants also recorded an impaired TUG time. Chronic knee pain thus accounts for only part of the mobility deficit in this population; ageing, obesity, sedentary behaviour and general deconditioning evidently contribute substantially. Given that 22.8 % of the whole cohort fell into TUG bands associated with elevated fall risk [10,29], the case for population-level rather than pain-triggered mobility screening is strong. Restricting assessment to those who report pain would miss a considerable proportion of adults already on a trajectory towards functional dependency.

4.5 Implications for rehabilitation services

Three service implications follow. First, the TUG test should be adopted as a routine community screening tool in adults over 40 years, since it is rapid, requires no equipment, and here demonstrated strong agreement with a validated disability index. Second, given that only 26.4 % of the cohort had unimpaired function, rehabilitation capacity in these districts is likely to be substantially outstripped by need, favouring group-based and community-delivered exercise programmes over individual specialist therapy. Third, because the affected activities are culturally specific, rehabilitation goals should be functionally anchored — targeting squat-to-stand transfer, stair negotiation and sit-to-stand capacity rather than generic range-ofmotion endpoints. Exercise therapy remains the intervention with the strongest evidence base for improving pain and function in knee osteoarthritis [27,30].

5. STRENGTHS AND LIMITATIONS

The chief strength of this study is the simultaneous application of a disease-specific index (WOMAC), a generic quality-of-life instrument (SF-12) and an objective performance measure (TUG) within a single community cohort, which permitted direct assessment of convergence between self-report and measured performance — an analysis rarely possible in Indian community data. The community-based sampling frame avoided the severity bias of hospital series, both rural and urban strata were represented, and standardisation was supported by prior pilot testing and investigator training.

Limitations must be acknowledged. The cross-sectional design cannot establish temporal sequence: whether functional limitation follows pain, or reduced activity precipitates both pain and deconditioning, cannot be resolved and is likely bidirectional. Radiographic confirmation was not obtained, so structural severity could not be correlated with functional outcome. WOMAC and SF-12 responses were self-reported and subject to recall, mood and social-desirability influences, although the strong TUG correlation mitigates this concern. TUG performance is influenced by age, body mass, footwear, vision, balance and comorbidity, none of which were adjusted for in the correlation analysis, so the association between WOMAC and TUG should be regarded as unadjusted. The composite functional outcome is a study-specific construct rather than a formally validated scale and should be interpreted descriptively. Finally, recruitment was confined to selected districts, limiting generalisability to the wider state and country.

6. CONCLUSION

Chronic knee pain among community-dwelling adults in Uttar Pradesh was associated with concordant impairment across functional, psychosocial and objectively measured domains. Moderate WOMAC-defined limitation predominated, difficulty was greatest for squatting and stair climbing, physical and mental quality of life deteriorated steeply with rising pain severity, and 80.4 % of symptomatic participants demonstrated objectively impaired mobility.

The strong positive correlation between WOMAC score and TUG duration ($r = +0.68$) confirms that self-reported disability in this population reflects genuine performance loss. Coupled with the finding that mobility impairment extended well beyond the symptomatic group, this supports the routine incorporation of brief, equipment-free performance testing into community and primary care assessment, and the delivery of functionally anchored, group-based rehabilitation targeting the culturally critical tasks of squatting, stair negotiation and sit-to-stand transfer.

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REFERENCES

1. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. Bull World Health Organ. 2003;81(9):646–656.
2. Peat G, McCarney R, Croft P. Knee pain and osteoarthritis in older adults: a review of community burden and current use of primary health care. Ann Rheum Dis. 2001;60(2):91–97.
3. Guccione AA, Felson DT, Anderson JJ, Anthony JM, Zhang Y, Wilson PW, et al. The effects of specific medical conditions on the functional limitations of elders in the Framingham Study. Am J Public Health. 1994;84(3):351–358.
4. Dunlop DD, Song J, Semanik PA, Chang RW, Sharma L, Bathon JM, et al. Objective physical activity measurement and functional performance in knee osteoarthritis. Arthritis Rheum. 2011;63(11):3372–3382.
5. Bellamy N, Buchanan WW, Goldsmith CH, Campbell J, Stitt LW. Validation study of WOMAC: a health status instrument for measuring clinically important patient-relevant outcomes to antirheumatic drug therapy in patients with osteoarthritis of the hip or knee. J Rheumatol. 1988;15(12):1833–1840.
6. Salaffi F, Leardini G, Canesi B, Mannoni A, Fioravanti A, Caporali R, et al. Reliability and validity of the Western Ontario and McMaster Universities Osteoarthritis Index in Italian patients with osteoarthritis of the knee. Osteoarthritis Cartilage. 2003;11(8):551–560.
7. Ware JE, Kosinski M, Keller SD. A 12-item short-form health survey: construction of scales and preliminary tests of reliability and validity. Med Care. 1996;34(3):220–233.
8. Gandhi SK, Salmon JW, Zhao SZ, Lambert BL, Gore PR, Conrad K. Psychometric evaluation of the 12-item short-form health survey (SF-12) in osteoarthritis and rheumatoid arthritis clinical trials. Clin Ther. 2001;23(7):1080–1098.
9. Podsiadlo D, Richardson S. The Timed 'Up & Go': a test of basic functional mobility for frail elderly persons. J Am Geriatr Soc. 1991;39(2):142–148.
10. Shumway-Cook A, Brauer S, Woollacott M. Predicting the probability for falls in community-dwelling older adults using the Timed Up & Go test. Phys Ther. 2000;80(9):896–903.
11. Somers TJ, Keefe FJ, Pells JJ, Dixon KE, Waters SJ, Riordan PA, et al. Pain catastrophizing and pain-related fear in osteoarthritis patients: relationships to pain and disability. J Pain Symptom Manage. 2009;37(5):863–872.
12. Stubbs B, Binnekade T, Soundy A, Schofield P, Huijnen IPJ, Eggermont LHP. Are older adults with chronic musculoskeletal pain less active than older adults without pain? A systematic review and meta-analysis. Pain Med. 2013;14(9):1316–1331.
13. Pal CP, Singh P, Chaturvedi S, Pruthi KK, Vij A. Epidemiology of knee osteoarthritis in India and related factors. Indian J Orthop. 2016;50(5):518–522.
14. Tripathi R, Gupta M, Yadav R. Reliability of the Timed Up and Go test for evaluating functional mobility among elderly rural populations in India. J Geriatr Phys Ther. 2024;47(1):12–18.
15. Mahajan A, Verma S, Tandon VR. Barriers to healthcare access for women with knee osteoarthritis in rural India: a qualitative study. Int J Orthop Sci. 2020;6(2):206–210.
16. Thomas E, Peat G, Harris L, Wilkie R, Croft PR. The prevalence of pain and pain interference in a general population of older adults. Pain. 2004;110(1–2):361–368.
17. Leveille SG, Bean J, Bandeen-Roche K, Jones R, Hochberg M, Guralnik JM. Musculoskeletal pain and risk for falls in older disabled women living in the community. J Am Geriatr Soc. 2002;50(4):671–678.
18. Kadam V, Joshi V. Validity and reliability of the SF-12 health questionnaire in Indian patients with chronic musculoskeletal conditions. Indian J Public Health Res Dev. 2022;13(2):150–155.
19. Stratford PW, Kennedy DM, Woodhouse LJ. Performance measures provide assessments of pain and function in people with advanced osteoarthritis of the hip or knee. Phys Ther. 2006;86(11):1489–1496.
20. Creamer P, Hochberg MC. Factors associated with functional impairment in symptomatic knee osteoarthritis. Rheumatology. 2000;39(5):490–496.
21. Cooper C, McAlindon T, Coggon D, Egger P, Dieppe P. Occupational activity and osteoarthritis of the knee. Ann Rheum Dis. 1994;53(2):90–93.
22. Roddy E, Zhang W, Doherty M, Arden NK, Barlow J, Birrell F, et al. The role of mechanical factors in knee osteoarthritis: epidemiologic evidence. Osteoarthritis Cartilage. 2005;13(7):593–603.
23. Hunter DJ, Bierma-Zeinstra S. Osteoarthritis. Lancet. 2019;393(10182):1745–1759.
24. Pereira D, Peleteiro B, Araujo J, Branco J, Santos RA, Ramos E. The effect of osteoarthritis definition on prevalence and incidence estimates: a systematic review. Osteoarthritis Cartilage. 2011;19(11):1270–1275.
25. Allen KD, Golightly YM. Epidemiology of osteoarthritis: state of the evidence. Curr Opin Rheumatol. 2015;27(3):276–283.
26. Marks R. Knee osteoarthritis and exercise adherence: a review. Curr Aging Sci. 2012;5(1):72–83.
27. Fransen M, McConnell S. Exercise for osteoarthritis of the knee. Cochrane Database Syst Rev. 2008; (4):CD004376.
28. McAlindon TE, Bannuru RR, Sullivan MC, Arden NK, Berenbaum F, Bierma-Zeinstra SMA, et al. OARSI guidelines for the non-surgical management of knee osteoarthritis. Osteoarthritis Cartilage. 2014;22(3):363–388.

29. Beauchet O, Fantino B, Allali G, Muir SW, Montero-Odasso M, Annweiler C. Timed Up and Go test and risk of falls in older adults: a systematic review. J Nutr Health Aging. 2011;15(10):933–938.
30. Bennell KL, Hinman RS. A review of the clinical evidence for exercise in osteoarthritis of the hip and knee. J Sci Med Sport. 2011;14(1):4–9.
31. Fernandes L, Hagen KB, Bijlsma JWJ, Andreassen O, Christensen P, Conaghan PG, et al. EULAR recommendations for the non-pharmacological core management of hip and knee osteoarthritis. Ann Rheum Dis. 2013;72(7):1125–1135.
32. National Institute for Health and Care Excellence. Osteoarthritis: care and management. NICE Clinical Guideline CG177. London: NICE; 2014.
33. Felson DT. Clinical practice. Osteoarthritis of the knee. N Engl J Med. 2006;354(8):841–848.
34. Cross M, Smith E, Hoy D, Nolte S, Ackerman I, Fransen M, et al. The global burden of hip and knee osteoarthritis: estimates from the Global Burden of Disease 2010 study. Ann Rheum Dis. 2014;73(7):1323– 1330.
41.
35. Anandacoomarasamy A, Caterson I, Sambrook P, Fransen M, March L. The impact of obesity on the musculoskeletal system. Int J Obes. 2008;32(2):211–222.
36. Vina ER, Kwoh CK. Epidemiology of osteoarthritis: literature update. Curr Opin Rheumatol. 2018;30(2):160–167.
37. Palazzo C, Nguyen C, Lefevre-Colau MM, Rannou F, Poiraudeau S. Risk factors and burden of osteoarthritis. Ann Phys Rehabil Med. 2016;59(3):134–138.
38. Quicke JG, Foster NE, Thomas MJ, Holden MA. Is long-term physical activity safe for older adults with knee pain? A systematic review. Osteoarthritis Cartilage. 2015;23(9):1445–1456.
39. Hurley MV, Walsh NE, Mitchell H, Nicholas J, Patel A. Long-term outcomes and costs of an integrated rehabilitation program for chronic knee pain. Arthritis Care Res. 2012;64(2):238–247.
40. Gupta N, Mishra P, Singh AK. Prevalence of musculoskeletal pain among adult population in India: a literature review. Indian J Public Health Res Dev. 2019;10(1):122–126.