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Adherence to Lifestyle Modifications and Associated Factors Among Adult Hypertensive Patients Attending Chronic Follow-up Units in Public Health Centres of Addis Ababa, Ethiopia, 2025

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ABSTRACT

Hypertension is a leading risk for death and disability globally, along with increasing comorbidity. Hypertension is one of the modifiable risk factors for CVD and renal diseases. The most neglected causes of uncontrolled hypertension are unhealthy lifestyles. Most research done on hypertension focuses on medication, adverse events of the medication, and the patients'" sense of well-being. Populations in low and middle-income countries are especially being affected through engagement with easily modifiable risk factors like unhealthy diet, tobacco, Alcohol and physical inactivity. Even though there are a large number of patients in the NCD unit of Addis Ababa health centers, research has not been conducted sufficiently to assess patient adherence to lifestyle modifications. To assess the level of adherence to lifestyle modifications and associated factors among hypertensive patients attending follow-up in NCD units of public health centers in Addis Ababa, Ethiopia. -Institution-based Cross-sectional study conducted at three health centers selected by simple random Sampling, sample size is 416, and study participants were selected using systematic random Sampling. Data were collected using the KOBO toolbox and transferred to SPSS version 27.0.1 for data processing and analysis. Descriptive statistics were used to describe study variables. Bivariate and multivariable regression analysis were performed with 95% confidence intervals and a p-value <0.05 to declare statistically significant associations. The results were finally presented using text and tables. The study included 414 respondents, yielding a response rate of 99.5%. Almost half of the study participants (50.9%) were male, and the mean Age was 56.59 (44.05, 69.14). The respondents' adherence to lifestyle modifications was 17.2%. Age, sex, educational status, knowledge about the disease and self-efficacy were found to be significantly associated with the dependent variable. The level of adherence to lifestyle modifications was generally found to be low. Therefore, educational sessions that specifically focus on lifestyle modifications and ongoing Support for patients should be designed, and studies assessing all components of lifestyle change should be conducted for comparison among different subgroups.

INTRODUCTION

Hypertension, or raised blood pressure, is a leading risk factor for death and disability globally and is often accompanied by increasing comorbidities. An estimated 1.39 billion adults worldwide live with hypertension—349 million in high-income countries and 1.04 billion in low- and middle-income countries (LMICs) (1)(2). Although it is a global public health concern, hypertension disproportionately affects populations in LMICs, which account for nearly 80% of deaths—primarily due to weak health systems.

In Ethiopia, the prevalence of hypertension is steadily increasing, currently estimated at 34.7%, with a higher proportion among males (53.8%) compared to females (46.2%) (3). Uncontrolled hypertension significantly raises the risk of cardiovascular diseases such as stroke, myocardial infarction, and congestive heart failure, as well as complications like chronic kidney and eye diseases. Hypertension-related complications account for 9.4 million of the 17 million annual cardiovascular-related deaths worldwide. It is also responsible for 45% of heart disease deaths and 51% of stroke deaths (4).

Despite these grave outcomes, hypertension remains poorly controlled globally, mainly due to inadequate non-pharmacological interventions such as lifestyle modifications. Effective health promotion should therefore integrate both pharmacological treatment and lifestyle changes, as both are proven to help prevent and control hypertension. Recommended lifestyle modifications include adhering to the DASH diet, restricting sodium intake, engaging in regular physical activity, moderating alcohol consumption, and quitting Smoking. Although many patients prioritize medication, adherence to both pharmacological and non-pharmacological treatments should be given equal emphasis (5).

Several studies worldwide have demonstrated suboptimal adherence to lifestyle modifications. In Ethiopia, adherence to self-care practices is low, estimated at just 23%, while adherence to antihypertensive medication is approximately 67% (5). Given that many lifestyle and diet-related factors are modifiable, their role in hypertension prevention and treatment is vital—especially for patients with additional cardiovascular risk factors such as dyslipidemia and diabetes (6).

Multiple factors influence adherence to both medication and lifestyle changes. These include demographic characteristics (e.g., Age, income, education), comorbidities, knowledge of the disease, self-efficacy, social Support, smoking status, obesity, alcohol use, sedentary behavior, and the availability of continuous health education and counseling (6).

To implement lifestyle modifications successfully, systemic changes may be necessary—such as the formation of multidisciplinary teams, incentives for counseling, and public campaigns that reinforce the fact that hypertension, when controlled, need not limit one's quality of life. Primary care practitioners should recommend lifestyle changes for all pre-hypertensive and hypertensive patients.

Hypertension presents a significant public health challenge globally and is often underestimated, particularly in LMICs. While its development and progression can usually be prevented or delayed through healthy lifestyle choices, there is a lack of research examining adherence to these lifestyle modifications in Ethiopia. Hence, this study aims to assess adherence to lifestyle modifications and associated factors among hypertensive patients attending chronic follow-up units in selected health centers in Addis Ababa, Ethiopia.

(a) 1.1. Statement of the Problem

Hypertension is one of the most significant modifiable risk factors for cardiovascular and renal diseases. However, awareness, treatment, and control of hypertension remain very low in developing countries like Ethiopia (7). Once considered rare, hypertension is now a significant cause of morbidity and mortality in these regions. Despite the rising threat posed by non-communicable diseases (NCDs), communicable diseases continue to dominate the attention of policymakers and foreign aid organizations (8).

Evidence shows that early identification and self-management of chronic diseases, such as hypertension, are effective strategies. Clinical guidelines consistently recommend lifestyle modifications alongside pharmacological therapy, including dietary changes, regular exercise, smoking cessation, and reduced alcohol consumption. Yet, adherence to these recommendations remains poor (5).

Even with the availability of effective antihypertensive drugs, outcomes have not improved as expected—partly due to low adherence to lifestyle modifications. A study at Dessie Referral Hospital reported an adherence rate of only 23.6% to lifestyle changes (9). These findings highlight the persistent issue of uncontrolled hypertension, often rooted in poor adherence to both medication and lifestyle interventions.

The World Health Organization (WHO) emphasizes that improving adherence to lifestyle changes should take precedence over developing new medications. Nevertheless, most research focuses heavily on medication-related factors, neglecting the impact of unhealthy lifestyles, particularly in LMICs. Easily modifiable risk behaviors—such as poor diet, physical inactivity, Smoking, and harmful alcohol use—are prevalent and need urgent attention (8).

Only a limited number of studies have specifically examined adherence to recommended lifestyle behaviors. These few studies indicate particularly low adherence to physical exercise (10). Such noncompliance leads to poor blood pressure control, irreversible health complications, and increased reliance on expensive and complex healthcare services (11).

Some researchers have investigated factors that influence adherence, often emphasizing sociodemographic characteristics. For instance, a study conducted in Addis Ababa found significant associations between marital status, employment status, duration of hypertension, and medication adherence (12).

Despite the influence of demographic variables, there is a lack of comprehensive research examining the broader range of factors that affect adherence to lifestyle modification. Given the growing burden of hypertension and its complications, greater

attention must be directed toward understanding and addressing barriers to lifestyle changes. This study aims to fill that gap.

1.1. Significance of the Study

Adherence to lifestyle modification practices remains a significant challenge for patients living with hypertension. Effective management of hypertension requires patients to make consistent lifestyle changes, actively monitor their blood pressure, and adhere to prescribed treatment regimens as early as possible. Identifying existing gaps in adherence to lifestyle modifications among hypertensive patients is crucial for informing policymakers and guiding the development of targeted interventions to address these gaps. Such efforts could play a vital role in preventing and controlling cardiovascular and renal complications associated with uncontrolled hypertension.

Furthermore, this study has significant implications for clinical practice, particularly in informing nursing interventions that aim to enhance patient adherence and outcomes. By highlighting the magnitude of the issue, the findings can serve as a foundation for evidence-based health education and behavioral change strategies. Additionally, the study can provide a baseline for future research on adherence to lifestyle modifications among patients with hypertension and other chronic diseases.

Despite the high number of patients attending non-communicable disease (NCD) clinics in health centers across Addis Ababa, there is a noticeable lack of research assessing patient adherence to recommended lifestyle modifications. This study aims to fill that gap and provide valuable insights for both practice and policy.

2. Literature Review

Numerous studies around the globe have examined adherence to lifestyle modification practices among patients diagnosed with hypertension. These modifications—such as reducing salt intake, following a fruit- and vegetable-based diet, increasing physical activity, limiting alcohol consumption, and quitting Smoking—are crucial for managing hypertension and lowering cardiovascular risk.

A systematic review (13) found that adherence to these practices varies significantly across populations. Factors influencing adherence include Age, gender, socioeconomic status, and health literacy. In the United States, one study (14) reported that only 50% of hypertensive patients adhered to dietary recommendations, and adherence to physical activity guidelines was even lower. Similarly, a European study (15) demonstrated that although lifestyle modifications led to improved blood pressure control, only a minority of patients consistently followed all recommended behaviors. These findings highlight the global challenge of adherence and underscore the need for tailored interventions to address population-specific barriers to adherence.

In Africa, studies reveal unique contextual challenges. A Nigerian study (16) reported low adherence to dietary and physical activity guidelines, mainly due to cultural food practices and limited access to exercise facilities. In South Africa, adherence was hindered by poverty and low educational levels, despite general awareness of the importance of lifestyle changes (17). In Ghana, poor health literacy and inadequate counseling from healthcare providers have been identified as significant barriers to adherence to lifestyle modifications (18). These findings highlight how social determinants—beyond individual behavior—play a substantial role in shaping adherence across African settings. Thus, culturally sensitive and multifaceted approaches are necessary to address these challenges effectively.

In Ethiopia, research on lifestyle modification adherence is expanding. A study conducted in Addis Ababa (19) reported that only 30% of hypertensive patients adhered to dietary recommendations, and even fewer engaged in regular physical activity. Barriers included low awareness of hypertension management guidelines, cultural nutritional habits, and limited access to recreational facilities. Another study in the Amhara region (20) found that low income and education were major predictors of poor adherence. Furthermore, lack of regular follow-up and healthcare provider support significantly hindered sustained lifestyle changes, especially in rural communities (21). A 2016 study in Addis Ababa revealed that only 23% of respondents adhered to all recommended lifestyle modifications, although 69.1% adhered to dietary changes.

Beyond demographic and socioeconomic factors, psychological and behavioral components also influence adherence. Constructs such as health beliefs, self-efficacy, motivation, and perceived severity of illness are well-established determinants of health behavior. A cross-sectional study in India (22) showed that patients who perceived their hypertension as a serious health threat and believed in the effectiveness of non-pharmacologic interventions were more likely to adhere to lifestyle recommendations. These findings support the Health Belief Model, which emphasizes perceived benefits, perceived barriers, and self-efficacy as drivers of health-related behaviors. Patients with higher self-confidence in their ability to change behaviors (self-efficacy) were more consistent in reducing salt intake, increasing physical activity, and avoiding Alcohol.

Social and familial Support also plays a critical role in adherence to lifestyle modification. A qualitative study from Kenya (23) found that emotional and instrumental Support from family—especially spouses and children—motivated patients to follow dietary advice and stay active. Peer support groups further reinforced accountability and shared goals, contributing to sustained lifestyle changes. These findings suggest that adherence interventions should include patients' immediate social networks to create a supportive environment.

Equally important is the role of the healthcare system and the interactions between providers and patients. Studies from multiple low- and middle-income countries (LMICs) (24) have demonstrated that the quality and frequency of lifestyle counseling directly influence adherence. Barriers such as limited time for counseling, poor communication, lack of continuity in care, and absence of structured follow-up contribute to poor adherence. These findings underscore the

need to incorporate lifestyle counseling into routine hypertension care, supported by trained health professionals and standardized educational materials.

In response to systemic barriers, digital health interventions have gained momentum as tools to promote adherence to healthcare. Mobile health (mHealth) applications, SMS reminders, and telehealth platforms have shown promise in enhancing patient engagement. A pilot study in Tanzania (25) that used mobile phone messages to provide lifestyle advice resulted in improved adherence and patient satisfaction. These digital tools can help bridge gaps in access to care, particularly in resource-limited settings. However, challenges such as low digital literacy, limited smartphone ownership, and poor internet access in rural areas remain. Therefore, while promising, the successful implementation of digital solutions must address these infrastructural and equity-related challenges.

In summary, the literature indicates that a complex interplay of individual, interpersonal, systemic, and technological factors influences adherence to lifestyle modifications among patients with hypertension. Addressing poor adherence requires a multidimensional approach—combining patient education, psychological Support, provider training, health system strengthening, and digital innovation. Most importantly, these interventions must be culturally and contextually adapted to the local setting, particularly in low-resource environments like Ethiopia. A deep understanding of these dimensions is crucial for guiding the design of sustainable, evidence-based strategies that aim to improve the long-term outcomes of hypertensive patients across diverse populations.

2.1. Conceptual Framework

Framwork is shown on Figure 1.

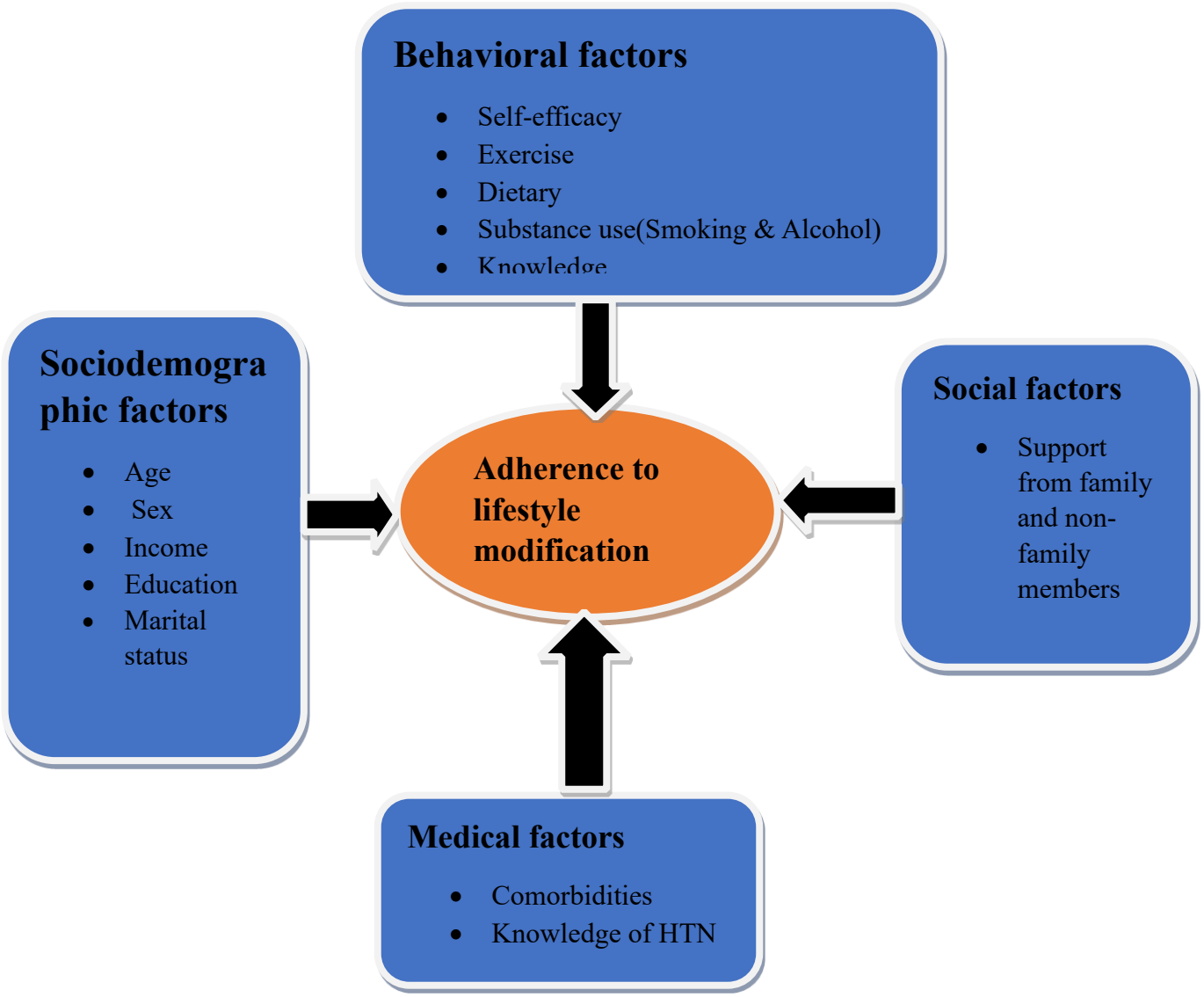

Figure 1. Proposed conceptual framework showing the factors associated with adherence to life style modifications of hypertension; adapted from review of literature (11)(5).

3. Objective

3.1. General Objective

To assess adherence to lifestyle modification practices and associated factors among hypertensive patients attending chronic follow-up units in selected health centers in Addis Ababa, Ethiopia, 2025

3.2. Specific Objectives

- To determine the level of adherence to lifestyle modification practices (dietary changes, physical activity, smoking cessation, and alcohol moderation) among hypertensive patients.
- To identify sociodemographic factors associated with adherence to lifestyle modification practices.
- To assess the impact of knowledge, self-efficacy, and health beliefs on adherence to lifestyle modifications.
- To examine the role of healthcare provider counseling and follow-up support in influencing lifestyle modification adherence.
- To explore the influence of social and familial Support on patients' adherence to lifestyle modifications.

METHODS

Study Area

Addis Ababa, the political capital and the most significant commercial and cultural hub of Ethiopia, is geographically situated at the center of the country, at 9°2' N latitude and 38°45' E longitude. The city lies at an average altitude of 2,400 meters above sea level, with its highest point located at Entoto Hill in the northern part of the city, rising to 3,200 meters.

Administratively, Addis Ababa is divided into 11 sub-cities (known as kifle ketemas) and 116 woredas, which are the most minor administrative units. According to the 2007 national census conducted by the Central Statistical Agency (CSA), the city had a population of 3,384,569. More recent projections estimate that the population will have reached 3,859,638 by 2022 (23). The total land area of Addis Ababa is approximately 530.14 square kilometers (km²).

The city is linguistically diverse. According to the 2007 census, the most widely spoken languages include Amharic (71.0%), Oromiffa (10.7%), Gurage (8.37%), Tigrigna (3.60%), Silt'e (1.82%), and Gamo (1.03%) (22).

Health infrastructure in Addis Ababa is relatively more developed than in other parts of the country. According to the 2012 Ethiopian Fiscal Year (EFY) Health and Health-Related Indicators published by the Ministry of Health, the city hosts a total of 49 hospitals. Of these, 13 are public (6 managed by the Addis Ababa City Administration and five by NGOs), and 32 are privately owned. Additionally, the city has 27 public health centers, 130 public health stations, and approximately 700 private clinics of varying levels of quality. These facilities play a vital role in delivering healthcare services to the rapidly growing urban population.

Study Design and Period

An institutional-based cross-sectional study was conducted from December 2024 to February 2025.

Population

Target/Source population

All hypertensive patients attending follow-up care at health centers in Addis Ababa, Ethiopia.

Study population

Hypertensive patients who meet the inclusion criteria and are present during the data collection period.

Study units

Individual Patients

Inclusion and exclusion criteria

Inclusion criteria

All patients aged 18 years and above with hypertension.

Patients who have been on antihypertensive treatment for at least six months before the commencement of the study.

Exclusion Criteria

Patients who are severely ill during the data collection period.

Patients with known mental health disorders that impair communication or comprehension.

Patients with communication difficulties that hinder effective participation in the study.

Sample Size Determination

The size of the study participants who were recruited into the research was calculated using the single population proportion formula separately. After comparing proportions for DietDiet related adherence, and exercise adherence, sample size was calculated considering a proportion of 0.437 (to get the largest sample size) (17), level of confidence of 95%, and margin of error 5%:

Sample size (n) = (Z ∝/2 P×(1-p))/d2

Where;

Z-level of significance, which is 1.96

p - Proportion of patients who adhere to lifestyle modifications

q- Proportion of patients who don’t adhere to self-management practices

d- Margin of error (0.05)

n- Minimum sample size

Substituting the values for each of these variables in the above formula, the sample size is estimated to be 378. Adding a non-response rate of 10%, the final sample size is 416.

To determine the sample size for identifying associated factors, the researcher used the following parameters based on a prior study:

Sample size (n) = (Z ∝/2 P×(1-p))/d2

Where;

Z-level of significance, which is 1.96

p - Proportion of patients who use Alcohol (0.2)

q- Proportion of patients who don't use Alcohol (0.8)

d- Margin of error (0.05)

n- Minimum sample size

These values were derived from a study conducted in Jimma University Medical Center (2021), where alcohol use was identified as a significant predictor of adherence to lifestyle modification.

Substituting the values for each of these variables in the above formula, the sample size is estimated to be 246. Adding a non-response rate of 10%, the final sample size is 271.

Since the first objective required 416 participants and the second objective required 271, the larger sample size (416) was used to ensure sufficient power for both objectives.

Sampling technique/procedures

Ninety-eight public health centers in 11 sub-city administrations of Addis Ababa city give chronic follow-up services. Addis Ketema Sub-City is selected by the lottery method. From Addis Ketema sub-city, three health centers were chosen using a lottery method (simple random Sampling). The selected health centers were Felege Meles Health Center, Abebe Bikila Health Center, and Ginbot 20 Health Center. The study was conducted on the selected health centers 'NCD follow-up units. The number of study units for each subject was selected using simple random Sampling. In Felege Meles HC 138, in Abebe Bikila HC 139 and Ginbot 20 HC 139 (Figure 2).

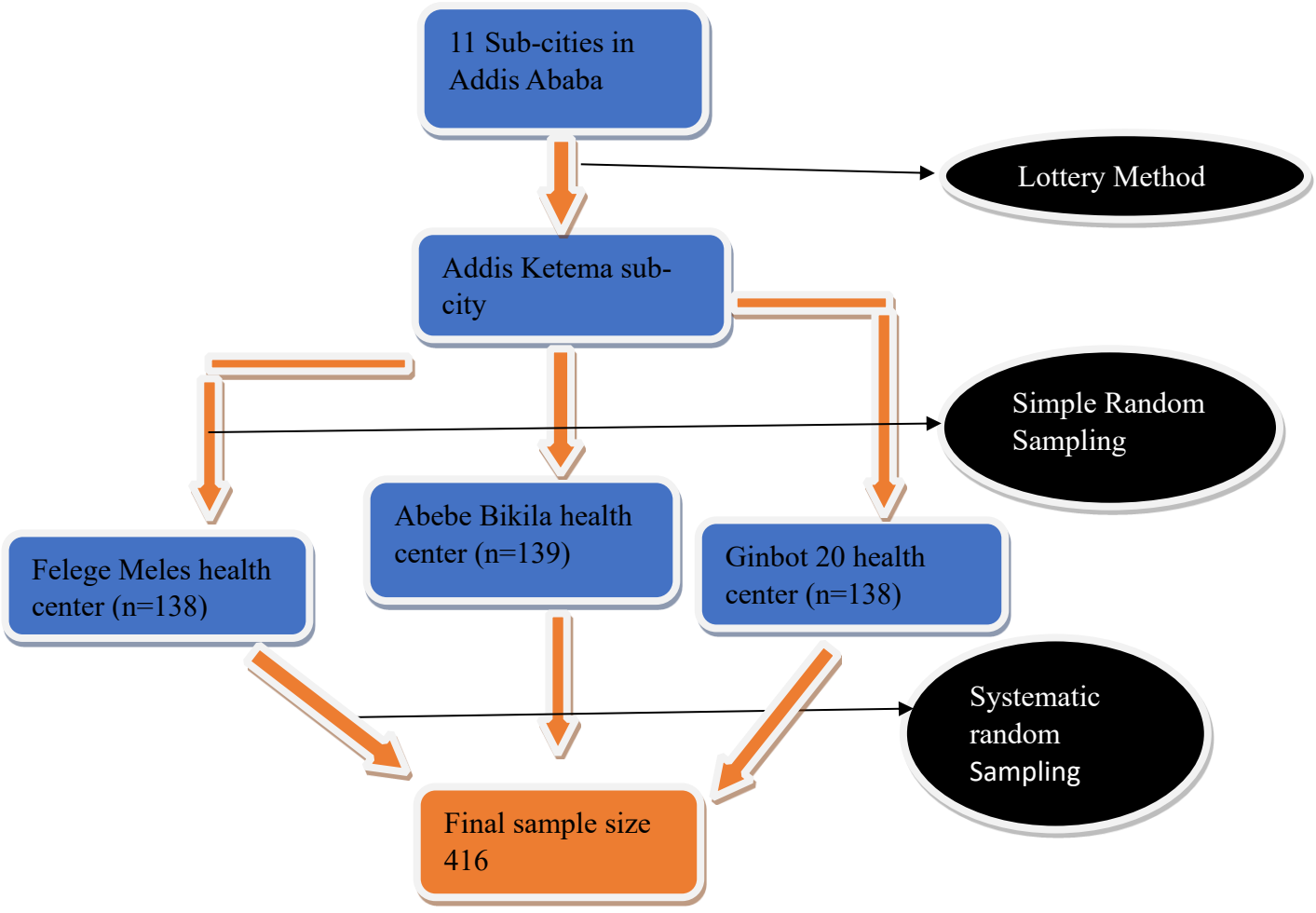

Figure 2. Sampling Techniques.

4.7. Variables of the Study

4.7.1. Dependent Variable

Level of Adherence to recommended lifestyle modifications (Good adherence vs poor adherence).

4.7.2. Independent Variables

• Sociodemographic factors

o Age, sex, marital status, level of education, income

• Personal factors

o Comorbidities, knowledge about the disease, duration of hypertension, duration of antihypertensive medication intake

• Behavioral factors

o Self-efficacy

• Social factors

o Support from families and non-family members of the society

4.8 Operational Definition

- **Adherence:** The extent to which a person's behavior (executing lifestyle changes) corresponds with recommendations from health care providers.
- **Good adherence to lifestyle modification:** Means Adherence to Diet-related adherence, Exercise-related adherence, smoking-related adherence and Alcohol consumption-related adherence(5).
- **Poor adherence to lifestyle modification:** means if the client failed to adhere to either one of the above components of adherence.
- **Diet-related adherence:** In this study, respondents who reported usually or always consuming a diet rich in vegetables, grains, and fruits, rarely or never consuming salt, and rarely or never consuming foods rich in spices and saturated fat were considered adherent.
- **Exercise-related adherence:** respondents who reported that they exercise for >30 minutes per day, at least three times per week.
- **Smoking-related adherence:** respondents who reported that they either never smoked or stopped smoking.
- **Alcohol consumption-related adherence:** respondents who reported that they either never consumed Alcohol or stopped consuming Alcohol (24).
- **Comorbidities:** respondents with one or more medical conditions in addition to HTN.
- **Knowledge about hypertension:** respondents with scores above the mean value on the Hypertension Evaluation of Lifestyle and Management (HELM) scale were considered to have good knowledge about hypertension (25).
- **Social** Support refers to the Support gained from family and non-family members. In this study, respondents whose score was above the mean value on the Duke Social Support and Stress scale were considered to have social Support (26).
- **Self-efficacy** is the belief in one's capabilities to organize and execute the courses of action required to produce a given attainment. In this study, respondents who scored above the mean value on the six items of the Chronic Disease Self-Efficacy Scale were considered to have good self-efficacy in coping with and managing their disease (27).

4.9. Data Collection Instruments

A structured, interviewer-administered questionnaire, similar to those used in previous studies, is employed to collect data on adherence to lifestyle modifications and associated factors, utilizing the KOBO toolbox. All the questions were prepared in English and translated into Amharic by experts who are fluent in both languages, and then back-translated into English to ensure consistency.

Adherence to lifestyle modification was assessed in terms of four components, including diet, regular exercise, alcohol consumption, and cessation of Smoking. Since there were no available standard questionnaires to determine adherence to lifestyle modifications, it was prepared by the principal investigator from a review of pertinent literature (5)(11)(28).

The Hypertension Evaluation of Lifestyle and Management (HELM) scale, comprising 14 items, was utilized as a tool to assess respondents' knowledge (25). The questions were modified to 10 as the questions "7 and 8" were country-specific, and questions "12 and 13" did not meet the study objectives. The tool contains selected-response items, with the correct answer coded as "1" and the incorrect answer as "0".

The Duke Social Support and Stress Scale, which contains 12 items, was used to assess Support gained from family, friends or significant others. Responses were coded as follows: "none" =0, "some" =1, "a lot" =2, "yes" =2, "no" =0 and "there is no such person" =0. Blank responses were considered as "0". The support score was calculated by summing the six responses in both sections (family and non-family Support); based on the reply to the last question, 2 was added to the family or non-family Support. The resulting total was divided by 22 and then multiplied by 100 to obtain a score ranging from 0 to 100 (26).

The six items of the Chronic Disease Self-Efficacy Scale were used to measure self-efficacy. The reported internal consistency reliability was 0.91(27). Initially, each item contained a 10-point scale ranging from "totally unconfident", "unconfident", "not sure", confident ", and "totally confident". The alternatives were modified to five categories: completely unconfident (scored 1), unconfident (scored 2), not sure (scored 3), confident (scored 4), and confident (scored 5).

4.10. Data Collection Methods

Data were collected through face-to-face interviews. The investigator was responsible for the overall management of the project, including the development of the final questionnaire, securing the participation of selected patients, identifying, training, and assigning data collectors and supervisors.

The Data collectors were three trained diploma nurses assigned to each of the three health centers' chronic follow-up units and supervised by one General medical practitioner (MD). The principal investigator provided daily overall supervision. The purpose of the training was to ensure that all the data collectors had the same information about the study instrument and followed the same interview procedures. The training covered the purpose of the study, confidentiality, and how to approach and forward questions to clients.

4.11. Data Quality Assurance

Both the data collectors and supervisors received one-day training on the research's objective and methodology, as well as the data collection approach. The questionnaire was translated into Amharic and then back-translated into English by another person to verify consistency. A pretest was conducted in 5% of the samples at a healthcare institution that was not included in the final study. The data collection instrument was assessed for completeness, consistency, and applicability and was ratified accordingly. The study procedures protected the patient's privacy by allowing anonymous and voluntary participation.

4.12. Data Processing And Analysis

Data were checked and cleaned after being entered into the KOBO toolbox and then imported into SPSS version 27.0 software for analysis. Incomplete and inconsistent data were excluded from the study. Descriptive statistics were used to describe the sample. The results of the descriptive statistics were expressed as percentages and frequencies. Associations between independent and dependent variables were initially analyzed using bivariate analysis to identify factors associated with the outcome variable. Those variables that were found to have an association with the outcome variable at $P < 0.2$ were entered into multivariate logistic regression to test for independent association. The magnitude of the association between the independent variables and the dependent variable was measured using odds ratios and 95% confidence intervals (CIs). P values below 0.05 were considered statistically significant.

4.13. Ethical Consideration

The Addis Ababa Health Bureau wrote the cooperation letter after obtaining ethical clearance and a support letter from the Africa Medical College. The cooperation letter was then submitted to Adiss Ketema Sub City Health Bureau, followed by the Health Centers NCD Department, and permission was obtained from the department. General information about the study's objective is explained to those who are concerned. The confidentiality of the data collected was ensured.

4.14. Result Dissemination

The findings were disseminated to the Africa Medical College Public Health Department using hard copy. The document will also be submitted to governmental and non-governmental stakeholders, such as the Addis Ababa health bureau, which serves on the NCD program, specifically the hypertension control program. Finally, it will be submitted for publication.

RESULTS

1. Sociodemographic Characteristics of Participants

Out of the total patients attending the chronic follow-up units of the three health centers during the study period, 414 eligible clients were included in the study, with a response rate of 99.5%. Analysis was made based on the 414 completed questionnaires. The study consisted of 211 (50.7%) males, which was nearly equal to the number of females. The mean Age of the respondents was 56.59 (44.04, 69.14) years. The majority of the respondents (49.5%), (77.4%), (38.9%) and (50.4%) of the respondents were in the age group 40-59 years, married, illiterate and retired, respectively. Two hundred six (49.5%) respondents have an income of 10,000 to 20,000 Ethiopian Birr (ETB), and 7(1.7%) have a monthly income of less than 5,000 ETB (Table 1).

Table 1: Sociodemographic characteristics of respondents attending chronic follow-up units of health centers, Addis Ababa, Ethiopia, 2024 (n=414).

Variables		Frequency n=414	Percent
Age	21-39	33	7.9
	40-59	**206***	49.5
	≥60	175	42.1
Sex	Male	**211***	50.7
	Female	203	48.8
Marital status	Married	**322***	77.4
	Single	49	11.8
	Divorced	24	5.8
	Widowed	19	4.6
Educational level	Illiterate	**162***	38.9
	Read and write	39	9.4
	Primary	26	6.3
	Secondary	82	19.7
	College/University	105	25.2
Work status	Retired	**209***	50.4
	Non employed	108	26
	Private business	40	9.6
	Private employee	34	8.2
	Government employee	23	5.5
Monthly Income	<5,000ETB	7	1.7
	5,000-10,000ETB	147	35.3
	10,000-20,000ETB	**206***	49.5
	>20,000ETB	54	13

2. Personal Characteristics of Participants

Out of the total 414 respondents, 207 (49.8%) were hypertensive for four or more years, and 186 (44.7%) were on hypertensive treatment for a similar amount of time. In general, 84 (20.2%) respondents have comorbid diseases, of which diabetes mellitus was found to be the most frequent comorbidity, with 15.9% of the respondents having it; 1% have coronary artery disease, 1.2 % have a history of stroke, 0.7% have CKD, and 1.4% have other comorbid diseases. The mean score for knowledge was found to be 5.64, and 350 out of 414 participants demonstrated knowledge about hypertension in general (Table 2).

Table 2: Personal characteristics of respondents in chronic follow-up units of health centers in Addis Ababa, Ethiopia, 2024 (n=414).

Variables		Frequency n=414	%
Time since diagnosis	Less than two years	81	19.6%
	Two to four years	126	30.4%
	Four or more years	207	50%
Duration since treatment	Less than two years	95	23%
	Two to four years	133	32%
	Four or more years	186	45%
Comorbidities	Present	84	20.3%
	Absent	330	79.7%
Knowledge about Hypertension	Good	350	84.5%
	Poor	64	15.5%
Blood pressure measurement	Controlled	309	74.6%
	Uncontrolled	105	25.4%

3. Behavioral and Social Characteristics of Participants

The mean scores for self-efficacy and social support were calculated and adopted as influencing factors to lifestyle recommendations adherence.

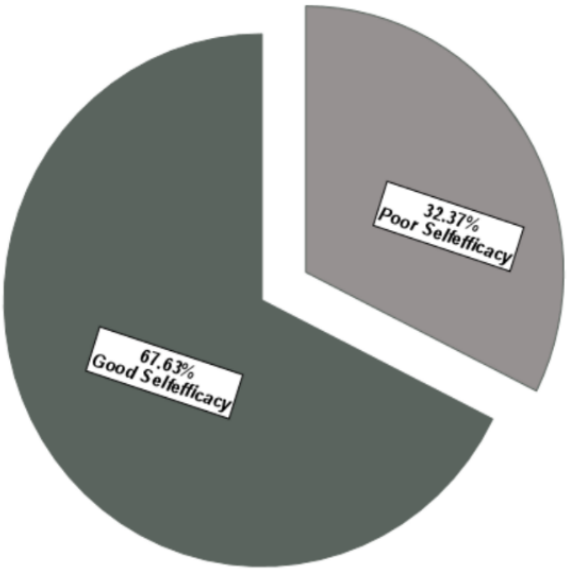

Figure 3: Self-efficacy of respondents attending chronic follow-up units of health centers in Addis Ababa, Ethiopia, 2024.

The mean score for the 6-item Chronic Disease Self-Efficacy Scale was computed based on the participants' responses and was found to be 22.42 ± 5.12. The respondents who scored above the mean on the chronic disease self-efficacy scale were 280 (67.3%) (Figure 3). Similarly, the total mean score of respondents' social Support on the Duke's social support and stress scale was 31.75 ± 4.47. More than half (59.4%) of the patients got Support from family and/or family members.

4. Adherence to Recommended Lifestyle Modifications

This study found that 17.2% (10.46%, 23.94%) of the respondents were adherent to all studied lifestyle recommendations (Good adherence). Of the respondents, 45.2% (56.9%, 33.47%) were adherent to DietDiet-related recommendations. The majority (97.4 %) of participants were nonsmokers or had ceased Smoking, and 66.6% of the participants were not alcohol consumers. Approximately half of the respondents (49.7%) did not engage in regular physical exercise for at least 3 days a week, with a minimum duration of 30 minutes per day. Most respondents (48.9%) reported jogging as the most common physical activity among those who were adherent to their exercise regimen. The study found that respondents were more adherent to behaviors related to lifestyle modifications like Smoking, physical activities and alcohol consumption, than dietary modification (Table 3 and 4)).

Table 3: Adherence to Lifestyle Modifications Among Hypertension Patients: Dietary, Exercise, Smoking, and Alcohol Consumption.

Variables		Frequency N=414	Percent
Adherence to lifestyle modifications	Good adherence	71	17.2%
	Poor adherence	343	82.8%
Diet-related adherence	Adherent	188	45.4%
	Non adherent	226	54.6%
Exercise-related adherence	Adherent	209	50.5%
	Non adherent	205	49.5%
Smoking	Ceased	405	97.6%
	Didn't cease	10	2.4%
Alcohol consumption	No consumption	277	66.6%
	Consume	137	32.9%

Table 4: Percentage of respondents' adherence to the types of lifestyle recommendations in health centers in Addis Ababa, Ethiopia, 2024.

Number of components adhered to	Percentage of respondents
All four components	17%
Three components	18%
Two components	43%
One component	22%

5. Factors Associated with Adherence to Lifestyle Modifications

After bivariate binary logistic regression was done for each variable, sex, Age, level of education, knowledge about hypertension and self-efficacy were found to be significantly associated (P-value<0.05) with good lifestyle adherence Female respondents were found 2 times more likely to have good adherence to recommended lifestyle modifications when compared to their male counterparts (AOR=2.251, 95% CI: 1.1256, 4.034). Unemployed respondents were found to have better adherence than the employed ones. Respondents in the older adult group were found to be adherent twice as often as respondents in the young adult age group (AOR = 2.2284, 95% CI: 1.237-6.017). Respondents with good knowledge were 1.4 times more likely to exhibit good adherence (Table 5).

Table 5: Shows the demographic, personal, social and behavioral factors associated with lifestyle adherence.

Variables		Lifestyle adherence		COR (95% CI)	AOR (95% CI)
		Good Adherence N(%)	Poor adherent N(%)		
Sex					
	Male	22(31)	189(55.1)	1.00	1.00
	Female	49(69)	154(44.9)	2.733(1.583,4.720)	**2.251(1.256,4.034***
Age in years					
	21-39	21(29.6)	154(44.9)		1.00
	40-59	41(57.7)	165(48.1)	1.822(1.031,3.222)	1.555(0.849,2.847)
	≥60	9(12.7)	24(7)	2.750(1.128,6.707)	**2.284(1.237,6.017)***
Education					
	No formal education	31(43.6)	169(49.3)	1.00	1.00
	Formal education	40(56.4)	174(50.7)	1.253(0.749,2.096)	1.412(0.807,2.473)
Knowledge					
	Poor knowledge	7(9.8)	57(16.6)	1.00	1.00
	Good knowledge	64(90.2)	286(83.4)	1.822(0.613,3.450)	1.454(0.613,3.450)
Self-efficacy					
	Poor efficacy	46(64.8)	234(68.2)	1.00	1.00
	Good efficacy	25(35.2)	109(31.8)	1.167(0.682,1.997)	**1.335(1.116,2.329)***

*AOR= statistically significant at p<0.05.

DISCUSSION

The study assessed adherence to lifestyle modifications and associated factors among hypertensive patients attending chronic follow-up units at selected health centers in Addis Ababa.

The mean Age of the participants in this study was 56.59 ± 12.55 years, which supports the notion that the disease primarily affects individuals in their late middle adulthood and above. Out of the 414 respondents, 211 (50.7%) were male, consolidating the results of different studies that the prevalence of hypertension is higher in males than in females. This could be due to psychosocial stress in males and health-seeking behavior in females (2–4,9,21,29)

This study aimed to assess the prevalence of adherence to lifestyle modifications and associated factors among hypertensive patients in health centers in Addis Ababa.

Adherence to Lifestyle Modifications

Respondents with good adherence (including diet, exercise, smoking cessation and alcohol consumption) in this study were only 17.2% (10.46%-23.94%). A study in Nepal, Netherland, Addis Abeba (Black lion hospital) and Desse found out that 20.3%, 17%, 23 % and 23.6% of respondents were adherent to all types of lifestyle recommendations respectively(9)(15)(30)(5), Finding from this research is almost similar with researches mentioned above suggesting that lifestyle modification adherence patterns may be similar across populations with shared sociodemographic characteristics. However, research conducted in Kumasi, Ghana (31) reported 72% adherence to lifestyle modifications. This could be due to the differences in cultural habits between the two countries and the residence of the study participants.

This study asserted that diet-related adherence is explained by consuming foods low in sodium, fat, and spicy foods, including more fruits, vegetables, grains, and beans in the diet. The prevalence of diet-related adherence in this study was 45.2% (33.47%,56.93%). This is slightly lower than a study done in Addis Ababa, where 69.1% of the respondents were found to be adherent, which is nearly similar to a study done in Desse (11). In contrast, a study done in Nepal found that the majority (69.3%) of the study participants didn't follow a special dietary modification (30). The discrepancy between the two local studies and the study from Nepal could be due to differences in dietary habits between the two countries and the residence of the study participants.

In this study, the exercise-related adherence rate was 31.4% (21.2%, 41.58%). Similar studies conducted in Ghana and Aksum (Ethiopia) found a 40.7% and 59.1% adherence, respectively (31,32). The possible explanation could be related to cultural differences and a lack of an organized setup in living areas in developing countries, such as Ethiopia, especially since the. Specifically, the sampling population of this study consists of individuals from a low socioeconomic status in Addis Ababa.

Smoking is one of the critical risk factors for CVDs, including hypertension. A large portion, 97.4% (96.2%, 98.6%) of respondents in this study had ceased Smoking or never smoked before. Findings related to smoking cessation are in line with studies conducted in Ghana, Nepal, and Aksum (Ethiopia), where the majority of respondents were found to be adherent (30–32).

In this study, respondents who consume Alcohol were found to be 66.6%. Over 84.3% of participants in a study in Ghana stated that they never drank Alcohol. This discrepancy can be attributed to cultural and religious factors.

Factors Associated with Recommended Lifestyle Modifications

This study found that females were more likely to adhere to lifestyle modifications. Several studies support this finding. For instance, a Ghanaian study found that males were poor at engaging with lifestyle components (30–32). This may lead to greater health consciousness and better healthcare engagement.

Middle and adult respondents were found to be more adherent than young adult respondents. A study from Ghana supports this finding. The reason for age-related differences could be further explained by the increased awareness about management and control of HTN that comes with increased Age and maturity.

Respondents with good efficacy were found to be more adherent than those with poor efficacy, which is consistent with most studies, including a survey conducted in Algeria in 2022 (33). This discrepancy could be due to increased attention and concern given by the respondents with poor efficacy because of the incapacities created after diagnosis and treatment of hypertension.

Strengths and Limitations

Strengths

Primary data from health centers. Collecting first-hand data from patients in actual healthcare settings adds depth and validity to your findings.

The study employs a comprehensive approach, assessing multiple lifestyle modifications (Diet, Exercise, Smoking, and Alcohol) rather than focusing solely on medication adherence.

It has local relevance in addressing the gap in adherence to lifestyle modifications among hypertensive patients in Addis Abeba.

Applying bivariate and multivariate binary logistic regression allowed us to identify independent predictors of adherence. This adds scientific rigor and helps isolate fundamental determinants from confounders.

The study provides data for urban populations in sub-Saharan Africa, which are often underrepresented in lifestyle-related cardiovascular research.

Limitations

The study didn't include hypertensive patients who were attending follow-up in private health facilities and hospitals. Additionally, it did not consider hypertensive patients who did not visit health institutions during the study period. The cross-sectional study design used was unable to establish cause-and-effect relationships. Additionally, research methodologies that involve self-reported measures rely heavily on individuals' memory, and recall bias may be a concern.

CONCLUSION

This study found that good adherence to recommended lifestyle modifications among hypertensive patients in Addis Ababa remains low (17.2%), particularly in dietary habits and physical activity. Smoking cessation and alcohol consumption were relatively higher, but overall adherence to multiple lifestyle recommendations was poor.

Factors such as sex, Age, and self-efficacy were significantly associated with adherence. Women, older individuals, and those with good self-efficacy were more likely to adhere, indicating that targeted strategies to improve self-efficacy could improve adherence rates.

Given the critical role of lifestyle modifications in hypertension management, urgent efforts are needed to bridge the gap between self-efficacy and practice among hypertensive patients.

Recommendations

Good adherence to lifestyle is significantly low, at 17.2%. Therefore, the researcher provides the following recommendations for policymakers, healthcare providers, and future researchers.

For Policymakers

Prioritize behavioral interventions for women and older adults, as they tend to have higher adherence rates, leveraging their existing strengths. For example, develop community-based peer support programs in which older patients mentor younger patients with hypertension.

Implement targeted health literacy programs for people with a low educational background.

Reinforce self-efficacy through personalized patient plans, as self-efficacy has been significantly associated with adherence. Therefore, health policies should mandate structured one-on-one goal-setting sessions between healthcare providers and patients with hypertension.

Redefine and promote alcohol abstinence as a key public health goal.

Incentivize physical activity through workplace and community programs.

For Health Care Providers

Design educational sessions that primarily focus on lifestyle modifications and ongoing Support for patients

Providing appropriate client/family education on all recommended lifestyle recommendations

Strengthen follow-up systems for patients with hypertension to reinforce adherence to lifestyle modifications.

For Future Studies

Conduct qualitative studies to explore cultural and socioeconomic barriers to lifestyle modifications.

Implement and assess the impact of community-based interventions on lifestyle adherence.

Expand studies to include hypertensive patients in private healthcare settings and rural areas to compare adherence levels.

Acronyms And Abbreviations

BP	Blood pressure
CSA	Central statistical agency
CVD	Cardiovascular disease
DM	Diabetes mellitus
HELM	Hypertension evaluation of lifestyle and management
HTN	Hypertension
MoH	Ministry of Health
NCD	Non-communicable disease

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