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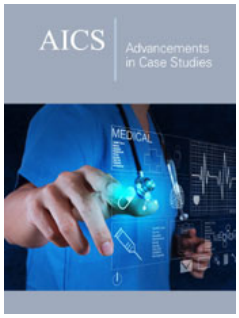
# Clinical, Functional and Radiographic Characteristics of Osteoarthritis Among Adults Aged ≥50 Years: A Retrospective Observational Study from a Service Hospital in India

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## Abstract

**Background:** Osteoarthritis (OA) is a common cause of pain, functional limitation and reduced health-related quality of life in older adults. Indian estimates vary according to population, setting and diagnostic criteria. Evidence from service-hospital populations is limited.

**Methods:** We conducted a retrospective observational study of 500 adults aged ≥50 years whose records were available from a service hospital in Jharkhand, India, during September 2024 to September 2026. The primary outcome was OA documented in the medical record. Demographic, anthropometric, lifestyle, comorbidity, previous joint injury or surgery, symptom, health-related quality-of-life and available radiographic variables were analyzed. Knee radiographs were graded using the Kellgren-Lawrence (K/L) scale; K/L grade ≥2 was classified as definite radiographic knee OA. Between-group comparisons used independent-samples t-tests and chi-square or Fisher exact tests, as appropriate. Multivariable logistic regression estimated Adjusted Odds Ratios (aORs) with 95% Confidence Intervals (CIs).

**Result:** Documented OA was present in 177/500 participants (35.4%; 95% CI 31.3-39.7%). Mean age was 63.54±8.46 years and mean BMI was 26.13±4.02kg/$m^2$. Among participants with documented OA, the knee was the primary affected site in 119/177 (67.2%), followed by the hand (10.2%), hip (8.5%), spine (7.3%), shoulder (4.5%) and ankle (2.3%). Compared with participants without documented OA, those with OA were older (65.76±8.34 vs 62.32±8.29 years; P<0.001), had higher BMI (26.65±4.25 vs 25.84±3.86kg/$m^2$; P=0.036), greater pain and morning stiffness, and lower EQ-5D-5L index values (all P<0.001). Among 175 participants with available knee radiographs, 72 (41.1%) had K/L grade ≥2. In the adjusted model, age (aOR 1.051 per year, 95% CI 1.027-1.076), BMI (aOR 1.051 perkg/$m^2$, 95% CI 1.001-1.103), previous joint injury (aOR 2.174, 95% CI 1.273-3.711) and low physical activity (aOR 1.536, 95% CI 1.004-2.350) were independently associated with documented OA. Model discrimination was modest (AUC 0.660).

**Conclusion:** In this facility-based retrospective dataset, documented OA was common and predominantly affected the knee. Older age, higher BMI, previous joint injury and low physical activity were independently associated with documented OA. The observed 35.4% proportion should not be interpreted as population prevalence, and the observed associations should not be considered causal.

**Keywords:** Osteoarthritis; Knee osteoarthritis; Ageing; Body mass index; Previous joint injury; Physical activity; WOMAC; EQ-5D-5L; Retrospective observational study and India

## Introduction

Osteoarthritis (OA) is a chronic joint disorder associated with pain, stiffness, functional limitation and structural change. Its burden increases with age and is influenced by factors including excess body weight, previous joint injury, occupational or mechanical loading,

and other metabolic and behavioral factors. The global burden of OA is substantial and is expected to increase as populations age [1]. Indian studies have reported substantial variation in the burden of knee OA. Differences in age structure, geographic setting, diagnostic criteria, sampling and ascertainment contribute to this heterogeneity. Recent Indian systematic reviews have reported marked variation in estimates according to study setting and case definition [2-4]. Symptoms, functional status, health-related quality of life and structural findings provide complementary information in OA. The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) assess pain, stiffness and physical function, while the EQ-5D-5L provides a generic measure of health-related quality of life [5,6]. Radiographic severity of knee OA is commonly described using the Kellgren-Lawrence classification, although radiographic abnormalities and symptoms do not necessarily correspond closely [7]. Evidence from service-hospital populations in India remains limited, particularly when clinical characteristics, functional burden, health-related quality of life and available radiographic findings are considered together. We therefore aimed to characterize OA documented among adults aged ≥50 years attending a service hospital and to describe associated demographic, clinical, functional, quality-of-life and radiographic characteristics. A secondary objective was to identify factors independently associated with documented OA.

## Methods

### Study design and setting

This was a retrospective observational study based on existing clinical records of adults aged ≥50 years. The study was conducted at service hospital at Jharkhand, India, during September 2024 to September 2026. Reporting was structured in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations [8].

### Participants and eligibility

The final analytic dataset comprised 500 eligible records. Inclusion criteria were age ≥50 years, either sex, and availability of the prespecified study variables. Records were excluded when the assessed joint was affected by known inflammatory arthritis, active joint infection, crystal arthropathy as the primary cause of current symptoms, malignancy involving the joint, recent major trauma precluding standardized assessment, congenital or developmental joint disease substantially altering joint anatomy, previous joint replacement of the evaluated joint, or neurological disease causing major independent functional impairment. Participants with missing values for individual variables were retained in analyses for which the relevant data were available, and the denominator was reported. The source dataset did not contain the number of records screened before the final 500 or a complete exclusion log; therefore, no unsupported screening or exclusion counts were introduced.

### Definition of the primary outcome

The primary outcome was record-documented OA, defined as osteoarthritis recorded in the clinical medical record. Because this was a retrospective record-based study, the diagnosis was not re-established prospectively by the investigators. Accordingly, the study reports the proportion of records with documented OA rather than a population prevalence estimate.

### Variables and outcome measures

Variables included age, sex, residence, education, occupation, occupational loading, BMI, physical activity level, sedentary hours per day, smoking, alcohol use, diabetes, hypertension, dyslipidaemia, thyroid disease, family history of OA, previous joint injury, previous joint surgery, joint and knee symptoms, pain intensity on a 0-10 numerical rating scale, morning stiffness duration, knee range-of-motion limitation, knee tenderness and knee deformity. WOMAC pain, stiffness, physical function and total scores and EQ-5D-5L index values were analyzed when recorded. WOMAC data were available for 150/500 participants (134 with documented OA and 16 without). Because ascertainment was incomplete and markedly unbalanced, WOMAC analyses were considered secondary and descriptive and were not included in the primary multivariable model.

### Data management

Data were extracted into a structured electronic database. Range checks, missing-data assessment and logical consistency checks were performed. No values were altered to conform to published estimates. The supplied final dataset was analyzed without imputation of missing WOMAC, radiographic or follow-up values.

### Statistical analysis

Continuous variables were summarized as mean ± Standard Deviation (SD), and categorical variables as frequencies and percentages. Between-group differences were assessed using independent-samples t-tests for continuous variables and chi-square or Fisher exact tests for categorical variables, as appropriate. The prespecified multivariable logistic regression model used documented OA as the dependent variable and included age, BMI, sedentary hours per day, sex, diabetes, hypertension, family history of OA, previous joint injury and physical activity category. Moderate physical activity was the reference category for the physical-activity variables. Variables that formed part of the clinical diagnostic pathway were not entered as predictors to reduce incorporation bias. Results are presented as adjusted odds ratios (aORs) with 95% CIs. Model discrimination was assessed using the Area Under the Receiver Operating Characteristic Curve (AUC), and multicollinearity was assessed using Variance Inflation Factors (VIFs). A two-sided $P<0.05$ was considered statistically significant.

### Ethics

The study was approved by the institutional ethics committee, and the requirement for individual informed consent was waived because the study involved retrospective, minimal-risk analysis of de-identified clinical records.


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## Result

### Study population

The final analytic dataset included 500 adults aged ≥50 years. Mean age was 63.54±8.46 years (range, 50-89 years), mean BMI was 26.13±4.02kg/m$^2$ (range, 17.5–38.0kg/m$^2$), and 255 (51.0%) participants were female. Record-documented OA was present in 177 participants (35.4%; 95% CI 31.3-39.7%) (Table 1).

**Table 1**:

| Characteristic | Overall (n=500) |
|---|---|
| Age, mean±SD, years | 63.54±8.46 |
| BMI, mean±SD, kg/m$^2$ | 26.13±4.02 |
| Sedentary hours/day, mean±SD | 6.29±2.13 |
| Female sex | 255 (51.0%) |
| Male sex | 245 (49.0%) |
| Rural residence | 268 (53.6%) |
| Urban residence | 232 (46.4%) |
| Low physical activity | 187 (37.4%) |
| Moderate physical activity | 216 (43.2%) |
| High physical activity | 97 (19.4%) |
| Smoking | 128 (25.6%) |
| Alcohol use | 130 (26.0%) |
| Diabetes | 81 (16.2%) |
| Hypertension | 168 (33.6%) |
| Dyslipidaemia | 122 (24.4%) |
| Thyroid disease | 32 (6.4%) |
| Family history of OA | 114 (22.8%) |
| Previous joint injury | 69 (13.8%) |
| Previous joint surgery | 28 (5.6%) |

### Clinical characteristics according to OA status

(Table 2)

**Table 2**:

| Variable | OA (n=177) | No OA (n=323) | P Value |
|---|---|---|---|
| Age, years | 65.76±8.34 | 62.32±8.29 | <0.001 |
| BMI, kg/m$^2$ | 26.65±4.25 | 25.84±3.86 | 0.036 |
| Sedentary hours/day | 6.26±2.07 | 6.31±2.16 | 0.811 |
| Pain NRS, 0-10 | 4.22±2.53 | 0.81±1.10 | <0.001 |
| Morning stiffness, min | 29.23±20.86 | 7.29±8.04 | <0.001 |
| EQ-5D-5L index | 0.70±0.10 | 0.88±0.07 | <0.001 |

### Anatomical distribution of documented OA

Among the 177 participants with documented OA, the knee was the most frequently recorded primary affected site, followed by the hand, hip, spine, shoulder and ankle (Table 3).

**Table 3**:

| Primary Affected Site | n | % of OA |
|---|---|---|
| Knee | 119 | 67.20% |
| Hand | 18 | 10.20% |
| Hip | 15 | 8.50% |
| Spine | 13 | 7.30% |
| Shoulder | 8 | 4.50% |
| Ankle | 4 | 2.30% |

### WOMAC and quality-of-life measures

WOMAC data were available for 150 participants (134 with documented OA and 16 without). Among participants with available WOMAC data, mean WOMAC pain, stiffness, physical function and total scores in the OA group were 7.60±2.22, 1.92±1.20, 21.87±7.27 and 31.39±8.69, respectively. Corresponding values in the 16 participants without documented OA were 7.88±2.21, 1.69±1.47, 18.29±7.07 and 27.86±9.12. None of the between-group comparisons reached statistical significance; Interpretation is limited by the small and highly unbalanced available sample (Table 4).

**Table 4**:

| WOMAC Variable | OA (n=134) | No OA (n=16) | P Value |
|---|---|---|---|
| Pain | 7.60±2.22 | 7.88±2.21 | 0.646 |
| Stiffness | 1.92±1.20 | 1.69±1.47 | 0.559 |
| Function | 21.87±7.27 | 18.29±7.07 | 0.072 |
| Total | 31.39±8.69 | 27.86±9.12 | 0.158 |

### Radiographic findings

Radiographic knee assessment was available for 175 participants. K/L grade ≥2 was present in 72/175 (41.1%). This is a radiographic proportion among the subgroup with available knee radiographs and should not be interpreted as the prevalence of OA in the complete 500-participant dataset (Table 5).

**Table 5**:

| K/L Grade | n | % Among Radiographed (n=175) |
|---|---|---|
| 0 | 49 | 28.00% |
| 1 | 54 | 30.90% |
| 2 | 46 | 26.30% |
| 3 | 20 | 11.40% |
| 4 | 6 | 3.40% |

### Multivariable logistic regression

The multivariable model included all 500 participants and 177 OA events. Model discrimination was modest (AUC 0.660). VIFs ranged from 1.01 to 1.19, indicating no important multicollinearity (Table 6).


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**Table 6**:

| Predictor | Adjusted OR | 95% CI | P Value |
|---|---|---|---|
| Age, per year | 1.051 | 1.027-1.076 | <0.001 |
| BMI, per kg/m$^2$ | 1.051 | 1.001-1.103 | 0.044 |
| Sedentary hours/day | 0.981 | 0.896-1.074 | 0.676 |
| Male sex | 0.867 | 0.590-1.273 | 0.467 |
| Diabetes | 0.99 | 0.588-1.667 | 0.969 |
| Hypertension | 1.225 | 0.816-1.839 | 0.328 |
| Family history of OA | 0.9 | 0.567-1.430 | 0.657 |
| Previous joint injury | 2.174 | 1.273-3.711 | 0.004 |
| Low physical activity | 1.536 | 1.004-2.350 | 0.048 |
| High physical activity | 1.067 | 0.623-1.827 | 0.814 |

### Missing data and follow-up variables

Missingness were concentrated in WOMAC, radiographic and follow-up variables. WOMAC variables were available for 150/500 participants, knee K/L grade for 175/500, follow-up pain and follow-up WOMAC for 135/500, and new joint involvement for 441/500. Because follow-up ascertainment was incomplete and the primary objective was characterization of documented OA, follow-up variables were not included in the primary analysis.

## Discussion

In this retrospective study of 500 adults aged ≥50 years attending a service hospital, OA was documented in 35.4% of records. The knee was the predominant primary affected site, accounting for 67.2% of documented OA cases. Participants with documented OA were older, had a modestly higher mean BMI, reported greater pain and morning stiffness, and had lower EQ-5D-5L index values than those without documented OA. The 35.4% figure should not be interpreted as population prevalence. The study was facility-based, retrospective and dependent on clinician documentation rather than standardized prospective case ascertainment. Indian systematic reviews have demonstrated substantial heterogeneity in knee-OA estimates according to population, setting and diagnostic criteria. [2-4] The present findings are therefore most appropriately interpreted as a description of OA documented in this service-hospital dataset. The predominance of knee involvement is consistent with established OA epidemiology. [1,2] Increasing age and higher BMI were independently associated with documented OA in the adjusted analysis. Previous joint injury showed the largest adjusted association among the categorical predictors, with more than twice the odds of documented OA. This is compatible with the recognized relationship between prior joint injury and subsequent degenerative joint change, although the retrospective design and record-based exposure ascertainment do not establish temporality for every observation. Low physical activity was independently associated with documented OA, whereas sedentary hours per day were not. This finding requires cautious interpretation because reduced activity may be a consequence of pain and functional limitation rather than an antecedent exposure. Thus, the observed association should not be interpreted as evidence that low physical activity causes OA. The distinction also illustrates that categorical physical-activity level and reported sedentary time may capture different aspects of behavior.

Participants with documented OA had substantially lower EQ-5D-5L index values than those without documented OA. The Indian EQ-5D-5L value set provides an established framework for deriving preference-based health-state values in India [6]. However, the present analysis is descriptive and does not establish population utility norms or treatment-related changes in health-related quality of life. WOMAC findings were exploratory because data were available in only 30% of participants and were markedly unbalanced between groups. The absence of statistically significant differences should therefore not be interpreted as evidence of equivalence between participants with and without documented OA. The small non-OA subgroup substantially limits precision. Among participants with available knee radiographs, 41.1% had K/L grade ≥2. This estimate cannot be directly compared with the 35.4% proportion of documented clinical OA because the radiographic subgroup was selected by availability of imaging and the primary outcome included OA at multiple anatomical sites. Interpretation of K/L grading also depends on consistent application of the classification system [7]. The study has potential clinical relevance for service-hospital practice because the recorded burden of symptoms and reduced quality of life indicates that OA may represent a meaningful source of morbidity among older adults attending such facilities. Current international recommendations emphasize individualized, multicomponent non-pharmacological management, including education, exercise, weight management and support for function and participation [9,10]. The present study did not evaluate treatment effectiveness and therefore cannot determine whether such interventions improve outcomes in this population.

## Strengths and Limitations

### Strengths

a. A relatively large single-center dataset of 500 adults aged ≥50 years.

b. Availability of demographic, anthropometric, behavioral, co-morbidity, symptom and health-related quality-of-life variables.

c. A prespecified multivariable model that excluded variables forming part of the clinical diagnostic pathway, reducing the risk of incorporation bias.

d. Availability of radiographic K/L grading in a defined subgroup.

e. Explicit reporting of missingness and avoidance of unsupported reconstruction of screening, exclusion or missing-data counts.

### Limitations

a) The retrospective record-based design permits information and selection bias and limits causal inference.

b) Facility-based sampling limits generalizability to the wider Indian population.


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c) The primary outcome was record-documented OA rather than a prospectively standardized diagnosis.

d) Radiographs were available for only 175 participants, creating potential selection bias in radiographic analyses.

e) WOMAC was available for only 150 participants, with only 16 participants without documented OA represented in that subset.

f) The source or measurement instrument used to categorize physical activity was not documented in the supplied materials.

g) Only final K/L grades were available, preventing calculation of inter-observer agreement.

h) Incomplete follow-up data prevented robust longitudinal analysis.

i) Residual confounding from unmeasured factors cannot be excluded.

## Conclusion

Among 500 adults aged ≥50 years in a service-hospital retrospective dataset, OA was documented in 35.4% of records and most commonly involved the knee. Older age, higher BMI, previous joint injury and low physical activity were independently associated with documented OA. Documented OA was also associated with greater pain and morning stiffness and lower health-related quality of life. Because the study was facility-based and retrospective, the observed proportion should not be interpreted as population prevalence and the observed associations should not be considered causal. Prospective, multicenter Indian studies using standardized diagnostic criteria and more complete functional and radiographic assessment are warranted.

## Declarations

### Ethics approval and consent to participate

The study was approved by the institutional ethics committee. The requirement for individual informed consent was waived because this was a retrospective, minimal-risk study using de-identified clinical records.

### Consent for publication

Not applicable; no individually identifiable patient information is reported.

### Availability of data and materials

The underlying patient-level dataset is subject to institutional confidentiality restrictions. A suitably de-identified dataset may be made available from the corresponding author or institution, subject to applicable institutional approvals.

### Authors' contributions

SS, AK and SD contributed to study conception, protocol development, data acquisition, data analysis and interpretation. SS, AK, SD, AR and AC contributed to manuscript drafting and final approval of the submitted version. All authors approved the final manuscript.

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