

PREVALENCE AND FACTORS ASSOCIATED WITH HYPERTENSION AMONG HEALTH WORKERS OF CENTRAL HOSPITALS IN NEPAL

Prakash Ghimire^{1,2*}, Alisha Khadka³, Amornrat Anuwatnonthakate¹, Supaporn Trongsakul¹

¹Department of Public Health, School of Health Science, Mae Fah Luang University, Chiang Rai, Thailand

²Department of Health Services, Ministry of Health and Population, Nepal

³College of Nursing, Nepalese Army Institute of Health Sciences, Kathmandu, Nepal

*Corresponding Author: Prakash Ghimire

Email: prakash.ghimire707@gmail.com

ABSTRACT

Hypertension is a significant public health issue considered as the world's biggest killer among the working-age group. Health workers are one of the working groups who are facing several factors in their lives that could induce hypertension among them. Nevertheless, there is a lack of information about hypertension among Nepalese health workers. Therefore, this cross-sectional study aimed to determine the prevalence and factors associated with hypertension among health workers of central hospitals in Nepal. A total of 422 health workers aged ≥ 30 years from seven central hospitals of Nepal were selected using a proportionate stratified systematic random sampling method. Information regarding characteristics (socio-demographic, clinical, behavioral, occupational, and perceived stress) of participants were obtained by face to face interviews using a questionnaire after getting informed written consent. Participant's blood pressure and body mass index were measured based on the World Health Organization STEP Surveillance Manual. Binary logistic regression model was used to identify the associated factors of hypertension. The prevalence of hypertension was 35.31% (95% CI: 30.70%-40.10%). After controlling potential confounding factors through multivariate analysis, seven factors (increasing age, low educational level, being married, low fruit & vegetable consumption, low physical activity, alcohol use, and increased perceived stress) were found as significant independent predictors of hypertension. In conclusion, hypertension is highly prevalent among Nepalese health workers. Effective behavioral change interventions and routine health screening programs focusing on hypertension should be implemented to control hypertension among this neglected group, Nepalese health workers.

Keywords: Health Workers, Hypertension, Perceived stress, Physical activity, Prevalence, Nepal

INTRODUCTION

Hypertension is a growing global public health concern responsible for substantial morbidity and mortality, primarily affecting the working-age population of low and middle-income countries (World Health Organization, 2018). Hypertension is the topmost preventable non-communicable disease (NCD), as well as a risk factor of NCDs that embraced 9.4 million deaths, more than the deaths from infectious illnesses combined (International Federation of Pharmaceutical Manufacturers and Associations, 2016; World Health Organization, 2018). The worldwide prevalence of hypertension among adult people aged ≥ 18 years was around 22% in 2015 (World Health Organization, 2018). In the South-East

Asian Region (SEAR), hypertension accounted for 1.5 million deaths each year and found that one in three adults has high blood pressure (World Health Organization, 2013). A meta-analysis revealed the high prevalence of hypertension (33.80%) in Nepal as compared to other SAARC (South Asian Association for Regional Cooperation) countries (Neupane *et al.*, 2014). Nepal is a landlocked, least developed country situated in the SEAR currently facing a triple burden of disease, including overwhelming consequences of NCD, significantly hypertension.

Based on the Nepal Step Survey 2013, the hypertension rate in the Nepalese adult people was 25.70% (Aryal *et al.*, 2014). Furthermore, the pooled analysis of hypertension prevalence rate among the adult population of diverse geographical

locations in Nepal was ranged from 15.1% to 38.9% (Dhungana *et al.*, 2016; Khanal *et al.*, 2017; Neupane *et al.*, 2017). The working-age adult population was the victim of 12.2 million premature deaths from NCD, mainly hypertension worldwide (World Health Organization, 2017). Health workers are an essential cohort of the nation that belongs to the working-age group. As health guardians, health workers are health role models for their patients, families, and communities.

The health of health workers is of great significance because they must be healthy for their better job performance. Unfortunately, the working conditions of health workers expose them to long working duration, shift duties, unhealthy dietary habits, sedentary lifestyle, and stress, which are the significant inducers of hypertension (Taylor and Bithoney, 2012; Manyisa and Aswegen, 2017; World Health Organization, 2017; Muzzi, Pawlina and Schnorr, 2018). Hypertension is not only responsible for deaths among health workers but also accountable for their disability, poor mental health and quality of life, an increased burden in health expenditure of the nation, altered health system and its effects on patients, low workplace productivity from their absence (Taylor and Bithoney, 2012; World Health Organization, 2013; Kretchy, Owusu-daaku and Danquah, 2014; Asay *et al.*, 2016; International Federation of Pharmaceutical Manufacturers and Associations, 2016). Several studies evident the momentous upsurge of hypertension and further cardiovascular disease risk factors in health workers in comparison to other working groups (Sumaila *et al.*, 2016). Few studies show the prevalence of hypertension among health workers at 9.20% in India, 8.60% in Iran, and 35.27% in Thailand, respectively (Sahebi, Vahidi and Mousavi, 2010; Ahmed, Jadhav and Sobagaiah, 2018; Sirinara, Hanprathet and Jiamjarangsri, 2019). Nonetheless, until now, no studies have been conducted, which shows the direct figure of hypertension among health

workers in Nepal. Therefore, a study is necessary to uncover the concealed situation of hypertension among Nepalese health workers.

Health workers are the pillar of the health system in Nepal. The majority of the Nepalese health workers (23.00%) with diverse job cadre are working in the central level hospitals (Ministry of Health and Population, 2013). These hospitals have a high burden of workload, sedentary work style, deprived sleep, and shift work as compared to other levels of health organizations in Nepal (Thapa, Malla and KC, 2018). To date, there is no provision of health screening programs focusing on hypertension for Nepalese health workers, due to which the Nepalese government is unaware of their health situation and thought that their health is not of priority concern.

Thus, this study aimed to estimate the prevalence and determine the factors associated with hypertension among health workers of central hospitals in Nepal, which could facilitate the formulation of effective health intervention to control the foreseeable burden of hypertension in a neglected group, Nepalese health workers.

METHODS

An analytical cross-sectional study was conducted among health workers in seven central hospitals located in Lalitpur and Kathmandu districts of Bagmati Province, Nepal, from September to November 2019. Central hospitals are the tertiary level health organization under the health system of Nepal. In 2019, there were eleven central hospitals, according to the ministry of health and population, Nepal. Out of them, seven central hospitals were included as the study settings in this study as they consist of a large number of varieties of health workers working and dealing with the high flow of patients and workload (Ministry of Health and Population, 2013).

Based on the reports from

respective central hospitals, there was a 1,942 study population working in the study settings on the date of study in 2019. All the health workers aged ≥ 30 years working in central hospitals for at least one year were inclusion criteria of this study. Whereas, pregnant, who were unable to respond, and on leave or training were the exclusion criteria.

After using Cochran formula ($n = Z^2pq/e^2$); Z (desired confidence interval)=1.96, p (assumed prevalence)=0.5 (Naing, Winn and Rusli, 2006), $q=0.5$, e (allowable error)=0.05 and adding 10% to account any errors, the total required

sample size was estimated at 422. The appropriate sample was chosen using a proportionate stratified systematic random sampling method where strata refer to the types of health workers (doctors, nursing staff, paramedic staff, and other health staff). Firstly, the proportion of the required sample size (21.73%) inside the stratum of each central hospital was determined. Then, inside each stratum, the first sample was taken randomly, followed by the consecutive sample at each 5th interval until getting the required number of samples from respective hospitals (Figure 1).

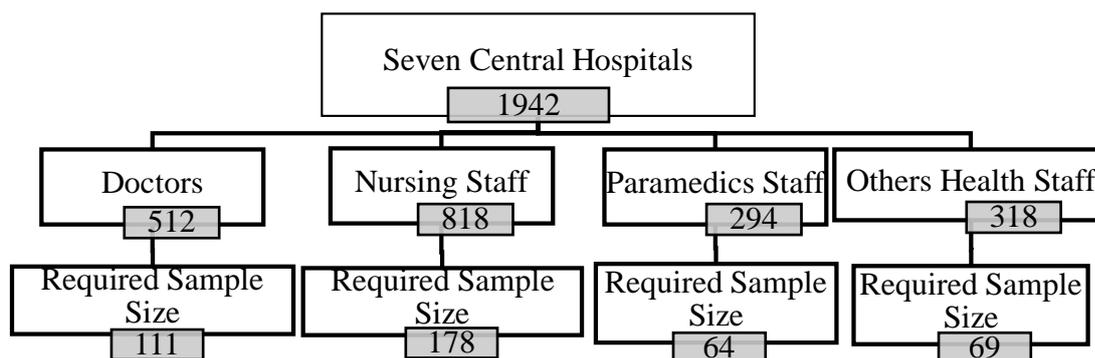


Figure 1. Flowchart of sample selection

A questionnaire was developed based on the WHO STEP Survey Questionnaire, Cohen's Perceived Stress Scale-10, and literature review. Questionnaire's internal validity was evaluated by three Nepalese experts based on IOC method and found each item of questionnaire as congruent (IOC score >0.5). A translated Nepali version questionnaire was piloted in 30 randomly selected health workers of tertiary hospital; other than study settings, to check its face validity and reliability. The internal consistency of the perceived stress-related questions was tested and found Cronbach's alpha value at 0.746. Then, the information about socio-demographic characteristics (age, sex, educational level, marital status, monthly family income, type of health workers, employment status), clinical characteristics (family history of

hypertension, history of known NCDs) behavioral characteristics (amount of salt intake, added salt intake, fruits & vegetable consumption, physical activity level, alcohol use, tobacco use), occupational characteristics (work duration, shift work, sleep duration), and perceived stress of the participants were obtained by face-face-interviews using a questionnaire. The physical measurement tools (digital BP machine, digital weighing machine, and portable standard stature) were identified, calibrated, and used to measure blood pressure, height, and weight of the participants based on the WHO STEP Surveillance Manual (Aryal *et al.*, 2014).

Three readings of blood pressure were taken from participants and categorized as hypertensive if the mean of last two readings has ≥ 140 mmHg systolic blood pressure or/and ≥ 90 mmHg diastolic

blood pressure or had a self-reported history of hypertension (Chobanian *et al.*, 2003; Aryal *et al.*, 2014).

Body mass index was calculated using the formula, $BMI = \text{weight (kg)} / \text{height (m}^2\text{)}$ and classified as underweight (<18.50), normal ($18.50-24.99$), and Obese (≥ 30). Physical activity level was assessed by self-reported duration and intensity of physical activity per week, later converted into Metabolic Equivalent Task (MET)-minute/week. METs-value for moderate-intensity activity and vigorous-intensity activity was 4 MET/minute and 8 MET/minute. The normal physical activity level was adopted as ≥ 600 MET-minute/week. The consumption of fruits and vegetables less than five servings per day termed as Low consumption. Individuals who used alcohol products (at least 50 grams) and tobacco products in their lifetime were referred as alcohol users and tobacco users, respectively. Regarding perceived stress, participants were asked ten questions (four positive and six negative) and labelled the score (0-4) of responses to each question. Then, the total score was categorized as (0-13)=low perceived stress, (14-26)=moderate perceived stress, and (27-40)=high perceived stress (Cohen and Williamson, 1988; NH Department of Administrative Services, 2014).

Data were compiled, coded, entered, cleaned, and analyzed in SPSS V.20.0. Descriptive statistics were used to describe the characteristics of the participants. All the categorical data were presented as frequency and percentage, while continuous data as mean with standard deviation. Hypertension prevalence was illustrated in percentage with 95% Confidence Interval (CI). The associated factors from univariate analysis at p-value 0.2 were entered into the multiple logistic regression model to detect the significant independent factors of hypertension with Adjusted Odds Ratio (AOR) at 95% CI and p-value < 0.05 .

The ethical review board of Mae Fah Luang University (REH-62164) and

Nepal Health Research Council (Reg. no. 696/2019) approved this study based on the Helsinki Declaration 2002. The written permission for data collection was obtained from the study settings. The informed written consent was taken from the participants prior to the data collection and confidentiality was maintained thoroughly.

RESULTS

A total of 422 health workers were enrolled with a 100% response rate in the study. The mean (\pm standard deviation) age of the participants was 36.50 (± 5.77) years old. Majority of the participants were aged 30-39 years (59.70%), female (58.80%), graduate (36.00%), married (82.50%), and nursing staff (42.20%). 16.40% were other health staff (pharmacy staff, laboratory staff, radiological staff, anesthesia staff, dietetics staff, ophthalmic staff, and dental staff). Similarly, 38.60% of participants had a monthly family income of 51000-80000 NRs, and 75.80% had permanent employment.

Half of the participants (50.90%) had a family history of hypertension, whereas only 13.27% of participants found to have a history of diabetes. 11.37% of the participants had history of other NCDs (kidney disease, hypothyroidism, hyperthyroidism, arthritis, asthma, gout, hemorrhoids, hyperlipidemia, and migraine). More than half of the participants were overweight (52.80%). 66.80% of participants had a habit of low fruits and vegetable consumption (<5 servings/day). The minority of the participants (31.80%) consumed the recommended amount of salt (<5 grams/day). Furthermore, only 37.70% of participants used added salt before and during eating food. 62.80% of participants found to be less physically active (<600 MET-minute/week). Majority of the participants (59.20%) consumed at least one standard drink of alcohol in their lifetime, while only 27.50% of participants found to use tobacco products. Most of the

participants were working on a rotating shift basis (53.60%) and had a work duration of 1-9 years (55.70%). 85.10% of participants had normal sleep duration (≥ 6 hours/day). Regarding the perceived stress, more than 3/5th of the participants (62.60%) perceived a moderate level of stress (Table 1). The proportion of hypertension was

higher among participants with age 40-49 years, female, post-graduate or higher education, married, nursing staff, family history of hypertension, overweight, low fruits & vegetable consumption, high salt intake (5-10 grams/day), low physical activity, alcohol use and a moderate level of perceived stress (Table 1).

Table 1. Characteristics of hypertensive and non-hypertensive participants

Characteristics	Total n (%)	Hypertension	
		Yes n (%)	No n (%)
Total	422 (100.00)	149 (35.31)	273 (64.69)
Socio-demographic characteristics			
Age (years)			
30-39	252 (59.70)	44 (29.53)	208 (76.19)
40-49	137 (32.50)	81 (54.36)	56 (20.51)
50-59	33 (7.80)	24 (16.11)	9 (3.30)
mean \pm SD = 36.50 \pm 5.77			
Sex			
Male	174 (41.20)	74 (49.66)	100 (36.63)
Female	248 (58.80)	75 (50.34)	173 (63.37)
Level of education			
Technical School Leaving Certificate (TSLC)	41 (9.70)	14 (9.39)	27 (9.89)
Proficiency Certificate Level (PCL)	108 (25.60)	36 (24.16)	73 (26.74)
Graduate	152 (36.00)	49 (32.88)	102 (37.36)
Post-graduate or higher	121 (28.70)	50 (33.57)	71 (26.01)
Marital status			
Unmarried	52 (12.30)	4 (2.68)	48 (17.58)
Married	348 (82.50)	134 (89.93)	214 (78.39)
Separated/ Divorced and Widowed	12 (5.20)	11 (7.39)	9 (4.03)
Monthly family income (NRs)			
20000-50000	103 (24.40)	29 (19.46)	74 (27.11)
51000-80000	163 (38.60)	50 (33.56)	113 (41.39)
81000-110000	81 (19.20)	30 (20.13)	51 (18.68)
>110000	75 (17.80)	40 (26.85)	35 (12.82)
Type of health worker			
Doctors	112 (26.50)	41 (27.52)	71 (26.01)
Nursing staff	178 (42.20)	59 (39.60)	119 (43.59)
Paramedic staff	63 (14.90)	22 (14.76)	41 (15.02)
Other health staff	69 (16.40)	27 (18.12)	42 (15.38)

Characteristics	Total n (%)	Hypertension	
		Yes n (%)	No n (%)
Employment status			
Permanent	320 (75.80)	128 (85.91)	192 (70.33)
Contract	70 (16.60)	14 (9.39)	56 (20.51)
Temporary	32 (7.60)	7 (4.70)	25 (9.16)
Clinical characteristics			
Family history of hypertension			
Yes	215 (50.90)	98 (65.77)	117 (42.86)
No	186 (44.10)	43 (28.86)	143 (52.38)
Unknown	21 (5.00)	8 (5.37)	13 (4.76)
History of diabetes			
Yes	56 (13.27)	36 (24.16)	20 (7.33)
No	366 (86.73)	113 (75.84)	253 (92.67)
History of other NCD			
Yes	48 (11.37)	18 (12.08)	30 (10.99)
No	374 (88.63)	131 (87.92)	248 (89.01)
Body Mass Index			
Normal	184 (43.60)	30 (20.13)	154 (56.41)
Overweight	223 (52.80)	109 (73.15)	114 (41.76)
Obesity	15 (3.60)	10 (6.72)	5 (1.83)
Behavioral characteristics			
Fruit and vegetable consumption (servings/day)			
<5	282 (66.80)	129 (86.58)	153 (56.04)
≥ 5	140 (33.20)	20 (13.42)	120 (43.96)
Amount of salt intake (grams/day)			
<5	134 (31.80)	26 (17.45)	108 (39.56)
5-10	228 (54.00)	88 (59.06)	140 (51.28)
>10	60 (14.20)	35 (23.49)	25 (9.16)
Added salt intake			
Yes	159 (37.70)	70 (46.98)	89 (32.60)
No	263 (62.30)	79 (53.02)	184 (67.40)
Level of physical activity (MET-minutes/week)			
<600	265 (62.80)	123 (82.55)	142 (52.01)
≥600	157 (37.20)	26 (17.45)	131 (47.99)
Tobacco use			
Yes	116 (27.50)	69 (46.31)	47 (17.22)
No	306 (72.50)	80 (53.69)	226 (82.78)
Alcohol use			
Yes	250 (59.20)	132 (88.59)	118 (43.22)
No	172 (40.80)	17 (11.41)	155 (56.78)
Occupational characteristics			
Shift work			
Day (non-shift)	155 (36.70)	65 (43.62)	90 (32.96)
Morning shift	41 (9.70)	19 (12.76)	22 (8.06)
Rotating shift	226 (53.60)	65 (43.62)	161 (58.98)
Work duration (years)			
1-9	235 (55.70)	47 (31.54)	188 (68.87)
10-19	123 (29.10)	62 (41.61)	61 (22.34)

Characteristics	Total n (%)	Hypertension	
		Yes n (%)	No n (%)
≥ 20	64 (15.20)	40 (26.85)	24 (8.79)
Sleep duration (hours/day)			
<6	63 (14.90)	49 (32.89)	14 (5.13)
≥6	359 (85.10)	100 (67.11)	259 (94.87)
Level of perceived stress (score)			
Low (0-13)	144 (34.10)	20 (13.43)	124 (45.42)
Moderate (14-26)	264 (62.60)	118 (79.19)	146 (53.48)
High (27-40)	14 (3.30)	11 (7.38)	3 (1.10)

The prevalence of hypertension among health workers was 35.31% (95% CI: 30.70-40.10). Out of those with hypertension, 79 (53.02%) participants had diagnosed hypertension, whereas 70(46.98%) participants had undiagnosed hypertension. Furthermore, almost half of the participants 39 (49.40%) with diagnosed hypertension, were not able to control their hypertension.

In multivariate analysis, the significantly associated factors of hypertension were age, educational level, marital status, fruits & vegetable consumption, physical activity, alcohol use, and perceived stress. The results showed that health workers who fell under age group 40-49 years and age group 50-59 years were 3.11 times (AOR:3.11, 95% CI:1.38-6.97), and 6.18 times (AOR:6.18, 95% CI:1.51-25.30) more likely to get hypertension respectively as compared to health workers aged 30-39 years. The health workers who had the Technical School Leaving Certificate (TSLC) level of education were 4.58 times (AOR:4.58, 95% CI:1.44-14.62), more likely to have hypertension as compared to participants

who had a post-graduate or higher level of education. The chance of having hypertension in married health workers was 4.34 times (AOR:4.34, 95% CI:1.85-15.90) as compared to unmarried health workers. Health workers who consumed <5 servings of fruits and vegetable per day were 2.27 times (AOR:2.27, 95% CI:1.06-4.88), more likely to get hypertension than those who consumed ≥five servings of fruits and vegetable per day. Similarly, health workers with low physical activity (<600 MET-minutes/week) were 2.49 times (AOR:2.49, 95% CI:1.12-5.14), more likely to be hypertensive as compared to those with normal physical activity (≥600 MET-minutes/week). Moreover, among alcohol users, the odds of having hypertension had increased by 4.57 times (AOR:4.57, 95% CI:2.11-9.92) than non-alcohol drinkers at all. Additionally, health workers who had moderate perceived stress and high perceived stress were 2.64 times (AOR:2.64, 95% CI:1.26-5.54) and 15.09 times (AOR:15.09, 95% CI:2.27-100.22) more likely to have hypertension respectively than health workers who had low perceived stress (Table 2).

Table 2. Univariate and multivariate analysis of factors associated with hypertension

Factors	Crude OR (95% CI)	p-value	Adjusted OR (95%CI)	p-value
Age (in years)				
30-39	Reference		Reference	
40-49	6.84 (4.27-10.95)	<0.001	3.11 (1.38-6.97)	0.006
50-59	12.61 (5.48-28.97)	<0.001	6.18 (1.51-25.30)	0.011
Sex				
Male	1.71 (1.14-2.56)	0.010	1.05 (0.49-2.26)	0.897

Factors	Crude OR (95% CI)	p-value	Adjusted OR (95%CI)	p-value
Female	Reference		Reference	
Education level				
TSLC	0.74 (0.35-1.54)	0.417	4.58 (1.44-14.62)	0.010
PCL	0.71 (0.41-1.22)	0.213	2.37 (0.96-5.85)	0.061
Graduate	0.68 (0.41-1.11)	0.122	1.87 (0.82-4.25)	0.134
Post-graduate or higher	Reference		Reference	
Marital status				
Unmarried	Reference		Reference	
Married	7.14 (2.65-21.31)	<0.001	4.34 (1.85-15.90)	0.027
Separated/ divorced and widowed	12.00 (3.21-44.86)	<0.001	2.59 (0.44-15.28)	0.293
Monthly family income (NRs)				
20000-50000	Reference		Reference	
51000-80000	1.13 (0.66-1.94)	0.661	0.61 (0.26-1.41)	0.251
81000-110000	1.50 (0.80-2.80)	0.201	0.85 (0.31-2.31)	0.757
>110000	2.92 (1.56-5.45)	0.001	1.26 (0.45-3.67)	0.665
Type of health worker				
Nursing staff	Reference			
Doctors	1.16 (0.71-1.91)	0.546		
Paramedic staff	1.08 (0.59-1.98)	0.798		
Other health staff	1.29 (0.73-2.30)	0.376		
Type of employment				
Permanent	Reference		Reference	
Contract	0.37 (0.20-0.70)	0.002	0.91 (0.35-2.35)	0.840
Temporary	0.42 (0.18-1.00)	0.050	3.40 (0.99-11.58)	0.050
Family history of hypertension				
Yes	2.79 (1.80-4.30)	<0.001	1.49 (0.80-2.79)	0.211
Unknown	2.05 (0.80-5.26)	0.137	1.43 (0.37-5.57)	0.604
No	Reference		Reference	
Known diabetes				
Yes	4.03 (2.23-7.27)	<0.001	1.26 (0.54-2.95)	0.589
No	Reference		Reference	
Known kidney disease				
Yes	1.10 (0.26-4.67)	0.896		
No	Reference			
Other known NCD				
Yes	1.11 (0.57-2.18)	0.761		
No	Reference			
Body mass index				
Normal	Reference		Reference	
Overweight	4.91 (3.06-7.86)	<0.001	1.58 (0.81-3.05)	0.176
Obesity	10.27 (3.27-32.18)	<0.001	4.49 (0.99-20.36)	0.051
Fruits and vegetable consumption (servings/day)				

Factors	Crude OR (95% CI)	p-value	Adjusted OR (95%CI)	p-value
< 5	5.06 (2.98-8.58)	<0.001	2.27 (1.06-4.88)	0.035
≥5	Reference		Reference	
Amount of salt intake (gram/day)				
< 5	Reference		Reference	
5-10	2.61 (1.58-4.32)	<0.001	1.40 (0.67-2.93)	0.376
> 10	5.81 (2.98-11.35)	<0.001	2.02 (0.73-5.63)	0.178
Added salt intake				
Yes	1.82 (1.22-2.76)	0.004	0.82 (0.43-1.57)	0.549
No	Reference		Reference	
Physical activity (METminutes/week)				
< 600	4.36 (2.69-7.09)	<0.001	2.49 (1.12-5.14)	0.013
≥ 600	Reference		Reference	
Tobacco use				
Yes	4.15 (2.64-6.50)	<0.001	1.23 (0.57-2.68)	0.585
No	Reference		Reference	
Alcohol use				
Yes	10.20 (5.83-17.84)	<0.001	4.57 (2.11-9.92)	<0.001
No	Reference		Reference	
Work duration (years)				
0-9	Reference		Reference	
10-19	4.06 (2.52-6.55)	<0.001	1.46 (0.66-3.23)	0.346
≥20	6.66 (3.66-12.13)	<0.001	1.22 (0.40-3.77)	0.726
Shift work				
Day work	Reference		Reference	
Morning shift	1.19 (0.60-2.39)	0.612	1.46 (0.55-3.88)	0.442
Rotating shift	0.56 (0.36-0.86)	0.008	0.66 (0.34-1.31)	0.236
Sleep duration (hours per day)				
<6	9.06 (4.79-17.14)	<0.001	1.85 (0.77-4.43)	0.168
≥6	Reference		Reference	
Level of perceived stress (score)				
Low (0-13)	Reference		Reference	
Moderate (14-26)	5.01 (2.94-8.52)	<0.001	2.64 (1.26-5.54)	0.010
High (27-40)	22.73 (5.83-88.68)	<0.001	15.09 (2.27-100.22)	0.005

DISCUSSION

It is the first epidemiological study that demonstrates the prevalence of hypertension with its associated factors among Nepalese health workers. The prevalence of hypertension among health workers in the current study was 35.31%. This prevalence is higher than the previous studies in India (9.20%), Iran (8.60%), and Ghana (16.07%) (Sahebi, Vahidi and

Mousavi, 2010; Ahmed, Jadhav and Sobagaiah, 2018; Osei-yeboah *et al.*, 2018). It could be possible due to that previous studies has included individual aged <30 years, excluded the individual with hypertension and diabetes, and different study settings; primary care center of rural areas (Sahebi, Vahidi and Mousavi, 2010; Ahmed, Jadhav and Sobagaiah, 2018; Osei-yeboah *et al.*, 2018). Besides, one study had an annual health screening program for

health workers, which could promote awareness among health care workers and led to a low prevalence of hypertension when comparing to this study (Osei-yeboah *et al.*, 2018). The study from Thailand demonstrates prevalence (35.27%) consistent with the current finding, where the analogous working environment of participants (in tertiary hospitals of urban areas) might be a reason behind it (Sirinara, Hanprathet and Jiamjarasrangsi, 2019). Aryal *et al.* (2014) reported 36.60% of hypertension prevalence among Nepalese adult population aged ≥ 30 years, which is slightly higher than the current result. Comparing to the general population, it could be possible that health workers may have higher profound health knowledge, which leads to better health behaviours and disease prevention.

In this study, increasing age was significantly associated with hypertension. A similar result was reported by previous studies among health workers in Nigeria, Thailand, and Ghana (Sumaila *et al.*, 2016; Osei-yeboah *et al.*, 2018; Sirinara, Hanprathet and Jiamjarasrangsi, 2019). Nepal demographic health survey 2016 revealed the same finding that increasing age was significantly associated with hypertension among Nepalese adults (Kibria *et al.*, 2018). It was physiologically evident that older people are inevitable to get hypertension, a result of gradual changes in the cardiovascular system; vascular remodelling, arterial stiffness, and endothelial dysfunction (Alghatrif *et al.*, 2013).

A current study found that health workers having TSLC level of education were at high risk of hypertension than health workers with post-graduate or higher education. Health workers with TSLC education tended to have limited health knowledge as they learned only 18 months of basic health courses (Council For Technical Education and Vocational Training, 2020). Furthermore, analysis of current findings revealed that health workers with TSLC education were less

physically active, use alcohol, consume less fruits and vegetables, and had increased perceived stress, i.e., known inducers of hypertension. Similarly, low education was significantly associated with hypertension among Iranian health workers and Nepalese adults (Sahebi, Vahidi and Mousavi, 2010; Chataut, Adhikari and Sinha, 2011). A consistent result was indicated in the past research (Schwenk, 2017).

The current study showed that being married was significantly associated with hypertension among health workers. A similar finding was noted from previous studies in Nepalese adult population and health workers (Sahebi, Vahidi and Mousavi, 2010; Dhungana *et al.*, 2016). Nepalese married people, especially females in urban areas, have busy and complicated life boost them to acquire stressful life, low physical activity, and unhealthy eating behaviours such as junk foods rather than fruits and vegetables (Ban, 2018). A research evidence back-up the current result by describing that the transition from single to married life possesses lifestyle modification such as sedentary lifestyle, which adversely impacts their blood pressure resulting in hypertension (Wood, Goesling and Avellar, 2007).

Low fruits and vegetable consumption was found to be a significant predictor of hypertension among health workers in this study. Fruits and vegetable are a great source of potassium, which helps to prevent hypertension by maintaining renal homeostatic function (Wu and Wolley, 2019). A meta-analysis reported a similar association of low fruits and vegetable consumption with hypertension among the Asian population (Li *et al.*, 2016). Previous studies in the Nepalese adult population found no association of fruits and vegetable consumption with hypertension (Dhungana *et al.*, 2016; Khanal *et al.*, 2017; Neupane *et al.*, 2017). The unhealthy working environment (shift work, stress, high workload, unavailability of fruit and vegetable in the workplace) of the health

workers force them to consume less fruit and vegetable than general people. The study setting of this study was in Kathmandu valley, Nepal, where unhealthy eating behaviours are in increasing trend, i.e., people prefer to eat easily available junk foods instead of fruits and vegetables (Resource Centre for Primary Health Care, 2016).

This study found the association between low physical activity and hypertension in health workers. Ibrahim stated that inadequate physical activity alters blood pressure homeostasis resulting in hypertension (Ibrahim, 2018). A consistent result was observed in the studies among the Nepalese population and Nigerian health workers (Chataut, Adhikari and Sinha, 2011; Dhungana *et al.*, 2016; Sumaila *et al.*, 2016). Biddle found that less physically active individuals experience more stress in their life, which is also a crucial inducer of hypertension (Biddle, 2016). Health workers of central hospitals in this study mainly use vehicles for transportation and deal with high workload with less or no physical movement makes them less physically active the whole day.

The current study found the association of alcohol use with hypertension among health workers. It was theoretically evident that alcohol use causes vasoconstriction action and alteration in the renin-angiotensin-aldosterone system, which ultimately leads to alcohol-induced hypertension (Crestani *et al.*, 2014). With several reasons such as culturally acceptable in ethnic groups, peer pressure, stressful married life, family history of alcohol use, and smoking status, alcohol use is aggressively prevalent among the Nepalese population, especially in urban areas like Kathmandu. The percentage of alcohol use was found to be higher among the health workers (59.20%) in this study than the national figure among Nepalese adult population (26.5%) (Aryal *et al.*, 2014). Based on the current findings, it was found that increased perceived stress among health workers direct them to

consume more alcohol.

Regarding perceived stress, the current study found a significant association between increased perceived stress and hypertension. Research supported this association by stating that stress causes abnormal activation of the sympathetic nervous system alters hormonal cascades, which increases blood pressure, cholesterol levels, fibrinogen, and blood fluidity leads to cardiovascular events, including hypertension (Mucci *et al.*, 2016). Previous studies among the general population demonstrated similar findings that the increased perceived stress was a significant factor of hypertension (Redmond *et al.*, 2013; Bhelkar *et al.*, 2018). The past studies in Indian health workers and Brazilian health workers observed consistent finding with the current research (Owolabi *et al.*, 2012; Leonelli *et al.*, 2017). Health workers have dual responsibility towards their work setting, and home laid them prone to get high perceived stress. The health workers in this study deal with the high flow of patients in hospitals and family issues, which lodged them to experience more stress.

This study is equipped with several strengths. Firstly, it is a novel study that uncovered the hidden burden of hypertension in Nepalese health workers. Secondly, health workers were benefited from this study as they had a chance to know their hypertensive status and take preventive measures on time. Lastly, study findings added up the health data of health workers that would help different scholars for further studies. Nevertheless, this study has a limitation on its study design. This study applied the cross-sectional study design, which cannot prove the real causal relationship of disease, but appropriate to determine the prevalence.

CONCLUSION

High prevalence of hypertension with its modifiable factors (educational level, fruits and vegetable consumption,

physical activity, alcohol use, and perceived stress) and non-modifiable factors (age and marital status) among health workers were reported in the study. This study evident that health workers in Nepal are susceptible to hypertension as the general population, which might help to drag the attention of concerned bodies that health of health workers can deviate and priority of concern. It implies the urgent need for routine annual health examination, mainly focusing on the screening of blood pressure as well as effective interventions, including stress management strategies, lifestyle, and behavioural modification among Nepalese health workers. Knowledge, attitude, and practice regarding hypertension among Nepalese health workers can be a crucial part to investigate in further studies.

REFERENCES

- Ahmed, M. T., Jadhav, J. and Sobagaiah, R. T. (2018) 'Assessment of risk factors of non-communicable diseases among healthcare workers in Nelamangala: A cross sectional study', *International Journal of Community Medicine and Public Health*, 5(2), pp. 745–748. doi: 10.18203/2394-6040.ijcmph20180261.
- Alghatrif, M. *et al.* (2013) 'Longitudinal trajectories of arterial stiffness and the role of blood pressure: The balitmore longitudinal study of aging', *Hypertension*, 62(5), pp. 934–941. doi: 10.1161/HYPERTENSIONAHA.113.01445.
- Aryal, K. K. *et al.* (2014) *Non-communicable diseases risk factors: STEPS survey Nepal 2013*. Kathmandu.
- Asay, G. R. B. *et al.* (2016) 'Absenteeism and employer costs associated with chronic diseases and health risk factors in the US workforce', *Preventing Chronic Disease*, 13, pp. 1–11. doi: 10.5888/pcd13.150503.
- Ban, A. (2018) 'Triple burden of women: Conflicting gender norms', *The Himalayan Times*, 2 March.
- Bhelkar, S. *et al.* (2018) 'Association between stress and hypertension among adults more than 30 Years: A case-control study', *National Journal of Community Medicine*, 9(6), pp. 430–433.
- Biddle, S. (2016) 'Physical activity and mental health: Evidence is growing', *World Psychiatry*, 15(2), pp. 176–177. doi: 10.1002/wps.20332.
- Chataut, J., Adhikari, R. K. and Sinha, N. P. (2011) 'Prevalence and risk factors for hypertension in adults living in central development region of Nepal', *Kathmandu University Medical Journal*, 9(1), pp. 13–18. doi: 10.3126/kumj.v9i1.6255.
- Chobanian, A. V *et al.* (2003) 'The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure: The JNC 7 report', *Jama*, 289, pp. 2560–2572. doi: 10.1001/jama.289.19.2560.
- Cohen, S. and Williamson, G. (1988) 'Perceived stress in a probability sample of the United States', in Spacapan, S. and Oskamp, S. (eds) *The social psychology of health: claremont symposium on applied social psychology*. Thousand Oaks, CA, US: Sage Publications, Inc, pp. 31–67.
- Council For Technical Education and Vocational Training (2020) *Programs of TSLC*.
- Crestani, C. C. *et al.* (2014) 'Cardiovascular alterations at different stages of hypertension development during ethanol consumption: time-course of vascular and autonomic changes', *Toxicology and Applied Pharmacology*. Elsevier Inc., 280(2), pp. 245–255. doi: 10.1016/j.taap.2014.08.012.
- Dhungana, R. R. *et al.* (2016) 'Prevalence

- and associated factors of hypertension: A community-based cross-sectional study in municipalities of Kathmandu, Nepal', *International Journal of Hypertension*, 2016(236), pp. 1–10. doi: <http://dx.doi.org/10.1155/2016/1656938>.
- Ibrahim, M. M. (2018) 'Hypertension in developing countries: A major challenge for the future', *Current Hypertension Reports*. *Current Hypertension Reports*, 20(5), p. 38. doi: 10.1007/s11906-018-0839-1.
- International Federation of Pharmaceutical Manufacturers and Associations (2016) *Hypertension: putting the pressure on the silent killer*.
- Khanal, M. K. *et al.* (2017) 'Prevalence, associated factors, awareness, treatment, and control of hypertension: Findings from a cross sectional study conducted as a part of a community based intervention trial in Surkhet, Mid-western region of Nepal', *PLoS ONE*, 12(10), pp. 1–20. doi: 10.1371/journal.pone.0185806.
- Kibria, G. M. A. *et al.* (2018) 'Prevalence and associated factors of pre-hypertension and hypertension in Nepal: Analysis of the Nepal Demographic and Health Survey 2016', *Health Science Reports*, 1(10), p. e83. doi: 10.1002/hsr2.83.
- Kretchy, I. A., Owusu-daaku, F. T. and Danquah, S. A. (2014) 'Mental health in hypertension: Assessing symptoms of anxiety, depression and stress on anti-hypertensive medication adherence', *International Journal of Mental Health Systems*, 8, p. 25. doi: 10.1186/1752-4458-8-25.
- Leonelli, L. B. *et al.* (2017) 'Perceived stress among primary health care professionals in Brazil', *Revista Brasileira de Epidemiologia*, 20(2), pp. 286–298. doi: 10.1590/1980-5497201700020009.
- Li, B. *et al.* (2016) 'Fruit and vegetables consumption and risk of hypertension: A meta-analysis', *The Journal of Clinical Hypertension*, 18(5), pp. 468–476. doi: 10.1111/jch.12777.
- Manyisa, Z. M. and Aswegen, E. J. Van (2017) 'Factors affecting working conditions in public hospitals: A literature review', *International Journal of Africa Nursing Sciences*. *The Authors*, 6, pp. 28–38. doi: 10.1016/j.ijans.2017.02.002.
- Ministry of Health and Population (2013) *Human resource for health Nepal country profile*.
- Mucci, N. *et al.* (2016) 'Anxiety, stress-related factors, and blood pressure in young adults', *Frontiers in Psychology*, 7, p. 1682. doi: 10.3389/fpsyg.2016.01682.
- Muzzi, M., Pawlina, C. and Schnorr, G. P. (2018) 'Prevalence of stress in health workers in the context hospital', *Psychology and Behavioral Medicine Open Access Journal*, 0(0), pp. 15–21.
- Naing, L., Winn, T. and Rusli, B. N. (2006) 'Practical issues in calculating the sample size for prevalence studies', *Archives of Orofacial Sciences*, 1, pp. 9–14.
- Neupane, D. *et al.* (2014) 'Prevalence of hypertension in member countries of South Asian Association for Regional Cooperation (SAARC): Systematic review and meta-analysis', *Medicine*, 93(13), p. e74. doi: 10.1097/MD.0000000000000074.
- Neupane, D. *et al.* (2017) 'Awareness, prevalence, treatment, and control of hypertension in western Nepal', *American Journal of Hypertension*, 30(9), pp. 907–913. doi: 10.1093/ajh/hpx074.
- NH Department of Administrative Services (2014) *Perceived stress scale*.
- Osei-yeboah, J. *et al.* (2018) 'Cardiometabolic risk factors among healthcare workers: A cross-sectional study at the Sefwi-Wiawso municipal hospital, Ghana', *Biomedical Research International*, 2018(3), pp.

- 1–9. doi: 10.1155/2018/8904548.
- Owolabi, A. O. *et al.* (2012) ‘Work-related stress perception and hypertension amongst health workers of a mission hospital in Oyo’, *African Journal of Primary Health Care and Family Medicine*, 4(1), pp. 1–7. doi: 10.4102/phcfm.v4i1.307.
- Redmond, N. *et al.* (2013) ‘Perceived stress is associated with incident coronary heart disease and all-cause mortality in low-but not high-income participants in the reasons for geographic and racial differences in stroke study’, *Journal of the American Heart Association*, 2(6), p. e000447. doi: 10.1161/JAHA.113.000447.
- Resource Centre for Primary Health Care (2016) *A research on: The food environment of Kathmandu metropolitan area 2016*. Kathmandu.
- Sahebi, L., Vahidi, R. G. and Mousavi, S. H. (2010) ‘Prevalence of Hypertension and Associated Variables in Hospital Staff in Iran’, *Acta Medica Saliniana*, 39(1), pp. 6–13. doi: 10.5457/ams.138.10.
- Schwenk, T. L. (2017) *Lower education level is associated with higher risk for cardiovascular disease*, *Jama Internal Medicine*.
- Sirinara, P., Hanprathet, N. and Jiamjarasrangsi, W. (2019) ‘Prevalence of hypertension and associated factors among healthcare workers: A cross-sectional study’, *Chulalongkorn Medical Journal*, 63(3), pp. 193–199. doi: 10.14456/clmj.10.
- Sumaila, F. G. *et al.* (2016) ‘Prevalence of undiagnosed hypertension and its risk factors among health care workers of some selected hospitals in Dutse, Jigawa State, North western Nigeria’, *Advances of Science for Medicine*, 1(2), pp. 19–23. doi: 10.5281/zenodo.1308458.
- Taylor, M. and Bithoney, W. (2012) *10 Steps to developing a culture of health for hospital and health system employers [White paper]*.
- Thapa, D., Malla, G. and KC, A. (2018) ‘Sleep quality and related health problems among shift working nurses at a tertiary care hospital in eastern Nepal: A cross sectional study’, *Journal of Nursing and Health Studies*, 2(3), pp. 1–4. doi: 10.21767/2574-2825.100029.
- Wood, R. G., Goesling, B. and Avellar, S. (2007) *The effects of marriage on health: A synthesis of recent research evidence*. Princeton, NJ.
- World Health Organization (2013) *World health day: High blood pressure global and regional overview*.
- World Health Organization (2017) *Protecting workers health [Fact Sheet]*.
- World Health Organization (2018) *Non communicable disease country profiles 2018*.
- Wu, A. and Wolley, M. (2019) ‘The interplay of renal potassium and sodium handling in blood pressure regulation: Critical role of the WNK-SPAK-NCC pathway’, *Journal of Human Hypertension*, 33(7), pp. 508–523. doi: 10.1038/s41371-019-0170-6.