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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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3 1 **Prevalence and factors associated with chronic joint pain in Nepal: Findings from a**
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6 2 **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 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 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

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3 36 rehabilitation for people affected by chronic musculoskeletal conditions addressing related
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5 37 disabilities and loss of work in Nepal.
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8 38 **Keywords:** prevalence, chronic joint pain, musculoskeletal conditions, Nepal
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3 39 **Strength and limitation of the study**
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5 40 The major strength of our study is that this is the first nationwide population-based study of
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7 41 chronic joint pain in Nepal with a robust sampling technique i.e. multistage stratified cluster.
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10 42 Limitations for this study are similar to any cross-sectional population based study. First,
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12 43 radiological examination and symptomatic examination are the common confirmatory diagnostic
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14 44 methods for the epidemiological investigation of chronic joint pain. In our study, the
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16 45 symptomatic self-reported diagnosis method was used as the main inclusion criterion for chronic
17
18 46 joint pain, so a questionnaire administered by an enumerator was the primary screening tool.
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21 47 Another potential limitation of this study was the possibility of recall bias with a one-year time
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23 48 period affecting participants' ability to accurately self-report information about past pain or
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25 49 consultation behavior.
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50 **Introduction**

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

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

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

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

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78 **Methods**

79 **Study design**

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

84 **Sampling and sampling techniques**

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

90 **Outcomes**

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

94 **Covariates**

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

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3 99 fourth, highest); occupation (Employed, student, homemaker, unemployed, others) place of
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5 100 residence (urban , rural), province (province1, province 2, Bagmati province , Gandaki province,
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7 101 Lumbini province , Karnali province, sudurpaschim province). Health and lifestyle variable
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10 102 were (smoking(yes or no), alcohol consumption (yes or no), physical activity (sufficient,
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12 103 insufficient), Body Mass Index (underweight, overweight). Provincial distribution has not been
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14 104 included in logistic regression analysis.
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3 106 **Data collection tools and techniques:**
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6 107 **Data analysis**
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9 108 Data analysis was performed using Stata 13 statistical software. Descriptive analyses were
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11 109 reported for a categorical variable, with relative frequencies of the prevalence of chronic joint
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13 110 pain and respective 95% confidence intervals (95% CI) and p-value. Simple and multiple logistic
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15 111 regression analysis was used to determine the association of chronic joint pain with age, sex,
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17 112 education, marital status, occupation, residence, province, wealth quintile, BMI, physical
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19 113 activity, smoking and alcohol consumption. Crude and adjusted Odds ratios and 95% Confidence
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21 114 Intervals were reported and p-values of < 0.05 were considered statistically significant.
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26 115 **Ethical approval**
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29 116 The data used in this study was obtained from a cross-sectional nationwide population based
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31 117 survey. Ethical approval was taken from Ethical Review Board of Nepal Health Research
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33 118 Council prior to conduct the NCD STEPS survey 2019. The participants were informed about
34
35 119 the purpose of the research study and were asked to give their written consent to participate in
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37 120 the study. Regarding the under 18 years participants, both assent and consent was sought from
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39 121 the guardian/parents. The participants were also guaranteed confidentiality of their information
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41 122 and were notified that participation would be voluntary.
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124 **Results**

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126 **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/submetropolitan	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]

127 Missing value *

128 The overall prevalence and descriptive statistics of chronic joint pain in our study population are
 129 summarized in Table 1. The overall prevalence of chronic joint pain in Nepal was 17.0% (95%
 130 CI: 14.2- 20.2). The age-specific prevalence is found increasing with age and found highest 29.4
 131 % (95% CI: 24.9-34.3) in the age group of 45-69 years and lowest 9.5% (95% CI: 6.7-13.4)
 132 among 15-29 years aged participants. Prevalence was highest at 20.1% (95% CI: 16.7-23.9) in
 133 females compared to males 13.6. (95% CI: 11.0-16.7). The prevalence of chronic joint pain

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3 134 among participants who were none/less than primary educated was 25.6 [95% CI: 21.3, 30.4].
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5 135 Among participants with secondary education, were 10.8 (95% CI: 8.1, 14.4). The prevalence of
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8 136 chronic joint pain varied considerably also by province, ranged from 12.3% (95% CI: 7.5-19.5)
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10 137 in Bagmati province to 25.9% (95% CI: 19.9-33.1) in Karnali province. By wealth quintiles,
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12 138 prevalence ranged from 10.4% (95% CI: 6.8-15.6) in the highest wealth quintiles to 23.3% (95%
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14 139 CI: 18.9-28.5) in low quintile. In terms of occupation, the prevalence was highest at 20.8% (95%
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16 140 CI: 17.4 -24.6) among homemakers and lowest among students 6.3% (95% CI: 3.7-10.6).
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18 141 Regarding their marital status, proportion was highest (33.7% (95% CI: 26.1- 42.2)) among ever
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20 142 married and lowest among never married (7.3% (95% CI: 4.8 -11.0)).
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24 143 In our study, prevalence was more than double 17.8% (95% CI: 14.9-21.1) among participants
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26 144 who engaged in sufficient physical activity compared to insufficient physical activity 7.0%
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28 145 (95% CI: 4.3-11.2). In addition, we found a higher prevalence 18.4% (95% CI: 14.7-22.8) among
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30 146 current smokers compared to non-smokers 16.7% (95% CI: 13.8-20.1]. Similarly, those
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32 147 individuals classified as overweight had slightly higher prevalence i.e., 17.9% (95% CI: 14.4-
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34 148 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			
Submetropolitan 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

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

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

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3 158 higher age, being a female, belonging to the highest wealth quintile and only primary education,
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5 159 insufficient physical activity, were the only predictors which remained significantly associated
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8 160 with chronic joint pain on multiple logistic regressions.
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11 161 The results of our study show that participants aged 45-69 years (OR=2.36 ;95% CI: 1.56-3.55)
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13 162 and participants aged 30-44 years (OR=1.45;95% CI: 0.99-0.12) were more likely to have
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15 163 chronic joint pain when compared to participants aged 15-29 years. Similarly, female
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17 164 participants (OR=1.47;95% CI: 1.19 - 1.82) had more likely to have chronic joint pain compared
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20 165 to male participants. Furthermore, being in the highest wealth quintile (OR = 0.60; 95% CI:
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22 166 0.37-0.98), belongs to primary schooling (OR= 0.72; 95% CI: 0.52 - 0.98), participants who
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25 167 were classified as completing sufficient physical activity (OR = 0.40; 95% CI =0.25 - 0.65) were
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27 168 protective against chronic joint pain.
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170 Discussion

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

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

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

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3 192 Both wealth quintile and education show a protective effect on chronic joint pain. Wealth indices
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5 193 were a better discriminator than the educational attainment for chronic joint pain in our sample.
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7 194 This finding is new to Nepal as there are no supporting findings from Nepal. But few studies
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10 195 from outside Nepal show educational achievement has been reported to have better rheumatoid
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12 196 arthritis outcome concerning pain and function(19,20).

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15 197 Insufficient physical activity is a leading risk factor for NCDs and death worldwide. Some
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17 198 studies have suggested that people who exercise regularly have a higher prevalence of
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20 199 Neck/shoulder pain and Low Back Pain (21,22). In line with this finding, the multivariable
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22 200 model of this study also confirmed the relationship between chronic joint pain and sufficient
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24 201 physical activity. In contrast, recent studies have shown that multimodal exercise programs,
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26 202 which include a range of activity are effective at significantly reducing pain in osteoarthritis,
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28 203 fibromyalgia, Chronic low back pain, and Rheumatoid Arthritis (23–25).

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32 204 Our findings suggest that there is no relationship between smoking (current or previous) and
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34 205 chronic joint pain. Previous research examining the association between joint pain and smoking
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36 206 behavior has been inconsistent: some studies found a positive association (26–28) and others
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38 207 suggest no association(29).

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42 208 Alcohol consumption has many effects on bone, and increased alcohol consumption has been
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44 209 shown to be associated with higher bone density(30). Therefore, it can be expected that increased
45
46 210 alcohol consumption may be associated with increased joint pain among participants. However,
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48 211 there was no correlation between alcohol consumption and the presence of chronic joint pain in
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50 212 our study.
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3 213 Overall, the literature suggests an association between BMI and chronic joint pain(31,32), but the
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5 214 strength of the relationship varies by study and also etiology and type however we did not find
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7
8 215 any association between BMI with chronic joint pain in our survey.
9

10 11 216 **Conclusion**

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14 217 About one in five Nepali adults suffer from chronic joint pain. Ageing, female gender, belonging
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16 218 to a highest wealth quintile are the important associated factors for chronic joint pain. This
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18 219 population based nationally representative survey warrants health system's greater attention for
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20 220 addressing the challenges of pain and disabilities associated with chronic joint pain. Further
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22 221 prospective studies are needed to estimate the impact of this group of conditions particularly
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24 222 addressing related disabilities and loss of works. We believe the results of our study can support
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26 223 for policy and planning for chronic joint pain manangement in Nepal.
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16
17 232 interpretation of data and writing the manuscript. PG, SK, SB, and SS participated in the
18
19 233 acquisition, analysis and interpretation of data, and critical revision of the manuscript. All
20
21 234 authors wrote the article, edited and approved the final draft of the manuscript.
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31 238 and had final responsibility for the decision to submit for publication.
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38 240 **Patient and public involvement:** Patients and/or the public were not involved in the design, or
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40 241 conduct, or reporting, or dissemination plans of this research.
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3 1 **Prevalence and factors associated with joint pain in Nepal: Findings from a countrywide**
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5 2 **cross-sectional STEPS survey**
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14 **Abstract**

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

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

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

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

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

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

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

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3 36 for health policies directed to prevention, treatment and rehabilitation for people affected by
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5 37 chronic musculoskeletal conditions addressing related disabilities and loss of work in Nepal.
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9 38 **Keywords:** Prevalence, Non communicable diseases ,joint pain, Nepal
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3 39 **Strength and limitation of the study**
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5 **Strengths and limitations of this study**
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- 7
- 8 • To our knowledge, this is the first nationwide population-based study of joint pain in
9 Nepal.
 - 10 • We used a robust sampling technique i.e. multistage stratified cluster.
 - 11 • Due to the cross-sectional nature of the study, establishing a casual relationship between
12 the risk factors and the prevalence of the condition was not possible.
 - 13 • Diagnosis of joint pain was based on the self-reported questionnaire.
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42 Introduction

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

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

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3 64 physical activity, or vigorous physical work), and metabolic risk factors (obesity and other
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5 65 comorbid chronic conditions)(10–12)
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9 66 Despite their epidemiological, clinical, and health economic importance, current data on the
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11 67 prevalence and determinates of musculoskeletal complaints in developing countries like Nepal
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13 68 are limited. Available information is also based on a hospital setting which doesn't provide the
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15 69 real situation of joint pain. To date, country-specific joint pain prevalence across parameters of
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17 70 socioeconomic and behavioral factors have not been systematically evaluated in a large,
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19 71 nationally representative sample of the population from Nepal. Hence, this study aims to
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21 72 determine the prevalence of joint pain and its association with sociodemographic factors and
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23 73 underlying the behavioral factors.
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75 **Methods**

76 **Study design**

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

79 The survey was conducted using the standardized WHO NCD STEPS instrument version
80 3.2(13), by incorporating all of the core questions with some selected country-specific modules
81 to assess the joint and back pain in consultation with WHO regional office for South- east Asia.

82 The questionnaire was translated into Nepali and validated by translation and back translation.

83 The field enumerators underwent a 4-day intensive training before deployment. The STEPS field
84 work was carried out between February 9, 2019 to May 8, 2019. Participants were involved in
85 the study for two days. Data collection techniques included a face-to- face interview for
86 demographic information and behavioral measurement (STEP 1), physical measurements (STEP
87 2) and biochemical measurements (blood and urine) collection (STEP 3). The survey data were
88 collected by an android tablets on the spot and transferred and stored in ONA data base server

90 **Sampling and sampling techniques**

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

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3 97 error, 95% confidence interval and a non-response rate of 15%. With these adjustments, the final
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5 98 sample was 6475. Assuming a response rate of 86.7% in STEP 1, total sample size was adjusted
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8 99 for 5593. From each of the selected household, one person between the ages of 15-69 was
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10 100 sampled randomly from all the eligible adults in a household using the android tablet. Further
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12 101 details about the study methodology can be found on the STEPS Survey 2019 (14).
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15 102 **Outcomes**

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18 103 Primary outcome in this study was prevalence of joint pain. The secondary outcome measures
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20 104 were factors associated with joint pain in Nepal. Joint pain in our study was based on any self-
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22 105 reported symptoms of joint pain, stiffness and swelling lasting for more than 1 month in the past
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25 106 12 months. Participants were defined as having joint pain if they had either rheumatoid arthritis
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27 107 or osteoarthritis. Participants who reported having joint pain/stiffness/ swelling lasting for more
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29 108 than one month and not associated with any injury along with morning stiffness or stiffness after
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31 109 a long rest lasting less than 30 min that goes away after exercise of the joint are categorized as
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33 110 having probable arthritis; while participants who reported having morning stiffness or stiffness
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35 111 after a long rest lasting more than 30 min and that does not go away after exercise of the joint
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37 112 were categorized having probable rheumatoid arthritis
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45 114 **Covariates**

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48 115 The following covariates were investigated for association with joint pain. The demographic
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50 116 variables were stratified by sex (male, female) age group (15-29, 30-44, 45-69). The
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52 117 socioeconomic variables included marital status (never married, currently married, ever married);
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54 118 (education- None/less than primary, primary, secondary, more than secondary) wealth quintile
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3 119 (lowest, second, middle, fourth, highest); occupation (Employed, student, homemaker,
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5 120 unemployed, others) place of residence (urban , rural), province (province1, province 2, Bagmati
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7 121 province , Gandaki province, Lumbini province , Karnali province, sudurpaschim province).
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9 122 Health and lifestyle variable were smoking(yes or no), alcohol consumption (yes or no), physical
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11 123 activity (PA) was assessed using the WHO recommended Global Physical Activity
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13 124 Questionnaire (GPAQ) version 2 .0, calculating the Metabolic Equivalent of Task (MET) value
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15 125 in minutes per week for work, recreational, and transport domains. Sufficient physical activity
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17 126 was defined as any combination of physical activities that exceeds 600 METs per week or (more
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19 127 than 150 min per week). Insufficient physical activity (IPA) was defined according to WHO
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21 128 recommendation (less than 600 METs per week)or (less than 150 min per week). Body Mass
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23 129 Index(BMI)) in kg/m² was classified into following categories: Underweight (< 18.5 kg/m²),
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25 130 normal weight (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), and obesity (\geq 30 kg/m²). In the
26
27 131 final analysis, we merged 'underweight' and 'normal' as well as overweight and obese together as
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29 132 the number of individuals for these categories was too small to constitute a standalone BMI
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31 133 group. Provincial distribution has not been included in logistic regression analysis.
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3 **135 Data collection tools and techniques:**
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6 **136 Data management and analysis**
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9 137 Data were collected electronically using PDAs programmed with WHO e-STEPS software. The
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11 138 data from the field was downloaded from the personal digital assistant (PDA) which was then
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14 139 exported on Microsoft excel for cleaning and cross-checked the inconsistencies. Data analysis
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16 140 was performed using STATA 15.0 Stata Corp LLC, USA and Epi Info version 3.4 with
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18 141 appropriate methods for the complex sample design of the survey. Descriptive analyses were
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20 142 reported for a categorical variable, with relative frequencies of the prevalence of joint pain and
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22 143 respective 95% confidence intervals (95% CI) and p-value.
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26 144 Associations between dependent and independent variables were tested using Chi-square.
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28 145 Bivariate analysis was conducted to analyze the unconditional association between each
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30 146 explanatory variable and joint pain status. Multicollinearity, the variance inflation factor (VIF)
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32 147 was assessed for all the independent variables found to be statistically significant from the
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34 148 bivariate analysis. All explanatory variables in the bivariate analysis were inserted in the
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36 149 multivariate binary logistic regression model to see the independent effect of each variable on
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38 150 occurrence of joint pain. For those variables that were not included in the final model, only the
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40 151 unadjusted odds ratio are presented. Finally, we present both unadjusted and adjusted odds ratios
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44 152 with 95% confidence intervals (CIs).
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56 **155 Ethical approval**
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9 156 The data used in this study was obtained from a cross-sectional nationwide population based
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11 157 survey. Ethical approval was taken from Ethical Review Board of Nepal Health Research
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14 158 Council prior to conduct the NCD STEPS survey 2019. The participants were informed about
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16 159 the purpose of the research study and were asked to give their written consent to participate in
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18 160 the study. Regarding the under 18 years participants, both assent and consent was sought from
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20 161 the guardian/parents. The participants were also guaranteed confidentiality of their information
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23 162 and were notified that participation would be voluntary.
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164 **Results**

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166 **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/submetropolitan	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 than 150 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]

167 Missing value *

168 The overall prevalence and descriptive statistics of joint pain in our study population are
 169 summarized in Table 1. The overall prevalence of joint pain in Nepal was 17.0% (95% CI: 14.2-
 170 20.2). The age-specific prevalence is found increasing with age and found highest 29.4 % (95%
 171 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

172 years aged participants. Prevalence was highest at 20.1% (95% CI: 16.7-23.9) in females
173 compared to males 13.6. (95% CI: 11.0-16.7). The prevalence of joint pain among participants
174 who were none/less than primary educated was 25.6 (95% CI: 21.3- 30.4). Among participants
175 with secondary education, were 10.8 (95% CI: 8.1- 14.4). The prevalence of joint pain varied
176 considerably also by province, ranged from 12.3% (95% CI: 7.5-19.5) in Bagmati province to
177 25.9% (95% CI: 19.9-33.1) in Karnali province. By wealth quintiles, prevalence ranged from
178 10.4% (95% CI: 6.8-15.6) in the highest wealth quintiles to 23.3% (95% CI: 18.9-28.5) in low
179 quintile. In terms of occupation, the prevalence was highest at 20.8% (95% CI: 17.4 -24.6)
180 among homemakers and lowest among students 6.3% (95% CI: 3.7-10.6). Regarding their
181 marital status, proportion was highest (33.7% (95% CI: 26.1- 42.2)) among ever married and
182 lowest among never married 7.3% (95% CI: 4.8 -11.0).

183 In our study, prevalence was more than double 17.8% (95% CI: 14.9-21.1) among participants
184 who engaged in sufficient physical activity compared to insufficient physical activity 7.0% (95%
185 CI: 4.3-11.2). In addition, we found a higher prevalence 18.4% (95% CI: 14.7-22.8) among
186 current smokers compared to non-smokers 16.7% (95% CI: 13.8-20.1]. Similarly, those
187 individuals classified as overweight had slightly higher prevalence i.e., 17.9% (95% CI: 14.4-
188 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**

Characteristics	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			
Submetropolitan 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

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

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

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3 196 the variables age, sex, education, province, wealth quintile, occupation, marital status, and
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5 197 physical activities were significantly ($P \leq 0.05$) associated with joint pain. However, higher age,
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7 198 being a female, belonging to the highest wealth quintile and only primary education, insufficient
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9 199 physical activity, were the only predictors which remained significantly associated with joint
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11 200 pain on multiple logistic regressions.
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15 201 The results of our study show that participants aged 45-69 years (OR=2.36 ;95% CI: 1.56-3.55)
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17 202 and participants aged 30-44 years (OR=1.45;95% CI: 0.99-0.12) were more likely to have joint
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19 203 pain when compared to participants aged 15-29 years. Similarly, female participants
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21 204 (OR=1.47;95% CI: 1.19 - 1.82) had more likely to have joint pain compared to male
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23 205 participants. Furthermore, being in the highest wealth quintile (OR = 0.60; 95% CI: 0.37-0.98),
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25 206 belongs to primary schooling (OR= 0.72; 95% CI: 0.52 - 0.98), participants who were classified
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27 207 as completing sufficient physical activity (OR = 0.40; 95% CI =0.25 - 0.65) were protective
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29 208 against joint pain.
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210 Discussion

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

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

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

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3 231 Both wealth quintile and education show a protective effect on joint pain. Wealth indices were a
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5 232 better discriminator than the educational attainment for joint pain in our sample. This finding is
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7 233 new to Nepal as there are no supporting findings from Nepal. But few studies from outside Nepal
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9 234 show educational achievement has been reported to have better rheumatoid arthritis outcome
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12 235 concerning pain and function(25,26).

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15 236 Well planned physical activity has a protective effect on the joints; this is confirmed by the
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17 237 numerous scientific studies(27–29). Physical activity and exercise are increasingly being
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19 238 promoted and offered in various health care setting, and for a variety of chronic musculoskeletal
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21 239 conditions. However our multivariable model of this study confirmed the relationship between
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23 240 joint pain and sufficient physical activity. This seems contrary to the common notion that a
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25 241 sufficient physical activity may decrease the risk of chronic joint pain; this contrasting finding
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27 242 may be due to the fact that, we used the self-report measurement based on GPAQ questionnaire
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29 243 rather direct measurement via observation or other methods e.g multimodal exercise based
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31 244 approach , which may have resulted bias in the association between physical activity and joint
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33 245 pain, an objective measure - preferable for assessing the physical activity level in the population.

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36 246 Our findings suggest that there is no relationship between smoking (current or previous) and
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38 247 joint pain. Previous research examining the association between joint pain and smoking behavior
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40 248 has been inconsistent: some studies found a positive association (30–32) and others suggest no
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42 249 association(33).

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45 250 Alcohol consumption has many effects on bone, and increased alcohol consumption has been
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47 251 shown to be associated with higher bone density(34). Therefore, it can be expected that increased
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49 252 alcohol consumption may be associated with increased joint pain among participants. However,
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253 there was no correlation between alcohol consumption and the presence of joint pain in our
254 study.

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

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

266 **Conclusion**

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

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3 274 can support for policy and planning for joint pain managment in Nepal.
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16
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18
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32
33 289 repositories and can be accessed freely at <https://nada.searo.who.int/index.php/catalog/76> . The
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35 290 data used in the study are also available from this platform.
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44 293 conduct, or reporting, or dissemination plans of this research.
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47 294 **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.