Research 🔖

Prevalence and predictors of arthritis among adults in a rural set-up in Kenya: a cross-sectional study

🆔Shem Nyarunda Kinara, Harun Mbugua Kimani, Gordon Oluoch Ogweno

Corresponding author: Shem Nyarunda Kinara, Department of Family Medicine Community Health and Epidemiology, Kenyatta University, Nairobi, Kenya. shemkny@gmail.com

Prevalence and predictors of arthritis among adults in a rural set-up in Kenya: a cross-sectional study

Shem Nyarunda Kinara[1,&], Harun Mbugua Kimani[1], Gordon Oluoch Ogweno[2]

[1]Department of Family Medicine Community Health and Epidemiology, Kenyatta University, Nairobi, Kenya, [2]Department of Medical Physiology, Kenyatta University, Nairobi, Kenya

[&]Corresponding author
Shem Nyarunda Kinara, Department of Family Medicine Community Health and Epidemiology, Kenyatta University, Nairobi, Kenya

Abstract

Introduction: arthritis is a significant public health problem affecting many people globally. Exposure to various risk factors puts individuals at risk of developing arthritis. Therefore, this study aimed to assess the prevalence and predictors of arthritis among residents of a rural set-up in Nyamira County, Kenya. Methods: a community-based cross-sectional study design was employed. Simple random sampling was utilized to select households from a household list. All the residents of the sampled household above 40 years were included. Descriptive analysis was done to describe the study population. Bivariate and multivariate analysis was

also done to identify statistically significant arthritis-related variables. **Results:** the prevalence of arthritis was 44.6%. Previous joint injury/infection [AOR=2.74; 95%CI=1.59-4.77; p<0.001], being unemployed [AOR=2.77; 95%CI=1.50-5.21; p=0.001], age above 51 years, and hypertension [AOR=1.90; 95%CI=1.03-3.53, p=0.040] were associated with an increased risk of arthritis. Conversely, being male [AOR=0.42; 95% CI=0.22-0.75; p=0.005], standing for > 2 hours [AOR=0.48; 95%CI=0.29-0.81; p=0.006], and constant shifting from sit to stand positions [AOR=0.45; 95% CI=0.26-0.76; p=0.003] were associated with a lower risk of arthritis. Most participants (75%) had an arthritis knowledge score of more than 66%. **Conclusion:** the study found a high prevalence of arthritis in the community. Arthritis was strongly associated with various risk factors under study. Therefore, there is a need to take preventive measures for modifiable factors to enhance a reduced prevalence of arthritis.

Introduction

Osteoarthritis (OA) and rheumatoid arthritis (RA) are a significant public health problem affecting many people globally [1,2]. These conditions are often associated with pain, stiffness, reduced range of motion, and joint deformities [3]. Globally, approximately 7.6% had osteoarthritis in 2019, an increment of 132.2% of the total cases since 1990 [1]. The trend is also replicated in rheumatoid arthritis, where approximately 20 million prevalent cases and 1.2 million incident cases affected people globally as of 2017 [2]. An epidemiological analysis of RA incidence from 1990 to 2019 found an increment of 6.47% [4]. In Africa, the burden of OA ranges from 0.4% to 82.7% [5,6], while that of RA varies from 0.1% to 2.5% [5]. A Community Oriented Programme for the Control of Rheumatic Diseases in Africa in two sub-Saharan Africa (SSA) countries found the prevalence of osteoarthritis to be 6.1% and 22.1% in peri- and semi-urban Nigeria, respectively [7,8] and 36.8% in rural Congo [9]. Conversely, the exact prevalence of RA in SSA is unknown; however, it is statistically projected to be

135.7 to 231.1 per 100,000 people [2]. In Kenya, there is limited data on the spectrum of rheumatic diseases. Despite that, a hospital study found the prevalence of OA to be 9.6% [10], while a population-based survey conducted in urban slums of Nairobi indicated that approximately 42.6% had arthritis symptoms, with 25.3% having an arthritis diagnosis [11]. Together, these findings suggest an increasing burden of arthritis within our populations.

The rise in the incidence of RA patients may be associated with increased survival [12], early detection, advanced medical practices, environmental exposures, and genetic factors [13]. Africa's rheumatic diseases are probably higher than other parts of the globe in terms of morbidity and mortality, as patients often present at a later stage of disease [14,15]. With an ageing global population and an increase in arthritis attributed to activity limitation [16], the economic and health burden will increase significantly [17]. This may lead to a loss of dependence, lack of social participation, workplace absenteeism, and reduced psychological well-being [17,18]. Similarly, arthritis risk factors such as occupational exposures [19] and multimorbidity of non-communicable diseases [20] are on the rise in low- and middle-income countries (LMIC), and Kenya is one of them. This can lead to a high prevalence of arthritis cases. According to the Nyamira county integrated development plan 2018 -2019, arthritis was the second cause of morbidity [21]. Therefore, to comprehend predisposing arthritis risk factors among people living in LMIC, there is a need for population-based studies and evidence-based prevention strategies.

This study aimed to assess the prevalence and predictors of arthritis among residents of a rural set-up in Nyamira County, Kenya, where arthritis was the second.

Methods

Study design: we conducted a cross-sectional study using a household survey among residents living in rural Nyamira County. This study was conducted

between the 1st and 30th of January 2023 by investigators affiliated with Kenyatta University.

Study setting: the Tombe area has 2,270 households and 8,912 people in Nyamira County, Kenya. Nyamira County has a population size of 605,576 [22].

Sample size determination: this study utilized Fisher's unlimited and finite population formula.

Unlimited population:

Finite population:

Where Z is the z score set at 1.96, which corresponds to a 95% confidence level, εis the margin of error set at 5%, Nis household population size for the Tombe location (2270) [22], and x̂is the population proportion of the primary outcome (arthritis) set at 21.5% [23]. After finite population correction and adjustments for spoilt questionnaires (10%), the total sample size yielded 258 households.

Participants: all participants above forty years in the randomly sampled households were selected to participate in the arthritis household survey from the thirty-three selected community units. Trained research assistants conducted interviews with 307 persons who consented to participate.

Variables/measures

Arthritis status: doctor-diagnosed and symptom-based criterion: arthritis status, the outcome variable, was measured using a doctor's diagnosis and an arthritis symptom-based criterion. Doctor-diagnosed arthritis was based on participant responses to the question, *"Have you ever been diagnosed with/told by a healthcare professional you have arthritis (a disease of the joints or, by other names, rheumatism or osteoarthritis)?"* Those who responded "No" were further screened with an arthritis symptom-based algorithm developed by the WHO SAGE study team [24] to determine the pattern of symptoms indicative of

osteoarthritis instead of symptoms most likely to show inflammatory arthritis as shown in Table 1.

Correlates of arthritis: this study's independent variables were sociodemographic, occupation-related stressors, lifestyle, and medical risk factors. The sociodemographic factors assessed included age (40-50, 51-60, 61-70, 71+), gender (male or female), education (high school and above, below primary school, or no formal schooling), marital status (married/cohabiting or single/divorced/ widowed/separated), social health insurance (No or Yes), employment status (self-employed/ employed or unemployed), household size (1-4 or 5+), and area of residence (rural or town centre). The medical risk factors assessed included previous joint injury (Yes or No) and comorbidities (Yes-specify or No). On the other hand, the occupational-related stressors explored entailed repetitive joint movements (standing for >2 hours or constant shifting from sit to stand position), carrying heavy loads ≥10kg, walking for >3km, and tea picking being measured as (Daily/regularly or Never/Rarely). The lifestyle risk factors assessed involved exercise (Yes or No). Finally, the level of knowledge on arthritis was assessed using a validated knowledge tool adopted from a study on knowledge of symptomatic knee osteoarthritis among railway workers [25]. The tool had thirty-five components assessing knowledge of risk factors, signs and symptoms, disability, preventive measures, and aspects to relieve arthritis symptoms.

Statistical methods: data was analyzed using the R version 4.2.2. Univariate analysis was done, where data was analyzed into frequency and percentages. Bivariate analysis was conducted to estimate the association between dependent (arthritis) and independent variables (sociodemographic, medical, occupational, and lifestyle factors) in a statistically significant manner (p≤0.05). Under the bivariate settings, the association between categorical variables was assessed using Pearson's Chi-Square test. The association between categorical variables such as gender, the highest level of education, and employment status, among

others and continuous variables, e.g., age and household size, were done using two-sample t-tests, assuming Gaussian distribution for continuous variables. A two-sample Wilcoxon rank sum test was used for the association between categorical and continuous variables, which are not normally distributed. All two-way variable interactions for significant risk factors with arthritis were investigated through multivariate logistic regression models. We also performed a survival analysis to assess the median age of developing arthritis among females and males.

Ethical approval and consent to participate: ethical approval to carry out this research was obtained from the Kenyatta University Ethical Review Committee (KUERC). Besides that, informed consent was sought from all individuals who agreed to participate in the study. This is after the procedures, benefits, disadvantages, and objectives of this study had been explained to them.

Results

Respondent´s characteristics: the respondent characteristics of the 307 participants included are shown in Table 2. Most participants were aged 40-50, 112(36.5%), and many had a household size of between 1 and 4 people, 172 (56.0%). Regarding other variables, 197 (64.2%) were females, 135 (44.0%) had the highest level of education, 239 (77.9%) were married/cohabiting and 168 (54.7%) had a social health insurance. Most people exercised 197 (64.2%) and lived in rural set-ups, 245 (79.8%), as opposed to town centres within the community.

Prevalence of arthritis within the community: the proportion of respondents with arthritis among the 307 participants recruited in the study was 137/307. This gave a prevalence of 44.6%.

Knowledge on arthritis: knowledge of arthritis was assessed based on thirty-five items. From the density plot (Figure 1), 75% of the participants

scored more than 66%, making the arthritis knowledge score right-skewed.

Predictors of arthritis - a multivariate logistics regression analysis: Table 3 shows the predictors of arthritis after a multivariate logistics regression analysis. Age above 51 plus years, unemployed (AOR 2.77 [1.50-5.21], p=0.001), staying in a town centre (AOR 2.02 [1.08-3.83], p=0.028), previous joint injury/infection (AOR 2.74 [1.59-4.77], p=0.001) and having hypertension (AOR 1.90 [1.03-3.53], p=0.040) had increased odds of developing arthritis. On the other hand, being male (AOR 0.42 [0.23-0.75], p=0.005), standing for >2 hours daily (AOR 0.48 [0.29-0.81], p=0.006) and constantly shifting between sit to stand positions (AOR 0.45 [0.26-0.76], p=0.003) were found to have a lower risk of arthritis.

Survival analysis of arthritis based on gender and age: Figure 2 shows the survival probability of arthritis based on gender the probability of developing arthritis increases as age advances. Our survival curve starts at age 40 since that was the minimum age in our data set. There is a significant difference between males and females, with log-rank test p-value <0.001, where females are more prone to developing arthritis than males. Moreover, females have a short median age of 63 years compared to 75 years in males.

Discussion

This study determined the prevalence and predictors of arthritis among adults living in a rural set-up, Kenya. We found out that there was a high prevalence of arthritis. Additionally, age, being male, the unemployed, staying in a town center, previous joint injury, having hypertension, standing for >2hours daily, and constant shift from sit to stand positions to be significant predictors of arthritis.

The current study revealed that 137 (44.6%) had arthritis. The prevalence of the current study was higher than a Kenyan urban slums study (25.3%) [11] and a WHO study in six low and

middle-income countries (China, Ghana, Russia, India, Mexico, and South Africa) (21.5%) [23]. The difference in prevalence with the urban slums study may be related to the composition of the study participants, methodology, and the research targeting participants above 60 years. On the other hand, variations with the WHO study may be related to differences in working environments, geographical locations, and diverse populations. However, our prevalence was within the range of a systematic review and meta-analysis of arthritis in Africa [5]. The high prevalence within our communities implies the need of evidence-based prevention strategies. Besides that, this study showed a high level of arthritis knowledge score. This score exceeded a survey of Malaysian railway workers (53.6%) [25]. The difference in the findings may be related to the continued effort by the county Department of Health to create awareness of arthritis, being the second cause morbidity as of 2017 [21]. Knowledge empowerment of patients with chronic diseases allows for purposeful use of the knowledge about the condition to achieve specific health related goals [26].

From this study, it was found that the age of the study participant was a significant predictor of arthritis. People above 71 years had the highest odds of developing arthritis compared to those between 40 and 50. These findings are similar to studies in six low and middle-income countries [23], the US National Health Interview Survey [27], and an OA systematic review and meta-analysis [28]. When comparing females and males, our survival analysis showed that females had a shorter median age of developing arthritis than males. Subsequently, being male was associated with lower odds of developing arthritis, corresponding to established consensus [28,29]. However, there is need for a longitudinal study to perform the arthritis survival analysis. Our study being a cross-sectional study might have faced recall bias. Besides that, being unemployed was associated with a high risk of arthritis. This concurs with a risk factors study that found early retirement, unemployment, unskilled labour, manual work, and lower-than-average income are linked with the

development of osteoarthritis [30]. Moreover, unemployed people tend to do heavy physical activities, which increases the risk of developing musculoskeletal disorders [31]. To avoid increased incidences of osteoarthritis in low and middle income countries, there is need for review and prevention of occupational exposures to ergonomic risk factors [32].

The majority of the participants with arthritis were from remote parts rather than town centres. Our findings concur with a Chinese population study that found a high prevalence of arthritis among those living in rural areas [28]. Similarly, a United States population study found that rural residents had arthritis as a highly prevalent health condition [16]. Rural areas are highly prevalent because of recognized risk factors, including older age, obesity, and lower socioeconomic status [16]. Unlike the two previous studies, obesity is not a problem in the remote areas of Kenya; it affects people living in urban centres [33]. Of importance is that many of the participants (64.2%) in the study exercised. Exercise in combination with other arthritis therapies can help improve physical activity as well as reduce joint pain [34]. A previous joint injury or infection was recognized as a significant predictor of arthritis. This is consistent with previous research studies that have shown joint injuries can significantly enhance the risk of osteoarthritis, depending on the patient's age and time from the onset of injury [28,35,36]. Continuous release of inflammatory mediators into the joint may lead to the arthritis pathogenesis [37,38].

Hypertension was found to have a strong association with arthritis. Comparing other studies, a US National Health and Nutrition Examination Survey (1999-2018) found that individuals with hypertension were indeed at a higher risk of developing arthritis compared to those without hypertension. It also showed that hypertensive individuals had a 27% greater likelihood of developing arthritis during the study period [39]. An intricate interplay exists between arthritis and comorbidities, including cardiovascular diseases,

diabetes, and asthma [4]. These findings underscore the importance of considering hypertension as a potential risk factor for arthritis and highlight the need for further research into the mechanisms underlying this association.

Standing for >2 hours per day was found to be protective. This finding is against a systematic review and meta-analysis study on risk factors of arthritis that showed standing for >2 hours daily was associated with the development of arthritis [28]. The difference in findings may be related to the heterogeneous characteristics of our population as opposed to the homogeneous nature of the comparison study. In addition to that, we measured constant shifting from sitting to standing position, which showed a protective element on arthritis. We did not find any studies assessing the combined effect of sitting and standing. However, literature shows that sitting for >2 hours daily protects against arthritis [28]. Therefore, there is a need to assess the combined effect of constant shifting from standing to sitting positions among the rural populations. Finally, more studies will be vital to measure the dose-response relationship on repetitive joint movements towards the development of arthritis.

The cross-sectional nature of this study might bring bias. However, in some instances we could seek medical records to avoid recall bias. Additionally, this study was conducted in one part of Nyamira County, and therefore, it cannot be generalized to other remote parts of Kenya with different economic and social activities. The strength of this study is that we explored a variety of risk factors, used a representative sample, and utilized a standardized data collection method.

Conclusion

The prevalence of arthritis was found to be very high. Age, gender, employment status, area of residence, previous joint injury, hypertension, standing of > 2 hours per day, and constant shift from sit to stand positions were vital predictors of arthritis. Besides that, participants also had a high

arthritis knowledge score. Therefore, there is a need for pragmatic, evidence-based strategies to prevent modifiable risk factors of arthritis.

What is known about this topic
- *Arthritis is a significant public health problem affecting many people globally;*
- *There are many types of arthritis; however, the common ones are rheumatoid arthritis and osteoarthritis;*
- *Risk factors for arthritis are either modifiable or non-modifiable.*

What this study adds
- *We found a high prevalence of arthritis among residents in rural areas of Nyamira County, Kenya;*
- *This study is among a few conducted in the remote areas of Kenya assessing the predictors of arthritis;*
- *Our Kaplan-Meier analysis curve showed that males had a shorter median age of developing arthritis compared to females.*

Competing interests

The authors declare no competing interests.

Authors' contributions

Conception and study design: Shem Nyarunda Kinara, Harun Mbugua Kimani and Gordon Oluoch Ogweno. Data collection: Shem Nyarunda Kinara. Data analysis and interpretation: Shem Nyarunda Kinara, Harun Mbugua Kimani and Gordon Oluoch Ogweno. Manuscript drafting: Shem Nyarunda Kinara. Manuscript revision: Shem Nyarunda Kinara, Harun Mbugua Kimani and Gordon Oluoch Ogweno. All authors approved final version of the manuscript: Guarantor of the study: Shem Nyarunda Kinara.

Acknowledgments

promoters who facilitated the data collection of this study. We acknowledge and appreciate the participation of those who accepted to be interviewed for their time and shared information.

Tables and figures

Table 1: symptom-based questions and related algorithms to ascertain prevalent arthritis
Table 2: respondent characteristics
Table 3: predictors of arthritis - a multivariate logistics regression analysis
Figure 1: distribution of knowledge of arthritis
Figure 2: survival analysis of arthritis based on gender and age

References

1. GBD 2021 Osteoarthritis Collaborators. Global, regional, and national burden of osteoarthritis, 1990-2020 and projections to 2050: a systematic analysis for the Global Burden of Disease Study 202 Lancet Rheumatol. 2023;5(9): e508-e522. **PubMed│ Google Scholar**

2. Safiri S, Kolahi AA, Hoy D, Smith E, Bettampadi D, Mansournia MA *et al.* Global, regional and national burden of rheumatoid arthritis 1990-2017: a systematic analysis of the Global Burden of Disease study 2017. Ann Rheum Dis. 2019;78(11): 1463-1471. **PubMed│ Google Scholar**

3. Senthelal S, Li J, Ardeshirzadeh S, Thomas MA. Arthritis. In: StatPearls. 202 Treasure Island (FL). StatPearls Publishing http: //www.ncbi.nlm.nih.gov/books/NBK518992/. Accessed 3 January 2024. **Google Scholar**

4. Zou W, Fang Y, Xu D, Zhu Y. Increasing global burden of rheumatoid arthritis: an epidemiological analysis from 1990 to 2019. Arch Med Sci. 2023;19(4): 1037-1048. **PubMed│ Google Scholar**

5. Usenbo A, Kramer V, Young T, Musekiwa A. Prevalence of Arthritis in Africa: A Systematic Review and Meta-Analysis. PloS One. 2015;10(8): e0133858. **PubMed│ Google Scholar**

6. Yahaya I, Wright T, Babatunde OO, Corp N, Helliwell T, Dikomitis L *et al.* Prevalence of osteoarthritis in lower middle- and low-income countries: a systematic review and meta-analysis. Rheumatol Int. 2021;41(7): 1221-1231. **PubMed│ Google Scholar**

7. Courage UU, Stephen DP, Lucius IC, Ani C, Oche AO, Emmanuel AI *et al.* Prevalence of musculoskeletal diseases in a semi-urban Nigerian community: results of a cross-sectional survey using COPCORD methodology. Clin Rheumatol. 2017;36(11): 2509-2516. **PubMed│ Google Scholar**

8. Olufemi A, Hakeem OB, Olalade WK, Sunday OO, Oluwole AO. Epidemiology of rheumatic and musculoskeletal diseases in a Nigerian peri-urban community: results of a cross-sectional survey using the COPCORD stage 1 model. Reumatologia. 2022;60(6): 366-375. **PubMed│ Google Scholar**

9. Nzambi JD, Malemba J, Lebughe L, Mpembele E, Mulenga C, Lukusa A *et al.* The epidemiology of rheumatic disorders in a rural area of the Democratic Republic of Congo (DRC): A COPCORD study. **Google Scholar**

10. Nour HA, Oyoo GO, Joshi MD, Otsyeno FMT, Muriithi IM. Patterns of knee, hip and hand osteoarthritis in Kenyatta National Hospital. East Afr Orthop J. 2014;8(2): 60-63. **Google Scholar**

11. Aboderin I, Nanyonjo A. Musculoskeletal health conditions among older populations in urban slums in sub-Saharan Africa. Best Pract Res Clin Rheumatol. 2017;31(2): 115-128. **PubMed│ Google Scholar**

12. Widdifield J, Paterson JM, Bernatsky S, Tu K, Tomlinson G, Kuriya B *et al.* The epidemiology of rheumatoid arthritis in Ontario, Canada. Arthritis Rheumatol Hoboken NJ. 2014;66(4): 786-793. **PubMed│ Google Scholar**

13. Costenbader KH, Chang S-C, Laden F, Puett R, Karlson EW. Geographic variation in rheumatoid arthritis incidence among women in the United States. Arch Intern Med. 2008;168(15): 1664-1670. **PubMed| Google Scholar**

14. Adebajo A, Davis P. Rheumatic diseases in African blacks. Semin Arthritis Rheum. 1994;24(2): 139-153. **PubMed| Google Scholar**

15. Mody GM. Rheumatology in Africa-challenges and opportunities. Arthritis Res Ther. 2017;19(1): 49. **PubMed| Google Scholar**

16. Boring MA, Hootman JM, Liu Y, Theis KA, Murphy LB, Barbour KE *et al.* Prevalence of Arthritis and Arthritis-Attributable Activity Limitation by Urban-Rural County Classification - United States, 2015. MMWR Morb Mortal Wkly Rep. 2017;66(20): 527-532. **PubMed| Google Scholar**

17. March L, Smith EUR, Hoy DG, Cross MJ, Sanchez-Riera L, Blyth F *et al.* Burden of disability due to musculoskeletal (MSK) disorders. Best Pract Res Clin Rheumatol. 2014;28(3): 353-366. **PubMed| Google Scholar**

18. Tsang A, Von Korff M, Lee S, Alonso J, Karam E, Angermeyer MC *et al.* Common chronic pain conditions in developed and developing countries: gender and age differences and comorbidity with depression-anxiety disorders. J Pain. 2008;9(10): 883-891. **PubMed| Google Scholar**

19. Brennan-Olsen SL, Solovieva S, Viikari-Juntura E, Ackerman IN, Bowe SJ, Kowal P *et al.* Arthritis diagnosis and symptoms are positively associated with specific physical job exposures in lower- and middle-income countries: cross-sectional results from the World Health Organization's Study on global AGEing and adult health (SAGE). BMC Public Health. 2018;18(1): 7. **PubMed| Google Scholar**

20. Adelowo O, Omokhowa A, Ochiagha O, Uhunmwangho CU. Comorbidities in Nigerian patients with rheumatoid arthritis. Clin Rheumatol. 2024 Jan;43(1): 23-28. **PubMed| Google Scholar**

21. County Government of Nyamira. Nyamira County Integrated Development Plan 2018-2022. Accessed 3rd January 2024.

22. Kenya National Bureau of Statistics. 2019 Kenya Population and Housing Census Volume I: Population by County and Sub-County. Accessed 3rd January 2024.

23. Brennan-Olsen SL, Cook S, Leech MT, Bowe SJ, Kowal P, Naidoo N *et al.* Prevalence of arthritis according to age, sex and socioeconomic status in six low and middle income countries: analysis of data from the World Health Organization study on global AGEing and adult health (SAGE) Wave 1. BMC Musculoskelet Disord. 2017;18(1): 271. **PubMed| Google Scholar**

24. Chatterji S. World Health Organisation's (WHO) Study on Global Ageing and Adult Health (SAGE). BMC Proc. 2013;7(Suppl 4 European Workshop on Health and Disability Surveilla): S1. **PubMed| Google Scholar**

25. Ganasegeran K, Menke JM, Challakere Ramaswamy VM, Abdul Manaf R, Alabsi AM, Al-Dubai SAR. Level and determinants of knowledge of symptomatic knee osteoarthritis among railway workers in Malaysia. BioMed Res Int. 2014;2014: 370273. **PubMed| Google Scholar**

26. Vainauskienė V, Vaitkienė R. Enablers of Patient Knowledge Empowerment for Self-Management of Chronic Disease: An Integrative Review. Int J Environ Res Public Health. 2021;18(5): 2247. **PubMed| Google Scholar**

27. Barbour KE, Helmick CG, Boring M, Brady TJ. Vital Signs: Prevalence of Doctor-Diagnosed Arthritis and Arthritis-Attributable Activity Limitation - United States, 2013-2015. MMWR Morb Mortal Wkly Rep. 2017;66(9): 246-253. **PubMed| Google Scholar**

28. Blagojevic M, Jinks C, Jeffery A, Jordan KP. Risk factors for onset of osteoarthritis of the knee in older adults: a systematic review and meta-analysis. Osteoarthritis Cartilage. 2010;18(1): 24-33. **PubMed| Google Scholar**

29. Cui A, Li H, Wang D, Zhong J, Chen Y, Lu H. Global, regional prevalence, incidence and risk factors of knee osteoarthritis in population-based studies. EClinicalMedicine. 2020;29-30: 100587. **PubMed| Google Scholar**

30. Jørgensen KT, Pedersen BV, Nielsen NM, Hansen AV, Jacobsen S, Frisch M. Socio-demographic factors, reproductive history and risk of osteoarthritis in a cohort of 4.6 million Danish women and men. Osteoarthritis Cartilage. 2011;19(10): 1176-1182. **PubMed| Google Scholar**

31. Mehlum IS, Kristensen P, Kjuus H, Wergeland E. Are occupational factors important determinants of socioeconomic inequalities in musculoskeletal pain? Scand J Work Environ Health. 2008;34(4): 250-259. **PubMed| Google Scholar**

32. Hulshof CTJ, Pega F, Neupane S, van der Molen HF, Colosio C, Daams JG et al. The prevalence of occupational exposure to ergonomic risk factors: A systematic review and meta-analysis from the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury. Environ Int. 2021;146: 106157. **PubMed| Google Scholar**

33. Mkuu R, Barry A, Yonga G, Nafukho F, Wernz C, Gilreath T et al. Prevalence and factors associated with overweight and obesity in Kenya. Prev Med Rep. 2021;22: 101340. **PubMed| Google Scholar**

34. Sasaki R, Honda Y, Oga S, Fukushima T, Tanaka N, Kajiwara Y et al. Effect of exercise and/or educational interventions on physical activity and pain in patients with hip/knee osteoarthritis: A systematic review with meta-analysis. Plos One. 2022;17(11): e0275591. **PubMed| Google Scholar**

35. Punzi L, Galozzi P, Luisetto R, Favero M, Ramonda R, Oliviero F et al.Post-traumatic arthritis: overview on pathogenic mechanisms and role of inflammation. RMD Open. 2016;2(2): e000279. **PubMed| Google Scholar**

36. Driban JB, Eaton CB, Lo GH, Ward RJ, Lu B, McAlindon TE. Association of knee injuries with accelerated knee osteoarthritis progression: data from the Osteoarthritis Initiative. Arthritis Care Res. 2014;66(11): 1673-1679. **PubMed| Google Scholar**

37. Molnar V, Matišić V, Kodvanj I, Bjelica R, Jeleč Ž, Hudetz D et al. Cytokines and Chemokines Involved in Osteoarthritis Pathogenesis. Int J Mol Sci. 2021;22(17): 9208. **PubMed| Google Scholar**

38. Motta F, Barone E, Sica A, Selmi C. Inflammaging and Osteoarthritis. Clin Rev Allergy Immunol. 2023;64(2): 222-2. **PubMed| Google Scholar**

39. Liang X, Chou OHI, Cheung CL, Cheung BMY. Is hypertension associated with arthritis? The United States national health and nutrition examination survey 1999-2018. Ann Med. 2022;54(1): 1767-1775. **PubMed| Google Scholar**

Table 1: symptom-based questions and related algorithms to ascertain prevalent arthritis	
Question number	**Question text and algorithm**
1	During the last 12 months, have you experienced pain, aching, stiffness or swelling in or around the joints (like arms, hands, legs or feet) that were not related to an injury and lasted for more than a month?
2	During the last 12 months, have you experienced stiffness in the joint in the morning after getting up from bed or after a long rest of the joint without movement?
3	Did this stiffness last for more than 30 minutes?
4	Did this stiffness go away after exercise or movement in the joint?
Algorithm	*If a participant responded with 'yes' to questions 1 and/or 2 and responded with 'no' to questions 3 and 4, then the participant was categorized as most likely having osteoarthritis (rather than inflammatory arthritis)*

Table 2: respondent characteristics		
Characteristic	**Total (N=307)**	**Percentage %**
Age group		
40-50	112	**36.5**
51-60	64	20.8
61-70	75	24.4
71 +	56	18.2
Gender		
Female	197	**64.2**
Male	110	35.8
Education		
High school and above	135	**44.0**
Below primary school	113	36.8
No formal schooling	59	19.2
Marital status		
Married/Cohabiting	239	**77.9**
Single/Divorced/Widowed/Separated	68	22.1
Social health insurance		
No	139	45.3
Yes	168	**54.7**
Current employment status		
Self-employed/Employed	232	**75.6**
Unemployed	75	24.4
Household size		
1-4	172	56.0
5+	135	44.0
Area		
Rural	245	79.8
Town center	62	20.2
Exercise		
No	110	35.8
Yes	197	64.2

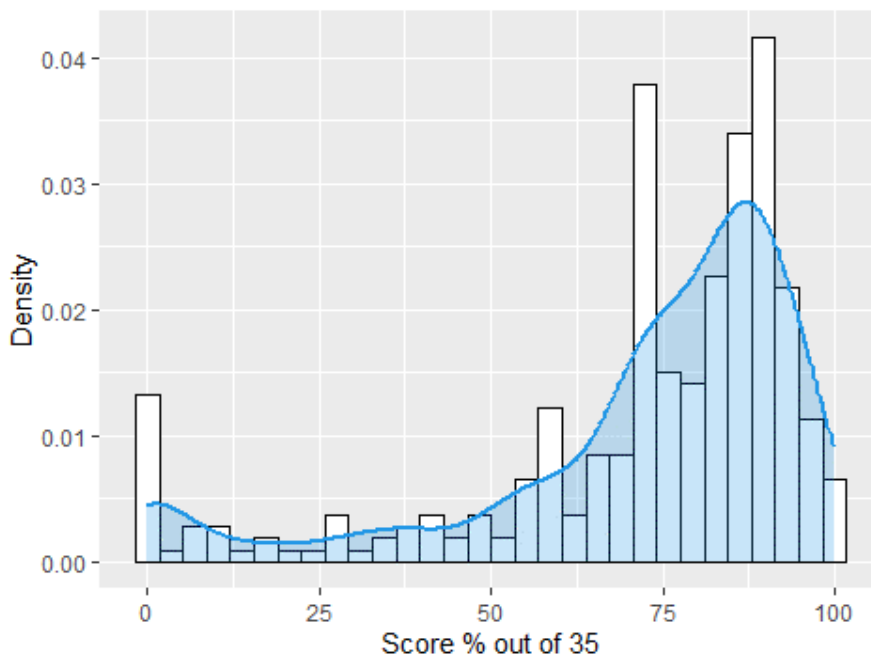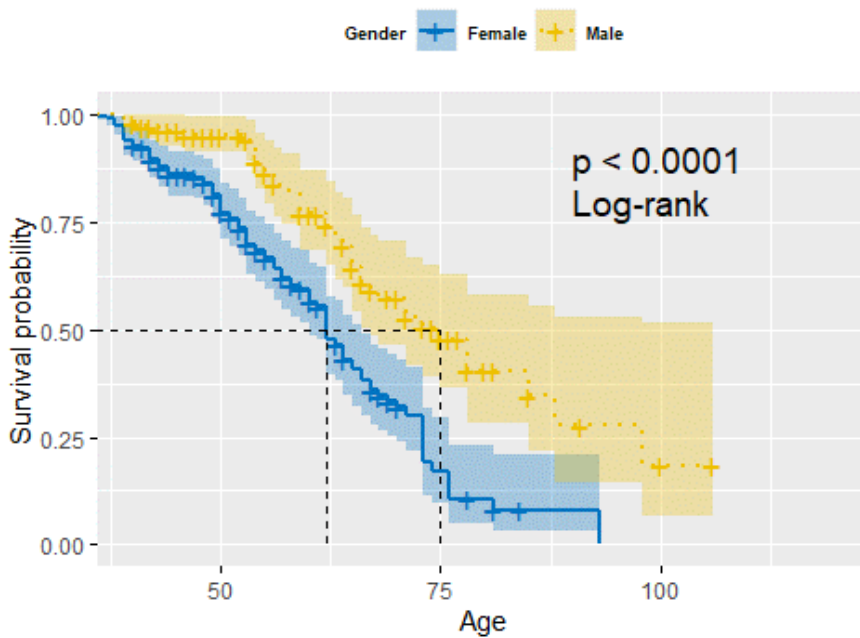| Table 3: predictors of arthritis - a multivariate logistics regression analysis				
Variable/category	Unadjusted ORs (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Age				
40-50	-		-	
51-60	2.07 (1.09-3.95)	p=0.026	**2.10 (1.06-4.20)**	**p=0.034**
61-70	2.86 (1.56-5.31)	p=0.001	**2.45 (1.20-5.07)**	**p=0.015**
71 +	4.50 (2.30-9.05)	p<0.001	**4.67 (1.93-11.72)**	**p=0.001**
Gender				
Female	-		-	
Male	0.59 (0.36-0.95)	p=0.030	**0.42 (0.23-0.75)**	**p=0.005**
Education				
High school and above	-		-	
Below primary school	1.60 (0.96-2.68)	p=0.071	1.54 (0.86-2.80)	p=0.149
No formal schooling	2.84 (1.52-5.39)	p=0.001	1.40 (0.65-3.02)	p=0.393
Social health insurance				
No	-		-	
Yes	1.62 (1.03-2.57)	p=0.038	1.62 (0.96-2.78)	p=0.074
Employment status				
Self-employed/Employed	-		-	
Unemployed	3.91 (2.26-6.94)	p<0.001	2.77 (1.50-5.21)	**p=0.001**
Area				
Rural	-		-	
Town center	1.67 (0.96-2.95)	p=0.072	**2.02 (1.08-3.83)**	**p=0.028**
Previous joint injury				
No	-		-	
Yes	2.76 (1.70-4.51)	p<0.001	**2.74 (1.59-4.77)**	**p=0.001**
Hypertension				
No	-		-	
Yes	2.48 (1.45-4.29)	p=0.001	**1.90 (1.03-3.53)**	**p=0.040**
Standing for >2 hours/day				
No	-		-	
Yes	0.46 (0.29-0.74)	p=0.001	**0.48 (0.29-0.81)**	**p=0.006**
Constant shifting: sit-stand daily				
No	-		-	
Yes	0.45 (0.28-0.72)	p=0.001	**0.45 (0.26-0.76)**	**p=0.003**
Carrying heavy loads >10kg				
Daily/regularly	-		-	
Never/Rarely	1.72 (1.08-2.75)	p=0.023	1.12 (0.60-2.07)	p=0.721
Walking for > 3km				
Daily/Regularly	-		-	
Never/Rarely	2.04 (1.27-3.30)	p=0.004	1.54 (0.86-2.76)	p=0.146
Tea picking				
Daily/Regularly	-		-	
Never/Rarely	1.87 (1.19-2.97)	p=0.007	1.56 (0.89-2.71)	p=0.117

Figure 1: distribution of knowledge of arthritis

Figure 2: survival analysis of arthritis based on gender and age