



# BMJ Open Active commuting and leisure-time physical activity among adults in western Nepal: a cross-sectional study

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## ABSTRACT

**Objective** To determine the prevalence and sociodemographic factors associated with active commuting and leisure-time physical activity (LTPA) among adults in western Nepal.

**Design** Cross-sectional study.

**Setting** Adults from semiurban areas in western Nepal.

**Participants** 2815 adults aged 25–65 years who participated in the ‘Community-Based Management of Hypertension in Nepal (COBIN)’ Study. Multiple logistic regression analysis was used to identify the sociodemographic factors associated with active commuting and LTPA.

**Outcome** Self-reported participation in active commuting and LTPA.

**Results** Most study participants (96%) commuted actively (walked or cycled) from one place to another. Our results showed that only a small proportion (3.7%) of participants engaged in moderate or vigorous LTPA. Compared with those in paid employment, the odds of commuting actively were higher among people working in agriculture or as labourers (OR: 4.57, 95% CI: 2.46 to 8.48), those retired/unemployed (OR: 2.98, 95% CI: 1.42 to 6.25) and those in unpaid employment (OR: 1.85, 95% CI: 1.06 to 3.22). Adults who were overweight or had obesity were less likely to commute actively. Compared with adults aged 25–34 years, older adults were less likely (OR: 0.35, 95% CI: 0.17 to 0.72) to engage in LTPA. Women were 0.46 times less likely to engage in LTPA compared with men.

**Conclusion** Most adults engaged in active commuting for work or travel. Less than 5% participated in any form of moderate or vigorous LTPA. Longitudinal studies incorporating objective assessment of physical activity and a range of individual, interpersonal, and environmental factors will help understand how to promote active commuting and LTPA among Nepalese adults.

**Trial registration number:** ClinicalTrials.gov NCT02428075.

## BACKGROUND

Transport-related physical activity, referred to as active commuting, includes using active modes of transportation such as walking or cycling to commute from one place to another. Leisure-time physical activity (LTPA) is defined as physical activities performed as part of the exercise, recreation or

## Strengths and limitations of this study

- A cross-sectional study with a large sample size and excellent response rate (>95%).
- This study is one of the first papers to examine factors associated with active commuting and leisure-time physical activity among Nepalese adults, with a focus on semiurban areas in western Nepal.
- One limitation is that since data on active commuting and leisure-time physical activity were self-reported by the participants, some form of recall or social desirability bias may have occurred.
- We have focused on available sociodemographic factors and future studies may like to explore the association with interpersonal, cultural and broader environmental factors.

sports.<sup>1 2</sup> Active commuting and LTPA offer a range of health, social<sup>3</sup> and productivity benefits, including higher levels of physical well-being<sup>4</sup> and mental well-being,<sup>5</sup> reduced sickness-related absences,<sup>5</sup> and decreased risk of all-cause mortality,<sup>6–10</sup> cardiovascular disease (CVD),<sup>6 9 10</sup> type 2 diabetes mellitus (T2DM)<sup>10 11</sup> and several types of cancer.<sup>9 12 13</sup>

The 2019 Noncommunicable Disease Risk Factors Stepwise approach to Surveillance (STEPS) Survey<sup>14</sup> reported that LTPA contributed 7.3% and active commuting contributed 31.2% to total physical activity minutes among Nepalese adults.<sup>14</sup> Participation in active commuting was more common in metropolitan and submetropolitan areas. The same survey found that active commuting and LTPA increased with increasing household wealth and educational attainment. Further, the participation of women in LTPA was less than that of men.<sup>14</sup> Previous Nepalese studies have reported an age-related decline in active-commuting and negative association with higher education, marital status and unpaid employment.<sup>15</sup>

While occupational physical activity is still the major contributor to total physical activity

among Nepalese adults, the percentage contribution has decreased from 64.8% to 61.5% between 2013 and 2019.<sup>14</sup> Urbanisation, mechanisation and a shift from manual to sedentary occupations (such as from agriculture to desk-based jobs) are further expected to decrease occupational physical activity in the future.<sup>15 16</sup> In addition, the benefits from occupational activities are reported inconsistently<sup>17 18</sup> while the health benefits of LTPA are more pronounced than other domains of physical activity.<sup>2 19–22</sup> Hence, there is a need to promote other domains of physical activity, particularly LTPA, even in countries like Nepal where there is relatively higher engagement in occupational physical activity.

Information on active commuting and LTPA is required to guide public health interventions targeting non-communicable diseases, including CVD, T2DM and hypertension, in Nepal and similar settings. However, studies of LTPA and active commuting among Nepalese adults are scant. This study aimed to identify the prevalence and sociodemographic factors associated with active commuting and participation in LTPA among adults in Gandaki province, Nepal.

## METHODS

### Study design and setting

This study used cross-sectional data collected as part of the Community-Based Management of Hypertension in Nepal (COBIN) Study. The details about the study methods have been previously published.<sup>23</sup> We have presented the study findings following the Strengthening the Reporting of Observational Studies in Epidemiology reporting guidelines for observational studies.<sup>24</sup> The study was conducted in Lekhnath municipality, a semiurban area located around 180 km west of the country's capital, Kathmandu. According to the 2011 population census, the total population of the municipality was 58 816. Before federalisation, the municipality was divided into 15 smaller administrative units called *wards*. The municipality is a semiurban area with limited health services comprising one primary healthcare centre, three subhealth posts and two urban healthcare centres.<sup>23</sup>

### Study participants and data collection

Study participants were adults aged 25–65 years who had registered for voting in Lekhnath municipality in the 2007 election. Out of the 9500 households in the municipality, 2882 households were randomly selected using the voter database. Given that the primary purpose of the COBIN population-based survey was to estimate the prevalence of hypertension,<sup>25</sup> a sample size of 2882 was determined using the estimated hypertension prevalence of 25%, 5% margin of error, a design effect of 1% and 80% response rate. If any households had more than one eligible participant at the time of data collection, one of them was selected to participate in the survey using the Kish method.<sup>26</sup> Those severely ill who could not engage in physical activity, those unable to consent, pregnant

women and those unlikely to be in the study area for the intervention duration were not eligible for inclusion.

We used an adapted version of the WHO STEPS Survey questionnaire<sup>27</sup> to collect data on participant's demographics, lifestyle behaviours, anthropometric characteristics and blood pressure. Trained data enumerators with academic qualifications in health science (such as nurses or health assistants) used the structured questionnaire for data collection during home visits. Data were collected from 2815 adults (response rate of 97.7%). Further details about sampling, participant recruitment and data collection are provided in the study protocol<sup>23</sup> and previously published studies.<sup>28 29</sup>

### Outcome variables

Transport-related active commuting and LTPA were the outcome variables of interest in this study. Information on active commuting and LTPA was collected using questions in the STEPS Instrument based on the Global Physical Activity Questionnaire (GPAQ). Study participants self-reported their participation in occupational, transport and leisure-time domains. The GPAQ is one of the most commonly used measures to collect population-level physical activity prevalence data in low/middle-income countries<sup>30</sup> and has been used previously in the Nepalese population.<sup>31–33</sup>

To determine if participants actively commuted from one place to another, they were asked: 'Do you walk or use a bicycle (pedal cycle) for at least 10 min continuously to get to and from places?' Responses were recorded as 'Yes' or 'No', and those who responded 'Yes' were considered as active commuters in this study. Information with respect to LTPA was probed using two questions: (1) engagement in any vigorous-intensity sports, fitness or recreational (leisure) activities that cause significant increases in breathing or heart rate, such as running or playing football for at least 10 min continuously on any day of the week, and (2) engagement in any moderate-intensity sports, fitness or recreational (leisure) activities that cause a slight increase in breathing or heart rate, such as brisk walking, cycling, swimming, playing volleyball for at least 10 min continuously on any day of the week. Participants responding 'Yes' to any of these two questions were categorised as engaging in LTPA.

### Exposure variables

The exposure variables of interest in this study were age, gender, education, occupation, monthly income, ethnicity, marital status and body mass index (BMI). Educational attainment was categorised as: schooling up to primary level, secondary and higher secondary level, and attainment of higher education. The occupational classifications were paid employment (government and non-government employees and the self-employed), unpaid employment (homemakers, agriculture and manual labour), and retired or unemployed (students, retirees and those who were unemployed). Based on monthly income, participants were classified into income

quartiles, with the cut-offs for first (lowest) to fourth (highest) quartiles being 12 000, 20 000 and 35 000 Nepalese rupees (12 000 Nepalese rupees=US\$100 as of 26 July 2020). BMI was calculated using the height and weight measurements and categorised as underweight (<18.5 kg/m<sup>2</sup>), normal weight (18.5–24.9 kg/m<sup>2</sup>), overweight (25–29.9 kg/m<sup>2</sup>) and obese (≥30 kg/m<sup>2</sup>). Ethnicity was classified as advantaged and disadvantaged ethnic groups. Advantaged ethnic groups included the relatively advantaged Janajatis and upper-caste groups, while disadvantaged ethnic groups included the Dalits, disadvantaged Janajatis, the disadvantaged non-Dalit Terai caste and religious minorities.<sup>15 34</sup> Marital status categories cohabiting and separated/widowed/divorced were merged to create 'ever married' for regression analysis. Information on sitting time was collected by asking participants: 'How much time do you usually spend sitting or reclining on a typical day?'

### Statistical analysis

Descriptive statistics are reported as frequencies and percentages for categorical variables. For continuous variables (age and sitting time), mean and SD are reported. Levene's test was used to test the assumption of equal variance for independent sample t-test. We first calculated the domain-specific metabolic equivalent (MET)-minutes per week by multiplying the number of minutes of activity at each intensity by the number of days per week for the three physical activity domains (occupational, leisure-time and transport-related). We then summed the domain scores to calculate the total physical activity score and categorised them as low (<600 MET-min/week), moderate (600–3000 MET-min/week) and high (>3000 MET-min/week) for descriptive analysis. We have reported median and IQRs for active commuting and LTPA-related METs-minutes per week. Bivariate associations between the exposure variables and participation in active commuting and LTPA were analysed with X<sup>2</sup> tests. We conducted separate multivariable-adjusted logistic regression analysis to determine the associations between exposure variables (age, gender, education, occupation, income, ethnicity, marital status, BMI) and outcome variables (active commuting and LTPA). Adjusted ORs and corresponding 95% CIs are reported. A p value of <0.05 was considered statistically significant. All statistical analyses were carried out in Stata V.16 (StataCorp, College Station, Texas, USA).

### Patient and public involvement

Since this is a secondary data analysis from the primary study (COBIN), this substudy did not involve patients or the public in the design and conduct.

## RESULTS

### Characteristics of participants

This study analysed the data of 2815 adults aged 25–65 years for whom complete data were available. Mean age of

the participants was 45.3±10.2 years, and women were on average 1.2 years younger than men. Women represented 63% of the sample, and 52% were educated up to primary level. Higher education levels were 14% and 2% among men and women, respectively. Working in agriculture or as labourers were the most common occupations (38%), while 9% were either retired or unemployed. Based on BMI, 36% of the study participants were categorised as overweight, and 12% were classified as having obesity. A large majority (96%) of the study participants commuted actively from one place to another. Among those who actively commuted, the median MET-min/week for active commuting was 1680 (Q1=840, Q3=2520). On the other hand, only 3.7% of the study participants engaged in any form of moderate or vigorous LTPA. The average sitting time was around 180 min/day (table 1). There were significant differences between men and women in occupation, income quartiles, marital status, BMI, total physical activity and engagement in LTPA (table 1).

### Factors associated with active commuting and LTPA

The bivariate analysis results (table 2) showed that those with primary education were more likely to undertake active commuting than those with secondary or higher education. Likewise, those engaged in agriculture or as labourers, those ever married and normal-weight participants were more likely to report active commuting. In contrast, younger adults (25–34 years), men, those educated up to higher secondary level, those engaged in agriculture or working as labourers, and those ever married were more likely to engage in moderate or vigorous LTPA.

Table 3 presents the results of multiple logistic regression analysis examining sociodemographic factors associated with active commuting and LTPA. Compared with adults engaged in paid employment, those in unpaid employment, working in agriculture or as labourers, and those retired or unemployed had 1.85 (95% CI: 1.06 to 3.22), 4.57 (95% CI: 2.46 to 8.48) and 2.98 (95% CI: 1.42 to 6.25) higher odds of commuting actively, respectively. Similarly, those who ever married were 3.62 (95% CI: 1.64 to 7.96) times more likely to commute actively than those never married. On the other hand, compared with underweight adults, those who were in the overweight and obese categories of BMI were less likely to commute actively, with ORs of 0.46 (95% CI: 0.29 to 0.73) and 0.36 (95% CI: 0.20 to 0.66), respectively. No statistically significant associations were observed with active commuting and the following: age, gender, education, income or ethnicity. On the other hand, compared with adults aged 25–34 years, older adults aged 55–64 years had the lowest OR of 0.35 (95% CI: 0.17 to 0.72) of engaging in LTPA. Further, women were 0.46 (95% CI: 0.27 to 0.77) times less likely to engage in LTPA than men. No statistically significant associations were observed between LTPA participation and education, occupation, income, ethnicity, marital status and BMI.

**Table 1** Descriptive characteristics of study participants (n=2815)

Characteristics	Frequency (%)	Men (n=972) N (%)	Women (n=1843) N (%)	P value
Age (years)	45.3±10.2	46±10.7	44.8±9.8	0.003
25–34	536 (19.0)	193 (19.9)	343 (18.6)	<0.001
35–44	861 (30.6)	240 (24.7)	621 (33.7)	
45–54	846 (30.1)	303 (31.2)	543 (29.5)	
55–64	570 (20.3)	234 (24.1)	336 (18.2)	
Level of education				<0.001
Up to primary level	1466 (52.1)	293 (30.1)	1173 (63.6)	
Up to higher secondary level	1170 (41.6)	541 (55.7)	629 (34.1)	
Higher level	179 (6.4)	138 (14.2)	41 (2.2)	
Occupation				<0.001
Paid employment	578 (20.5)	346 (35.6)	232 (12.6)	
Unpaid employment	894 (31.8)	37 (3.8)	857 (46.5)	
Agriculture/labour	1089 (38.7)	377 (38.8)	712 (38.6)	
Retired/unemployed	254 (9.0)	212 (21.8)	42 (2.3)	
Monthly income quartiles				0.021
First	777 (27.6)	289 (29.7)	488 (26.5)	
Second	727 (25.8)	269 (27.7)	458 (24.8)	
Third	666 (23.7)	215 (22.1)	451 (24.5)	
Fourth	645 (22.9)	199 (20.5)	446 (24.2)	
Ethnicity				0.198
Disadvantaged groups	813 (28.9)	266 (27.4)	547 (29.7)	
Advantaged groups	2002 (71.1)	706 (72.6)	1296 (70.3)	
Marital status				<0.001
Never married	71 (2.5)	44 (4.53)	27 (1.5)	
Ever married	2744 (97.5)	928 (95.5)	1816 (98.5)	
BMI				<0.001
Underweight	189 (6.7)	92 (9.5)	97 (5.3)	
Normal	1265 (44.9)	491 (50.5)	774 (42.0)	
Overweight	1018 (36.2)	318 (32.7)	700 (37.9)	
Obese	343 (12.2)	71 (7.3)	272 (14.8)	
Total physical activity				<0.001
Low	29 (1.0)	18 (1.8)	11 (0.6)	
Moderate	250 (8.9)	152 (15.6)	98 (5.3)	
High	2536 (90.1)	802 (82.5)	1734 (94.1)	
Undertakes LTPA				<0.001
Yes	104 (3.7)	58 (6.0)	46 (2.5)	
No	2711 (96.3)	914 (94.0)	1797 (97.5)	
Uses active commuting				0.053
Yes	2701 (96.0)	923 (95.0)	1778 (96.5)	
No	114 (4.0)	49 (5.0)	65 (3.5)	
Mean sitting time (min)	179.8±103	184.9±112.3	177.1±97.6	0.067

BMI, body mass index; LTPA, leisure-time physical activity.

## DISCUSSION

This study found that a vast majority (96%) of study participants walked or used a cycle to commute from one place

to another. However, the proportion of adults participating in any form of moderate or vigorous LTPA for at least 10 min at a time was minimal. Participation in overall

**Table 2** Characteristics of those engaged in LTPA and active commuting

Characteristics	Frequency	Active commuting			LTPA		
		Yes N (%)	No N (%)	P value	Yes N (%)	No N (%)	P value
Age (years)				0.095			
25–34	536	504 (18.67)	32 (28.07)		38 (36.54)	498 (18.38)	<0.001
35–44	861	829 (30.72)	32 (28.07)		25 (24.04)	836 (30.86)	
45–54	846	817 (30.27)	29 (25.44)		28 (26.92)	818 (30.20)	
55–64	570	549 (20.34)	21 (18.42)		13 (12.50)	557 (20.56)	
Sex				0.053			<0.001
Men	972	923 (34.17)	49 (42.98)		58 (55.77)	914 (33.71)	
Women	1843	1778 (65.83)	65 (57.02)		46 (44.23)	1797 (66.29)	
Level of education				<0.001			<0.001
Up to primary level	1466	1420 (52.57)	46 (40.35)		32 (30.77)	1434 (52.90)	
Up to higher secondary level	1170	1122 (41.54)	48 (42.11)		59 (56.73)	1111 (40.98)	
Higher level	179	159 (5.89)	20 (17.54)		13 (12.50)	166 (6.12)	
Occupation				<0.001			0.021
Paid employment	578	529 (19.59)	49 (42.98)		27 (25.96)	551 (20.32)	
Unpaid employment	894	856 (31.69)	38 (33.33)		23 (22.12)	871 (32.13)	
Agriculture and labour	1089	1072 (39.69)	17 (14.91)		38 (36.54)	1051 (38.77)	
Retired/unemployed	254	244 (9.03)	10 (8.77)		16 (15.38)	238 (8.78)	
Monthly income quartiles				0.347			0.725
First	777	751 (27.80)	26 (22.81)		32 (30.77)	745 (27.48)	
Second	727	696 (25.77)	31 (27.19)		29 (27.88)	698 (25.75)	
Third	666	642 (23.77)	24 (21.05)		23 (22.12)	643 (23.72)	
Fourth	645	612 (22.66)	33 (28.95)		20 (19.23)	625 (23.05)	
Ethnicity				0.211			0.267
Disadvantaged groups	813	786 (29.10)	27 (23.68)		25 (24.04)	788 (29.07)	
Advantaged groups	2002	1915 (70.90)	87 (76.32)		79 (75.96)	1923 (70.93)	
Marital status				<0.001			<0.001
Never married	71	60 (2.22)	11 (9.65)		9 (8.65)	62 (2.29)	
Ever married	2744	2641 (97.78)	103 (90.35)		95 (91.35)	2649 (97.71)	
BMI				0.001			0.403
Underweight	189	183 (6.78)	6 (5.26)		3 (2.88)	186 (6.86)	
Normal	1265	1233 (45.65)	32 (28.07)		47 (45.19)	1218 (44.93)	
Overweight	1018	963 (35.65)	55 (48.25)		42 (40.38)	976 (36.00)	
Obese	343	322 (11.92)	21 (18.42)		12 (11.54)	331 (12.21)	

BMI, body mass index; LTPA, leisure-time physical activity.

total physical activity was at a reasonable high level, though 1% did not meet the recommended levels of total physical activity (less than 150 min/week of moderate physical activity or equivalent). The reported prevalence of physical inactivity is lower than that reported by STEPS 2019 (7.4%).<sup>14</sup> Participants spent almost 180 min/day sitting, slightly lower than the national estimates of 201 min/day.<sup>14</sup> Previous studies from Nepal have also reported a low prevalence of LTPA among adults.<sup>14 15 35</sup> This pattern is similar to other South Asian countries, as reported by a systematic review among South Asian adults that found the majority did not engage in LTPA.<sup>36</sup> Another study

from Singapore<sup>37</sup> found that participants in full-time employment were less likely to engage in LTPA regularly. In the present study, we did not observe any association between LTPA and occupation.

Previous studies from Saudi Arabia<sup>38</sup> and Iran<sup>39</sup> have reported an age-related decline in LTPA participation, and older adults are less likely to engage in LTPA. The results from our study agree with this. However, a study in Taiwan has reported that age was positively related to LTPA and attributed this to an increase in LTPA in the post-retirement period (60–65 years of age). This paradox can be explained by younger adults being time-poor

**Table 3** Multivariable adjusted associations of sociodemographic factors with active commuting and LTPA

Characteristics	OR (95% CI)	
	Active commuting	LTPA
<b>Age (years)</b>		
25–34	1	1
35–44	1.31 (0.77 to 2.26)	0.43 (0.25 to 0.75)
45–54	1.16 (0.64 to 2.10)	0.51 (0.29 to 0.90)
55–64	0.88 (0.45 to 1.74)	0.35 (0.17 to 0.72)
<b>Sex</b>		
Men	1	1
Women	1.19 (0.71 to 1.99)	0.46 (0.27 to 0.77)
<b>Level of education</b>		
Up to primary level	1	1
Up to higher secondary level	0.97 (0.59 to 1.59)	1.58 (0.95 to 2.63)
Higher level	0.59 (0.28 to 1.27)	1.54 (0.66 to 3.59)
<b>Occupation</b>		
Paid employment	1	1
Unpaid employment	1.85 (1.06 to 3.22)	1.08 (0.55 to 2.14)
Agriculture and labour	4.57 (2.46 to 8.48)	1.25 (0.71 to 2.21)
Retired/unemployed	2.98 (1.42 to 6.25)	1.15 (0.59 to 2.27)
<b>Monthly income quartiles</b>		
First	1	1
Second	0.99 (0.57 to 1.70)	0.86 (0.51 to 1.46)
Third	1.22 (0.68 to 2.19)	0.73 (0.41 to 1.28)
Fourth	1.09 (0.63 to 1.92)	0.59 (0.33 to 1.09)
<b>Ethnicity</b>		
Disadvantaged groups	1	1
Advantaged groups	0.97 (0.60 to 1.55)	1.18 (0.72 to 1.94)
<b>Marital status</b>		
Never married	1	1
Ever married	3.62 (1.64 to 7.96)	0.45 (0.19 to 1.03)
<b>BMI</b>		
Underweight	1	1
Normal	0.73 (0.29 to 1.81)	0.39 (0.12 to 1.27)
Overweight	0.46 (0.29 to 0.73)	1.32 (0.85 to 2.05)
Obese	0.36 (0.20 to 0.66)	1.28 (0.65 to 2.49)

Analysis is adjusted for all variables in the table.  
BMI, body mass index; LTPA, leisure-time physical activity.

and juggling long working hours, caring responsibilities and economic pressure.<sup>40</sup> Future research is needed to explore the reasons for the age-related decline in LTPA participation and to identify recreational activities that older Nepalese adults are willing to participate in. This information will be crucial to design interventions that can be quickly adopted by older adults and bring sustained behaviour change for increasing fitness levels.

Our study findings reiterate the results from previous studies from Nepal,<sup>14 35</sup> Singapore,<sup>37</sup> Taiwan<sup>40</sup> and Saudi

Arabia<sup>38</sup> that have shown that women are less likely to engage in LTPA. This potentially could be because of the traditional gender roles that limit women's free outdoor movement.<sup>36</sup> Further, the allocation of household and caring responsibilities primarily to women usually results in a lack of time and energy to engage in non-domestic forms of physical activity such as active commuting or LTPA.<sup>41 42</sup> It will be vital for future interventions to incorporate strategies to address gender norms and create a supportive family and community environment to promote LTPA participation among women.

Our study results showed that, compared with people in paid employment, those in unpaid employment, working in agriculture or as a labourer, and those retired or unemployed were more likely to engage in active commuting. Lack of pedestrian and cyclist-friendly infrastructures, pollution, and/or lack of changing and shower facilities at the workplaces may also be other factors that limit active commuting among employed adults.<sup>35 43 44</sup> These results are consistent with a previous study from Nepal that has reported government employees are less likely to engage in transport-related active commuting.<sup>35</sup> In our recent qualitative study among Nepalese adults, we found that lack of infrastructure for active commuting, increased access to motorised transport, and lack of resting areas and basic amenities act as barriers to engage in transport-related physical activity. In the same study, participants reported that the removal of these barriers would create a facilitating environment.<sup>16</sup> Increased social support and favourable workplace norms and policies might promote active commuting,<sup>44</sup> which needs to be further explored among Nepalese adults.

Adults who had been ever married were more likely to commute actively than those never married, a result consistent with that reported by a previous secondary analysis of the 2013 Nepal STEPS Survey.<sup>15</sup> We also found that adults in the overweight and obese category were less likely to commute actively than those who were underweight. However, because of the cross-sectional nature of this survey, temporality could not be determined, and prospective studies are recommended to understand the causal factors.

This study has several strengths to be noted. First, we had a large sample size representing semiurban areas in western Nepal. Second, there was a high participant response rate of more than 95%. Third, this is one of the few studies to provide insights on the prevalence and correlates of LTPA in Nepal. However, there are some limitations that need to be considered when interpreting the results. Our study was limited to one municipality in Gandaki province. Though most of the municipalities share similar sociodemographic characteristics, the study results might not always represent other provinces of Nepal. Since active commuting and LTPA participation were self-reported by the participants, some form of recall or social desirability bias may have been present. Active commuting and LTPA are complex behavioural constructs affected by various individual, interpersonal,

cultural and broader environmental factors.<sup>45</sup> Still, our study has focused only on associations with sociodemographic factors. Despite our attempt to recruit a sex-balanced sample, nearly two-thirds of the participants were women. Though men and women differed in background characteristics, we were unable to run sex-specific regression analyses because of the low proportion of people engaging in LTPA, and those not engaging in active commuting.

## CONCLUSION

This study found that a large majority of Nepalese adults engage in active commuting, but less than 5% participated in any form of moderate or vigorous LTPA. Paid employment, being unmarried, and being overweight or obese decreased the likelihood of active commuting. On the other hand, women and older adults were less likely to participate in LTPA. Longitudinal studies incorporating objective assessments of physical activity variables and a range of individual, interpersonal, and environmental factors will be valuable to understand additional factors that contribute to active commuting and LTPA among Nepalese adults. Future interventions might need to incorporate workplace-based strategies, address gender norms that limit women's participation in LTPA and develop tailored programmes for older adults.

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**Data availability statement** Data are available upon reasonable request. The datasets analysed during the current study will be available from the last author on reasonable request.

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