

Original Research Article

Prevalence of radiographic osteoarthritis in an outpatient clinic at a teaching and referral hospital in Laikipia County, Kenya

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ABSTRACT

Background: Osteoarthritis (OA) is a leading cause of chronic pain and disability globally, particularly among older adults. In sub-Saharan Africa, including Kenya, OA represents a growing public health burden amid demographic transitions and lifestyle changes. Despite this, there is limited local data on its prevalence, correlates especially in rural communities. This study aimed to determine the prevalence and predictors of radiographic OA in patients at a Teaching and Referral Hospital in Laikipia.

Methods: A cross-sectional study in an orthopaedic outpatient clinic was conducted for 4 months involving 194 participants aged ≥ 18 years. Systematic random sampling was employed. Data were collected using a structured researcher-administered questionnaire for sociodemographic and clinical information. Anthropometric measurements were taken and imaging reports were reviewed to confirm OA diagnosis and severity. Descriptive statistics summarized patient characteristics. Logistic regression models identified independent predictors of OA. Informed consent and ethical approvals were obtained.

Results: The overall prevalence was 32.5% (95% CI: 26.2–39.4). OA was significantly more common among females (61.9%), older adults (mean age 62.9 ± 13.5 years) and those with comorbidities (60.3%). Nearly half (47.6%) were obese. The knee was the most frequently affected joint. Multivariate analysis revealed that increasing age (AOR=1.094, $p < 0.001$), obesity (AOR=6.190, $p = 0.008$) and poor functional status (ECOG ≥ 1) (AOR=8.393, $p = 0.001$) were independent predictors.

Conclusions: OA is highly prevalent in this rural setting. Advanced age, obesity and functional limitations are key predicting factors. Targeted screening prioritizing older patients and mandatory assessment of obesity and functional status are essential for timely management.

Keywords: Kenya, Laikipia county, Musculoskeletal burden, OA prevalence, Radiographic osteoarthritis

INTRODUCTION

Osteoarthritis is a significant and growing public health burden in Kenya, marked by a considerable gap in prevalence data and a lack of a clinical profile of patients diagnosed with the disease, especially in the country's

rural communities. Globally, OA affected 7.6% of the population in 2020, with cases rising by 113.25% between 1990 and 2019 and an additional 20% is anticipated by 2032.¹⁻³ Usenbo et al estimate that in Africa, the prevalence ranges from 7.95% to 82.7% in adults over 65.⁴

Though many Kenya hospital-based studies report prevalences ranges between 10% to 20%, these figures are predominantly drawn from urban populations thus raising concerns about their applicability to rural settings.⁵⁻¹⁰ Conversely, some community based studies estimate the prevalence to be around 44.6% - 49.6%, highlighting a disparity in local data.¹¹⁻¹³ Furthermore, most existing research primarily focuses on a single joint within specific urban contexts. For instance, Bosire et al, Dino et al and Mwaura centred their work on knee OA in urban outpatient clinics.⁷⁻⁹ While informative, these findings may not reflect the broader osteoarthritis burden across Kenya's diverse socioeconomic and geographic landscape. Osteoarthritis prevalence and its risk factors such as sex, age, physical activity, weight, hypertension and diabetes likely vary between rural and urban settings due to differences in occupational strain, diet and healthcare access.^{6,12,15-23}

This narrow focus extends beyond geography to anatomy. Not only is there limited representation of non-knee OA in local studies, but this also creates a significant knowledge gap regarding the need for literature on other forms of the condition, including hip, hand and spine osteoarthritis in Kenya. While Nour et al reported that 77% of cases affected the knee, Onsare found hip OA to be more prevalent (35.02%) in their specific setting. Such divergence highlights regional variations in OA patterns that warrant further investigation.^{6,10} These comparisons are further complicated by methodological inconsistencies, including differing diagnostic tools, population selection and data sources, which hinder a unified understanding of the national OA burden.

Lastly, an epidemiologic analysis at NTRH identified musculoskeletal conditions, including OA, as a leading diagnosis, although specific prevalence data were unavailable.¹⁴ Additionally, NTRH's 2022 outpatient records showed a 28% increase in OA cases, but the prevalence and clinical profile of the disease remain largely based on opinion rather than evidence. In this context, gathering rural-specific data is not only necessary for clinical understanding but also crucial for shaping differentiated policy responses. Rural populations often experience unique challenges that may alter both disease prevalence and impact.

This study is not only timely but also necessary. By focusing on a rural hospital in Laikipia, it provides evidence for underserved populations, guiding tailored interventions and rural-inclusive policies to improve musculoskeletal care equity across Kenya's diverse landscape.

METHODS

Study settings and design

This descriptive, hospital-based, cross-sectional study was conducted over four months from December 2024 at

NTRH, a public level 4 facility in Laikipia County. It's the largest referral hospital in Laikipia serving the Mount Kenya region. NTRH's high-volume outpatient department and specialized imaging services provided an ideal setting for recruiting the study sample.

Target population and eligibility

The target population included all patients aged 18 or older attending NTRH's Orthopaedics Outpatient Clinic during the four-month study period

Inclusion criteria

Participants were 18 years of age or older. Provided informed written consent. Participant had relevant radiographs taken within 6 months of study period.

Exclusion criteria

Individuals with terminal illness or cognitive impairment. Patients with other documented non-OA arthropathies, including, but not limited to, Rheumatoid Arthritis, Gout or other inflammatory joint diseases.

Sample size determination

The sample size was calculated using the formula established by Cochran (24). Using a 95% confidence level ($Z=1.96$) and 5% precision ($e=0.05$), the calculation assumed a conservative osteoarthritis prevalence (p) of 29.7%, derived from comparable rural South African data (4).

$$no=(Z/e)^2 pq$$

Substituting these values yielded an initial sample size (n_0) of 321. With NTRH records showing 144 monthly clinic patients, the finite population (N) over three months was 432. Applying the finite population correction formula adjusted the final sample size accordingly. Applying the finite population correction formula below;

$$n=no/(1+(no-1)/N)$$

The calculation resulted in 184 participants. Finally, factoring in a 5% non-response rate for potential data gaps, the final target sample size was set at 194 participants.

Sampling procedure

Eligible patients were enrolled via systematic random sampling ($k=2$) until the target sample size was reached. The interval was determined by dividing the finite population ($n=432$) by the sample size ($n=194$). Every second patient was selected, with the first participant chosen through simple random sampling from the clinic's booking list.

Data collection tools and procedures

The data collection utilized a structured, researcher-administered questionnaire in conjunction with objective anthropometric measurements and a review of diagnostic imaging reports.

Data collection instruments and measures

To gather quantitative data, a structured questionnaire was developed based on literature, focusing on socio-demographic and clinical independent variables. These included age, sex, occupation, family history, marital status, residence, BMI, prior joint trauma, hypertension, diabetes, functional status, deformities, alcohol consumption and smoking.

The dependent variable, OA presence, was confirmed via radiographic imaging, so as to ensure diagnostic accuracy and minimize bias. The questionnaire also recorded joint sites and severity. Severity was classified using the Kellgren-Lawrence (K-L) scale, where grades 1–2 denoted Mild/Moderate OA and grades 3–4 denoted Severe OA.

Procedure for data collection

The researcher introduced themselves to the clinic In-Charge, explained the study's purpose and obtained permission to access patient records. Once a patient was sampled and eligibility confirmed, the researcher explained the study's objectives and obtained informed written consent before data collection.

To minimize errors and address potential illiteracy, the researcher read and elaborated on questions as needed. Medical history, including comorbidities and trauma, was cross-checked with hospital files. Anthropometric data (weight and height) were collected using a calibrated scale and tape measure to calculate the body mass index (BMI).

Data analysis

Data were cleaned, coded and analyzed using SPSS. Univariate analysis employed frequencies and percentages for categorical variables and means, medians and standard deviations for continuous variables. For bivariate analysis, the Chi-square and Fisher's exact tests assessed associations between categorical variables, while t-test compared means for continuous variables. Variables with a p value ≤ 0.05 were included in the subsequent multivariate analysis. Multiple logistic regression models were utilized to identify variables independently associated with the presence OA, reporting 95% Confidence Intervals. Statistical significance was set at $p < 0.05$.

Ethics considerations

Ethical approval was secured from the Mount Kenya University Ethics Review Committee (Ref: MKU/ISERC/4615 approval number 3337) and a research permit obtained from National Commission for Science Technology and Innovation (NACOSTI/P/25/414752). All participants provided informed written consent after being fully informed of the study's purpose and procedures. Participation was voluntary and confidentiality was ensured by assigning unique identification codes to all data. Hard-copy data were stored in locked cabinets and electronic files were password-protected and accessible only to the research team.

RESULTS

The study enrolled 194 patients, of whom 63 were diagnosed with radiographic osteoarthritis (OA). This resulted in an overall prevalence of 32.5% (95% CI: 26.2, 39.4) among patients attending the orthopedics outpatient clinic. The clinical and demographic characteristics of the 63 OA patients are summarized in Table 1. The mean age was 62.9 years (SD=13.5), confirming the disease predominant in the older adult population. The majority of OA patients were female (61.9%) compared to males (38.1%). Most participants resided in Laikipia County (73.0%). Occupationally, patients were most frequently retired (28.6%) or self-employed tradesmen (28.6%). Regarding marital status, 65.1% of the patients were married, while 19.0% were widowed.

Analysis of clinical factors revealed that 77.8% of OA patients had a BMI classified as overweight or obese (obese 47.6%, overweight 30.2%). Smoking was reported by 15.9% of participants and the majority (69.8%) reported never consuming alcohol. Comorbidities were highly prevalent, affecting 60.3% of the OA patients. The most frequently reported conditions were hypertension (39.7%) and diabetes (11.1%). Additionally, 34.9% of the patients reported a previous history of joint injury. A positive family history of OA was reported by 33.3% of the patients.

The knees were the most common anatomical region affected, accounting for 57.1% of diagnoses (right knee 33.3% and left knee 23.8%). This was followed by the hips (left 20.6%, right 19.0%). Notably, the severity grade showed that the majority of cases were categorized as severe (54.0%) using the Kellgren-Lawrence scale, while 46.0% were classified as mild to moderate. Functional status reflected this severity, with 60.3% of patients reporting some degree of restriction in physical activity (ECOG 1 or 2). The bivariate analysis (Table 2) identified several demographic and clinical factors significantly associated with the presence of radiographic OA at the $p < 0.05$ level. These included older age ($p < 0.001$), female gender ($p = 0.045$), specific occupation (retired status), marital status (widowed), obesity ($p = 0.005$), presence of

comorbidities (hypertension and diabetes), impaired ECOG functional status and a positive family history of OA. Factors such as residence, smoking, alcohol consumption and previous joint trauma did not show a statistically significant association. Subsequently, a multivariable logistic regression model (Table 3) was used to identify independent predictors of OA after adjusting for potential confounders. In this model, only three factors remained statistically significant: increasing age, obesity and functional impairment.

Increasing age was a highly significant independent predictor of OA, with each additional year increasing the

odds of OA by 9.4% (adjusted odds ratio, AOR=1.094, 95% CI: 1.044–1.145, $p<0.001$). Obesity also showed a strong independent association, with obese individuals having over six times the odds of OA compared to those with normal weight (AOR=6.190, 95% CI: 1.616–23.697, $p=0.008$). Finally, functional impairment emerged as a robust independent predictor; individuals with mild functional limitation (ECOG 1) had significantly higher odds of OA (AOR=8.393, 95% CI: 2.422–29.079, $p=0.001$) compared to those with no limitation. Sex, occupation, marital status, comorbidities, hypertension, diabetes and family history were not statistically significant in the final multivariable model.

Table 1: Showing the clinical and demographic characteristics of the patients with osteoarthritis.

Variables	Category (n=63)	Frequency (N)	(%)
Sex	Male	24	38.1
	Female	39	61.9
Age (in years)	Mean (SD)	62.9 (13.5)	-
County	Laikipia	46	73.0
	Nyeri	13	20.6
	Meru	2	3.2
	Others	2	3.2
Occupation	Employed	16	25.4
	Self-employed (Tradesman)	18	28.6
	Not working	11	17.5
	Retired	18	28.6
Marital Status	Married	41	65.1
	Single	5	7.9
	Widowed	12	19.0
	Divorced/Separated	5	7.9
BMI	Normal weight	14	22.2
	Over weight	19	30.2
	Obese	30	47.6
Smoking	No	53	84.1
	Yes	10	15.9
Alcohol	Never	44	69.8
	Sometimes	6	9.5
	Occasionally	9	14.3
	Often	2	3.2
	Always	2	3.2
Comorbidities	No	25	39.7
	Yes	38	60.3
Comorbidities	Hypertension	25	39.7
	Diabetes	7	11.1
	Lower/Upper Limb Fracture	6	9.5
	Joint Ligamentous Injury	5	7.9
	Others	8	12.7
ECOG functional	0	25	39.7
Status	1	28	44.4
	2	10	15.9
Family history	No	42	66.7
	Yes	21	33.3
Joint affected	Knee right	21	33.3

Continued.

Variables	Category (n=63)	Frequency (N)	(%)
	Knee left	15	23.8
	Hip right	12	19.0
	Hip left	13	20.6
	Spine	9	14.3
	Hand right	3	4.8
	Hand left	1	1.6
	Ankle right	2	3.2
	Elbow right	1	1.6
	Shoulder right	3	4.8
Previous injury	No	41	65.1
	Yes	22	34.9
Severity grade	Mild/Moderate	29	46.0
	Severe	34	54.0

Table 2: Showing a bivariate analysis showing association between participants' characteristics and osteoarthritis.

Variable	Category (n=194)	No OA (N, %)	OA (N, %)	P value
Sex	Male	70 (74.5)	24 (25.5)	0.045 ^c
	Female	61 (61.0)	39 (39.0)	
Age (in years)	Mean (SD)	44.8 (13.9)	62.9 (13.5)	<0.001 ^t
	Range	18–80	18–90	
County	Laikipia	94 (67.1)	46 (32.9)	0.972 ^f
	Nyeri	26 (66.7)	13 (33.3)	
	Meru	7 (77.8)	2 (22.2)	
	Others	4 (66.7)	2 (33.3)	
Occupation	Employed	53 (76.8)	16 (23.2)	<0.001 ^c
	Self-employed (Tradesman)	43 (70.5)	18 (29.5)	
	Not working	30 (73.2)	11 (26.8)	
	Retired	5 (21.7)	18 (78.3)	
Marital status	Married	83 (66.9)	41 (33.1)	<0.001 ^f
	Single	38 (88.4)	5 (11.6)	
	Widowed	4 (25.0)	12 (75.0)	
	Divorced/Separated	6 (54.5)	5 (45.5)	
BMI	Underweight	2 (100.0)	0 (0.0)	0.005 ^f
	Normal weight	53 (79.1)	14 (20.9)	
	Overweight	44 (69.8)	19 (30.2)	
	Obese	32 (51.6)	30 (48.4)	
Cigarette smoking	No	107 (66.9)	53 (33.1)	0.675 ^c
	Yes	24 (70.6)	10 (29.4)	
Alcohol consumption	No	84 (65.6)	44 (34.4)	0.431 ^c
	Yes	47 (71.2)	19 (28.8)	
Comorbidities	No	90 (78.3)	25 (21.7)	<0.001 ^c
	Yes	41 (51.9)	38 (48.1)	
Hypertension	No	117 (75.5)	38 (24.5)	<0.001 ^c
	Yes	14 (35.9)	25 (64.1)	
Diabetes	No	128 (69.6)	56 (30.4)	0.009 ^f
	Yes	3 (30.0)	7 (70.0)	
Limb fracture	No	111 (66.1)	57 (33.9)	0.272 ^c
	Yes	20 (76.9)	6 (23.1)	
Joint injury	No	118 (67.0)	58 (33.0)	0.655 ^c
	Yes	13 (72.2)	5 (27.8)	
Others	No	123 (69.1)	55 (30.9)	0.118 ^c
Comorbidities	Yes	8 (50.0)	8 (50.0)	
ECOG functional	0	104 (80.6)	25 (19.4)	<0.001 ^c

Continued.

Variable	Category (n=194)	No OA (N, %)	OA (N, %)	P value
Status	1	18 (39.1)	28 (60.9)	
	2	9 (47.4)	10 (52.6)	
Family History of OA	No	117 (73.6)	42 (26.4)	<0.001 ^c
	Yes	14 (40.0)	21 (60.0)	

^c Chi Square test. ^f Fisher's Exact test. ^t t-test.

Table 3: A multivariate logistic regression analysis showing factors associated with Osteoarthritis.

Variable	AOR	95% CI	P value
Sex			
Male	1		
Female	0.613	0.229 – 1.638	0.329
Age (continuous)	1.094	1.044 – 1.145	<0.001***
Occupation			
Employed	1		
Self-employed (Tradesman)	0.410	0.134 – 1.247	0.116
Not working	0.906	0.223 – 3.678	0.890
Retired	0.511	0.088 – 2.944	0.453
Marital status			
Married	1		
Single	0.530	0.140 – 1.999	0.349
Widowed	1.060	0.138 – 8.117	0.995
Divorced/Separated	0.758	0.088 – 6.479	0.800
BMI			
Normal weight	1		
Overweight	1.040	0.325 – 3.322	0.947
Obese	6.190	1.616 – 23.697	0.008**
Comorbidities			
No	1		
Yes	1.959	0.621 – 6.176	0.251
Hypertension			
No	1		
Yes	1.371	0.313 – 6.009	0.675
Diabetes			
No	1		
Yes	3.180	0.333 – 30.367	0.315
ECOG status			
0	1		
1	8.393	2.422 – 29.079	0.001**
2	3.855	0.460 – 32.265	0.213
Family history of OA			
No	1		
Yes	3.035	0.957 – 9.628	0.059

p<0.05*, p<0.01, ***p<0.001.

DISCUSSION

The prevalence of radiographic OA was found to be 32.5% among patients at the orthopedic clinic. This finding indicates a substantial disease burden in Laikipia County, aligning with regional estimates for Africa and the Middle East, which typically range between 31% and 34%.²⁵ However, this figure is notably higher than historical Kenyan hospital-based studies reporting 10–20%, though it remains consistent with South African data of 33.1%.^{4,6,7,9} This upward trend likely reflects the

epidemiological transition of non-communicable diseases (NCDs) in low- and middle-income countries (LMICs), driven by aging populations and rising obesity rates. In contrast, while the results exceeded most inland hospital studies, they remain lower than some Kenyan community-based reports citing rates near 50%.¹¹⁻¹³ This disparity suggests that hospital data may only capture a subset of the true community burden. Furthermore, variations may stem from methodological differences; community-based studies often rely on convenience sampling or self-reported symptoms, which can lead to

misdiagnosis. Self-reported arthritis may also not align with clinical findings.²⁶ Conversely, this study likely captured a more accurate prevalence estimate. By using systematic random sampling and imaging-based diagnosis (X-rays), the researchers minimized selection bias and ensured clinical validation. The demographic profile at NTRH reinforces OA as a disease primarily affecting older, female populations. With a mean age of 62.9 years and a 61.9% female majority, these findings support biological hypotheses regarding OA pathogenesis, particularly the role of estrogen deficiency in post-menopausal women.^{15,16} From an occupational standpoint, the high representation of tradespeople (28.6%) suggests that repetitive mechanical stress and physical labor inherent in rural livelihoods contribute significantly to joint degradation. The knee was the most affected site (57.1%), followed by the hip (20.6%), confirming that weight-bearing joints bear the primary disease burden in this population.

Multivariate logistic regression identified aging, obesity and functional impairment as the most robust independent predictors of OA. The finding that each additional year of age increases the odds of OA by 9.4% underscores its degenerative nature.^{17,18} Additionally, 64.5% of patients were overweight or obese. The strong association with obesity (AOR=6.19) highlights a vital modifiable risk factor, echoing findings from other LMICs.^{6,21-23} This suggests that the OA burden in rural Kenya is not merely a result of aging but is also heavily influenced by the metabolic and mechanical consequences of high BMI. The mechanical load on joints and systemic inflammation induced by adipokines like leptin and TNF- α are probable mechanisms attributed to OA in obesity.

Functional assessment using the ECOG performance status indicated significant impairment: 44.4% experienced restrictions (ECOG 1) and 15.9% were unable to work (ECOG 2). While functional limitation was a strong predictor, this correlation clinically illustrates the debilitating nature of the disease, as biological degeneration translates into lost physical independence. This aligns with the Wilson and Cleary model, where biological factors cascade into functional limitations that reduce overall quality of life.²⁷ However, contrary to this trend, some literature suggests a subset of individuals maintain active lifestyles despite significant radiographic OA.²⁰

Finally, a notable observation was the lack of independent statistical significance for comorbidities like hypertension and diabetes in the multivariable model, despite their high prevalence. This may suggest that while these NCDs often co-exist with OA, they likely share common predisposing risks such as obesity rather than acting as direct causative agents for joint degeneration in this specific study.

CONCLUSION

These findings provide crucial, previously unavailable localized data, confirming that OA constitutes a substantial burden in rural healthcare. Identifying increasing age, obesity and functional impairment as independent predictors refines the understanding of risk factors pertinent to the Nanyuki population and establishes a foundational understanding of the disease's scope. Consequently, targeted screening is essential, prioritizing females and older patients (≥ 62.9 years). Screening protocols should integrate mandatory assessments of obesity and functional status to identify high-risk individuals, enabling timely management and improved outcomes within the region.

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