# Sex Differences on Behavioural Risk Factors of Hypertension among Rural Community Dwellers, Nepal: A Cross-Sectional Survey

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*Cite this article as:* Sharma, M., Singh, B., & Adhikari, B. (2025). Sex Differences on Behavioural Risk Factors of Hypertension among Rural Community Dwellers, Nepal: A Cross-Sectional Survey. Nepalese Heart Journal, 21(2). 53-59

Submission Date: June 27, 2024 Accepted Date: April 11, 2025

### Abstract



**Background:** The increase in hypertension in developing countries has been brought about by the increasing prevalence of risk factors, such as increased alcohol consumption, smoking, obesity, physical inactivity, and low fruit and vegetable intake. This study was conducted to assess gender differences in the prevalence of behavioural risk factors of hypertension.

**Methods:** Study design was cross-sectional survey. Adults residing in the Parsauni Rural Municipality, were the study population. In-person interview was done using WHO STEPs questionnaire among 596 samples selected via PPS technique. Height, weight, waist circumference, and hip circumference were measured by health personnel following standard technique. BMI and waist–hip ratio were calculated using standard formula. The data was analyzed using SPSS version 20 (IBM SPSS).

**Results:** Out of 596 respondents, a higher proportion of women were past smokers (13.9%), and a higher proportion of males were current tobacco users (14.2%). Only 38.5% of respondents attempted to quit smoking, of which 3.0% were female. Similarly, 29.0% were past and 20.1% were current alcohol users. Only 40.8% and 56.0% of respondents were involved in vigorous-intensity and moderate-intensity physical activity, respectively. Only 41.6% and 8.6% of respondents consumed vegetables and fruits daily, respectively. There was no association of alcohol consumption, physical activity, or fruit and vegetable consumption with respondents' sex. The odds of diagnosed hypertension were high among females (1.242, p = 0.034). Due to the cross-sectional design, causal relationships cannot be established.

**Conclusions:** Behaviour-related health risks such as physical inactivity, low fruit and vegetable consumption, tobacco and alcohol use, overweight and obesity, and high-risk waist-to-hip ratios are high in community people.

Key words: BMI; high blood pressure; NCD; obesity; waist- hip-ratio

DOI: http://doi.org/10.3126/nhj.v21i2.70938



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### Introduction

It is estimated that 31.1% of adults are hypertensive.<sup>1</sup> The global prevalence of hypertension (HTN) is projected to decrease to 20.3% in 2040, with the highest prevalence in low-income countries.<sup>2</sup> National data of Nepal shows HTN among 18% female and 23% male.<sup>3</sup> The increase in chronic diseases in developing countries has been brought about by the increasing prevalence of risk factors, such as increased alcohol consumption, smoking, obesity, physical inactivity, and low fruit and vegetable intake.<sup>4</sup> WHO launched the Global Hearts Initiative in 2016 to reduce the prevalence of hypertension by 25% by 2025<sup>5</sup>, while Nepal witnessed 14% of deaths attributable to high systolic blood pressure and 13% to smoking in the disease burden.<sup>6</sup>

By eliminating common risk factors, mainly tobacco use, unhealthy diet, physical inactivity, and the harmful use of alcohol, up to 80% of Non-communicable diseases, including HTN, can be prevented<sup>7</sup>, and clustering of these risk factors increases his risk of heart problems.<sup>8</sup> Knowledge about risk factor distribution patterns among population cohorts is important for effective management. However, previous studies in Nepal focused on HTN prevalence, knowledge, and associated factors<sup>9-11</sup>, while other studies focusing on risk factor distribution in community cohorts missed rural settings.<sup>12-14</sup> Thus, we undertook this study to assess gender differences in the prevalence of four major behavior risk factors, namely physical activity, fruit and vegetable consumption, tobacco and alcohol use, overweight and obesity, waist-to-hip ratio, and HTN-related information.

### **Methods**

A cross-sectional survey design was used. Parsauni Rural Municipality of Province Two, Nepal was the study setting. This rural setting was selected because it reflects the socio-economic disparities and access challenges typical of underserved regions in Nepal. Males and females greater than 18 years old, available at the time of data collection, and physically able to communicate were the study population. The sample size was calculated applying the Cochran formula  $Z^2(p-q)/L^2$ , the PPS sampling technique was used to select 596 samples, and the sampling frame was the voter list. Their participation in this study was voluntary. Data was collected via in-person interview technique after obtaining consent from the respondents. Six staff nurses and health assistants working in the Parsa district were enrolled as data collectors and trained before data collection. The interviews were in the Bhojpuri language using the WHO STEP questionnaire, and colorful show cards were used as needed.

Height was measured with the removal of shoes, hat, and hair tie and standing with feet together, knees straight and with the back against the wall and heels touching the ground, arms on the side, and eyes in front parallel to the ground (facing the interviewer). The reading coinciding with the occipital edge was noted in centimeters. The weighting machine was placed on a firm flat surface and the weight of all participants was taken with minimum clothes on the body & was recorded in kilograms with the help of a standard digital weighing machine, which was adjusted to 'zero' weight while measuring it. Participants were requested to remove shoes and extra clothes, stand on the scale with one foot on each side of the scale, face forward, and wait until asked to step off. The waist circumference was measured by placing the measuring tape midway between the top of the hip bone (iliac crest) and the bottom of the last rib. Measurement was taken in a room of the house (private area) with light clothing. Hip circumference was measured around the maximum circumference

of the buttocks. Participants were requested to wrap the tape around the buttocks. Measurement was read at the level of tape to the 0.1 cm. The BMI was calculated as weight in kilograms divided by the square of the height in meters (kg/m2) [weight (kg)/height (m2)]. The waist-hip ratio was calculated by dividing waist circumference by hip circumference.

The data was analyzed using SPSS version 20 (IBM SPSS). Researchers conducted descriptive statistical analyses, such as frequency distributions, measures of central tendency, and dispersion. The odds ratio for risk factors was estimated using a 2/2 table, and the confidential interval (CI) was set at a 95% level of significance. The Ethical Review Board of the Nepal Health Research Council reviewed the proposal and provided ethical clearance (ref. 381).

#### Findings

A total of 600 respondents were surveyed, four were excluded from the analysis due to incomplete data. Among the respondents, 13.9% of women reported being former smokers, while 14.2% of men were current tobacco users (figure 1) and their ages ranged from 18 to 80 years.

# Sex of the Respondents (n = 596)



Figure 1: Sex distribution of the respondents

Regarding salt intake, 49.2% of the respondents sometimes added extra salt to their food, while 10.7% often and 4.7% always did (figure 2).



Figure: 2 Respondents' additional salt consumption habit

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Respondents consumed different types of alcoholic drinks, of which local spirit was the most frequently (57.5%) used. (figure 3)



Figure 3: Respondents' usual alcohol types (n=173)

Apart from 596 respondents, a higher proportion of women were smokeless tobacco users (16.4%) and past smokers (13.9%) compared to male and their odds were 1.124. However, a higher proportion of males were current tobacco users (14.2%) and the odds were 1.125. An equal proportion of males and females were daily smokers (12.4%). Out of 76.5% daily smokeless tobacco users, a greater portion of males (40.1%) were male. Out of 38.5% of respondents who tried to quit smoking, a greater proportion of females who tried to quit both smoked (23.0%) and smoked less tobacco (23.4%) use in comparison to males. The odds of smoking quit were 1.384 for females (table 1).

Table1:	Gender	differences	in	smoking habits	
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Variables	Male (n 284)	Female (n 312)	Total (n 596)	χ2	р	OR	CI
	No. (%)	No. (%)	No. (%)				
Past Smokers	41 (10.0)	57 (13.9)	98 (23.8)	1.230	.267	1.124, F	.921-1.37
Past smokeless tobacco users	53 (11.3)	77 (16.4)	130 (27.7)	1.948	.267	1.124, F	.921-1.37
Current tobacco users	84 (14.2)	78 (13.1)	162 (27.2)	1.574	.210	1.125, M	.940-1.34
Daily smokers	74 (12.4)	74 (12.4)	148 (24.8)	.436	.509	1.067, M	.883-1.28
Daily smokeless tobacco users	65 (40.1)	59 (36.4)	124 (76.5)	.068	.794	1.048, M	.532- 2.27
Attempted to quit smoking session	23 (15.5)	34 (23.0)	57 (38.5)	3.452	.063	1.357, F	.990- 1.09
Attempted to quit smokeless tobacco use	22 (17.7)	29 (23.4)	51 (41.1)	2.993	.084	1.384, F	.961- 1.99
Passive smoking exposure	114 (19.1)	116 (19.5)	230 (38.6)	.550	.458	1.067, M	.900-1.26

M = odds of male, F = odds of female

In comparison to males, a higher proportion of females were alcohol users. Out of 29.0% of past alcohol users, 16.4% were women, and out of 20.1% of current alcohol users, 11.7% were female. Regarding physical activity, 40.8% of respondents were involved in vigorous-intensity physical activity, and 22.0% were female.

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Variables	Male (n 284) No. (%)	Female (n 312) No. (%)	Total (n 596) No. (%)	χ2		OR	CI	
Past alcohol consumer	75 (12.6)	98 (16.4)	173 (29.0)	1.085	.179	1.120, F	.953- 1.31	
Current alcohol users	50 (8.4)	70 (11.7)	120 (20.1)	2.157	.142	1.147, F	.963- 1.36	
Vigorous intensity activity	112 (18.8)	131 (22.0)	243 (40.8)	.401	.527	1.052, F	.901- 1.22	
Moderate physical intensity	164 (27.5)	170 (28.5)	334 (56.0)	.641	.423	1.072, M	.903 -1.27	
Daily fruits consumption	23 (4.4)	22 (4.2)	45 (8.7)	.332	.564	1.096, M	.811- 1.48	
Daily vegetables consumption	110 (20.1)	117 (21.4)	227 (41.6)	.035	.852	1.017, M	.735- 1.45	
Median days of fruit consumption in a week 2.5 (Q1=2,Q3=4)								
Median of fruit servings in a week 1 (Q1=1, Q3=2)								
Median days of vegetable consumption in a week 5 (Q1=3.5, Q3=7)								
Median of vegetable servings in a day 2, (Q1=1, (Q3=2)								

Table 2: Gender differences in alcohol consumption, physical activity and food habits

M= odds of male, F= odds of female

Similarly, out of 56.0% of respondents involved in moderate-intensity physical activities, 28.5% were female. Only 41.6% of respondents consumed vegetables daily, while 8.7% of respondents consumed fruits daily. There is no such difference in the proportion of males and females in fruit and vegetable consumption. Respondents' median days of fruit consumption in a week was 2.5 with 2-4 IQR and their median days of vegetable consumption was 5 with 3.5-7 IQR (table 2). Among 61.4% of respondents, who measured their BP, 39.6% were said to have HTN. Among those proportion of females was higher (22.7%), and the odds of females was 1.242 which was significant statistically. Of those diagnosed with HTN, only 87.6% took the prescribed medicine and the proportion and odds of females were higher (48.3% & 1.516) in this regard. Among the moderate to high health risk waist-to-hip ratio of the respondents, 55.0% were female and their odds were 1.179. Similarly, among the 20.8% of respondents who were overweight and obese, an almost equal proportion was male and female. However, odds ratio was higher among females (1.102) (table 3).

Table 3: Gender d	lifferences in anthropometric	e measurement and blood pr	essure related information
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Variables	Male (n 284)	Female (n 312)	Total (n 596)	χ2	р	OR	CI	
	No. (%)	No. (%)	No. (%)					
Ever measured BP	181 (30.4)	185 (31.0)	366 (61.4)	1.232	.266	1.104, M	.925- 1.31	
Ever diagnosed HTN (n= 336)	62 (16.9)	83 (22.7)	145 (39.6)	4.306	.038	1.242, F	1.01-1.51	
Have taken medicine (n= 89)	35 (39.3)	43 (48.3)	78 (87.6)	1.362	.243	1.516, F	.676- 3.39	
Waist to hip ratio								
Low health risk	16 (2.7)	25 (4.2)	41 (6.9)	1 214	.252	.179, F	.358- 1.31	
Moderate to high health risk	268 (45.0)	287 (55.0)	555 (93.1)	1.314				
BMI								
Normal	220 (36.9)	252 (53.4)	472 (79.2)	085	.321	1.102, F	.903- 1.34	
Overweight and obese	64 (10.7)	60 (10.1)	124 (20.8)	.765				

M= odds of male, F= odds of female

### **Discussion**

Out of 596 respondents, 52.3% were female and 47.7% were male. Their age ranged from 18 to 80 years. In this study, it was found that the four established behavioral risk factors of HTN: tobacco consumption, passive smoking, alcohol consumption, inadequate fruit and vegetable consumption, and physical inactivity are upright in the rural community residents. Moreover, other risk behaviors of HTN such as high health risk waist-to hip ratio, overweight and obesity, and discontinuation of HTN medication were also prevalent in the study.

Respondents consumed different types of smoke and smokeless tobacco products. Overall, 27.2% of respondents in this study were current tobacco users, of which a higher proportion (14.2%) was male with odds of 1.125 compared to females (13.1%). The proportion of women consuming any type of tobacco in this study (13.1%) was higher than the National average (5.0%), while the proportion of tobacco consumption among males was lower than (28.0%) of the National data.<sup>3</sup> Overall tobacco consumption in this study was lower than the slum population of Kathmandu (35.6%)12 and the same as the rural population of Myanmar (27.0%).<sup>15</sup> In comparison to males, a higher proportion of females were past smokers (13.9%) with an odds ratio of 1.124, however, a higher proportion of males were current tobacco users (14.2%) with an odds ratio of 1.125 in this study. In line with our findings, a study has reported that being male increased the odds of current tobacco use.16 Differing from the previous results, Majic and their friend reported a higher prevalence of smoking (both current and past) among females.17 While, among the Indian population, most of the men were both current and past smokers compared to females.<sup>18</sup> On top of that out of 38.5% of respondents who tried to quit smoking, a greater proportion of females who tried to quit both smoked (23.0%) and smoked less tobacco (23.4%) use in comparison to males. It is clinically significant that the odds ratio to quit smoking for females was 1.384. This gender difference might be due to stigma among marginalized groups, and those groups have higher smoking session attempts.19

The prevalence of alcohol use and smoking among community residents has been increasing in trends in a span of 20 years.<sup>20</sup> We found a higher proportion of female alcohol users than males. Out of 29.0% of past alcohol users, 16.4% were women, and out of 20.1% of current alcohol users, 11.7% were female, indicating a smaller difference between genders. However, the proportion of alcohol use in this study is significantly lower than in a study of Chitwan of Nepal, where 53.7% of males consumed alcohol.<sup>21</sup> A study in Myanmar reported that 19.9% rural population was currently drinking alcohol<sup>15</sup>, and a higher proportion of males consume alcohol than females and hazardous alcohol use is more pronounced in the male population.<sup>16-18</sup> In this study local spirit was the most frequently (57.5%) used alcohol types.

Previous studies have reported low physical activity, overweight and obesity increased over time among the rural population.<sup>20</sup> Regarding physical activity, in this study, females were more physically active than males. Out of 40.8% of respondents involved in vigorousintensity physical activity, 22.0% were female. Similarly, out of 56.0% of respondents involved in moderate-intensity physical activities, 28.5% were female. Similar trends were reported by Pengpid and Peltzer, where low odds of physical activity (OR 0.48, CI 0.39 to 0.58), and high sedentary lifestyle (OR 1.35, CI 0.96 to 1.83) among the male population.<sup>16</sup> Disagreeing with these findings, Majic and friends<sup>17</sup> reported a higher proportion of males (72.9%) involved in physical activities compared to females. While Rajkumar and Romate equalize males and females (32.5-32.8%) of being physically inactive in the Indian population.<sup>18</sup> In this study female population tends to have a health high-risk waist-to-hip ratio (55.0% out of 93.1%). Disagreeing with our finding, Prabhakaran et al<sup>22</sup> demonstrated higher mean hip circumference among males (0.99) compared to the female (0.83) population. Similarly, among the 20.8% respondents who were overweight and obese, almost equal proportions were male and female. However, the odds ratio was higher among females (1.102). However, the literature shows a lower tendency of overweight and obesity among males in comparison to females.<sup>16</sup> While the tendency of overweight and Herzegovina<sup>17</sup> and of India.<sup>18</sup>

WHO recommends more than five servings of fruits and vegetables for healthy living. However, in this study, the median days of fruit consumption was 2.5 in a week with 2-4 IQR and their median days of vegetable consumption was 5 with 3.5-7 IQR in a week. Similar to this finding a study among the Nepali population reported <2 days per week of the mean fruit consumption while comparable higher mean days (6) of vegetable consumption in a week.12 Only 41.6% of respondents in this study were daily vegetable consumers, while only 8.7% were daily fruit consumers. The difference between the male and female population regarding fruit and vegetable consumption was smaller. However, the literature supported a higher proportion of females (48.5%) consuming high fruits and vegetables compared to the male (36.0%) population.<sup>17</sup> In line with this, a study among Indian nationals, females consumed fewer fruits and vegetables than males (P 0.07).18 Contradicting previous findings, Pingpit and Peltzer reported higher odds of (1.13, CI 0.92 to 1.39) consuming low fruits and vegetables among the male population.<sup>16</sup> Regarding salt intake, 49.2% of the respondents sometimes added extra salt to their food, while 10.7% often and 4.7% always did. Supporting our finding, Ali et al reported that 14% of people residing in the urban area of Kathmandu, Nepal, take high salt-containing foods every day.12

Out of 61.4% of respondents, who measured their BP, 39.6% were said to have HTN. Among those proportion of females was higher (22.7%), and the odds of female was higher (OR 1.242, CI 1.01 – 1.51) which was significant statistically. A previous study in Nepal reported that 49% of the male and 34.7% of the female population have undiagnosed HTN12, while Rajkumar and Romate reported a higher prevalence of HTN among males (51.5%) in the Indian population.<sup>18</sup> Additionally, Majic et al, reported a higher proportion of males (18.2%) having hypertension compared to females (15.5%).17 Of whom diagnose with HTN, only 87.6% in this study took the prescribed medicine and the proportion and odds of female were higher (48.3% & 1.516) in this regard. Literature reported that female tends to do more frequent BP monitoring in comparison to males.17 This suggests a need for early risk stratification among community people. However, it should be considered that the crosssectional design allows us to capture associations, it limits the ability to establish causal relationships. Self-reporting bias in alcohol and tobacco use data might have impacted the findings.

### Conclusion

Many adults in Nepal exhibit high rates of behaviour-related health risks such as physical inactivity, low fruit and vegetable consumption, tobacco and alcohol use, overweight and obesity, and high-risk waist-to-hip ratios. Current smoking is more prevalent among men, while more women are former smokers. A larger proportion of women attempt to quit smoking compared to men. Women also tend to consume alcohol more than men. Physical activity levels are low across the population, with no significant gender difference. The average daily intake of fruits and vegetables is very low, with no notable disparity between men and women. A significant portion of the population has moderate to high health risk waist-to-hip ratio, and overweight and obesity with no observable gender difference. Few people monitor their blood pressure regularly, and there's no disparity in this practice between genders. There is a trend of non-adherence to prescribed antihypertensive medication, with women more likely to adhere than men. Hypertension is a growing public health concern in Nepal, therefore, ongoing surveillance of its risk factors in different population cohorts would be helpful. In this regard, Community-level interventions or partnerships with local healthcare providers would strengthen the risk factor target program. The results suggest the need for gender-sensitive public health programs focusing on smoking cessation, increased fruit and vegetable intake, and physical activity promotion. Future research should focus on reducing associated risk factors and preventing hypertension.

## Acknowledgments

University Grants Commission for faculty research award and data collectors.

# COI: none

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