Lifestyle Modification Practice and Associated Factors Among Diagnosed Hypertensive Patients in Selected Hospitals in Central Gondar Zone

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ABSTRACT

BACKGROUND: Hypertension is one of the leading causes of disability and death in both developed and developing countries including Ethiopia. Non-communicable diseases account for 42% of deaths in Ethiopia. However, it is still widely undetected and poorly controlled. Hence, this study aims to assess the lifestyle modification practices and related factors of adult hypertensive patients in the central Gondar region of northwestern Ethiopia.

METHODS: Institutional based, cross-sectional study was conducted from April 10 up to May 10, 2021. A simple random sampling was used to select 629 study participants. Data were collected by using self-administered and structured questionnaire. Data were entered to EpiData 4.6 and exported to SPSS 20 for further analysis. A multivariable logistic regression analysis was employed to identify the factors associated with lifestyle modification. Adjusted Odds Ratio (AOR) with 95% confidence interval was used to show the strength of association, while a P-value <.05 of was used to declare the significance of association.

RESULTS: The overall prevalence of recommended lifestyle modification in hypertensive patients was 24.2% (95% CI (20.8, 27.5)). Age ⩾65 years (AOR = 0.59, 95% CI: 0.39, 0.88), no formal education (AOR = 0.65, 95% CI: 0.4, 0.97), diagnosis time is 5 to 10 years (AOR = 1.93, 95% CI: 1.11, 3.34), co morbidities (AOR = 0.47, 95% CI: 0.3, 0.73), and rich wealth index (AOR = 1.99, 95% CI: 1.22, 3.27) are is significantly associated with good lifestyle modification practices.

CONCLUSIONS: The practice of good lifestyle modifications in the study area was found to be low among the hypertensive patients. Respondents' age, education status, wealth index, duration of diagnosis, and co morbidities were found to be significant factors related to good lifestyle modification practices. Therefore, more attention should be paid to providing nutrition counseling and health promotion to improve the practice of lifestyle modification in patients with hypertension.

KEYWORDS: Hypertension, lifestyle modification practice, central Gondar, Ethiopia

Introduction

Cardiovascular diseases (CVDs) are a group of disorders of the heart and blood vessels includes coronary heart disease, cerebrovascular, peripheral arterial disease, rheumatic heart disease, congenital heart disease, and deep vein thrombosis and pulmonary embolism, are major causes of mortality and morbidity.[1] Globally, 20% to 40% of mortality attributed by CVDs and 50% of these deaths occurred in the industrialized countries.[2] In addition, by 2030, the cost of CVD will reach 863 billion US dollars, which will increase by 22%.[3] Moreover, the trends of disability-adjusted life years (DALYs) and years of life lost also increased from 17.7 to 34.4 million.[4] DALYs decrease by 57% from 1990 to 2017 in Ethiopia.[5] Hypertension is one of the major groups of CVDs, it accounts for about 45% of global CVD morbidity and mortality.[6-8]

Hypertension is defined as increased blood pressure; the force of blood flowing through blood vessels is consistently too high as systolic blood pressure is greater than or equals to 140 mmHg or diastolic blood pressure greater than or equals to 90 mmHg.[9] Nowadays, hypertension is a major public problem in both developed and developing countries, leading to a significant increase in morbidity and mortality.[10,11] Two thirds of hypertension cases live in low- and middle-income countries.[4] Most affected hypertensive people are neither aware of possible problems nor informed of signs and symptoms.

Globally, 20% to 40% of mortality attributed by Cardiovascular Disease (CVD) and 50% of these deaths occurred in the industrialized countries.[2] Globally, 1.5 billion (29%) of adult population are expected to have develop hypertension by the year of 2025. About 30.8% and 12.8% of hypertension reports in African and Sub-Saharan Africa, respectively.[12,13] Whereas, high (28.3%) prevalence of hypertension is observed in Ethiopia.[14] In addition, the trends of disability-adjusted life years (DALYs) and years of life lost

also increased from 17.7 to 34.4 million.[4] DALYs decrease by 57% from 1990 to 2017 in Ethiopia.[5]

According to the World Health Organization (WHO), the impact of hypertension and other cardiovascular diseases in developing countries has increased due to changes in the epidemiology of population and lifestyle changes.[15] Urbanization increases the chance of fleeing from the countryside to the city, encouraging sedentary life and developing cardiovascular diseases.[16] In addition, smoking, obesity, alcohol consumption, high cholesterol, and lack of exercise are also factors that cause hypertension.[17] Therefore, lifestyle changes, including losing weight when overweight, adopting dietary practices, limiting dietary sodium intake, moderate alcohol consumption, regular exercise, stress reduction, and smoking cessation are the first solutions before starting to take antihypertensive drugs.[18-20]

As a member of the World Health Organization, Ethiopia pays special attention to non-communicable diseases, adopting a global strategy and formulating a national non-communicable disease strategy for up to 10 years.[9] However, there is very little information about the life-changing practices of hypertension cases, and no research has been conducted in the study area. Therefore, this study aims to evaluate the compliance of patients with diagnosed hypertension in the study area to lifestyle modification practices and related factors.

Methods

Study design and period

An institution-based cross-sectional study was conducted to assess the lifestyle modification practices and associated factors among hypertensive patients in selected primary hospitals in the Central Gondar zone, Northwest Ethiopia from April 10 to May 10, 2021.

Study area

The Central Gondar zone is part of the Amhara region, 727 km away from Addis Ababa, the capital of Ethiopia. It has 12 administrative districts with a general population of 2 896 928. At present, there are 9 primary public hospitals in the zone, providing prevention, promotion, and treatment health services.

Source and study population

All hypertensive patients who were on follow up at hospitals in Central Gondar Zone was the source population whereas all adult hypertensive patients who came for follow up during the study period in the selected primary hospitals were considered as the study population.

Inclusion and exclusion criteria

All hypertensive patients, age >18 years and on medical treatment at least for 1 month's period before the start of the study were included in this study and Individuals who were not capable of hearing, speaking, and critically ill were excluded from the study.

Sample size determination

The sample size is estimated by using a single population proportion formula, and considering the following assumptions, the previous lifestyle change is 49.6%,[21] the confidence level is 95%, the margin of error is 5%, and the design effect is 1.5. Finally, 634 is the final sample of the study, with a non-response rate of 10%.

Sampling techniques

There are 9 public hospitals in the study area that provide chronic follow-up services. First, 4 public hospitals were selected from all hospitals through simple random sampling. Then, according to the monthly follow-up of patients, the sample size is proportionally distributed among the selected hospitals. Finally, the study subjects were selected by using systematic random sampling in every second interval.

Data collection tool and procedures

The data was collected using structured pre-test interviewers based on management questionnaires adapted from the WHO manual[22] and similar previous studies.[10,23] The questionnaire was first developed in English and translated into Amharic, and then translated into English by 1 English and 4 public health experts to check consistency. Eight well-trained clinical nurses and a public health officer were recruited as data collectors and supervisors. The questionnaire included socio demography, knowledge, dietary diversity; household food security, and source of information of the study participants were included. Participants' health profiles were collected from the chart of the patients.

Variable measurements

Salt consumption is measured by 10 items, pay attention to a healthy diet, avoid salt in cooking and diet, and avoid high-salt foods. Calculate the average score after the measurement.

Calculate mean score after the measurement. The mean score greater than 5 is considered a low-salt diet for people with blood pressure, and a low-salt diet is considered good consumption of salt.[24]

Physical activity is assessed using 2 items, including, what is the total number of physical activities you have done for at least 30 minutes in the past 7 days? In the past 7 days, in addition to doing things at home or as part of work, how many 7 days did you do certain exercise activities? The response is summarized, providing a range of 0 to 14. Based on result patients scored 8 and above was labeled as good physical activity practice and below 8 was classified as poor physical activity practice.[24]

Alcohol intake was assessed using 3-item having yes, and no response. Participants who reported that they had not consumed alcohol in the past 7 days or stated that they usually did not drink alcohol at all were considered non-drinkers.

Cigarette Smoking was assessed with 1 item having yes and no response with the number of days Smoked in the past 7 days. If the respondent who did not report the number of days in the last week is considered a non-smoker.[24]

Evaluate weight management by using 10 items that are used to manage weight through dietary practices, such as reducing portion size and changing food, and exercising to lose weight in the past 30 days. Item response categories range from strongly agrees (1) to strongly disagree (5). Responses with a score greater than 40 and above are classified as having good weight management practices.[24]

Body mass index (BMI) is calculated as weight (kg) divided by height (m^2). Then, after calculation, a BMI of less than 18.5 kg/m^2 means underweight, a BMI between 18.5 and 24.9 is a normal weight, and a BMI between 25 and 29.9 is more than 30 kg/m^2 are rated as overweight and obese respectively.[25]

The household wealth index is determined using principal component analysis (PCA), which takes into account household assets such as the number of cereal products, houses, livestock, and farmland ownership. First, the variable is coded between 0 and 1. Then, the variables entered and analyzed using PCA, and those variables having a communality value of greater than 0.5 were used to produce factor scores. Finally, add up the factor scores and divide them into poor, medium, and rich.

Dietary diversity of hypertension patients was measured using a standardized and validated tool containing 10 food groups. Use 24-hour recall of oral reports to classify the food categories consumed by hypertensive patients. Then, individuals who consumed more than 5 good groups in the past 24 days were considered to have adequate diversity, while those who consumed less than 5 food groups the day before were classified as inadequate dietary diversity.[26]

House hold food insecurity was measured using Household Food Insecurity Access Scale (HFIAS). It consists of 9 items specific to an experience of food insecurity occurring within the previous 4 weeks. Respondents were asked whether they had encountered the items because of lack of food or money to buy food in the last month. Finally, zero has been assigned to food-secured households. And if the family scores, it is considered that a person is food insecure.[26]

Lifestyle change practices by using items that include all the time, most of the time, some time, and for other reasons, and have never done so. Each domain of self-care practice activities (limit of salt consumption, regular exercise, weight management, quitting smoking, and limiting of alcohol consumptions) was asked with specific questions for participants to respond from the alternatives of all the time, most of the time, some of the time, already doing for other reason and never did. Then, patients' response mean and above the mean are classified as good lifestyle modification practices, while those below the mean are considered poor lifestyle modification practices.[23]

Data collection procedures

The data was collected using standardized questionnaires managed by pre-test interviewers, which were adapted from the World Health Organization manual[22] and various literatures.[10,23] The interviews were conducted by 4 trained clinical nurses from each hospital through face-to-face interviews, and a public health supervisor was assigned to each hospital. Through direct interviews with patients, the study participants' social demographics, knowledge, attitudes toward hypertension, dietary diversity, family food safety, and information sources were collected. Health profiles were collected from the chart of the patients and BMI was measured by taking patients' weight and height. Lifestyle activities were evaluated by adapting to local conditions from the Hypertension Self-care Activity Scale.

Data quality control

The questionnaire was prepared in English, then translated into Amharic, and then translated back to English to maintain consistency. Provided 1-day training on data collection techniques for data collectors and supervisors. The pre-test is conducted in 5% of the total sample size outside the study area. Investigators and supervisors observe and review the completed questionnaires during the data collection process and feed them back to the data collector for close supervision. At the end of each data collection day, check the completeness of the questionnaire for the main investigator and supervisor.

Data processing and analysis

The clean data was input into EpiData version 4.6 software and transferred to SPSS version 20 software for further analysis. Descriptive statistics are presented in the form of text, tables, and graphs. Bi-variable logistic regression analysis was used to check which variables are related to the dependent variable. Variable having a *P*-value of less than .2 was entered into multivariable logistic regression analysis for controlling the possible effects of confounders. Model fitness is tested by Hosmer and Lemeshow goodness of fit. The results confirm that the model fits well, and use tolerance and variance inflation factor (VIF) to check for multicollinearity. Finally, based on the adjusted odds ratio (AOR) and 95% confidence interval (CI), variables with a statistically significant association (*P* value less than .05) were determined.

Ethical consideration

Ethical clearance was obtained from Institution of public Health Research Ethics Review Board with a Ref. No. IPHRERC/147/2021. Permission was obtained from the

hospitals' managers. Participate in the research and be informed; obtained written and signed consent from the patient's willingness to participate. The patient's privacy was maintained by conducting the interview in a private place and they will be informed that there won't be any incentive or harm for their participation in this study.

Results

Socio–demographic and economic characteristics of participants

In our study, 629 patients were participated with a response rate of 99.2%. More than half 349 (55.5%) of the respondents were males. The mean age of the respondents was 54.98 with (SD = ±11.66) years and more than half 321 (51%) of the participants were with the age of <65. Most of 511 (81.2%) of respondents were orthodox by religion. Two thirds, 404 (64.2%) participants are currently married, and nearly half, 290 (46.1%) participants cannot read or write. More than half of 354 (56.3%) respondents were rural residents. In terms of occupation, 156 (24.8%) of nearly a quarter of hypertensive patients are farmers. One third of participants 209 (33.2%) are from low-income families (Table 1).

Dietary diversity and household food security related factors of respondents

More than three-quarters (76.6%) of study respondents have adequate dietary diversity. Three-quarters (75.4%) of the respondents have food security. The majority (76%) of the participants ate the grain-based food group, while only one-third (34.8%) of the study participants ate organ meat (Figure 1).

Health profile, source of information, and individual related factors

About (27.5%) of the participants had a family history of hypertension. Among them, only 27.6% of patients have made good lifestyle practice, and less than half (46.6%) of the participants obtained information about good lifestyle practice from health professionals. Currently, more than one-third of 230 (36.6%) participants have co morbidities. More than a quarter of 185 (29.4%) study participants were overweight.

Knowledge and attitude of patients toward lifestyle modification practices

The mean knowledge score of lifestyle modification practices among hypertensive patients in central Gondar was 2.78 (SD ± 1.76). More than half 366 (58.2%) of participants were have good knowledge about lifestyle modification practice. Half 321 (51%) of participants did understand that reducing excess salt and increasing vegetables can improve their condition. Nearly two-thirds, 376 (59.8) participants

did not know the importance of regular physical activities to control HTN. More than half 352 (56%) of patients did not know the effect of smoking on hypertension and 369 (58%) of participants did not understand the effect of alcohol on their hypertension. More than half (59.8%) of respondents had a positive attitude toward lifestyle modification. More than half (59.8%) of the respondents have a positive attitude toward lifestyle modification. More than two-thirds of the 410 (65.2%) study participants agreed that diets such as fruits have a positive effect on health. Half of the 379 (59.5%) patients agreed that limiting alcohol intake had a positive effect on hypertension. About two-thirds of 421 (66.9%) patients agree on the importance of physical exercise in controlling hypertension (Table 2).

Lifestyle modification practice

In this study, only 24.2% (95% CI: 20.8, 27.5) of patients implemented all the recommended lifestyle modification. More than half, 57.6% of the patients had reduced salt in their daily diet, 35% of the respond had good weight management, 45% of patients had performed recommended level of physical activity, 95.1% of patients were non-smokers, and 62% of patients were not drinking alcohol.

Factors associated with lifestyle modification practices among hypertensive patients

The multivariable logistic regression output indicated that age of the participants, education status, wealth index, duration of diagnosis, having co-morbidities and knowledge were found to be statistically significant associated with good practice of lifestyle modifications at $P \leqslant .05$.

According to current findings, people over 65 are 41% less likely to get good lifestyle modification practice compared to people younger than 65 (AOR: 0.59, 95% CI: (0.39, 0.88)). Patients with a diagnosis duration of 5 to 10 years are 1.93 times more likely to good lifestyle modification practice than those with a diagnosis duration of less than 2 years (AOR = 1.93, 95% CI: (1.11, 3.34)).

Compared with patients without co morbidities, patients with co morbidities are 53% less likely to make practice good lifestyle modification (AOR = 0.47, 95% CI: 0.30, 0.73).

Compared with respondents with formal education, those without formal education were 35% less likely to lifestyle modification practice (AOR: 0.65, 95% CI (0.44, 0.97)). The odds of lifestyle modification practice among patients who had poor knowledge were 45% times less likely as compared to patients who had good knowledge (AOR: 0.55, 95% CI: (0.36, 0.85)). Finally, compared with respondents in the rich-poor index, respondents in the rich index are twice as likely to make lifestyle modification practice (AOR = 1.99, 95% CI: (1.22, 3.27)) (Table 3).

Table 1. Socio-demographic and economic characteristics of participants Central Gondar Zone, Northwest Ethiopia (N = 629).

VARIABLE	CATEGORY	FREQUENCY	PERCENT (%)
Sex of the respondent	Male	349	55.5
	Female	280	44.5
Age of the respondents in years	<65	321	51
	≥65	308	49
Religion	Orthodox	514	81.7
	Muslim	101	16.1
	Catholic	5	0.8
	Protestant	9	1.4
Marital status	Married	404	64.2
	Single	34	5.4
	Divorced	72	11.5
	Widowed	119	18.9
Education status	Illiterates	290	46.1
	Read and write only	114	18.1
	Elementary	87	13.8
	Secondary	82	13
	Higher education	56	8.9
Occupation	Governmental employed	77.0	12.2
	Privet employed	92	15.6
	Merchant	115	18.3
	Farmer	156	24.8
	House wife	163	25.9
	Retired	15	2.4
	Student	5	0.8
Place of residence	Rural	354	56.3
	Urban	275	43.7
House hold wealth Index	Poor	209	33.2
	Middle	217	34.5
	Rich	203	32.3

Discussion

Now, controlling high blood pressure requires a difficult task between the government and the pharmacological and non-pharmacological therapeutic treatment options. Nonetheless, current research attempts to assess the lifestyle modification practices of adult hypertensive patients in primary hospitals, because lifestyle modification practices are very important for the prevention and treatment of hypertension.

This study showed that in the center of the study area, only 24.2% of hypertensive patients implemented the recommended lifestyle changes. This finding is consistent with studies conducted in Iran 27.79% (55), Durame 27.3% (14), and Dessie 23.6% (25). However, this finding is lower than reported by Ghana (72%) (56), India 54.7% (11), and Canada 89% (54). The possible difference may be due to the fact that patients from developed countries may be able to obtain adequate counseling from healthcare providers on how to manage the effects of high blood pressure through good life-changing practices. In addition, adults with hypertension may have a higher level of education in developed countries, and they can increase their
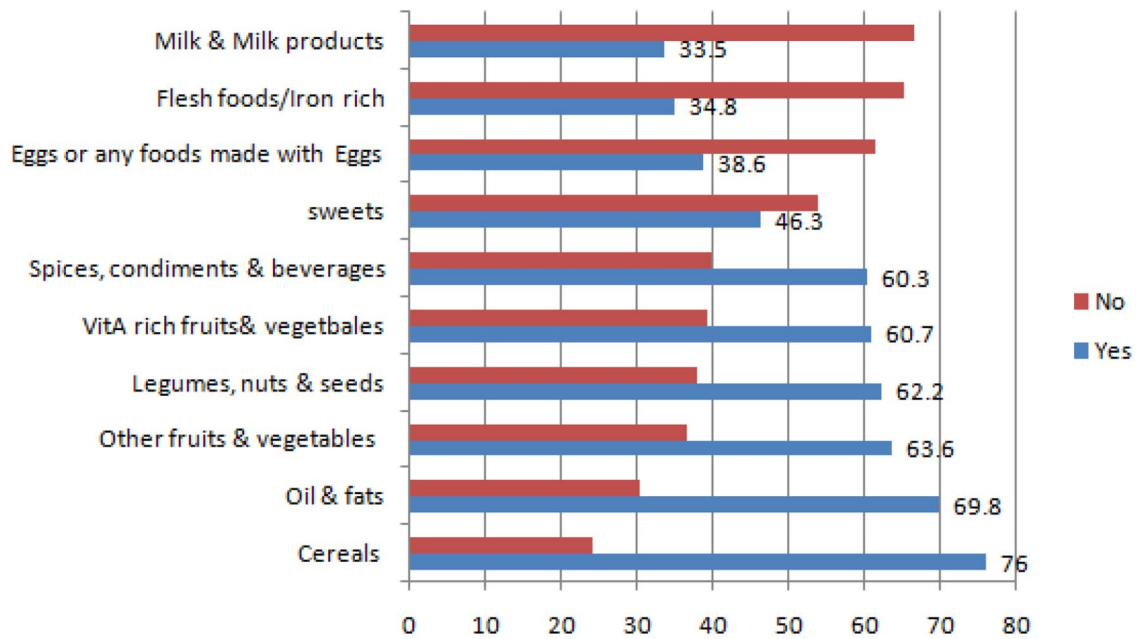
Figure 1. Proportion of adult hypertensive patients consuming individual food groups in the last 24 hours in Central Gondar Primary Public Hospitals.

awareness of lifestyle changes by reading magazines, leaflets, and books about managing hypertension.

This study showed that 35% of participants had good weight practice per management protocol which was higher than the result of the study done in West Bengal, India, 29% and African American hypertensive patients showed that only 30.1% of participants practiced weight reduction (44, 57) respectively. The possible explanation could be due to the difference in sample size, the current study used large sample size as compared with the previously done articles and the study setting areas. Among lifestyle modification 57.6% of the participants practicing limited salt diet (≤1 tsp/day of table salt). Similar study finding from Saudi Arabia shows that the 79.3% of patient practice low salt diet (58). This difference could be due to the economic class, the difference in the dietary habits and easy access of recommended diets.

The current study indicated that 45% of patients practiced physical activity for 30 minutes per day. In this study higher prevalence was observed when compared to the previous study conducted in Addis Ababa, 30.9% (33). South India, which was 24.5% (59), The lower prevalence was observed when compared with previous study conducted in North Carolina, 52.2% (60). This difference could be the instruments used to assess the level of physical activity level. Furthermore, the absence of organized community-based support and facilities for exercise in Ethiopia might have played a significant role in hindering patients to achieve the recommended level of physical activity. And also the study revealed that 95.9% of patients were non-smoker which was higher as compared with study conducted in Harar 81.5% (61). Jimma University Specialized Hospital 93% (62) and 62% of the participants were no alcohol drinkers. This finding was comparable to the

results of a study conducted among hypertensive patients at Ayder in Tigray region, where 67.2% (63) of patients were not consumption alcohol. This could be explained due to social, cultural, and religion influence that not promote alcohol drinking and smoking.

Compared with patients younger than 65 years old, patients older than or equal to 65 years old are 41% less likely to practice lifestyle modification. This finding is in line with study done from China (39), Nigeria (40), Durame (14), and Mizan (1). This may be because older people may be less educated and unable to obtain more information about lifestyle modification tools and procedures. In addition, with the increase of age, the income level generation decreases and the progress of hypertension are controlled by reducing the level of dietary modification, thereby affecting the level of lifestyle modification. Furthermore, young patients will be able to obtain a higher education status, which will help to obtain different information about good lifestyle modification from electronic and print media to manage their blood pressure. Younger patients may be prepared to exercise regularly to control the effects of high blood pressure.

On the other hand, Knowledge is also significantly associated with practice to healthy lifestyle modification. Hypertension patients who had poor knowledge were 45% times less likely to practice recommended lifestyle modifications than those had good knowledge. The possible explanation might be having good knowledge hypertensive patients about healthy lifestyle were more adherent to recommended practice of lifestyle modifications.

Educational status is significantly related to hypertensive patients with lifestyle modification practice. Patients without formal education were 35% less likely to practice lifestyle modification as compared to those who attended

Table 2. Health profile, source of information, and individual related factors among HTN patients in Central Gondar Zone primary public hospitals, Northwest Ethiopia, 2021(N=629).

VARIABLES	LIFESTYLE MODIFICATION PRACTICES	
	GOOD (N%)	POOR (N%)
Duration since diagnosis		
<2y	40 (26.3)	129 (27)
2-5y	51 (33.6)	210 (44)
5-10y	45 (29.6)	88 (18.4)
>10y	16 (10.5)	50 (10.5)
Family history of hypertension		
Yes	50 (32.9)	131 (27.5)
No	102 (67.1)	346 (72.5)
Hear of information		
Yes	128 (84)	37 (77.8)
No	24 (15.8)	106 (22.2)
Source of information's		
Health Professionals	75 (49.3)	21 (44.7)
Different medias	43 (28.3)	132 (27.7)
Family and friends	34 (22.4)	132 (27.7)
Co-morbidity		
Yes	45 (28.3)	187 (39.2)
No	109 (71.2)	290 (60.8)
Knowledge of patients toward LSMP		
Poor	52 (34.2)	206 (43.2)
Good	100 (65.8)	271 (56.8)
Attitude toward lifestyle modification practice		
Negative	61(40.1)	1929 (40.3)
Positive	91 (59.7)	285 (59.9)

formal education. This finding was supported by Nigeria (40) and Botswana (27). The possible explanation may be that individuals with higher education levels may be the main factor in reducing the mortality rate of hypertension through healthy lifestyle behaviors. Cognitive respect may be observed in patients with no formal education and formal education, because the level of education may increase the patient's awareness of the importance of recommending lifestyle changes to prevent hypertension and its complications. In addition, with a higher level of education, it is possible to obtain information, easily capture lifestyle modification during touch points, practice counseling, and prepare and perform physical activities according to a schedule.

Compared with participants with a low wealth index, participants with a high wealth index are almost twice as likely to make lifestyle modification. The report is supported by the findings of Saudi Arabia (66) and Durame (23). This could be due to patients with low income couldn't purchase the variety diet for increase meal plan for managing hypertension. In addition, patients with a high wealth index will be able to purchase materials for regular physical exercises and be able to pay for physical exercises at the Jim center on a regular basis.

Compared with patients who received treatment for less than 2 years, patients with diagnosis duration of 5 to 10 years were 1.93 times more likely to undergo lifestyle modification. This report is consistent with the findings of Mizan (1) and

Table 3. Multivariable logistic regression analysis factors of lifestyle modification among adult hypertension patients in central Gondar Zone public hospitals Northwest, Ethiopia, 2021 (N=629).

VARIABLES	LIFESTYLE MODIFICATION PRACTICE		COR (95% CI)	AOR (95% CI)
	GOOD	POOR		
Age				
<65 y	87 (57.2)	234 (49.1)	1	1
⩾65 y	65 (42.8)	243 (50.9)	0.72 (0.49, 1.04)*	**0.59 (0.39-0.88)****
Marital status				
Married	99 (65.1)	305 (63.9)	1	1
Single	4 (2.6)	31 (65)	0.39 (0.14, 1.15)*	0.56 (0.12-1.09)
Divorced	18 (11.8)	53 (11.1)	1.05 (0.59, 1.87)	1.13 (0.61-2.09)
Widowed	31 (20.4)	88 (18.4)	1.09 (0.68, 1.73)	1.07 (0.65-1.77)
Educational status				
No formal education	89 (58.6)	315 (66)	0.72 (0.5, 1.07)*	**0.65 (0.44-0.97)****
Formal education	63 (41.4)	162 (34)	1	1
Place of residence				
Rural	93 (61.1)	261(54.7)	1.31(0.89, 1.89)*	1.44 (0.95-2.19)
Urban	59 (38.8)	216(45.3)	1	1
Wealth index				
Poor	39 (25.7)	170(35.6)	1	1
Middle	52 (34.2)	165(34.6)	1.37 (0.86, 2.19)	1.48 (0.89-2.44)
Rich	61 (40.1)	142 (29.8)	1.87 (1.18, 2.97)*	**1.99 (1.22-3.27)****
Duration of diagnosis				
<2 y	40 (26.3)	129 (27)	1	1
2-5 y	51 (33.6)	210 (44)	0.78 (0.49, 1.25)	0.76 (0.47-1.24)
5-10 y	45 (29.6)	88 (18.4)	1.65 (0.99, 2.73)*	**1.93 (1.11-3.34)****
>10 y	16 (10.5)	50 (10.5)	1.03 (0.53, 2.01)	1.04 (0.52-2.09)
Co-morbidity				
Yes	45 (28.3)	187 (39.2)	0.61 (0.41, 0.91)*	**0.47 (0.3, 0.73)****
No	109 (71.2)	290 (60.8)	1	1

*Indicate significant at *P*-value less than 0.05 in multivariable logistic analysis.
**Indicate that *P*-value less than .005.

Nigeria (40). This may be due to the patient receiving long-term counseling and health education about the proposed life-style changes, which may be the cause of the difference.

Patient with co-morbidity were 53% less likely to practice lifestyle modification as compared with patients without co morbidity. This finding is consistent with the research done in Durame (14). The possible explanation may be that patients without co morbidities are more likely to change their lifestyles by earning income through a diversified and healthy diet. In addition, patients without co morbidities can take regular

physical exercises to reduce the complications of hypertension In addition, patients without co morbidities may have a good standard of living and can improve their lifestyle.

Limitations of the study

The main limitation of this study is that this study was only conducted in government health facilities, and did not consider hypertension patients and home hypertension patients who were followed up in private clinics. The use of cross-sectional research

does not allow inference of causality. In addition, during the data collection period, both Muslims and Orthodox Christians fasted, which affected the findings of this study's dietary diversity score.

Conclusion

The practice of good lifestyle modifications in the study area was found to be low among the hypertensive patients. Respondents' age, education status, wealth index, duration of diagnosis, and co morbidities were found to be significant factors related to good lifestyle modification practices. Therefore, more attention should be paid to providing nutrition counseling and health promotion to improve the practice of lifestyle modification in patients with hypertension.

Author Contributions

MS conceived the study, developed the tool, coordinated the data collection activity, and carried out the statistical analysis. MF, AA, and AK participated in the design of the study, tool development, and drafting the manuscript. MS drafted manuscript writing. AK reviewed the manuscript. All authors approved for final submission.

Ethical Approval and Consent to Participant

Ethical approval and clearance were obtained from University of Gondar Institutional Review Board of College of Medicine and Health Sciences. All hospitals managers were asked Permission to collect data. Objective of the study was explained clearly to all participants before conducting the interview and written informed consent were taken from each participant. To assure privacy, each complete questionnaire has unique code after they return to the investigators. Confidentiality and privacy were maintained by omitting personal identifier of the respondents during data collection procedure.

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Availability of Data and Materials

Data will be available upon request from the corresponding authors.

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