Factors Influencing Lifestyle Modification among Persons with Hypertension in Punaka, Bhutan

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ABSTRACT
Integration of lifestyle modification with modern medicine is recommended management of hypertension. This study aimed to describe lifestyle modification and explore factors predicting lifestyle modification among persons with hypertension in Punakha, Bhutan. Individual and family self-management theory guided this study. Simple random sampling technique was used to recruit 108 persons with hypertension visiting non-communicable disease (NCD) unit of Punakha District Hospital, Bhutan. Data on demographic characteristics and health information were collected using Demographic Questionnaire. Standard instruments such as Hypertension Self-care Profile Behavior Scale, Hypertension Knowledge-Level Scale, Hypertension Self-Efficacy Scale and Multi-dimension Scale of Perceived Social Support each bearing reliability coefficient of .83, .82, .81 and .85 respectively were used to measure the research variables. Data was analyzed using descriptive statistics and standard multiple regression. The result showed that lifestyle modification is high among the participants (M = 53.9, SD = 7.7). Standard multiple regression revealed hypertension knowledge (β = .19, p = .04) and perceived self-efficacy (β = .36, p < .001) as the significant predictor of lifestyle modification. Perceived social support did not predict lifestyle modification. All predictors explained 21.05% of variance in lifestyle modification (R² = 21.05%, F(4, 103) = 10.51, p < .001) among the participants. The findings indicate that lifestyle modification can be enhanced by designing an intervention directed toward strengthening hypertension knowledge and perceived self-efficacy. While providing interventional program, healthcare professional should involve both individual and family to motivate them in promotion of lifestyle modification.

Keywords: Lifestyle modification, Hypertension knowledge, Self-efficacy, Social support, Bhutan.

INTRODUCTION
Hypertension is serious public health issue devastating millions of lives across the world. It is defined as the persistent elevation of seated blood pressure of ≥140/90 mmHg measured on two or more separate occasions.¹ Worldwide prevalence of hypertension is soaring; the number of cases rose from 594 million in 1975 to 1.13 billion in 2015, majority of which are from low and middle income countries.² Globally, uncontrolled systolic blood pressure alone is responsible for 10.4 million deaths and 218 million disability adjusted life years.³ Ischemic heart diseases and the stroke which are the most common complications of hypertension accounted for combined death tolls of 15.2 million in 2016.⁴

Such dramatic rise in hypertension-related morbidity and mortality are mainly due to unhealthy lifestyle practices which include unhealthy diet, physical inactivity, heavy alcohol consumption, smoking, non-adherence to prescribed medication and psychological stress among hypertensive population.¹,⁵,⁶ For instance, hypertension is highly prevalent among heavy alcohol
drinkers (54.4%) and those who consume more than 5 gm of salt per day (40.7%). It is evident that blood pressure control with antihypertensive medication is inadequate among those with weight gain (OR: 2.18; 95%CI: 1.52-3.11; \( p < .001 \)), physical inactivity (OR: 1.19; 95%CI: 1.17-3.38, \( p = .01 \)), and high intake of salt (OR: 1.46, 95%CI: 1.02-2.07, \( p = .03 \)). A study also reveals that smoking increases systolic blood pressure by 4 mmHg and diastolic blood pressure by 3 mmHg. In addition, 91.8% of those who were non-adherence to prescribed medication was associated with uncontrolled blood pressure while 38.2% of those with psychological stress were reported to have raised blood pressure.

Bhutan, a small nation in the South Asia is also bearing the brunt of enormous socio-economic burden imposed by non-communicable disease which includes hypertension. Evidence reveals that non-communicable diseases accounted for 69% of the total deaths in Bhutan. Prevalence of hypertensive cases doubled from 16% in 2012 to 35.6 % in 2014 giving rise to number of life-threatening health issues including stroke, myocardial infarction and chronic kidney diseases in the country. It is interesting to note that increase in incidence of hypertension is associated with corresponding rise in incidence of stroke in Bhutan.

Bhutanese lifestyle which is embedded within its unique culture and tradition might have played a role in rising number of hypertension in the country. For instance consumption of alcohol is considered as socially accepted norm in Bhutan. While people’s engagement in prayers and meditation might have buffered the effect of psychological stress, traditional national dishes of Bhutan which are rich in carbohydrate, fats and excessive salt might have adversely impacted the health of the population. Thus viewing through the lens of unique Bhutanese lifestyle, persons with hypertension in Bhutan are at increased risks of developing dreadful complications related to uncontrolled blood pressure which calls for lifestyle modification.

Lifestyle modification refers to adoption of healthy lifestyle such as ingestion of healthy diet, physical activity, weight reduction, moderation in alcohol consumption, cessation of smoking, adherence to prescribed medication and stress management. Although much is not known on how non-adherence to lifestyle modification is affecting the persons with hypertension in Bhutan, it is evident that majority of the populations are non-compliance to it. A study shows that 22% of adult population were physically inactive, 42.4% were current alcohol drinkers, 6% of adults were obese, more than 50% of population did not engage in vigorous physical activity, 9% of adult had raised blood sugar and 88.1% with high blood pressure (≥ 140/90 mmHg) were not on antihypertensive medication. Likewise the prevalence of high salt intake, unhealthy diet and consumption of tobacco were 99%, 67% and 25% respectively among the general adult population in Bhutan.

While non-adherence to lifestyle modification is known to result in catastrophic health consequences, adherent to it is found to control blood pressure and prevent complications among the persons with hypertension. Adoption of Dietary Approach to Stop Hypertension diet (DASH diet) for instance is associated with 11 mmHg and 3 mmHg reduction in blood pressure for hypertensive and non-hypertensive cases respectively. It is also evident that engagement in regular physical activity such as exercise is associated with reduction of 7-10 mmHg and 4-8 mmHg of systolic and diastolic blood pressure respectively; reduction of 5.1kg of body weight is associated with 4.4 mmHg of systolic and 3.6 mmHg of diastolic blood pressure. Abstinence or moderation in alcohol intake is associated with prevention of millions of death secondary to hypertension and cardiovascular diseases. Smoking cessation is another important
lifestyle modifications that is known to curtail the burden of hypertension.  

Despite immense benefits of lifestyle modification in reducing blood pressure, literatures indicate that not many hypertensive patients practice it. This is evident from the fact that adherence to lifestyle modification ranges from 15.6% to 23% among hypertensive populations across several countries.\(^{23,23,24}\) Even in Bhutan, majority of general adult populations are not following recommended lifestyle modification thus exposing themselves to number of risk factors for hypertension.\(^{12,18}\)

Thus, in order to promote lifestyle modification, it is essential to understand the factors influencing lifestyle modification among persons with hypertension. According to individual and family self-management theory\(^{26}\) which was used as theoretical guide, proximal outcome which corresponds to lifestyle modification in this study is primarily influenced by the factors in self-management process. The factors embedded in self-management process such as knowledge, self-efficacy and social support which corresponds to hypertension knowledge, perceived self-efficacy and perceived social support in the current study are reported to predict lifestyle modification among persons with hypertension.\(^{23,26,27,28}\)

Literatures indicate hypertension knowledge as the predictor of lifestyle modification. It influences lifestyle modification by impacting behavior specific self-efficacy, outcome expectancy and goal congruence.\(^{25}\) A study demonstrates that those with high level of hypertension knowledge is positively associated with better compliance to lifestyle modification (\(\beta = .21; p < .001\)).\(^{27}\) Akoko and colleagues (2017) also described that those participants with high level of hypertension knowledge are 2.9 times likely to engage in lifestyle modification.\(^{29}\)

Similarly, perceived self-efficacy has been reported as a potent predictor of lifestyle modification. Self-efficacy refers to judgment of personal capability to organize and execute health promoting behavior such as lifestyle modification.\(^{30}\) Higher perceived self-efficacy reduces or eliminate perceived barriers to action which in turn directly influences execution of healthful behavior or through increasing the commitment to a plan of action.\(^{30}\)

A study in Indonesia shows self-efficacy as the strongest predictor of lifestyle modification (\(\beta = .32, p < .001\)) among hypertensive population.\(^{24}\) Similar study in Ethiopia demonstrates that those participants with good self-efficacy are 2.6 times more likely to adhere to low salt diet and 3.5 times more likely to engage in weight management compared to those with low self-efficacy.\(^{31}\)

Perceived social support which include provision of emotional, instrumental or informational support from family and healthcare providers\(^{25}\) is reported to influence lifestyle modification by enhancing the coping with stress. Evidence shows that those with high social support are 2.9 times more likely to engage in healthy lifestyle compared to those without social support.\(^{32}\) Further, perceived social support was reported as a significant predictor of self-management behavior (\(\beta = .368, p < .001\)).\(^{33}\)

Lifestyle modification is scientifically recommended management strategy to control blood pressure besides medicine. Factors such as hypertension knowledge, perceived self-efficacy and perceived social support were shown to predict lifestyle modification among hypertensive populations across the world. However, the study which focuses on influence of aforesaid predicting variables on lifestyle modification among persons with hypertension in Bhutan is limited. In addition, since the way of Bhutanese life is interwoven within its unique culture and tradition, findings from other countries may not be generalizable to its population. Conducting study in Punakha, Bhutan will help understand influence of such factors in lifestyle modification among Bhutanese persons with hypertension so that appropriate intervention can be devised to
minimize complications related to hypertension. Therefore, it is essential to investigate and find out the factors predicting lifestyle modification among the persons with hypertension in Punakha, Bhutan.

Objectives of the study
1. To describe lifestyle modification among persons with hypertension in Punakha, Bhutan.
2. To examine whether hypertension knowledge, perceived self-efficacy and perceived social support can predict lifestyle modification among persons with hypertension in Punakha, Bhutan.

Research hypothesis
Hypertension knowledge, perceived self-efficacy, and perceived social support can predict lifestyle modification among persons with hypertension in Punakha, Bhutan.

MATERIALS & METHODS
Research design
A predictive correlational research design was used to understand influence of hypertension knowledge, perceived self-efficacy and perceived social support on lifestyle modification among persons with hypertension in Punakha, Bhutan.

Population
The target population in this study was individuals diagnosed with essential hypertension who visited non-communicable disease (NCD) clinic of Punakha District Hospital.

Sample
The sample consists of persons diagnosed with hypertension who visited NCD clinic of Punakha District Hospital during March to April 2020. Recruitment of the sample was based on the following inclusion criteria: adult aged \( \geq 18 \) to \( \leq 60 \) years; have been diagnosed with hypertension for at least 6 months; taking at least one anti-hypertensive medication; able to read and write in English; no history of stroke; and no history of psychiatric illness.

Sample size
Tabachnick and Fidell’s formula (2009)\(^{36}\) was used to calculate sample size in this study. The formula is given by \( N \geq 104+m \) (where \( N \) is required sample size and \( m \) is number of independent variables). Since there are three independent variables in the current study, the sample size required was at least 107. A total of 108 samples were recruited for the study.

Sampling technique
Eligible participants for the study were selected using simple random sampling technique. This method warrants that every participant has exactly equal opportunity to be selected for the study.

Study setting
The study was conducted at non-communicable disease (NCD) clinic of Punakha District Hospital of Bhutan. Managed collaboratively by a doctor, a nurse, a nutritionist and other paramedical staff, the clinic is actively involved in implementation of WHO package of essential NCD (WHO PEN) program.\(^{34}\) The clinic provides patient-centered essential healthcare services such as diagnosis and treatment, follow up care and counselling on lifestyle modification for persons with non-communicable diseases based on standard guideline developed by WHO. On an average NCD clinic records more than 200 cases of hypertension per month.

Research instruments
Data was collected using self-administered research questionnaires. Demographic Questionnaire was used to gather demographic and health information of the participants.

Hypertension Self-Care Profile Behavior Scale\(^{17}\) was used to measure lifestyle modification among the participants. The scale consisted of 20 items hypertension self-care behavior such as taking medication, physical activity, low sodium and low fat diet, restricting alcohol consumption, non-smoking, weight control, and stress reduction. Item 15 and 16 were reversed coded. Scoring on each item was based on four points interval scale. The total
score of the scale range from 20 to 80 with higher score indicating high level of hypertension self-care behavior which reflect lifestyle modification. Lifestyle modification was also levelled as high for those participants who scored greater than or equal to overall mean.3

Hypertension Knowledge-Level Scale (HK-LS)36 was used to measure level of hypertension knowledge among the participants. The scale consisted of 22 items requiring standard response as “Correct, Incorrect or Don’t Know”. Correct response was given 1 point each while the incorrect statement or don’t know was given zero. Possible score for the scale range from 0-22 with higher score indicating better hypertension knowledge. The score obtained was summed up and was converted into percent to label hypertension knowledge as good ≥ 80%, fair 60-79% and poor ≤ 60%.24,37

Hypertension Self-efficacy Scale38 was used to measure perceived self-efficacy of the participants. It consisted of five items and each item begins with the phrase “How confident are you that you can…?” Response ranges from 1 (not confident at all) to 10 (totally confident). A mean score of 9 or greater (≥ 9) was classified as having good self-efficacy while the mean score lower than 9 was considered as poor self-efficacy.38

Multi-dimensional Scale of Perceived Social Support was used to measure perceived instrumental, informational and emotional social support from family, significant others and friends.39 The scale is 12 items self-reported questionnaire rated on a seven-point Likert scale. The total score ranges from 12 to 84 while the mean score of the scale ranges from 1 to 7. Based on the mean score, magnitude of social support was categorized as low: 1-2.9, moderate 3-5 and high 5.1-7.39

All standard research instruments had well-established psychometric properties. Reliability of standard research instruments for the current study was pilot-tested with 30 persons with hypertension who fulfilled the same inclusion criteria of the main study. The result generated reliability coefficient of .83, .82, .81 and .85 respectively for Hypertension Self-care Profile Behavior Scale, Hypertension Knowledge-Level Scale, Hypertension Self-Efficacy Scale and Multi-diminensional Scale of Perceived Social Support.

Ethical consideration

The permission to conduct study was granted by Institutional Review Board of Burapha University, Thailand (certificate number 005/2020) and Research Ethic Board of Health, Ministry of Health, Bhutan (Ref. No. REBH/Approval/2020/024). Permission to conduct study was also accorded by the clinical agency. Recruitment of participants were carried out purely on the basis of volunteerism. Only those participants who were willing and consented to take part in the study were recruited. All data obtained from the study were kept strictly confidential.

Statistical Analysis

The data were coded and entered into Statistical Software Package (Minitab 17) for analysis. Statistical significance was set at alpha level of .05. Descriptive statistics including frequency, percentage, mean (M) and standard division (SD) were used to describe demographic characteristics, independent and dependent variables. Standard multiple regression was used to examine predictors of lifestyle modification which included hypertension knowledge, perceived self-efficacy and perceived social support.

RESULT

The results of the study are presented as follows: demographic characteristics, health information, description of lifestyle modification and predicting factors of lifestyle modification.

Demographic characteristics

Demographic characteristics of the participants are shown in table 1. The result showed that more than half of participants
were male comprising 58.3%. Age of the participants ranged from 28-60 years with mean age of 49.3. Most of the participants were married (86.1%) and more than half (55.6%) were employed. Majority (37.1%) of participants earned monthly family income of Nu.10,000-Nu.20,000 ($130-$260) with 79.6% of the participants disclosing it as adequate. While 45% of the participants acquired information on hypertension from health professional, only 26.8% had attended hypertension awareness program. Only a small minority of 2.8% were current smoker while 23% were past smoker. Less than a quarter of the participants (22.2%) currently drink alcohol while 29.6% drank in the past.

Table 1: Frequency, percentage, mean, and standard division of demographic characteristics of the participants (n = 108)

| Characteristics                                      | Number(n) | Percentage (%) |
|------------------------------------------------------|-----------|----------------|
| Age                                                  |           |                |
| 20-30 years                                          | 2         | 1.9            |
| 31-40 years                                          | 20        | 18.5           |
| 41-50 years                                          | 35        | 32.4           |
| 51-60 years                                          | 51        | 47.2           |
| *(M = 49.3, SD = 8.4, min = 28, max = 60)*           |           |                |
| Gender                                               |           |                |
| Male                                                 | 63        | 58.3           |
| Female                                               | 45        | 41.7           |
| Education                                            |           |                |
| Primary School                                       | 36        | 33.3           |
| Secondary School                                     | 23        | 21.3           |
| High School                                          | 26        | 24.1           |
| Diploma                                              | 7         | 6.5            |
| Bachelor or higher                                   | 16        | 14.8           |
| Marital status                                       |           |                |
| Married                                              | 93        | 86.1           |
| Unmarried                                            | 3         | 2.8            |
| Divorced/separated/widowed                           | 12        | 11.1           |
| Employment status                                    |           |                |
| Employed                                             | 60        | 55.6           |
| Unemployed                                           | 38        | 35.2           |
| Retired                                              | 10        | 9.2            |
| Family income per month in Nu (Nu.76 = 1 USD)        |           |                |
| Less than Nu.10,000                                  | 14        | 12.9           |
| Nu.10,000 to Nu.20,000                               | 40        | 37.1           |
| Nu.20,000 to Nu. 30,000                              | 18        | 16.7           |
| Nu.30,000 to Nu. 40,000                              | 20        | 18.5           |
| Nu.40,000 and above                                  | 16        | 14.8           |
| Income adequacy                                      |           |                |
| Adequate                                             | 86        | 79.6           |
| Inadequate                                           | 22        | 20.4           |
| Source of information on hypertension *(N=200)       |           |                |
| Health professionals                                 | 90        | 45.0           |
| Television                                           | 58        | 29.0           |
| Printed documents                                    | 15        | 7.5            |
| Newspaper                                            | 12        | 6.0            |
| Radio                                                | 11        | 5.5            |
| Others (social media and internet)                   | 14        | 7.0            |
| History of attending hypertension awareness program   |           |                |
| Yes                                                  | 29        | 26.8           |
| No                                                   | 79        | 73.2           |
| Smoke cigarette                                      |           |                |
| Yes                                                  | 3         | 2.8            |
| No                                                   | 105       | 97.2           |
| smoked cigarette in the past                         |           |                |
| Yes                                                  | 25        | 23.0           |
| No                                                   | 83        | 77.0           |
| Drink alcohol                                        |           |                |
| Yes                                                  | 24        | 22.2           |
| No                                                   | 84        | 77.8           |
| Drank alcohol in the past                            |           |                |
| Yes                                                  | 32        | 29.6           |
| No                                                   | 76        | 70.4           |

* can answer more than 1 items
Health information of the participants

Health information of the participants is presented in table 2. The result showed that, 28.7% of the participants had comorbidities with diabetes ranked on the top with 19.4%. Of the total participants, 10.7% had normal blood pressure of <120/80 mmHg, 14.9% had elevated blood pressure, 33.1% had stage 1 hypertension and 41.3% had stage 2 hypertension. This staging of blood pressure indicate that 85.1% of the participants are at the higher risk for cardiovascular disease, end-stage renal disease, subclinical atherosclerosis and all-cause death. Overall 59.3% of the participants had their blood pressure controlled, while 40.7% had uncontrolled blood pressure. The mean body mass index was 27.1 (SD = 4) with 53.7% overweight (BMI 25 to 29.9) and 18.5% obese (BMI ≥ 30).59.3% of the participants were diagnosed with hypertension within the span of 1-5 years. 61.1% of the participants were on lone antihypertensive medications while 38.9% were on more than one antihypertensive medication. Not as many participants took traditional medicines to manage blood pressure with only 6.5% reported to have resorted to such practice.

| Health information                                      | Number (n) | Percent (%) |
|---------------------------------------------------------|------------|-------------|
| Comorbidities                                            |            |             |
| No                                                      | 77         | 71.3        |
| Yes                                                     | 31         | 28.7        |
| Diabetes                                                | 21         | 19.4        |
| Heart disease                                           | 8          | 7.4         |
| Others (gastritis & sinusitis)                          | 2          | 1.9         |
| Blood pressure (BP)                                     |            |             |
| Normal blood pressure: Systolic blood pressure < 120 & Diastolic blood pressure < 80 mmHg | 13 | 10.7 |
| Elevated SBP > 120-129 & DBP < 80 mmHg                 | 18         | 14.9        |
| Hypertension stage 1 SBP: 130-139 or DBP: 80-89 mmHg   | 40         | 33.1        |
| Hypertension stage 2: SBP ≥ 140 or DBP ≥ 90 mmHg       | 50         | 41.3        |
| Controlled BP (< 140/90 mmHg)                           | 64         | 59.3        |
| Uncontrolled BP (≥ 140/90 mmHg)                         | 44         | 40.7        |
| Body mass index (BMI)                                   |            |             |
| < 18.5                                                  | 2          | 1.9         |
| 18.5 to 24.9                                            | 28         | 25.9        |
| 25 to 29.9                                              | 58         | 53.7        |
| ≥ 30                                                    | 20         | 18.5        |
| Duration of hypertension (years)                        |            |             |
| Less than 1 year                                        | 4          | 3.7         |
| 1-5 years                                               | 64         | 59.3        |
| > 6 years                                               | 40         | 37.0        |
| Number of antihypertensive medications                  |            |             |
| 1                                                       | 66         | 61.1        |
| ≥2                                                      | 42         | 38.9        |
| Took traditional (herbal) medicine to control BP       |            |             |
| Yes                                                     | 7          | 6.5         |
| No                                                      | 101        | 93.5        |

Description of lifestyle modification

As presented in table 3, the participants occasionally practiced lifestyle modification [M = 53.9 (2.7), SD = 7.7]. Mean score of each dimensions of lifestyle modification also revealed that the participants occasionally practiced physical activity, healthy diet, weight reduction, moderation in alcohol consumption, stress management, and medication adherent (M = 2.6-2.9). However, mean score in the dimension of cessation of smoking (M = 3.3) was slightly higher than other dimensions of lifestyle modification. Also as reflected in table 4, half of the participants scored greater than or equal to mean score implying that 50% of the participants had high level of lifestyle modification.
3. Predicting factors of lifestyle modification

Predicting factors of lifestyle modification are presented in Table 5. It showed fair hypertension knowledge (M = 16.6, SD = 2.7), poor perceived self-efficacy was (M = 7.4, SD = 1.9) and high social support (M = 5.2, SD = 1.1) among the participants.

Pearson’s correlation test was performed to examine the relationship between lifestyle modification, hypertension knowledge, perceived self-efficacy and perceived social support. From the correlation matrix (Table 6), lifestyle modification was significantly correlated with hypertension knowledge (r = .27, p < .01), perceived self-efficacy (r = .43, p < .001) and perceived social support (r = .26, p < .01).

To determine the predictors of lifestyle modification, standard multiple regression was performed. The result of standard multiple regression is presented in Table 7. The result showed that hypertension knowledge, perceived self-efficacy and perceived social support explained 21.05% of variance in lifestyle modification (F3, 104 = 10.51, p < .001). However, only hypertension knowledge (β = .19, p = .04) and perceived self-efficacy (β = .36, p < .001) significantly explained the variance in lifestyle modification. Of the two significant predictors, hypertension knowledge better explained the variance in lifestyle modification followed by perceived self-efficacy. Perceived social support did not significantly explain variance in lifestyle modification (β = .11, p = .26).

**DISCUSSION**

The discussions of the findings were presented based on objectives and
hypothesis of the study. The first objective was to describe lifestyle modification and the second objective was to examine the factors predicting lifestyle modification among persons with hypertension in Punakha, Bhutan.

**Lifestyle modification**

Findings of the study indicated that the participants occasionally practiced lifestyle modification. The reasons for this result can be enumerated in terms of national health policy and demographic characteristics of the participants.

At the policy level, the Royal Government of Bhutan has accorded the highest consideration to combat growing burden of non-communicable disease in Bhutan. One of the national strategies instituted by the Ministry of Health of Bhutan was implementation of WHO PEN program across many healthcare centers. This novel program ensures that all the adult population are screened for risk factors of non-communicable diseases (NCD) and all the patients suffering from NCD are periodically monitored and followed. The program also mandates provision of health education and counseling for the patients with hypertension and other non-communicable diseases. Based on individual and family self-management theory this program will magnetize individual’s engagement in lifestyle modification by enabling conducive physical and social environment and by enhancing their understanding about the condition and its management. However, to ensure that persons with hypertension always practice healthy self-care behaviour, continuous motivation, monitoring and evaluation of lifestyle modification is indispensible.

Socioeconomic characteristics of the participants might have also played a role in promoting outcome of lifestyle modification in this study. Our study showed that 86.1% of the participants were married. Marital status is reported to influence lifestyle modification wherein the married demonstrated better lifestyle modification compared to their unmarried counterpart. Such positive impact of marriage on lifestyle modification could be due to material, informational and emotional support they received from their partners. Employment status might have also contributed for high lifestyle modification practice in the current study since 56.5% of the participants were employed. According to Ryan and Sawin (2009), physical and social environment such as work is related to engagement in lifestyle modification. A study also shows those who are employed are adherent to lifestyle modification compared to those who are unemployed, as they are more likely to gain support and information from the work place.

High level of lifestyle modification among half of the participants in the current study can also be explained in terms of educational status and chronic nature of disease. All the participants in the current study had formal education ranging from primary to graduate level. Literacy or education directly impacts lifestyle modification or indirectly by influencing self-management process. Literature indicates a degree of association between education and lifestyle modification wherein educated are more likely to adhere to lifestyle modification compared to their uneducated counterpart. A study reported education as a significant predicting factors of lifestyle modification (β = .11, p < .01) among older adults with hypertension. The possible explanation for such association is that educated participants are willing to seek information and are exposed to various sources of health-related information. It is also easy for them to understand about hypertension and healthy lifestyle. As enshrined in individual and family self-management theory, longer duration since diagnosis of hypertension is a condition specific factor which might have directly or indirectly promoted lifestyle modification in the present study. Our study indicated that 37% of the participants had duration of...
hypertension of 6 years or more. Longer duration of being hypertensive might have provided the participants with the platform to gain more health recommendations and counselling from healthcare providers as they have to periodically visit healthcare centre for follow up.\textsuperscript{43}

However, 40.7\% of the participants had uncontrolled blood pressure of $\geq 140/90$ mmHg in the present study which could be mainly due to the fact that adherence to medication was low among the participants. In addition culturally inherited dietary habit of Bhutanese population consisting of high carbohydrate diet consumed three times a day\textsuperscript{13} is an important factor which might have also contributed to excessive weight gain resulting in increased blood pressure\textsuperscript{2} as 53.7\% of the participants in the study were overweight. Weight reduction,\textsuperscript{20} stress management\textsuperscript{5} and salt reduction\textsuperscript{19} are reported to control blood pressure. However, adherence to these dimensions of lifestyle modification was not always practiced among the participants in the current study.

Another possible explanation for prevalence of uncontrolled blood pressure among large number of participants in the present study could be attributed to more number of male participants. Gender-specific perspective and social norms may challenge or facilitate engagement in lifestyle modification.\textsuperscript{25} A study by Kim & Kong (2015)\textsuperscript{44} showed that males are 1.9 times unlikely to follow recommended lifestyle modification compared to the females. This holds true for Bhutanese where men are more likely to drink alcohol and smoke compared to their women counterpart.\textsuperscript{12}

To achieve effective control of blood pressure the patients must be encouraged and motivated to engage in lifestyle modification through hypertension awareness and educational program. Organizing such program is crucial as it can help the patients in gaining the best and correct information which can help dispel their myths and misconception related to disease and its management. However, our data showed that only 26.8\% of the participants took part in hypertension awareness program. Therefore, the program should be planned and designed in such a way to reach all the targeted audiences including their family members.

**Factors predicting lifestyle modification**

The findings of the study revealed that lifestyle modification among persons with hypertension in Bhutan was predicted by hypertension knowledge ($\beta = .19$, $p = .04$) and perceived self-efficacy ($\beta = .36$, $p < .001$) which is in line with the objective of the study. However, perceived social support ($\beta = .11$, $p = .26$) was not the significant predictor of lifestyle modification in this study which is in contrast to the research hypothesis. All the predictors explained 21.05\% of variance in lifestyle modification.

In consistent with the hypothesis of the study, hypertension knowledge significantly predicted lifestyle modification among persons with hypertension in Bhutan. According individual and family management theory, knowledge which corresponds to hypertension knowledge influences lifestyle modification by modulating behavior specific self-efficacy, outcome expectancy and goal congruence.\textsuperscript{25} The theory also postulated that knowledge influences engagement in self-regulation behavior such as goal setting, self-monitoring and reflective thinking, decision making and self evaluation, which ultimately impact individual’s engagement in lifestyle modification. Possession of good hypertension knowledge is reported to positively influence patients perception about management of hypertension while lack of it can negatively alter their perception of illness,\textsuperscript{36} which result in poor lifestyle modification.

Hypertension knowledge which significantly predicted lifestyle modification in the current study can be explained by the fact that the Ministry of Health, Royal Government of Bhutan has accorded extra-
ordinary priority to confront growing burden of hypertension and other non-communicable disease (NCD). One such initiative was reformation and amendment of national health policy which mandates people-centred approach in management of NCD thus strengthening physical and social environment to engage in lifestyle modification. This program ensure that the patients are knowledgeable on various aspects of disease such as causes, risk factors and management approach. As patients gain deeper understanding about disease and its management, they are more likely to engage in lifestyle modification.

The finding of our study is in congruence with those of the previous studies. A study demonstrated that hypertension knowledge predicted 8.1% of variance in practice of lifestyle modification among the cohort of hypertensive patients ($\beta = .28, p < .01$). Similarly, a study in Cameroon reported that those participants with high level of hypertension knowledge are 2.9 times likely to comply with lifestyle modification practice compared to those with low hypertension knowledge.

In consistent with our research hypothesis, perceived self-efficacy is another factor which significantly predicted lifestyle modification in the current study. Theoretically, it is hypothesized that behavior specific self-efficacy primarily influence the proximal outcome – lifestyle modification. The studies also indicate that perceived self-efficacy motivate the patients directly by leveling the expectations for behaviour changes and indirectly by eliminating perceived barriers to action and/or increasing their commitment to the plan of action. If hypertensive patients are assured that hypertension is controllable and that their capability to carry out lifestyle modification is sufficient, then their likelihood of engaging in lifestyle modification will increase.4

Findings from other study also support those of the present study where self-efficacy is reported as the strongest predictor of lifestyle modification ($\beta = .32, p < .001$). Similar study also reported that those participants with high level of self-efficacy were 2.6 times more likely (AOR: 2.58, 0.95CI: 1.41-4.73) to engage in weight management behavior than those with low self-efficacy. Likewise, a compliance to lifestyle modification is four times higher among those with high self-efficacy than those with low self-efficacy.

Similarly, perceived social support is one of the factors which is reported as the potent predictor of lifestyle modification in the previous studies. Perceived social support include instrumental, informational and emotional support received from family, friends and significant others. According to Ryan and Sawin (2009) it is assumed that social facilitation such as presence of perceived social support can direct, encourage and support individual and family’s engagement in self-management behavior.

Perceived social support was high among the participants in this study. However, it did not significantly predict lifestyle modification among the participants. This finding is in contrast with our research hypothesis and previous literatures. The previous study showed that perceived social support predicted 15.10% of variance in self-management behavior among the cohort of hypertensive patients ($\beta = .36, p < .001$). A similar study conducted in Ethiopia also reported remarkable association between perceived social support and adherence to low salt diet (AOR: 2.81, 0.95CI: 1.20-6.53). In addition, individuals with good social support are more likely to adopt lifestyle modification (AOR: 2.20, 0.95CI:1.27-3.82, p < 0.01) compared to their counterpart.

The possible explanation for perceived social support not predicting lifestyle modification can be attributed to deeply rooted Buddhist belief which defines the way of life in Bhutan. Buddhism strongly embraces love, compassion, care and social cohesion among the people. Prevalence of joint family also ensures high level of social support among the Bhutanese.
population. Therefore, in Bhutanese context social support should be considered as a naturally occurring phenomenon emanating from its intricately woven pattern of spiritualism, culture and tradition. Thus social support as a ritualistic norm failed to predict lifestyle modification among persons with hypertension in Bhutan.

CONCLUSION
The study revealed high level of lifestyle modification among the half of the participants. However another half of the participants had lifestyle modification score lower than mean score with considerable number of participants presented with uncontrolled blood pressure. This underscore the importance of further consolidating lifestyle modification especially in the area of diet, salt reduction, physical activity and weight reduction. The interventional program should be strategically targeted to enhance hypertension knowledge and perceived self-efficacy among persons with hypertension in Punakha, Bhutan.

Implications for nursing practice
Findings of the current study might be useful in the following areas:

1. Nursing practice
The findings of the study provided deeper insight regarding lifestyle modification and its predicting factors among persons with hypertension in Punakha, Bhutan. This information can be useful in developing appropriate nursing intervention to foster lifestyle modification among hypertensive patients by targeting on hypertension knowledge and perceived self-efficacy to control blood pressure and to prevent untoward complications.

2. Nursing education
It can also be useful for nurse educator to enhance nursing student’s knowledge on non-pharmacological approach of managing hypertension.

3. Health policy
The need to manage chronic diseases and to adopt lifestyle modification to promote health is recognized as the collective responsibility of individual and their family. In the light of above, there should be provision in health policy which mandates that individual patient is adequately counseled on fundamental aspects of lifestyle modification and their significance in promotion of health. The health system should also promotes home visit by healthcare professionals to encourage and motivate both individual and family to engage in lifestyle modification

Recommendations for future research
Since the study was conducted in a single setting it must be acknowledged that the findings may not represent all the characteristics of Bhutanese patients with hypertension. For the purpose of generalization of results among Bhutanese hypertensive population, we recommend replicating the study in multiple settings. Future study should explore appropriate interventional program to test whether promotion of hypertension knowledge and perceived self-efficacy can foster lifestyle modification among persons with hypertension in Bhutan.

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