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Prevalence and factors associated with chronic joint pain in Nepal: Findings from a countrywide cross-sectional STEPS survey

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Abstract

Objective This study aims to determine the prevalence of chronic joint pain and its association with demographic, socioeconomic, and behavioral factors in the adult population of Nepal.

Design The study was a national cross sectional population-based study.

Setting We used the most recent nationally representative population-based cross-sectional health survey (STEPS survey, 2019) from all seven provinces of Nepal including both urban and rural areas

Participants The participants were men and women aged 15 to 69 years, who were usual residents of the households for at least 6 months and have stayed the night before the survey.

Primary and secondary outcome Primary outcomes in this study were prevalence of chronic joint pain. Chronic joint pain in our study was based on any self-reported symptoms of joint pain, stiffness and swelling lasting for more than 1 month in the past 12 months. Data were weighted to generate national estimates.

Results The prevalence of self-reported chronic joint pain in Nepal was 17%(95% CI: 14.3-20.2) with higher prevalence for older adults, females, single, primary education, highest wealth quintile, student, those with sufficient physical activity, those living in the Bagmati province of Nepal. In multivariable analysis self-reported chronic joint pain was found to be associatedwith advanced age (AOR=2.36; 95% CI 1.56-3.55), sex (AOR=1.47; 95% CI: 1.19 - 1.82) and sufficient physical activity (AOR = 0.40; 95% CI: 0.25 - 0.65).

Conclusions The results showed a high prevalence of chronic joint pain in Nepal's adult population. Considering the process of ageing and rapid growth in non-communicable disease, this study warrants the need for health policies directed to prevention, treatment and

rehabilitation for people affected by chronic musculoskeletal conditions addressing related disabilities and loss of work in Nepal.

Keywords: prevalence, chronic joint pain, musculoskeletal conditions, Nepal

Strength and limitation of the study

The major strength of our study is that this is the first nationwide population-based study of chronic joint pain in Nepal with a robust sampling technique i.e. multistage stratified cluster.

Limitations for this study are similar to any cross-sectional population based study. First, radiological examination and symptomatic examination are the common confirmatery diagnostic methods for the epidemiological investigation of chronic joint pain. In our study, the symptomatic self-reported diagnosis method was used as the main inclusion criterion for chronic joint pain, so a questionnaire administered by an enumerator was the primary screening tool. Another potential limitation of this study was the possibility of recall bias with a one-year time period affecting participants' ability to accurately self-report information about past pain or consultation behavior.

Introduction

Worldwide, musculoskeletal disorders especially joint and back pain represent the leading contributor to disability (1) and its burden is growing because of the ageing and increasing world population. A recent analysis of Global Burden of Disease (GBD) data showed that around 1.71 billion people globally have musculoskeletal conditions. Musculoskeletal condition is widely recognized as the leading cause of disability in developed countries (2). However, disability related to joint and back pain is projected to markedly increase in Low-and Middle- Income Countries (LMICs) where resources are scarce, quality of care is generally low and people are becoming more sedentary (3).

Arthritis is now recognized as one of the most common causes of joint pain. (4). Patients routinely seek medical attention for joint pain, and it is one of the leading causes of activity limitation and absenteeism at work and poses a heavy economic burden on individuals, and society. (5)

Chronic joint pain is a significant public health concern that differentially burdens vulnerable populations, such as the elderly, children, and ethnic/racial minorities, due to disparities in treatment and resources (6). In a country like Nepal most of the poor people are engaged in physically demanding jobs. People not being able to perform physical work due to back pain may put many additional people into poverty. However, it is also highlighted that 80% of people with chronic pain in Nepal continue to work to fulfill the demand for money (7). Despite their epidemiological, clinical, and health economic importance, current data on the prevalence and determinates of musculoskeletal complaints in developing countries like Nepal are limited. Available information is also based on a hospital setting which doesn't provide the real situation

of chronic joint pain. To date, country-specific chronic joint pain prevalence across parameters of socioeconomic and behavioral factors have not been systematically evaluated in a large, nationally representative sample of the population from Nepal**.** Hence, this study aims to determine the prevalence of chronic joint pain and its association with sociodemographic factors and underlying the behavioral factors.

Methods

Study design

We used the most recent nationally representative population-based cross-sectional health survey (STEPS survey, 2019) from all seven provinces of Nepal including both urban and rural areas. The survey collected information on Noncommunicable Disease (NCD) risk factors and other NCD related information in the general population.

Sampling and sampling techniques

This population based national representative sample was drawn through multistage cluster sampling using the Central Bureau of Statistics (CBS) data. A total of 25 households were sampled from each of the clusters. Household data were collected from adults aged 15-69 years by a trained enumerator. Further details about the study methodology can be found on the STEPS Survey 2019 (8).

Outcomes

Primary outcomes in this study were chronic joint pain. Chronic joint pain in our study was based on any self-reported symptoms of joint pain, stiffness and swelling lasting for more than 1 month in the past 12 months.

Covariates

The following covariates were investigated for association with chronic joint pain. The demographic variables were stratified by sex (male, female) age group (15-29, 30-44, 45-69). The socioeconomic variables included marital status (married, unmarried); (education- None/less than primary, primary, secondary, more than secondary) wealth quintile (lowest, second, middle,

fourth, highest); occupation (Employed, student, homemaker, unemployed, others) place of residence (urban , rural), province (province1, province 2, Bagmati province , Gandaki province, Lumbini province , Karnali province, sudurpaschim province). Health and lifestyle variable were (smoking(yes or no), alcohol consumption (yes or no), physical activity (sufficient, insufficient), Body Mass Index (underweight, overweight). Provincial distribution has not been included in logistic regression analysis.

Data collection tools and techniques:

Data analysis

Data analysis was performed using Stata 13 statistical software. Descriptive analyses were reported for a categorical variable, with relative frequencies of the prevalence of chronic joint pain and respective 95% confidence intervals (95% CI) and p-value. Simple and multiple logistic regression analysis was used to determine the association of chronic joint pain with age, sex, education, marital status, occupation, residence, province, wealth quintile, BMI, physical activity, smoking and alcohol consumption. Crude and adjusted Odds ratios and 95% Confidence Intervals were reported and p-values of < 0.05 were considered statistically significant.

Ethical approval

The data used in this study was obtained from a cross-sectional nationwide population based survey. Ethical approval was taken from Ethical Review Board of Nepal Health Research Council prior to conduct the NCD STEPS survey 2019. The participants were informed about the purpose of the research study and were asked to give their written consent to participate in the study. Regarding the under 18 years participants, both assent and consent was sought from the guardian/parents. The participants were also guaranteed confidentiality of their information and were notified that participation would be voluntary.

Results

Table 1 Descriptive characteristics of participants with chronic joint pain

Numbers and proportions of chronic joint pain across all covariates		
	Chronic Joint pain	
Characteristics	**Total**	**Pain% (95% CI)**
Age (n= 5,593)		
15-29	1466	9.5[6.7,13.4]
30-44	2,039	17.4[14.1,21.2]
45-69	2,088	29.4 [24.9,34.3]
Sex (n= 5593)		
Women	3,595	20.1[16.7,23.9]
Men	1,998	13.6[11.0,16.7]
Educational attainment (n= 5592)*		
None/less than primary	2,792	25.6 [21.3,30.4]
Primary	1,051	12.4 [9.0,16.7]
Secondary	1,088	10.8 [8.1,14.4]
More than secondary	661	11 [7.4,16.1]
Place of residence (n= 5593)	-	
Metropolitan/submetorpolitan	705	9.9 [4.9,18.8]
Municipality	2,755	16.3 [12.9,20.4]

Rural municipality	2,133	19.8 [14.8,25.9]
Province (n= 5593)		
Province 1	804	15.9 [10.2,24.0]
Province 2	803	12.5[7.0,21.4]
Province 3	759	12.3 [7.5,19.5]
Gandaki province	793	16.6[11.4,23.4]
Lumbini province	797	18.8 [11.8,28.7]
Province 6	808	25.9 [19.9,33.1]
Sudoorpaschim	829	25.6 [19.0,33.5]
Wealth quintile (5,593)		
Lowest	1,653	23.3 [18.9,28.5]
Second	1,062	20.8 [15.8,26.9]
Middle	949	15.3 [11.6,19.9]
Fourth	878	15.3 [11.5,20.0]
Highest	1,051	10.4 [6.8,15.6]
Occupation (5,587)*	-	
Employed	1,707	16.3 [12.4,21.1]
Student	402	6.3 [3.7,10.6]
Homemaker	3,142	20.8 [17.4,24.6]
Unemployed	273	18.8 [12.5,27.3]
Others	63	16 [7.6,30.6]
Marital status (n= 5,592)*		
Never married	538	7.3 [4.8,11.0]

Currently married	4,752	18.9 [15.7,22.5]
Ever married	302	33.7 [26.1,42.2]
Physical activity (n= 5,493)*		
Sufficient	5,090	17.8 [14.9,21.1]
Insufficient	403	7 [4.3,11.2]
Smoking (n= 5593)		
No	4,528	16.7 [13.8,20.1]
Yes	1,065	18.4 [14.7,22.8]
Alcohol consumption (n= 5,593)		
No	4,441	16.6 [13.7,20.0]
Yes	1,152	18.6 [13.9,24.5]
Body mass index (n= 5,499)*		
Normal or underweight	4,009	16.8 [13.8,20.3]
Overweight	1,490	17.9 [14.4,21.9]

Missing value *

The overall prevalence and descriptive statistics of chronic joint pain in our study population are summarized in Table 1. The overall prevalence of chronic joint pain in Nepal was 17.0% (95% CI: 14.2- 20.2). The age-specific prevalence is found increasing with age and found highest 29.4 % (95% CI: 24.9-34.3) in the age group of 45-69 years and lowest 9.5% (95% CI: 6.7-13.4) among 15-29 years aged participants. Prevalence was highest at 20.1% (95% CI: 16.7-23.9) in females compared to males 13.6. (95% CI: 11.0-16.7). The prevalence of chronic joint pain

among participants who were none/less than primary educated was 25.6 [95% CI: 21.3, 30.4]. Among participants with secondary education, were 10.8 (95% CI: 8.1, 14.4). The prevalence of chronic joint pain varied considerably also by province, ranged from 12.3% (95% CI: 7.5-19.5) in Bagmati province to 25.9% (95% CI: 19.9-33.1) in Karnali province. By wealth quintiles, prevalence ranged from 10.4% (95% CI: 6.8-15.6) in the highest wealth quintiles to 23.3% (95% CI: 18.9-28.5) in low quintile. In terms of occupation, the prevalence was highest at 20.8% (95% CI: 17.4 -24.6) among homemakers and lowest among students 6.3% (95% CI: 3.7-10.6). Regarding their marital status, proportion was highest (33.7% (95% CI: 26.1- 42.2)) among ever married and lowest among never married (7.3% (95% CI: 4.8 -11.0)).

In our study, prevalence was more than double 17.8% (95% CI: 14.9-21.1) among participants who engaged in sufficient physical activity compared to insufficient physical activity 7.0% (95% CI: 4.3-11.2). In addition, we found a higher prevalence 18.4% (95% CI: 14.7-22.8) among current smokers compared to non-smokers 16.7% (95% CI: 13.8-20.1]. Similarly, those individuals classified as overweight had slightly higher prevalence i.e., 17.9% (95% CI: 14.4-21.9) compared to underweight 16.8% ((95% CI: 13.8, 20.3)

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152 **Table 2 Factors associated with chronic joint pain**

Characterstics	**Bivariate analysis**		**Multivariable analysis**	
	Crude OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Age				
15-29	1			
30-44	2 (1.39 , 2.86)	0.000	1.45 (0.99-.12)	0.058
45-69	3.94(2.73 ,5.70)	0.000	2.36(1.56-3.55)	0.000
Sex				
Men	1			
Women	1.60 (1.32 ,1.92)	0.000	1.47 (1.19 - 1.82	0.000
Educational attainment				
None/less than primary	1			
Primary	0.41 (0.29 ,0.57)	0.000	0.72 (0.52 - 0.98)	0.037
Secondary	0.35 (0.26 ,0.48)	0.000	0.76 (0.56 - 1.02)	0.068
More than secondary	0.36(0.22 ,0.58)	0.000	0.88 (0.53 - 1.44)	0.601
Place of residence				
Metropolitan/	1			
Submetorpolitan Municipality	0.45 (0.20 , 1.02)	0.055		

Rural municipality	0.79 (0.51 ,1.23)	0.296		
Province				
Sudoorpaschim	1			
Province 1	0.55(0.29 , 1.04)	0.067		
Province 2	0.42 (0.20 - 0.88)	0.022		
Bagmati Province	0.41 (0.21 - 0.79)	0.008		
Gandaki province	0.58 (0.32 - 1.03)	0.062		
Lumbini province	0.68 (0.35 - 1.31)	0.246		
Karnali province	1.02 (0.61 - 1.70)	0.943		
Place of residence				
Urban	1			
Rural	0.51(0.23 , 1.11)	0.090	1.57 (0.80 - 3.11)	0.192
Wealth quintile				
Lowest	1			
Second	0.86 (0.62 - 1.20)	0.385	1.02 (0.80 - 1.30)	0.879
Middle	0.59 (0.42 - 0.84)	0.003	0.78 (0.59 - 1.03)	0.084
Fourth	0.59 (0.39 - 0.90)	0.014	0.84 (0.59 - 1.20)	0.334
Highest	0.38 (0.22 - 0.65)	0.000	0.60 (0.37 - 0.98)	0.043
Occupation				
Employed	1			
Student	0.35 (0.19 - 0.64)	0.001	0.59(0.27 - 1.32)	0.198
Homemaker	1.35 (1.03 - 1.76)	0.028	0.85(0.64 - 1.13)	0.260
Unemployed	1.19 (0.73 - 1.95)	0.483	1.05(0.73 - 1.52)	0.785

Others	0.98 (0.40 - 2.40)	0.963	0.85 (0.39 - 1.89)	0.696
Marital status				
Unmarried	1			
Currently married	2.95 (1.94 - 4.46)	0.000	1.13 (0.72 - 1.76)	0.601
Single	6.43 (3.81 - 10.83)	0.000	1.27(0.77 - 2.10)	0.347
Body mass index				
Underweight	1			
Overweight	0.93(0.72 - 1.19)	0.562	1.02(0.83 - 1.25)	0.847
Alcohol consumption				
Yes	1			
No	0.87 (0.60 - 1.25)	0.451	1.09(0.80 - 1.48)	0.604
Physical activity				
Sufficient	1			
Insufficient	0.34(0.20 - 0.59)	0.000	0.40 (0.25 - 0.65)	0.000
Smoking				
Yes	1			
No	0.89(0.68 - 1.16)	0.392	0.89 (0.71 - 1.13)	0.337

* p<0.05; ** p<0.01; *** p<0.001

A summary of bivariate and multivariable analyses is presented in Table 2. A bivariate analysis was conducted to assess the association between chronic joint pain and risk factors. In bivariate analysis, the variables age, sex, education, province, wealth quintile, occupation, marital status, and physical activities were significantly ($P \leq 0.05$) associated with chronic joint pain. However,

higher age, being a female, belonging to the highest wealth quintile and only primary education, insufficient physical activity, were the only predictors which remained significantly associated with chronic joint pain on multiple logistic regressions.

The results of our study show that participants aged 45-69 years (OR=2.36 ;95% CI: 1.56-3.55) and participants aged 30-44 years (OR=1.45;95% CI: 0.99-0.12) were more likely to have chronic joint pain when compared to participants aged 15-29 years. Similarly, female participants (OR=1.47;95% CI: 1.19 - 1.82) had more likely to have chronic joint pain compared to male participants. Furthermore, being in the highest wealth quintile (OR = 0.60; 95% CI: 0.37-0.98), belongs to primary schooling (OR= 0.72; 95% CI: 0.52 - 0.98), participants who were classified as completing sufficient physical activity (OR = 0.40; 95% CI =0.25 - 0.65) were protective against chronic joint pain.

Discussion

This study reports population-based prevalence of self-reported Chronic joint pain and associated factors in Nepal's s adult population, aggregating rheumatic diseases and osteoarthritis, using data from the country's major nationally representative population based STEPS survey. The prevalence of Chronic joint pain in Nepal can be considered high, given that they are reported by about one in five adults. The overall prevalence of chronic joint pain in our study (17.0%) is equal to or lower than the prevalence presented in several other studies (9–13). Study design, methodologies applied, definitions, and presentation of results may explain most of the differences.

This study highlights that chronic joint pain is associated with older age, sex, education, province, wealth quintile, occupation, marital status, and physical activities**.** After adjusting for age, gender, wealth quintile, education, physical activity remained the correlates for chronic joint pain in this population.

In this study, as in the literature cited, women had 1.47 times greater prevalence of chronic joint pain than men. This finding may be explained, at least in part, by women being more inclined to report health problems in population surveys, sex-segregation of women into sedentary, repetitive and routine work, and the persisting gender imbalance in domestic work as well as being more frequent users of health services(14,15). In agreement with other studies a strong and increasing association was observed between age and chronic joint pain (16–18). Given longer life expectancy, the relation between age and increasing prevalence of non-communicable disease and functional disability demands more attention from health policymakers with a view to adjusting management of these conditions in the population.

Both wealth quintile and education show a protective effect on chronic joint pain. Wealth indices were a better discriminator than the educational attainment for chronic joint pain in our sample. This finding is new to Nepal as there are no supporting findings from Nepal. But few studies from outside Nepal show educational achievement has been reported to have better rheumatoid arthritis outcome concerning pain and function(19,20).

Insufficient physical activity is a leading risk factor for NCDs and death worldwide. Some studies have suggested that people who exercise regularly have a higher prevalence of Neck/shoulder pain and Low Back Pain (21,22). In line with this finding, the multivariable model of this study also confirmed the relationship between chronic joint pain and sufficient physical activity. In contrast, recent studies have shown that multimodal exercise programs, which include a range of activity are effective at significantly reducing pain in osteoarthritis, fibromyalgia, Chronic low back pain, and Rheumatoid Arthritis (23–25).

Our findings suggest that there is no relationship between smoking (current or previous) and chronic joint pain. Previous research examining the association between joint pain and smoking behavior has been inconsistent: some studies found a positive association (26–28) and others suggest no association(29).

Alcohol consumption has many effects on bone, and increased alcohol consumption has been shown to be associated with higher bone density(30). Therefore, it can be expected that increased alcohol consumption may be associated with increased joint pain among participants. However, there was no correlation between alcohol consumption and the presence of chronic joint pain in our study.

Overall, the literature suggests an association between BMI and chronic joint pain(31,32), but the strength of the relationship varies by study and also etiology and type however we did not find any association between BMI with chronic joint pain in our survey.

Conclusion

About one in five Nepali adults suffer from chronic joint pain. Ageing, female gender, belonging to a highest wealth quintile are the important associated factors for chronic joint pain. This population based nationally representative survey warrants health system's greater attention for addressing the challenges of pain and disabilities associated with chronic joint pain. Further prospective studies are needed to estimate the impact of this group of conditions particularly addressing related disabilities and loss of works. We believe the results of our study can support for policy and planning for chronic joint pain manangment in Nepal.

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Prevalence and factors associated with joint pain in Nepal: Findings from a countrywide cross-sectional STEPS survey

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Abstract

Objective This study aims to determine the prevalence of joint pain and its association with demographic, socioeconomic, and behavioral factors in Nepal.

Design The study was a national cross sectional population-based study.

Setting We used the most recent nationally representative population-based cross-sectional health survey, The WHO STEPwise approach to surveillance (STEPS) survey, 2019 from all seven provinces of Nepal including both urban and rural areas

Participants The participants were men and women aged 15 to 69 years, who were usual residents of the households for at least 6 months and have stayed the night before the survey.

Primary and secondary outcome measures Primary outcome in this study was prevalence of joint pain. The secondary outcome measure was factors associated with joint pain in Nepal. Joint pain in our study was based on any self-reported symptoms of joint pain, stiffness and swelling lasting for more than 1 month in the past 12 months. Data were weighted to generate national estimates.

Results The prevalence of self-reported joint pain in Nepal was 17%(95% CI: 14.3-20.2) with higher prevalence for older adults, females, ever married , none/ less than primary education, smoker, lowest wealth quintile, homemaker , those with sufficient physical activity and those living in the karnali province of Nepal. In multivariable analysis self-reported joint pain was found to be associated with advanced age (AOR=2.36; 95% CI 1.56-3.55), sex (AOR=1.47; 95% CI: 1.19 - 1.82) and sufficient physical activity (AOR = 0.40; 95% CI: 0.25 - 0.65).

Conclusions The results showed a high prevalence of joint pain in Nepal. Considering the process of ageing and rapid growth in non-communicable disease, this study warrants the need

for health policies directed to prevention, treatment and rehabilitation for people affected by chronic musculoskeletal conditions addressing related disabilities and loss of work in Nepal.

Keywords: Prevalence, Non communicable diseases ,joint pain, Nepal

Strength and limitation of the study

Strengths and limitations of this study

- To our knowledge, this is the first nationwide population-based study of joint pain in Nepal.
- We used a robust sampling technique i.e. multistage stratified cluster.
- Due to the cross-sectional nature of the study, establishing a casual relationship between the risk factors and the prevalence of the condition was not possible.
- Diagnosis of joint pain was based on the self-reported questionnaire.

Introduction

Worldwide, musculoskeletal disorders especially joint and back pain represent the leading contributor to disability (1) and its burden is growing because of the ageing and increasing world population. A recent analysis of Global Burden of Disease (GBD) data showed that around 1.71 billion people globally have musculoskeletal conditions. Musculoskeletal condition is widely recognized as the leading cause of disability in developed countries (2). However, disability related to joint and back pain is projected to markedly increase in Low-and Middle- Income Countries (LMICs) where resources are scarce, quality of care is generally low and people are becoming more sedentary (3).

Arthritis is now recognized as one of the most common causes of joint pain.(4). Patients routinely seek medical attention for joint pain, and it is one of the leading causes of activity limitation and absenteeism at work and poses a heavy economic burden on individuals, and society (5,6). Joint pain is a significant public health concern that differentially burdens vulnerable populations, such as the elderly, children, and ethnic/racial minorities, due to disparities in treatment and resources (7). In a country like Nepal most of the poor people are engaged in physically demanding jobs. People not being able to perform physical work due to back pain may put many additional people into poverty. However, it is also highlighted that 80% of people with chronic pain in Nepal continue to work to fulfill the demand for money (8). The epidemiology of chronic joint pain and its relationship with sociodemographic and behavioral factors have been reported by numerous studies from various geographical regions and countries(9). The literature indicates a set of factors associated with joint pain, such as sociodemographics factors (age, income, sex, and education), lifestyles (smoking and low

physical activity, or vigorous physical work), and metabolic risk factors (obesity and other comorbid chronic conditions)(10–12)

Despite their epidemiological, clinical, and health economic importance, current data on the prevalence and determinates of musculoskeletal complaints in developing countries like Nepal are limited. Available information is also based on a hospital setting which doesn't provide the real situation of joint pain. To date, country-specific joint pain prevalence across parameters of socioeconomic and behavioral factors have not been systematically evaluated in a large, nationally representative sample of the population from Nepal**.** Hence, this study aims to determine the prevalence of joint pain and its association with sociodemographic factors and underlying the behavioral factors.

Methods

Study design

We used the most recent nationally representative population-based cross-sectional health survey (STEPS survey, 2019) from all seven provinces of Nepal including both urban and rural areas. The survey was conducted using the standardized WHO NCD STEPS instrument version 3.2(13), by incorporating all of the core questions with some selected country-specific modules to assess the joint and back pain in consultation with WHO regional office for South- east Asia. The questionnaire was translated into Nepali and validated by translation and back translation. The field enumerators underwent a 4-day intensive training before deployment. The STEPS field work was carried out between February 9, 2019 to May 8, 2019. Participants were involved in the study for two days. Data collection techniques included a face-to- face interview for demographic information and behavioral measurement (STEP 1), physical measurements (STEP 2) and biochemical measurements (blood and urine) collection (STEP 3). The survey data were collected by an android tablets on the spot and transferred and stored in ONA data base server

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Sampling and sampling techniques

This population based national representative sample was drawn through multistage cluster sampling using the Central Bureau of Statistics (CBS) data. A total of 25 households were sampled from each of the clusters. Household data were collected from adults aged 15-69 years by a trained enumerators. Sample size calculation was based on the sample calculator used in the WHO STEPS approach. The sample size was adjusted for design effect for complex sample design set at 2, prevalence of 0.5 for most indicators as the conservative estimate, 0.05 margin of

error, 95% confidence interval and a non-response rate of 15%.With these adjustments, the final sample was 6475. Assuming a response rate of 86.7% in STEP 1, total sample size was adjusted for 5593. From each of the selected household, one person between the ages of 15-69 was sampled randomly from all the eligible adults in a household using the android tablet. Further details about the study methodology can be found on the STEPS Survey 2019 (14).

Outcomes

Primary outcome in this study was prevalence of joint pain. The secondary outcome measures were factors associated with joint pain in Nepal. Joint pain in our study was based on any self-reported symptoms of joint pain, stiffness and swelling lasting for more than 1 month in the past 12 months.Participants were defined as having joint pain if they had either rheumatoid arthritis or osteoarthritis. Participants who reported having joint pain/stiffness/ swelling lasting for more than one month and not associated with any injury along with morning stiffness or stiffness after a long rest lasting less than 30 min that goes away after exercise of the joint are categorized as having probable arthritis; while participants who reported having morning stiffness or stiffness after a long rest lasting more than 30 min and that does not go away after exercise of the joint were categorized having probable rheumatoid arthritis

Covariates

The following covariates were investigated for association with joint pain. The demographic variables were stratified by sex (male, female) age group (15-29, 30-44, 45-69). The socioeconomic variables included marital status (never married, currently married, ever married); (education- None/less than primary, primary, secondary, more than secondary) wealth quintile

(lowest, second, middle, fourth, highest); occupation (Employed, student, homemaker, unemployed, others) place of residence (urban , rural), province (province1, province 2, Bagmati province , Gandaki province, Lumbini province , Karnali province, sudurpaschim province). Health and lifestyle variable were smoking(yes or no), alcohol consumption (yes or no), physical activity (PA) was assessed using the WHO recommended Global Physical Activity Questionnaire (GPAQ) version 2 .0, calculating the Metabolic Equivalent of Task (MET) value in minutes per week for work, recreational, and transport domains. Sufficient physical activity was defined as any combination of physical activities that exceeds 600 METs per week or (more than 150 min per week). Insufficient physical activity (IPA) was defined according to WHO recommendation (less than 600 METs per week)or (less than 150 min per week). Body Mass Index(BMI)) in kg/m2 was classified into following categories: Underweight (< 18.5 kg/m2), normal weight (18.5–24.9 kg/m2), overweight (25–29.9 kg/m2), and obesity (≥ 30 kg/m2). In the final analysis, we merged 'underweight' and 'normal' as well as overweight and obese together as the number of individuals for these categories was too small to constitute a standalone BMI group. Provincial distribution has not been included in logistic regression analysis.

Data collection tools and techniques:

Data management and analysis

Data were collected electronically using PDAs programmed with WHO e-STEPS software. The data from the field was downloaded from the personal digital assistant (PDA) which was then exported on Microsoft excel for cleaning and cross-checked the inconsistencies.Data analysis was performed using STATA 15.0 Stata Corp LLC, USA and Epi Info version 3.4 with appropriate methods for the complex sample design of the survey. Descriptive analyses were reported for a categorical variable, with relative frequencies of the prevalence of joint pain and respective 95% confidence intervals (95% CI) and p-value.

Associations between dependent and independent variables were tested using Chi-square. Bivariate analysis was conducted to analyze the unconditional association between each explanatory variable and joint pain status. Multicollinearity, the variance inflation factor (VIF) was assessed for all the independent variables found to be statistically significant from the bivariate analysis. All explanatory variables in the bivariate analysis were inserted in the multivariate binary logistic regression model to see the independent effect of each variable on occurrence of joint pain. For those variables that were not included in the final model, only the unadjusted odds ratio are presented. Finally,we present both unadjusted and adjusted odds ratios with 95% confidence intervals (CIs).

Ethical approval

The data used in this study was obtained from a cross-sectional nationwide population based survey. Ethical approval was taken from Ethical Review Board of Nepal Health Research Council prior to conduct the NCD STEPS survey 2019. The participants were informed about the purpose of the research study and were asked to give their written consent to participate in the study. Regarding the under 18 years participants, both assent and consent was sought from the guardian/parents. The participants were also guaranteed confidentiality of their information and were notified that participation would be voluntary.

Results

Table 1 Descriptive characteristics of participants with joint pain

Numbers and proportions of joint pain across all covariates		
	Joint pain	
Characteristics	**Total**	**Pain% (95% CI)**
Age (n= 5593)		
15-29	1466	9.5[6.7-13.4]
30-44	2039	17.4[14.1-21.2]
45-69	2088	29.4 [24.9-34.3]
Sex (n= 5593)		
Women	3595	20.1[16.7-23.9]
Men	1998	13.6[11.0-16.7]
Educational attainment (n= 5592)*		
None/less than primary	2792	25.6 [21.3-30.4]
Primary	1051	12.4 [9.0-16.7]
Secondary	1088	10.8 [8.1-14.4]
More than secondary	661	11 [7.4-16.1]
Place of residence (n= 5593)	-	
Metropolitan/submetorpolitan	705	9.9 [4.9-18.8]
Municipality	2755	16.3 [12.9-20.4]

Rural municipality	2133	19.8 [14.8-25.9]
Province (n= 5593)		
Province 1	804	15.9 [10.2-24.0]
Province 2	803	12.5[7.0-21.4]
Bagmati province	759	12.3 [7.5-19.5]
Gandaki province	793	16.6[11.4-23.4]
Lumbini province	797	18.8 [11.8-28.7]
Karnali province	808	25.9 [19.9-33.1]
Sudoorpaschim	829	25.6 [19.0-33.5]
Wealth quintile (n=5593)		
Lowest	1653	23.3 [18.9-28.5]
Second	1062	20.8 [15.8-26.9]
Middle	949	15.3 [11.6-19.9]
Fourth	878	15.3 [11.5-20.0]
Highest	1051	10.4 [6.8-15.6]
Occupation (n=5587)*	-	
Employed	1707	16.3 [12.4-21.1]
Student	402	6.3 [3.7-10.6]
Homemaker	3142	20.8 [17.4-24.6]
Unemployed	273	18.8 [12.5-27.3]
Others	63	16 [7.6-30.6]
Marital status (n= 5592)*		
Never married	538	7.3 [4.8-11.0]

Currently married	4752	18.9 [15.7-22.5]
Ever married	302	33.7 [26.1-42.2]
Physical activity (n= 5493)*		
Sufficient (more than150 min per week)	5090	17.8 [14.9-21.1]
Insufficient (Less than 150 min per week)	403	7 [4.3-11.2]
Smoking (n= 5593)		
No	4528	16.7 [13.8-20.1]
Yes	1065	18.4 [14.7-22.8]
Alcohol consumption (n= 5593)		
No	4441	16.6 [13.7-20.0]
Yes	1,152	18.6 [13.9-24.5]
Body mass index (n= 5499)*		
Normal or underweight	4009	16.8 [13.8-20.3]
Overweight	1490	17.9 [14.4-21.9]
Total	5593	17.0 [14.3-20.2]

Missing value *

The overall prevalence and descriptive statistics of joint pain in our study population are summarized in Table 1. The overall prevalence of joint pain in Nepal was 17.0% (95% CI: 14.2-20.2). The age-specific prevalence is found increasing with age and found highest 29.4 % (95% CI: 24.9-34.3) in the age group of 45-69 years and lowest 9.5% (95% CI: 6.7-13.4) among 15-29

years aged participants. Prevalence was highest at 20.1% (95% CI: 16.7-23.9) in females compared to males 13.6. (95% CI: 11.0-16.7). The prevalence of joint pain among participants who were none/less than primary educated was 25.6 (95% CI: 21.3- 30.4). Among participants with secondary education, were 10.8 (95% CI: 8.1- 14.4). The prevalence of joint pain varied considerably also by province, ranged from 12.3% (95% CI: 7.5-19.5) in Bagmati province to 25.9% (95% CI: 19.9-33.1) in Karnali province. By wealth quintiles, prevalence ranged from 10.4% (95% CI: 6.8-15.6) in the highest wealth quintiles to 23.3% (95% CI: 18.9-28.5) in low quintile. In terms of occupation, the prevalence was highest at 20.8% (95% CI: 17.4 -24.6) among homemakers and lowest among students 6.3% (95% CI: 3.7-10.6). Regarding their marital status, proportion was highest (33.7% (95% CI: 26.1- 42.2)) among ever married and lowest among never married 7.3% (95% CI: 4.8 -11.0).

In our study, prevalence was more than double 17.8% (95% CI: 14.9-21.1) among participants who engaged in sufficient physical activity compared to insufficient physical activity 7.0% (95% CI: 4.3-11.2). In addition, we found a higher prevalence 18.4% (95% CI: 14.7-22.8) among current smokers compared to non-smokers 16.7% (95% CI: 13.8-20.1]. Similarly, those individuals classified as overweight had slightly higher prevalence i.e., 17.9% (95% CI: 14.4-21.9) compared to underweight 16.8% (95% CI: 13.8-20.3)

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192 **Table 2 Factors associated with joint pain**

Characterstics	**Bivariate analysis**		**Multivariable analysis**	
	Crude OR (95% CI)	P value	Adjusted OR (95% CI)	P value
Age				
15-29	1			
30-44	2 (1.39 -2.86)	***	1.45 (0.99-2.12)	*
45-69	3.94(2.73 -5.70)	***	2.36(1.56-3.55)	***
Sex				
Men	1			
Women	1.60 (1.32 -1.92)	***	1.47 (1.19 - 1.82	***
Educational attainment				
None/less than primary	1			
Primary	0.41 (0.29 -0.57)	***	0.72 (0.52 - 0.98)	*
Secondary	0.35 (0.26 -0.48)	***	0.76 (0.56 - 1.02)	0.068
More than secondary	0.36(0.22 -0.58)	***	0.88 (0.53 - 1.44)	0.601
Place of residence				
Metropolitan/	1			
Submetorpolitan Municipality	0.45 (0.20 - 1.02)	*		

Rural municipality	0.79 (0.51 -1.23)	0.296		
Province				
Sudoorpaschim	1			
Province 1	0.55(0.29 - 1.04)	0.067		
Province 2	0.42 (0.20 - 0.88)	*		
Bagmati Province	0.41 (0.21 - 0.79)	**		
Gandaki province	0.58 (0.32 - 1.03)	0.062		
Lumbini province	0.68 (0.35 - 1.31)	0.246		
Karnali province	1.02 (0.61 - 1.70)	0.943		
Place of residence				
Urban	1			
Rural	0.51(0.23 - 1.11)	0.090	1.57 (0.80 - 3.11)	0.192
Wealth quintile				
Lowest	1			
Second	0.86 (0.62 - 1.20)	0.385	1.02 (0.80 - 1.30)	0.879
Middle	0.59 (0.42 - 0.84)	**	0.78 (0.59 - 1.03)	0.084
Fourth	0.59 (0.39 - 0.90)	**	0.84 (0.59 - 1.20)	0.334
Highest	0.38 (0.22 - 0.65)	***	0.60 (0.37 - 0.98)	*
Occupation				
Employed	1			
Student	0.35 (0.19 - 0.64)	***	0.59(0.27 - 1.32)	0.198
Homemaker	1.35 (1.03 - 1.76)	*	0.85(0.64 - 1.13)	0.260
Unemployed	1.19 (0.73 - 1.95)	0.483	1.05(0.73 - 1.52)	0.785

Others	0.98 (0.40 - 2.40)	0.963	0.85 (0.39 - 1.89)	0.696
Marital status				
Unmarried	1			
Currently married	2.95 (1.94 - 4.46)	***	1.13 (0.72 - 1.76)	0.601
Single	6.43 (3.81 - 10.83)	***	1.27(0.77 - 2.10)	0.347
Body mass index				
Normal or Underweight	1			
Overweight	0.93(0.72 - 1.19)	0.562	1.02(0.83 - 1.25)	0.847
Alcohol consumption				
Yes	1			
No	0.87 (0.60 - 1.25)	0.451	1.09(0.80 - 1.48)	0.604
Physical activity				
Sufficient(more than 150 min per week)	1			
Insufficient (less than 150 min per week)	0.34(0.20 - 0.59)	***	0.40 (0.25 - 0.65)	***
Smoking				
Yes	1			
No	0.89(0.68 - 1.16)	0.392	0.89 (0.71 - 1.13)	0.337

* p<0.05; ** p<0.01; *** p<0.001

A summary of bivariate and multivariable analyses is presented in Table 2. A bivariate analysis was conducted to assess the association between joint pain and risk factors. In bivariate analysis,

the variables age, sex, education, province, wealth quintile, occupation, marital status, and physical activities were significantly ($P \leq 0.05$) associated with joint pain. However, higher age, being a female, belonging to the highest wealth quintile and only primary education, insufficient physical activity, were the only predictors which remained significantly associated with joint pain on multiple logistic regressions.

The results of our study show that participants aged 45-69 years (OR=2.36 ;95% CI: 1.56-3.55) and participants aged 30-44 years (OR=1.45;95% CI: 0.99-0.12) were more likely to have joint pain when compared to participants aged 15-29 years. Similarly, female participants (OR=1.47;95% CI: 1.19 - 1.82) had more likely to have joint pain compared to male participants. Furthermore, being in the highest wealth quintile (OR = 0.60; 95% CI: 0.37-0.98), belongs to primary schooling (OR= 0.72; 95% CI: 0.52 - 0.98), participants who were classified as completing sufficient physical activity (OR = 0.40; 95% CI =0.25 - 0.65) were protective against joint pain.

Discussion

This study reports population-based prevalence of self-reported joint pain and associated factors in the Nepal, aggregating rheumatic diseases and osteoarthritis, using data from the country's major nationally representative population based STEPS survey. The prevalence of joint pain in Nepal can be considered high, given that they are reported by about one in five adults. The overall prevalence of joint pain in our study (17.0%) is equal to or lower than the prevalence presented in several other studies (15–19). Study design, methodologies applied, definitions, and presentation of results may explain most of the differences.

This study highlights that joint pain is associated with older age, sex, education, province, wealth quintile, occupation, marital status, and physical activities**.** After adjusting for age, gender, wealth quintile, education, physical activity remained the correlates for joint pain in this population.

In this study, as in the literature cited, women had 1.47 times greater prevalence of joint pain than men. This finding may be explained, at least in part, by women being more inclined to report health problems in population surveys, sex-segregation of women into sedentary, repetitive and routine work, and the persisting gender imbalance in domestic work as well as being more frequent users of health services(20,21). In agreement with other studies a strong and increasing association was observed between age and joint pain (22–24). Given longer life expectancy, the relation between age and increasing prevalence of non-communicable disease and functional disability demands more attention from health policymakers with a view to adjusting management of these conditions in the population.

Both wealth quintile and education show a protective effect on joint pain. Wealth indices were a better discriminator than the educational attainment for joint pain in our sample. This finding is new to Nepal as there are no supporting findings from Nepal. But few studies from outside Nepal show educational achievement has been reported to have better rheumatoid arthritis outcome concerning pain and function(25,26).

Well planned physical activity has a protective effect on the joints; this is confirmed by the numerous scientific studies(27–29). Physical activity and exercise are increasingly being promoted and offered in various health care setting, and for a variety of chronic musculoskeletal conditions. However our multivariable model of this study confirmed the relationship between joint pain and sufficient physical activity. This seems contrary to the common notion that a sufficient physical activity may decrease the risk of chronic joint pain; this contrasting finding may be due to the fact that, we used the self-report measurement based on GPAQ questionnaire rather direct measurement via observation or other methods e.g multimodal excersie based approach , which may have resulted bias in the association between physical activity and joint pain, an objective measure - preferable for assessing the physical activity level in the population.

Our findings suggest that there is no relationship between smoking (current or previous) and joint pain. Previous research examining the association between joint pain and smoking behavior has been inconsistent: some studies found a positive association (30–32) and others suggest no association(33).

Alcohol consumption has many effects on bone, and increased alcohol consumption has been shown to be associated with higher bone density(34). Therefore, it can be expected that increased alcohol consumption may be associated with increased joint pain among participants. However,

there was no correlation between alcohol consumption and the presence of joint pain in our study.

Overall, the literature suggests an association between BMI and joint pain(35,36), but the strength of the relationship varies by study and also etiology and type however we did not find any association between BMI with joint pain in our survey.

Our study has several strengths and limitations. The main strengths include, large sample size, coverage of urban and rural residence; all three ecological belts of the country – the mountains hills and terai, and all provinces of Nepal making it nationally representative data and generalizable among Nepalese population. However, a questionnaire administered by an enumerators was the primary screening tool used and the diagnosis for joint pain was based on the answers to the symptomatic self-reported questions by participants .Another potential limitation of this study incude lack of standardized measuring tool for the joint pain and possibility of recall bias with a one-year time period .

Conclusion

About one in five Nepali population suffer from joint pain. Ageing, female gender, belonging to a highest wealth quintile are the important associated factors for joint pain. Similary, people having insuffeicnet physical activity (Less than 150 min per week) have a low risk of developing joint pain. This population based nationally representative survey warrants health system's greater attention for addressing the challenges of pain and disabilities associated with joint pain. Further prospective studies are needed to estimate the impact of this group of conditions particularly addressing related disabilities and loss of works. We believe the results of our study

can support for policy and planning for joint pain manangment in Nepal.

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Patient consent for publication : Not required.

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STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1-2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	5-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7-8
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	8-9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*7-9*
Bias	9	Describe any efforts to address potential sources of bias	10
Study size	10	Explain how the study size was arrived at	7-8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	10
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10
		(*b*) Describe any methods used to examine subgroups and interactions	10
		(*c*) Explain how missing data were addressed	10
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	7-8
		(*e*) Describe any sensitivity analyses	na
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7-8
		(b) Give reasons for non-participation at each stage	7-9
		(c) Consider use of a flow diagram	7-8
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8
		(b) Indicate number of participants with missing data for each variable of interest	10
Outcome data	15*	Report numbers of outcome events or summary measures	12-19
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear	10

		which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	10
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	na
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	10
Discussion			
Key results	18	Summarise key results with reference to study objectives	20-22
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	22
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	20-22
Generalisability	21	Discuss the generalisability (external validity) of the study results	22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	24

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.