



# Adherence to healthy lifestyle behaviours and associated factors among hypertensive patients in bahir dar city, northwest Ethiopia

Mulualem Gete Feleke<sup>1\*</sup>, Tesfaye Yitna<sup>1</sup>, Tamiru Alene<sup>2</sup>, Moges Wubneh<sup>3</sup>, Nigusie Solomon<sup>3</sup>

<sup>1</sup>Department of Nursing, College of Health Sciences and Medicine, University of Wolaita Sodo, Sodo, Southern Ethiopia.

<sup>2</sup>Department of Pediatrics Nursing, College of Health Sciences, University of Injibara, Injibara, Ethiopia.

<sup>3</sup>Department of Health Sciences, College of Health Sciences and Medicine, University of Debre Tabor, Debre Tabor, Ethiopia.

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## ABSTRACT

**Background:** In recent decades, the issue of adherence to lifestyle modifications is one of the keys to improving blood pressure control. Although lifestyle modification is a strong recommendation for the prevention and treatment of hypertension, little is known about the hindering and provoking factors with adherence to the recommended lifestyle modification in Ethiopia, particularly in Bahir Dar City. Therefore, this study aimed to investigate factors associated with the recommended lifestyle behaviours among people with hypertension in Bahir Dar City.

**Methods:** A cross-sectional study was conducted at Bahir Dar city governmental hospitals from February-March 2020. Proportional allocation and systematic random sampling techniques were used. Data was collected through face-to-face interviews and clients' chart reviews. The logistic regression model was used to assess the association between predictors and adherence to lifestyle modification. The association was interpreted using the odds ratio and 95% confidence interval.

**Results:** The result of 375 respondents included in this study, 210 (56%) were male. The mean age of the participants was 52.8 years. The proportion of adherence to healthy lifestyle modification was 14.9% (CI: 11.3, 18.4). Educational level college and above (AOR=7.6, CI=1.65, 34.81), knowledgeable about hypertension (AOR=4.8, CI=1.84, 12.27), measuring of blood pressure only on appointment date (AOR=0.2, CI=0.03, 0.64), and had strong social support (AOR=7.1, CI=2.85, 17.46) were adherence to lifestyle modification.

**Conclusion:** This study demonstrated that participants have low adherence to healthy lifestyle modification. Therefore, availed a social network of family and friends; providing healthy lifestyle education to address the participants' knowledge of hypertension is an integral part of overall health in people with hypertension.

**Keywords:** Adherence, Healthy lifestyle, Hypertension.

## INTRODUCTION

The ultimate goal of hypertension treatment is to control Blood Pressure (BP) to less than 130/80 millimetres of mercury (Whelton et al., 2018; Carey et al., 2018). Well-controlled BP has been associated with the mean reductions of more than 50% in the incidence of heart failure, more than 20% in the myocardial infarction, more than 14% (11%-17%) in chronic heart disease, and also more than 18% (15%-18%) in the stroke (Salam et al., 2019; Edgar et al., 2009). Lifestyle or behavioural factors critically determine the level of BP in individuals and the prevalence of hypertension in the population (Casey et al., 2019). A substantial body of evidence strongly supports the concept that lifestyle modification can have powerful effects on BP (Appel, 2003). Lifestyle modification has important roles in hypertensive people for first-line therapy, adjunct to drug therapy, and facilitating drug step-down or withdrawal (Appel, 2003).

Current recommendations for the prevention and treatment of high BP emphasize healthy lifestyle modification (Forman et al., 2009). Increase physical activity (exercising 3 or 4 times per week for an average of 40 minutes per session), reduced salt intake (less than 2,400 mg per day), increase potassium intake (2100 mg per day), and overall healthy dietary pattern, termed the Dietary Approaches to Stop Hypertension (DASH) diet, effectively lower BP. The DASH diet emphasizes fruits, vegetables, and low-fat dairy products and reduces fat and cholesterol (Casey et al., 2019).

Long-established lifestyle modifications that effectively lower BP include weight loss, reduced sodium intake, increased physical activity, smoking cessation, and limited alcohol consumption. Excess body fat is a predominant cause of hypertension with additive effects of dietary salt, alcohol, and physical inactivity (Oza et al., 2015; Robbins et al., 2011). The adoption of a healthy lifestyle by all individuals is critical in the prevention and an indispensable part of the management of those people with hypertension. Adherence to the DASH diet is decreased the Systolic and Diastolic Blood Pressure by 11 mm Hg and 3 mm Hg respectively. Low salt consumption also decreased SBP by 5-6 mmHg and DBP by 2-3 mmHg (Bakris et al., 2019).

There are many gaps in our current knowledge about the adoption of lifestyle change behaviours in hypertension people. Adherence to healthy lifestyle behaviours varied from country to country. Previous studies showed that adherence to lifestyle modifications was 1.7 % in Columbia, 44.1 in Kenya, 27.79% in Iran, 23% in Jordan, and 72% in Ghana (Fang

et al., 2016; Kimani et al., 2019; Akbarpour et al., 2018; Alefan et al., 2019; Obirikorang et al., 2018). It is also varied widely from place to place in Ethiopia. For instance, the overall adherence to recommended healthy life were 23% in Addis Ababa, 62.1% in Harar, 27.3% in south Ethiopia, 59.4% in Gondar, 33.3% - 68.92% in Oromia, and 20.3% in Tigray region (Tibebu et al., 2017; Nadewu et al., 2018; Buda et al., 2017; Worku et al., 2020; Angelo et al., 2020; Fetensa et al., 2019; Gebremichael et al., 2019).

Socio-demographic factors that had a significant association with adherence to lifestyle behaviour among people with hypertension were; sex, age, educational level, marital status, occupational status, income, and residency were significantly associated with adherence to healthy lifestyle modification (Alefan et al., 2019; Tibebu et al., 2017; Gebremichael et al., 2019; Buda et al., 2017; Angelo et al., 2020; Fetensa et al., 2019; Obirikorang et al., 2018; Nadewu et al., 2018; Hareri et al., 2013; Asgedom et al., 2020).

Clinical factors which were statistically associated with adherence to recommended healthy lifestyle modification among people with hypertension were; duration of hypertension, knowledge of hypertension, and information about healthy lifestyle, adherence to treatment, health care facility access, present of co-morbidity, frequency of hospital visit, lack of self-management counselling (Alefan et al., 2019; Tibebu et al., 2017; Buda et al., 2017; Angelo et al., 2020; Gebremichael et al., 2019; Hareri et al., 2013; Nadewu et al., 2018; Asgedom et al., 2020). Behavioural related factors such as social inhibition were negatively affected in life, self-efficacy, and khat chewing habit influenced adherence to the recommended healthy lifestyle modification in people with hypertension (Alefan et al., 2019; Angelo et al., 2020; Asgedom et al., 2020; Tibebu et al., 2017; Nadewu et al., 2018).

Findings from this study will assist hospital staff in better management of hypertension and create patient awareness of dietary adherence. This will reduce the patient's load in the clinic, as well as morbidity and mortality that are associated with poorly controlled hypertension. The identification of gaps in the area of adherence to a healthy lifestyle among hypertensive patients can use a part of one input for policymakers to emphasize this neglected issue and the development of programs that play a key role in the complication of hypertension to maintain vital organ functions.

There have not been many published works on adherence to healthy lifestyle modification in Ethiopia. Though various studies on hypertension have been conducted with the

knowledge and medication adherence, few studies have been carried out on adherence to healthy lifestyle modification in this region city administration.

Therefore, these findings cannot be generalized to the study area. Thus, this study aimed to assess the magnitude of adherence to healthy lifestyle behaviour and identify associated factors among people with hypertension in Bahir Dar city administration, Ethiopia.

## MATERIALS AND METHODS

### Study area, period and design

This was a cross-sectional study conducted at Bahir Dar city from February 23th to March 23th 2020. The city has three governmental hospitals. These hospitals are Felege Hiwot Comprehensive Specialized Hospital (FHCSH), Addis-Alem General Hospital, and Tibebe Gihon Specialized Teaching Hospital (TGSTH). These hospitals are provided in-patient and out-patient services with the vision to provide quality and universal care delivery in the city to facilitate personal and regional development. In the outpatient, chronic follow-up department, approximately 790 adult people with hypertension (450 in FHCSH, 240 in Addis Alem, and 100 in TGSH) are seen monthly.

### Study and source of population

All hypertensive patients on regular follow up in the government hospitals at Bahir Dar city administration were the source population, while all the selected hypertensive patients who fulfilled the inclusion criteria and were available during the time of data collection were the study population.

### Inclusion and exclusion criteria

All people with hypertension aged  $\geq 18$  years, and who had been on regular follow up were included in this study, while those individuals who had the hearing and/or verbal impairment, and severe illness during the time of data collection were excluded from the study.

### Sample size

The sample size was determined by using a single population proportion formula by considering the following assumptions: 95% (1.96) Confidence Interval (CI), 59.40% for adherence to healthy lifestyle modification, and 5% (0.05) marginal of error (Worku et al., 2020).

$$n = \frac{\left(\frac{z\alpha}{2}\right)^2 p * q}{d^2}$$

This yields an initial sample size of 351. By considering adjustment for the expected non-response rate (10%), the final sample size was 386 people with hypertension.

### Study variables

**Dependent variable:** Adherence to healthy lifestyle behavior.

**Independent variables:** Socio-demographic factors (Age, sex, marital status, religion, and ethnicity, level of education, income, residence, occupation, and living arrangement).

Clinical factors (Comorbidities, knowledge about the hypertension, duration of hypertension, BMI, number of follow-up visits and number of antihypertensive medication, blood pressure measurement, family history, pay medication cost).

Social factors (Support from families and non-family members of the society).

Behavioral factors (alcohol consumption, smoking habit, exercise).

### Sampling technique and procedure

Out of three public hospitals, that give hypertension follow-up services; all the three hospitals were selected conveniently. The numbers of study units from each hospital were proportionally allocated. Accordingly, 49, 213, and 113 cases were allocated proportionally to TGSTH, FCSH, and Adisalem hospital respectively, and then individual cases were recruited by a systematic random sampling procedure. After the first respondent was drawn by the lottery method, then every two intervals were interviewed until the sample size was reached.

### Data collection tool and measurement

A well-reviewed and structured questionnaire was used to collect data. The questionnaires consisted of demographic information about hypertension knowledge, Body Mass Index (BMI), social support, and adherence to the recommended healthy lifestyle modification. To assess clinical related data: co-morbidity, duration of HTN since diagnosis, and previous blood pressure were collected from the clients' charts by using checklists.

Adherence to the recommended healthy lifestyle modification was measured using questionnaires adapted from hypertension self-care

management questions. This was recommended by the joint national committee on detection, prevention, evaluation, and treatment of hypertension and WHO STEPS questionnaires (Casey et al., 2019; Osako et al., 2017; Ukpabi et al., 2017). Adherence to lifestyle modifications by using the following dimension: (a) adherence to the dietary recommendation which consists of six components of diet items, such as salt restriction, low-fat diet, consumption of vegetables, fruits, whole grain, low-fat dairy products; and (b) adherence regarding the control of tobacco and alcohol (4 items), which was called "smoking and alcohol management," and adherence to recommended physical activities.

Each item uses a 5-point Likert response scale except for physical activity: (1) never/very rarely, (2) rarely, (3) sometimes, (4) mostly, and (5) all of the time, with 1 to 5 points assigned, respectively, and reverse scores (saturated fat and sodium salt intake) are assigned for reverse questions (5-1 points). The dietary fruits, vegetables, whole grain, and low-fat dairy consumption were evaluated by asking how many times in the previous 7 days did the respondents eat the above-listed items. Those who responded "all" and "most times" were adherent while those who responded "sometimes", "rarely", or "none" were non-adherent. Dietary saturated fat and oil consumption was inquired about how many times in the previous 7 days the respondents ate. Those participants who responded "sometimes", "rarely", and "none" were considered adherent while those who responded "all", and "most time" were non-adherent.

Salt consumption was also evaluated in the previous 7 days by inquiring about the addition of raw table salt in addition to the one used to prepare the food item during meal times. Those who responded "rarely" and "none" were considered adherent to recommended salt, whereas "all times", "most times", and "sometimes" were considered non-adherent to recommended dietary salt. Adherence to recommended physical exercise was also considered when the participants were exercised for  $\geq 30$  min per day; at least three times per week (Lee et al., 2011). Therefore, the overall adherence to the recommended healthy lifestyle modification was scored who fulfilled the entire components.

Knowledge about hypertension was assessed by Hypertension Knowledge-Level Scale (HK-LS) questionnaires (Erkoc et al., 2012). This scale has 22 items that were used to assess respondents' knowledge. It contains parts of the definition, treatment, drug adherence, diet, lifestyle, and complications. The definition, lifestyle, diet, and complication part

of the questionnaire was used to assess the knowledge of people with hypertension. The tool contains selected-response items with yes and no responses; the right answer is coded as "1" and the wrong answer is coded as "0". Participants who scored equal to and above the mean value (7.2) on the hypertensive knowledge assessment scale were considered good knowledge. Participants who scored below the mean value (7.2) on the hypertensive knowledge assessment scale were considered poor knowledge.

People with hypertension who have supported by their families or friends or neighbors scored was assessed by the "Oslo 3-items social support scale." The score ranged from 3-14. Participants who scored OSSS-3, (1) from 3-8 were considered poor socials support, (2) from 9-11 were considered moderate support, and (3) from 12-14 were considered strong support (Kocalevent et al., 2018).

### **Data quality control**

Three BSc degree holder nurses for the data collection (one for each hospital) and three BSc degree holder's supervision (one for each hospital) were recruited during the data collection period (both the data collectors and the supervisors were not from the same hospitals). At each hospital, the aim of the study was clearly explained to the study participants before they were interviewed. The data collectors and supervisors were trained in one day on how to facilitate the data collection process and prevent errors. The questionnaire checked for completeness, accuracy, and consistency by supervisors.

All the questions were prepared in English and translated into the Amharic language by an expert who was fluent in both languages and back-translated to English to see its consistency. Two weeks before the actual data collection, the questionnaires were pre-tested on 5% of the total sample among people with hypertension who had follow-ups at Debre Tabor hospital to evaluate the consistency and applicability of the questionnaire. The reliability of the questionnaire was evaluated using Cronbach's alpha test ( $\alpha=0.76$ ).

Data collection was preserved in a secure environment to avoid loss and breach of confidentiality. The supervisor and principal investigator closely followed the data collection process. Appropriate times to complete the questionnaire were allocated for the participants, and the completed questionnaires were collected timely.

### **Data processing and analysis**

The collected data were entered, coded, and

edited into EPI-data version 3.1, and exported to SPSS version 23 for analysis. Descriptive statistics were used to illustrate the means, standard deviations, medians, and frequencies of the study variables. Bivariate analysis was computed, and those variables whose p-values less than or equal to 0.2 were fitted into the backward stepwise multivariate logistic regression model. Odds ratios with 95% confidence interval were used to determine the strength of the association between dependent and independent variables.

The Hosmer and Lemeshow goodness of fit tests for the model were checked. Finally, the degree of association was interpreted by using the odds ratio with a 95% confidence interval. The P-

value of  $\leq 0.05$  was considered statistically significant.

## RESULTS

### Socio-demographic characteristics of the participants

The 386 people with hypertension invited 375 participants in the study with a response rate of 97%. Of these, 210 (56%) were males. The mean age of the participants was 52.80 with a SD  $\pm 11.52$ . Most of the participants, 310 (82.7%) were Orthodox Tewahido religion followers and 318 (84.8%) participants were from urban areas (Table 1).

**Table 1.** Socio-demographic characteristics of participants in Bahir Dar city, northwest Ethiopia, 2020 (n=375).

Variables	Categories	Frequency	Percent
Sex	Male	210	56
	Female	165	44
Age	18-39	44	11.7
	40-59	209	55.7
	$\geq 60$	122	32.5
Religion	Orthodox Tewahido	310	82.7
	Muslim	45	12
	Protestant	20	5.3
Ethnicity	Amhara	359	95.7
	Tigre	12	3.2
	Other*	4	1.1
Marital status	Single	16	4.3
	Married	286	6.3
	Divorced	42	11.2
	Widowed	31	8.3
Educational level	Unable to read and write	93	24.8
	Able to read and write only	52	13.9
	Primary	54	14.4
	Secondary	58	15.5
	College and above	118	31.5
Occupational status	Farmer	51	13.6
	Housewife	73	19.5
	Governmental employee	100	26.7
	Private employee	37	9.9

	Merchant	75	20
	Retired	33	8.8
	Other**	6	1.6
Average monthly income	≤ 999	24	6.4
	1000-1999	52	13.9
	2000-2999	68	18.1
	≥ 3000	231	61.6
Residence	Rural	57	15.2
	Urban	318	84.8

**Note:** \*: level of significance.

**Table 2.** Clinical characteristics of respondents in Bahir Dar city, northwest Ethiopia, 2020 (N=375).

Variables	Categories	Frequency	Percent
Family history of HTN	No	277	73.9
	Yes	98	26.1
Duration of HTN	in year Less than 2 years	93	24.8
	2-4 years	129	34.4
	>4 years	153	40.8
Received nutritional education	No	179	47.7
	Yes	196	52.3
Knowledge of hypertension	Poor-knowledge	185	49.3
	Good-knowledge	190	50.7
Comorbidity	Yes	170	45.3
	No	205	54.7
Type of comorbidities	DM	43	25.3
	Stroke	24	14.1
	Renal disease	15	8.8
	Cardiac disease	27	15.9
	More than one	49	28.8
	Others*	12	7.1
Frequency of BP measurement	Daily	20	5.3
	Weekly	61	16.3
	Monthly	137	36.5
	During a symptom of HTN	75	20
	Only appointment date	82	21.9
Blood pressure status	Controlled	200	53.3
	Uncontrolled	175	46.7
Body mass index	Underweight	2	0.5
	Normal weight	167	44.5
	Overweight	166	44.3
	Obese	40	10.7
Social support	Strong	121	32.3
	Moderate	154	41.1
	Poor	100	26.6

**Note:** \*: level of significance.

## Clinical characteristics of the study participants

About 153 (40.8%) participants lived with hypertension for  $\geq$  four years and 277 (73.9%) of them had no family history of hypertension. Of the total enrolled participants, 196 (52.3%) of them had received education on hypertension and 166 (44.3%) had got overweight. Almost one-fourth (50.7%) of participants were knowledgeable about hypertension holding 7.25 for the mean score of knowledge. Nearly half (45.3%) of participants had comorbid diseases, of which, 49 (28.8%) of respondents had more than one comorbidities. The mean SBP and DBP of the

study participants were  $131.7 \pm 16.95$  and  $80.5 \pm 10.38$  respectively. Of the total participants, 121 (32.3%) reported that they had strong social support (Table 2).

## Adherence to healthy lifestyle behavior

In this study, the magnitude of adherence to healthy lifestyle modification was 14.9% (CI: 11.3, 18.4). In the case of each domain, these studies revealed that the majority of the participants were nonsmokers (98.7%) and adhere to alcohol consumption (91.2%). Less than half of the participants adhered to physical activity (41.9%) and diet (32.8%) (Table 3).

**Table 3.** Adherence to the recommended healthy lifestyle modification among people with hypertension in Bahir Dar city, northwest Ethiopia, 2020 (N= 375).

Variable		Frequency	Percent
Adherence to the recommended life style modifications	Adherent	56	56 14.9
	Non-adherent	319	85.1
Adherence to dietary recommendation	Adherent	123	32.8
	Non-adherent	252	67.2
Adherence to exercise recommendation	Adherent	157	41.9
	Non-adherent	218	58.1
Adherence to smoking cessations	Not smoked	370	98.7
	Not ceased	5	1.3
Adherence to the recommended alcohol consumption	Adhere	342	91.2
	Non-adherence	33	8.8
Salt intake reduction	Adherence	299	79.9
	Non-adherence	76	20.3
Maintenance of a normal weight	Adherence	167	44.5
	Non-adherence	208	55.5

**Table 4.** Multivariable logistic regression of factors associated with adherence to recommended health lifestyle modifications of people with hypertension in Bahir Dar city governmental Hospitals, Bahir Dar, Ethiopia, 2020 (N=375).

Variable	Adherence to lifestyle		Bivariate	Multivariable	
	Yes	No	COR (CI)	AOR (CI)	P-value
Age					
18-39	6	38	1	1	
40-59	42	167	1.6 (0.63, 4.02)	2.5 (0.89, 7.12)	0.084
≥ 60	8	114	0.4 (0.15, 1.36)	1.8 (0.49, 6.62)	0.381
Marital status					
Single	3	13	1	1	
Married	48	238	0.87 (0.24, 3.19)	0.7 (0.13, 3.33)	0.608
Divorced	2	40	0.2 (0.03, 1.44)	0.2 (0.02, 2.06)	0.186
Widowed	3	28	0.5 (0.08, 2.62)	1.9 (0.21, 17.09)	0.575
Educational level					
Can't read and write	2	91	1	1	0.078
Can read and write	3	49	2.8 (0.45, 17.24)	3.0 (0.45, 20.59)	0.253
Grade 1-8	6	48	5.7 (1.11, 29.26)	4.4 (0.79, 24.26)	0.092
Grade 9-12	10	48	9.5 (2.0, 45.02)	4.7 (0.91, 23.93)	0.065
Collage & above	35	83	19.2 (4.48, 82.26)	7.6 (1.65, 34.81)	0.009
Residence					
Rural	2	55	1	1	
Urban	54	264	5.6 (1.33, 23.76)	1.14 (0.18, 7.28)	0.887
Duration of hypertension					
<2 year	10	83	1	1	
2 to 4 year	30	99	2.5 (1.16, 5.45)	1.1 (0.41, 2.617)	0.952
>4 year	16	137	0.9 (0.42, 2.24)	1.1 (0.41, 3.06)	0.834
Received education					
No	12	167	1	1	
Yes	44	152	4.0 (2.05, 7.91)	1.3 (0.55, 3.216)	0.532
Frequency Blood pressure measurement					
Daily	9	11	1	1	
Weekly	15	46	0.4 (0.14, 1.15)	0.3 (0.09, 1.00)	0.05
Monthly	21	116	0.2 (0.08, 0.60)	0.3 (0.09, 0.92)	0.046
Feeling Sign of disease	7	68	0.1 (0.04, 0.41)	0.2 (0.06, 0.81)	0.024
Appointment date	4	78	0.1 (0.02, 0.24)	0.2 (0.03, 0.64)	0.011
Knowledge					
Poor-knowledge	6	179	1	1	
Good-knowledge	50	140	10.6 (4.44, 25.57)	4.8 (1.84, 12.27)	<0.001
Social support					
Poor	3	97	1	1	0.014
Moderate	18	136	4.3 (1.23, 14.93)	2.5 (0.66, 9.12)	0.182
Strong	35	86	13.2 (3.91, 44.32)	5.2 (1.44, 18.59)	0.012
Blood pressure status					



Controlled	40	160	1	1	
Uncontrolled	16	159	0.4 (0.22, 0.75)	1.9 (0.67, 5.289)	0.233
Comorbidities					
Yes	12	158	1	1	
No	44	161	3.6 (1.83, 7.07)	1.5 (0.68, 3.27)	0.325

### Factors associated with adherence to healthy lifestyle behavior

After adjusting potential confounders of other covariates, educational level, frequency of measuring blood pressure, knowledge about hypertension, and social support were found to be significantly associated with adherence to healthy lifestyle behaviour. Respondents who had college and above educational level were 7.6 times more likely to adhere to the overall healthy lifestyle modification than those who were unable to read and write (AOR=7.6, CI: (1.96, 34.81), P=0.009).

Those respondents who measured their blood pressure when they feel signs and symptoms only were 80% less likely to adhere to healthy lifestyle behaviour than those who were measured their blood pressure daily (AOR=0.2, CI: (0.06, 0.81), P=0.024). Those respondents who had good knowledge were 4.8 times more likely to be adherent to healthy lifestyle modification as compared to those who had poor knowledge (AOR=4.8, CI: (1.84, 12.27), P=0.001). Those respondents who had strong social support were 5.2 times more likely to be adherent to healthy lifestyle modification as compared to poor social support (AOR=5.2, CI: (1.44, 18.59), P<0.012) (Table 4).

### DISCUSSION

The ultimate goal of the hypertension treatment is to control blood pressure to less than 130/80 mmHg (Whelton et al., 2018). Adoption of a healthy lifestyle is important in the management of hypertension. Lifestyle or behavioural factors critically determine the level of BP control in an individual and the prevalence of hypertension in a population (Casey et al., 2019). A substantial body of evidence strongly supports the concept that lifestyle modification can have powerful effects on BP controlled (Svetkey et al., 2005). This study aimed to assess the magnitude of adherence to healthy lifestyle modification and determinates among people with hypertension.

In this study, the overall adherence to healthy lifestyle behaviours was 14.9%. A similar finding was reported in Nigeria (14.1%), much higher than a study reported in Saudi Arabia (4.2%) and Columbia (1.7%), and much lower

than the study reported in Ghana (72.0%), Iran (27.79%), Jordan (23%), and Addis Ababa (23%), Harar (62.1%) (Elbur, 2015; Fang et al., 2016; Obirikorang et al., 2018; Alefan et al., 2019; Tibebu et al., 2017; Nadewu et al., 2018). This discrepancy could be explained by methodological factors where the latter included a small sample of only male participants in Saudi Arabia. In Colombia, the health professional promoted the practice of curing medicine rather than a better preventive behaviour like a healthy lifestyle. That is why a scholar concluded that unhealthy habits in the health professional and attitudes that do not favor the promotion of healthy habits in their client and their community (Sanabria-Ferrand et al., 2007).

In the case of Ghana, The Ministry of Health Ghana launched adopted the concept of "Regenerative Health and Nutrition". Regenerative health and nutrition aimed to promote healthy lifestyles, dietary practices, and mother and child care practices that would help eliminate the many diseases that impact the health and well-being of Ghanaians. The improvement in healthy lifestyle behaviours among adult Ghanaians will help promote healthy living and potentially lead to a reduction in the prevalence of obesity among Ghanaians (especially in women) (Tagoe et al., 2011). In Addis Ababa, there may a day-to-day physical activity, moderate alcohol consumption, no smoking, and sufficient vegetable and fruit consumption; these four habits in combination can make a new lifestyle and healthy living habits.

In this study only 32.8% adhered to a healthy diet. This finding is higher than a study reported in Columbia (14.1%) and Korea (<20%) (Fang et al., 2016; Xiao et al., 2011). But, much lower than the previous studies reported in Hara (81.8%), Addis Ababa (64.7%), and Tigray (67.20%) (Nadewu et al., 2018; Hareri et al., 2013; Gebremichael et al., 2019).

There might be also due to the economic class, as the nation is more industrialized the chance of adhering to a diet decrease due to easy access of non-recommended diets in restaurant and hotels. The national difference, there might be due to basic knowledge, practice, and attitude about hypertension. In a study conducted in Bahir Dar, the level of knowledge

and practice among people with hypertension was poor (35), meanwhile in Addis Ababa and Tigray practice were relatively good (Ayele et al., 2017; Bacha et al., 2019; Bayray et al., 2018).

Physical activity plays an important role in preventing and managing hypertension. It is a cost-effective, practical, and natural, not need sophisticated technology, and effective way of controlling hypertension (Ghadieh et al., 2015). Despite the recommendation that confirms the health benefits of physical activities in reducing and preventing diseases, evidence showed that an ample of people remain physically inactive (Perkovic et al., 2007; Rossi et al., 2012). The result of our study showed that 41.9% of participants had adhered to physical exercise. Similar study reported in Korea (47.3%), Israel (50%) and Columbia (46.6%) (Fang et al., 2016; Ayele et al., 2017; Heymann et al., 2011). The magnitude of this finding is higher than a study conducted in Addis Ababa (31.4%) and lower than in Hara (62.3%) (Tibebu et al., 2017; Nadewu et al., 2018). More educational programs and intervention measures for adhering to physical activity should be targeted at people with hypertension.

In this study, 91.2% of participants were adhered to alcohol consumption; 98.7% of participants were non-smokers, and 79.9% of the participants had adhered to salt intake (limit less than 5 g per day of dairy consumption). Our findings indicated that more than 90% of the participants were adherent to healthy lifestyle modifications related to smoking and alcohol abstinence. This finding is consistent with the study conducted in Tigray, non-smoker were 89.9%-99.1% and alcohol abstainers were 67.2%-68.8%, Harar non-smoker were 95.8%, and alcohol adherence was 98.5% (Gebremichael et al., 2019; Niriayo et al., 2019; Nadewu et al., 2018).

In contrast, a low proportion of adherence to low salt intake was 29% in Tigray, Ayder comprehensive specialized hospital, and less than 20% in Korea (Ayele et al., 2017; Niriayo et al., 2019). This variation could be due to the differences in sociocultural factors. Salt intake in Korea principally comes from home-processed foods or condiments added during cooking, which differs from the situation in our country. Sodium intake in Korea is high, with about half the population consuming >4000 mg/day, twice the recommended upper limit (Lee et al., 2013). Adherence to the recommended salt intake of fewer than 5 grams per day for adults helps to reduce blood pressure and risk of cardiovascular disease, stroke, and coronary heart attack. The principal benefit of lowering salt intake is a

corresponding reduction in high blood pressure (World Health Organization, 2007).

In this study, 44.5% of the respondents maintain normal body weight which is supported by a study in Korea 50% and higher than the study in Tigray 21.45% (Ayele et al., 2017; Niriayo et al., 2019). However, this finding is lower than the study of Harar 56.4% (Nadewu et al., 2018). Maintaining a 3% to 5% weight loss can significantly reduce the risk of cardiovascular disease (Expert Panel et al., 2014; Harsha et al., 2008).

In this study, an increased level of literacy who are college and above are more likely to adhered to a healthy lifestyle as compared to less level of literacy who cannot read and write, read and write, and primary educated. A previous study done in Harar, Tigray, and Ghana suggested that participants with a higher level of literacy linked to better adhere to healthy lifestyle modification (Nadewu et al., 2018; Gebremichael et al., 2019; Obirikorang et al., 2018). This is because literacy is help to participate meaningfully and assertively in decisions that affect one's healthy lifestyle. Literacy enables people to read their own world and to write their own healthy history and practice the recommended healthy lifestyle (Morrisroe, 2014).

Frequency of blood pressure is negatively affected the healthy lifestyle modification. In this study, participants who measured blood pressure when they feel sign and symptoms was less likely adhered to healthy lifestyle modification than those who are measured their blood pressure daily. It may be due to the positive association of daily blood pressure measurement is important to identify white coat hypertension, detect masked elevated blood pressure, provide valuable information regarding treatment outcomes, and effectively adjust healthy life modification as recommended.

Knowledge about hypertension was significantly associated with healthy lifestyle modification. Participants who had good knowledge were 4.8 times more likely to adhere to healthy lifestyle behaviour. This is supported by the study finding in Addis Ababa, Mizan Tepi, Tigray, and Jordan (Tibebu et al., 2017; Angelo et al., 2020; Fetensa et al., 2019; Alefan et al., 2019). The findings suggest that good knowledge of hypertension is linked to adherence to healthy lifestyle modification and an improvement in blood pressure control (Deji-Dada et al., 2019).

In this study, social support was significantly associated with adherence to healthy lifestyle modification. Participants who had strong social support from their families, neighbours, and friends were 5.2 times more likely to adhere to healthy lifestyle modification. This finding was consistent with studies conducted in Addis

Ababa (Tibebu et al., 2017). This might be due to the effect of social support on emotional wellbeing (as in receiving love and empathy) and practical help (like the gift of money, assistance with recommended care).

## **CONCLUSION**

In the current study, adherence to healthy life behaviour is 14.9%. This shows that adherence to healthy lifestyle behaviour is very low. Educational level, daily blood pressure measurement, knowledge about hypertension, and social support were found significantly associated with adherence to the recommended healthy lifestyle modification. To be promoted to optimal blood pressure control client-centered care is essential. Therefore, the health care providers should be availed of a social network of family and friends and providing education about hypertension to produce positive impact for healthy lifestyle behaviour.

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## **INFORMED CONSENT AND PATIENT DETAILS**

This study was conducted after approval of the proposal by Bahir Dar University College of medicine and health sciences institutional review board committee. Before the actual data collection, ethical approval and clearance were obtained from this board. Permission and the supportive letter were obtained from the Amhara public health institute and each hospital medical director's office. Participation was voluntary information was also collected anonymously after obtaining written consent from each respondent by assuring confidentiality. The participants also told the objective of the study and the right to refuse, stop, or withdraw at any time of data collection. Finally, participants were informed that no incentive or harm for their participation in this study.

## **AVAILABILITY OF DATA AND MATERIALS**

All data are available in the manuscript.

## **ETHICS APPROVAL AND CONSENT TO PARTICIPATE**

Not applicable.

## **CONSENT FOR PUBLICATION**

Not applicable.

## **COMPETING INTERESTS**

The authors declare that we have no competing interests.

## **AUTHOR CONTRIBUTIONS**

All authors made important contributions to the manuscript preparation. MG and TA conceived the study and involved in the design, conduct the research and drafted the manuscript. MW, NS, and TY analysis, interpret the data and review the manuscript. All authors read and approved the final version of the manuscript.

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