LOW CARDIOVASCULAR RISK REDUCTION BEHAVIORS AMONG HYPERTENSIVES ATTENDING FOLLOW-UP CARE AT A TERTIARY-LEVEL HOSPITAL IN ADDIS ABABA, ETHIOPIA

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ABSTRACT

Introduction: Cardiovascular disease (CVD) outcomes in hypertensives are substantially influenced by risk-reduction behaviors. Even though hypertensives in Ethiopia have a high prevalence of behavioral risks for negative CVD outcomes, little is known about risk-reduction behaviors in this population. Therefore, this study aimed to investigate the CVD risk reduction behaviors among adult hypertensives in Addis Ababa, Ethiopia.

Method: A cross-sectional design was used. A sample of 384 hypertensives was selected using a systematic random sampling technique from the hypertension clinic registry. Epi data version 3.10 was used to clean the data, and SPSS version 25.0 was used for analysis. Descriptive statistic was used to determine participants' CVD risk reduction behavioral status. Bivariate chi-square test and ordinal logistic regression analyses were run to identify variables associated with participants' ranked CVD risk reduction behavioral status at the p-value < .05 cutoff for statistical significance.

Results: The mean (± standard deviation) age of participants was 53.61 (± 12.34) years, (range, 30-82 years), and 51.2% were males. The majority (56.5%) of them were at low CV risk reduction practices. Only 45.1% were at target BP control. The absence of comorbidities ($p < .001$), clinic visits every 3 months for hypertension ($p = .041$), normal body mass index ($p = .008$), hypertension duration of 5–9 years ($p = .034$), and young age adults ($p = .041$) were the characteristics significantly associated with the high CVD risk reduction practice.

Conclusion: Hypertensives' adoption of CVD risk reduction behaviors was low, with a variety of unmanaged risk factors and a few cardioprotective behaviors. Healthcare providers may improve patients' CV risk-reduction behavior through teaching lifestyle changes and more frequent clinic visits.

Keywords: *Comorbidity, Body mass index, Hypertension, CVD, Risk reduction behavior, Ethiopia.*

INTRODUCTION

Cardiovascular disease (CVD) remains the single largest cause of death and disabilities worldwide with over 17 million deaths each year, representing nearly 30% of all deaths with 10% global disease burden (GDB) (1,2). Over 80% of these fatalities occur in low and middle-income countries (LMICs) (3,4). Hypertension (HTN) is the primary cause of unfavorable CVD outcomes (such as stroke, coronary heart disease, heart failure, end-stage renal disease, and vision impairment) (5,6) and is estimated to cause 9.54 million deaths, of the 17 million CVD worldwide deaths each year (2,4).

In Sub-Saharan Africa (SSA), CVD is the most rapidly growing non-communicable disease (NCD) (7,8) accounting for more than 38% of the deaths which is estimated to rise in near future (9). According to WHO estimates (10), Ethiopia is demonstrating a steady shift from communicable diseases towards an increasing epidemic of NCDs mainly CVD (10). Although there is limited data in Ethiopia, CVD morbidity and mortality are high (25%) among patients with HTN (8,10,11).

Besides HTN, there are several well-established modifiable and non-modifiable risk factors contributing to CVD. The major modifiable behavioral risk factors including physical inactivity, tobacco use, unhealthy diet, and heavy alcohol use explain 80% or greater of the CVD burden (12). The lack of adherence to these modifiable lifestyle risk factors leads to other major proximal-risk factors for CVD and its adverse events including overweight/obesity, HTN, hyperglycemia, and dyslipidemia (12,13). Importantly, CVD often develops from the interaction of complex and multi-factorial mechanisms that include non-modifiable risk factors, physiological alternations, and socioeconomic status.

Accumulating evidence reveals a wide prevalence of risk factors and unsatisfactory CVD outcomes among hypertensive patients in Africa and other LMICs (2,8,14). Despite the enormous developments in the area of drug treatment and behavioral strategies for CVD reduction, hypertensives' primary and secondary CVD behavioral preventive measures adoption are reported to be suboptimal (15). This clearly emphasizes the saying "Knowing is not enough; we must apply." And "Willing is not enough; we must do." (16,17). Countries with limited resources, and yet facing the emerging epidemic of CVD and its catastrophic events critically need to design effective prevention strategies with the priority focus on at-risk community groups. Multiple health behavioral practices are needed to improve CVD outcomes that include healthy eating habits, engagement in physical activity, abstaining/quitting smoking, alcohol moderation, and visiting HCPs regularly are fundamental for the prevention and reduction of CV risk factors (17,18).

However, various factors are known to influence behavioral practices among hypertensives including knowledge of CVD, medication side effects(19), health insurance (20), sociodemographic and clinical characteristics (21), attendance to scheduled appointments (20), perceptions of risk (20), and sources of cues for behavioral actions (22). Furthermore, among hypertensives in Ethiopia, up to 40% were reportedly non-adherent to recommended therapies and in some studies, up to 80% had uncontrolled blood pressure (BP) (23,24) indicating a high risk for adverse CVD outcomes. On the other hand, individuals who adopted healthy behavioral practices (medication adherence, body weight control, regular physical activity, heart-healthy diet, moderation of alcohol, smoke cessation, and stress management) were effective in reducing adverse CVD outcomes (25). On the contrary, abundant evidence shows that behavioral risks for adverse CVD outcomes are widely prevalent among hypertensives in Ethiopia (24,26) and patients' risk reduction behaviors are largely unknown. Therefore, the study aimed at determining the status of CVD outcome risk reduction behavioral adoption and its determinants among adult hypertensives in Addis Ababa, Ethiopia.

METHODS AND MATERIALS

A cross-sectional study design was utilized and data were collected between February and August 2020 from hypertensives attending the outpatient cardiac clinic at Tikur Anbessa Specialized Hospital (TASH) in Addis Ababa, the largest tertiary hospital in Ethiopia. The sample consisted of 384 participants selected by the systematic random sampling technique from 1200 hypertensives on the clinic follow-up registry list. The inclusion criteria were: (a) age 30 years or older; (b) a minimum of three follow-up visits in the clinic; (c) the ability to hear and respond to questions in the local language (Amharic); (d) not pregnant; (e) no history of a CVD event such as myocardial infarction or stroke; and (f) the absence of a significant active Axis I psychiatric condition. Data were collected by three bachelor-prepared research assistants, who were trained for two days on study data collection methods, through face-to-face interviewer-administered standardized instruments that were translated by trained translators from English to Amharic (local language) and back to English. The translations were very consistent. The instruments were pilot tested in 10% of the Ethiopian hypertensives at another tertiary hospital to determine potential participants' understanding of the questionnaires. The independent variables included: 1. Sociodemographic (age, gender, marital status, level of education, and income information were based on self-report); 2. Clinical profiles (participants' self-reports on the interview questionnaire and reviews of their medical records provided information on the duration of HTN, co-morbidities, prior CVD-related hospitalization, antihypertensive medications, and family history of HTN, frequency of clinic visits, traditional medicine use for HTN, and sources of information on the seriousness of HTN, and measurement of BP, height, weight, and body mass index (BMI) using standard protocols). The BP was measured five minutes after participants completed the interview questionnaire, sitting in an armchair and feet flat on the floor using a standardized aneroid sphygmomanometer of normal

cuffs for adults by auscultatory method at the right brachial artery. Two readings were taken five minutes apart. If the two readings varied by > 5 mmHg a third reading was obtained. The average of the last two readings was used for the analysis. Values were interpreted as controlled BP if SBP <140 mmHg (<130 mmHg for patients with diabetes and CKD comorbidities), DBP <90mmHg (<80 mmHg for patients with diabetes and CKD comorbidities), and uncontrolled if SBP ≥140 mmHg (≥130 mmHg for patients with diabetes and CKD comorbidities), DBP >90 mmHg (>80 mmHg for patients with diabetes and CKD comorbidities) based on current Ethiopian HTN management protocol and other international guidelines (27,28). Without wearing shoes, height was measured with a handheld stadiometer and recorded to the closest 0.5 cm. Weight was recorded to the closest 0.1 Kg using a calibrated weight scale. Body mass index was computed by dividing weight (in Kg) by height (in M^2), and values were then classified using the Centers for Disease Control and Prevention (CDC) system (29); 3. Screening for depressive symptoms (was done using Patient Health Questionnaire nine [PHQ-9] Amharic language version (30)), The tool has an internal consistency of Cronbach's alpha 0.85 and has been used in Ethiopia. Scores range from 0 to 27. A score of ≥10 reflects moderate depressive symptoms while a score of ≥20 indicates severe symptoms. Patients with PHQ-9 scores ≥20 were discarded from the analysis because of the possibility of data bias; and 4. CVD-risk perception assessment (was done using the Attitude and Beliefs about Cardiovascular Disease [ABCD] Risk Questionnaire (31)). The questionnaire has Cronbach's alpha reliability of 0.85. Scores on the scale range from 0 to 32, with higher scores indicating that patients believe they are more likely to experience negative CVD events. The participants' risk was classified using percentiles as low (0–17.0), moderate (17.1–19.0), and high (19.1 - 32.0). Permission to use the ABCD questionnaire was obtained. The dependent variable: CVD risk reduction behaviors were measured by an eight behavioral practice items tool (1. regular exercise, 2. current smoking, 3. alcohol consumption, 4. fruits and vegetable consumption, 5. salt intake, 6. Medication adherence, 7. glycemic control [if diabetic], and 8. stress management). The tool was adapted from the WHO instrument for stepwise surveillance for chronic disease risk factors (32) and other previous studies based on a literature search (33,34). Items 1-6 had a response of yes (score of 1) or no response (score of 0), with item 2 reversed scored. Item 7 values were scored as <100 mg/dl (scored 1), and ≥ 100 mg/dl (scored 0). For item 8: the 10-item perceived stress scale (PSS), which has a Cronbach's alpha reliability of 0.85 and scores ranging from 0 to 40, was used. The PSS scores were initially interpreted as 0–13 (low stress), 14–26 (moderate stress), and 27–40 (high or severe stress) and then divided into two categories: managed stress (low stress, and scored 1), and unmanaged stress (moderate and high stress, scored 0). Finally. The scores of the 8 behavioral questions were added together to get the tool's overall composite score. The possible scores obtained range from zero to eight. Higher scores suggest that patients have adopted greater numbers of CVD risk reduction behaviors, whereas lower scores indicate that patients were at risk for potential CVD outcomes. Finally, from the composite score, the percentile was generated through the SPSS software to determine patients' CVD risk reduction behavioral status and place them in low, moderate, and high groups. The tool has a Cronbach's alpha .715 composite reliability that was computed from the pilot study.

STATISTICS

Epidata version 3.1 was used for data cleaning and SPSS version 25.00 statistical software package was used for the analysis. Both descriptive and inferential statistics (a two-sample t-test, bivariate chi-square test, and ordinal logistic regression model) analyses were used. All the test/model assumptions were ascertained showing no violations. The level of statistical significance was set at $p < .05$ level and the odds ratio (OR) at 95% CI was considered to declare that there exist independent variables effects on the CVD risk reduction behavioral practice. The findings are summarized in tables, graphs, and text.

Ethical approval: The study was approved by the Institutional Review Board (IRB) of Addis Ababa University, Ethiopia (IRB protocol # 09/81) and complied with the Declaration of Helsinki.

RESULTS

Data from 377 (98.18%, total n=384) were included in the analysis. The mean (±SD) age was 53.61 (± 12.34) years, (range, 30-82 years). Table 1 below presents the data of participants' sociodemographic and clinical characteristics.

Table1. ***Sociodemographic and clinical characteristics of study participants (n=377).***

Characteristics	Frequency	Percentage
Age category (in years)		
30-39 (young adults)	56	14.9
40-59 (middle-aged adults)	188	49.87
≥ 60 (elders)	133	35.2
Gender		
Male	193	51.2
Female	184	48.8
Marital status		
Single	52	13.8
Married	284	75.3
Divorced	21	5.6
Widowed	20	5.3
Educational status		
Cannot read and write	26	6.9
Elementary	135	35.8
High school	133	35.3
Diploma & above	83	22
Monthly income in ETB		
<1000	118	31.3
1000-3000	179	47.5
3001-6000	60	15.9
≥6001	20	5.3
Family history of HTN		
Yes	144	38.2
No	233	61.8
Frequency clinic visit for HTN		
Every month	20	5.3
Every 2 months	272	72.1
Every 3 months	53	14.1
Every 4 months or longer	32	8.5
Duration of HTN in years		
1-4	132	35.0
5-9	109	28.9
10-14	71	18.8
15-19	32	8.5
20+	33	8.8
Source of information on the seriousness of HTN	289	76.7
Physician	65	17.2
Nurse	7	1.8
Media	16	4.2
Others		
Comorbidity list (n = 212)		
Diabetes	102	48.1
HHD	28	13.2
CKD	23	10.9
Others	59	27.8
Current number of BP medications		
Single drug	138	36.6
Two drugs	172	45.6
≥3drugs	67	17.8
BMI		
Underweight	10	2.6
Normal	141	37.4
Overweight	171	45.4
Obese	55	14.6
Target BP controlled		
Yes	170	45.1
No	207	54.9

Note: ETB (Ethiopian Birr), BP (blood pressure), HTN (hypertension), HHD (hypertensive heart disease), CKD (chronic kidney disease), BMI (body mass index). Target BP controlled (<140/90 mm Hg, or <130/80 mm Hg if CKD and/or diabetes).

The mean (± SD) CVD risk reduction behavioral practice score was 5.23±1.16, range (2-8), and there were no significant mean differences based on gender; two-sample t (375) = -1.245, p=.214. Based on percentile scores participants' CVD risk reduction behaviors, the majority (56.5%, n = 213) of them were at low CVD risk reduction practices. The participants' ranked CVD risk reduction behaviors status is depicted in Figure 1 below

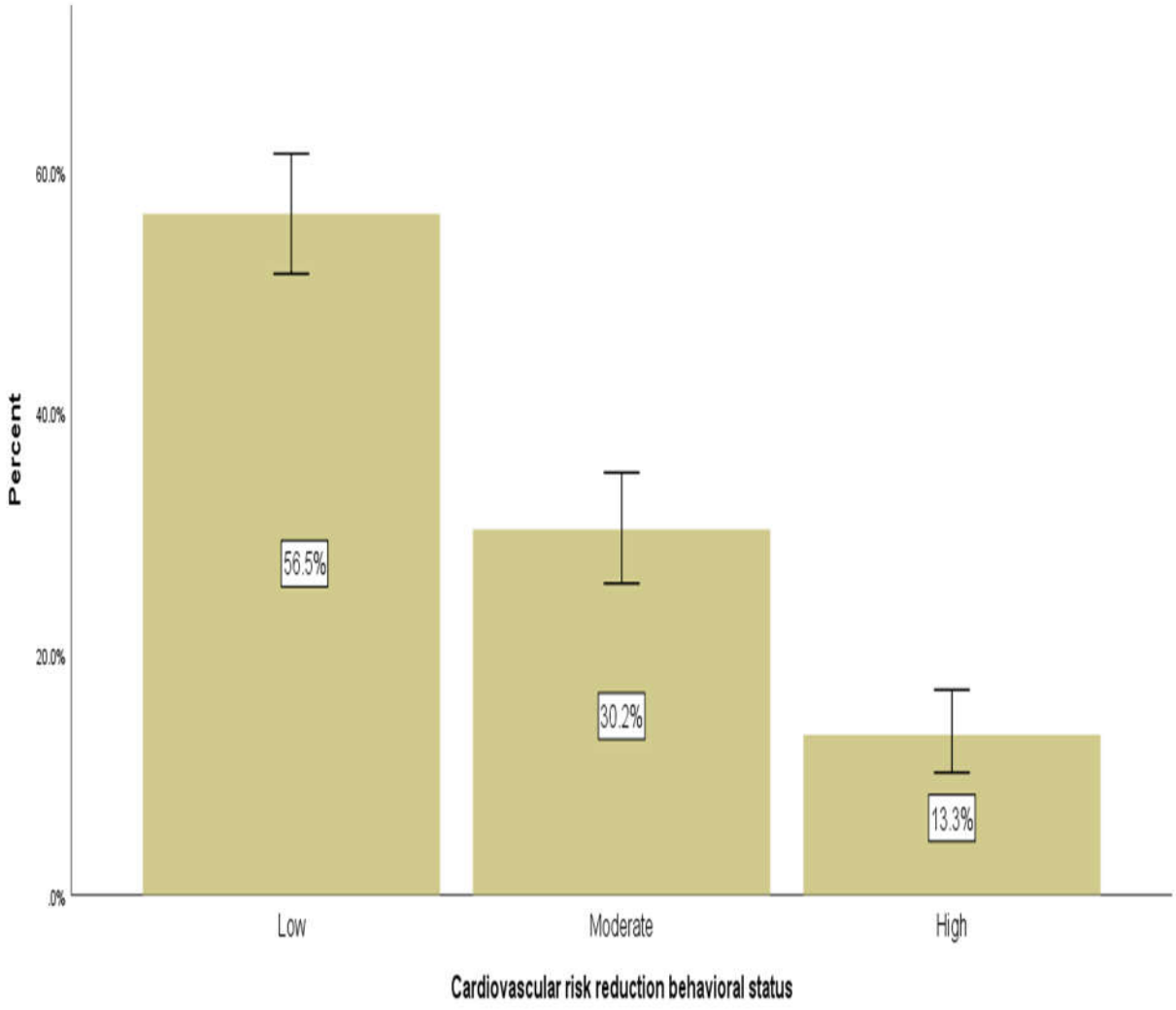

***Figure 1*. Bar graph showing the percentages of low, moderate and high (with error bars) CVD risk reduction behavioral practice status of study participants**

Further analyses of participants' specific CVD risk reduction behavior practices (Table 2) revealed some encouraging but still several poor practices. Higher rates of CVD reduction behaviors were observed regarding physical activity (PA), no smoking, and medication adherence. However, the rates of behavioral practices for numerous CV preventive behaviors, such as limiting salt in the diet, eating enough fruits and vegetables, managing stress, alcohol moderation, and a comorbid diabetes control were low.

Table 2. ***CVD risk reduction behavioral practice domains of study participants.***

Behavior	Yes n(%)	No n(%)
Engaged in regular PA		
Male	163 (84.45)	30 (15.54)
Female	152 (82.61)	32 (17.39)
Total (n = 377)	315 (83.55)	62 (16.44)
Current smoking		
Male	16 (9.29)	177(91.7)
Female	6 (3.26)	178 (96.74)
Total (n = 377)	22 (5.83)	355 (94.16)
Controlled diabetes		
Male	9 (13.64)	57 (86.36)
Female	8 (20)	32 (80)
Total (n = 106)	17 (16.04)	89 (83.96)
Dietary salt intake (<5 to 6 gm/d)		
Male	82 (42.49)	111 (57.51)
Female	76 (42.31)	108 (58.69)
Total (n = 377)	158 (41.91)	219 (58.09)
Fruit and vegetables (>5 servings/d)		
Male	56 (29.01)	137 (70.98)
Female	54 (29.34)	130 (70.65)
Total (n = 377)	110 (29.18)	267 (70.82)
Medication adherence		
Male	178 (92.2)	15 (7.8)
Female	169(91.8)	15 (8.2)
Total (n = 377)	347 (92)	30 (8)
Alcohol moderation		
Male	20 (10.36)	173 (89.64)
Female	9 (4.89)	175 (95.11)
Total (n = 377)	29 (7.69)	348 (92.31)
Managed stress		
Male	27 (13.99)	166 (86.01)
Female	13 (7.06)	171 (92.93)
Total (n = 377)	40 (10.61)	337 (89.39)

Note: n (number of sample), % (percentage) Engaged in regular moderate physical activity (PA) (walking for ≥30 minutes per day or cycling, gardening ≥ 5 times/week; or strenuous exercise: jogging, swimming, playing football for ≥4 hours/week). Current smoking (any form of tobacco smoking at least one cigarette per day during the previous 12 months including those who quitted within the past year). Diabetes controlled (current glycemic control: FBG <100 mg/dl). Dietary salt intake (<5 to 6 gm salt/ day add to diet). Medication adherence (self-reported strictly adhered: yes/no); Fruits and vegetable servings (had >5 servings/400-500gm) of fruits and vegetable/day (one serving is equivalent to one orange or one apple or one banana and three tablespoons of cooked vegetables); alcohol moderation (low to moderate alcohol intake within the past 12 months of 1drinks/day or <4 drinks/week for female, 1-2 drinks/day or < 4 drinks /week for male). Managed stress (computed from PSS). On bivariate chi-square test analysis (Table 3) of independent variables: age, monthly income, HTN duration, comorbidity, and BMI were significantly associated with CVD-risk reduction behaviors. However, all independent variables with p-values less than 0.25 were moved to the final ordinal logistic regression analysis model (Table 4) to test their strength of association with the CVD-risk reduction behavior.

Table 3. ***Bivariate chi-square test showing the association between CVD risk reduction behavior (high, moderate, and high) and independents variables of study participants (n = 377).***

	CVD risk reduction behavior practice						
Variable	**Low n(%)**	**Moderate n(%)**	**High n(%)**	**Total n(%)**	χ^2	**df**	**p - value**
Age category					12.137	4	**.016***
Young adults	24(42.9)	18(32.1)	14(25)	56(100)			
Middle-aged adults	110(58.5)	53(28.2)	25(13.3)	188(100)			
Elders	79(59.4)	44(33.1)	10(7.5)	133(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
Gender					.452	2	.798
Male	112(58)	56(29)	25(13)	193(100)			
Female	101(54.9)	59(32.1)	24(13)	184(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
Education level					5.320	6	.504
Cannot read and write	14(53.8)	4(42’3)	1(3.8)	26(100)			
Elementary	78(57.8)	41(30.4)	16(11.9)	135(100)			
High school	78(58.6)	38(28.6)	17(12.8)	133(100)			
College diploma & above	43(51.8)	25(30.1)	15(18.1)	83(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
Marital status							
Single	25(48.1)	21(40.4)	6(12.2)	52(100)	2.831	4	.586
Married	164(57.7)	82(28.9)	38(13.4)	284(100)			
Others	24(28.5)	12(29.3)	5(12.2)	41(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
Monthly income in ETB					14.002	6	**.030**
<1000	70(59.3)	40(39.9)	8(6.8)	118(100)			
1001-3000	104(58.1)	52(29.2)	23(12.8)	179(100)			
3001-6000	28(45.9)	17 (27.9)	16(26.2)	61(100)			
>6000	11(57.9)	6(31.6)	2(10.5)	19(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
Family Hx of HTN					.623	2	.732
No	128(54.9)	74(31.8)	31(13.3)	233(100)			
Yes	85(59)	41(28.5)	18(12.5)	144(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
HTN duration (in years)							
1-4	79(59.8)	33(25)	20(15.2)	132(100)			
5-9	54(49.5)	39(35.8)	16(14.7)	109(100)	12.769	6	**.047**
10-14	35(49.3)	24(33.8)	12(16.9)	71(100)			
15+ years	45(69.2)	18(27.7)	1(3.1)	65(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
Comorbidity							
N0	69(41.8)	65(39.4)	31(18.8)	165(100)	26.364	2	**.000***
Yes	144(67.9)	50(23.6)	18(8.5)	212(100)			
Total	213(56.5)	49(30.5)	49(13)	377(100)			
Traditional medicine uses for HTN					.583	2	.747
No	186(57.2)	98(30.2)	41(12.6)	325(100)			
Yes	27(51.9)	17(32.7)	8(15.4)	52(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			

Table 3 continued

	CVD risk reduction behavior practice						
Variable	**Low**	**Moderate**	**High**	**Total**	**χ^2**	**Df**	**p-value**
Hx of hospitalization related to HTN					5.889	2	.053
No	150(53)	92(32.5)	41(14.5)	283(100)			
Yes	63(67)	23(24.5)	8(21)	94(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
Frequency of Clinic visits for HTN					12.588	6	.050
Monthly	11(50)	7(35)	2(10)	20(100)			
Bimonthly	154(56.6)	86(31.6)	32(11.8)	272(100)			
Every 3 months	28(52.8)	11(20.8)	14(26.4)	53(100)			
Every 4 months or longer	20(62.5)	11(34.4)	1(3.1)	32(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
Medication adherence					2.635	2	.268
Adherent	200(57.6)	104(30)	43(12.4)	347(100)			
Not adherent	13(43.3)	11(36.7)	6(20)	30(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
Depressive symptom					3.498	2	.174
Absent	50(49)	35(34.3)	17(16.7)	102(100)			
Present	163(59.3)	80(29.1)	32(11.6)	275(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
CVD risk-perception					.539	4	.970
Low	124(56.1)	68(30.8)	29(13.1)	211(100)			
Moderate	21(55.3)	13(11.6)	4(10.5)	38(100)			
High	68(57.6)	34(28.8)	16(13.6)	118(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			
BMI					15.501	6	**.017***
Underweight	5(50)	4(40)	1(10)	10(100)			
Normal	65(46.1)	54(38.3))	22(15.6)	141(100)			
Overweight	104(60.8)	44(25.7)	23(13.5)	171(100)			
Obese	39(70.9)	512(21.8)	4(7.3)	55(100)			
Total	213(56.5)	115(30.5)	49(13)	377(100)			

*Note: ETB (Ethiopian Birr), Hx (history), HTN (hypertension), BMI (body mass index), CVD (cardiovascular disease), χ^2 (chi-square), df (degree of freedom), *(Bold figures indicate significant findings).*

In ordinal logistic regression analysis, the absence of comorbidity, clinic visits of every three months, normal BMI, HTN duration of 5-9 years, and young age adults were the statistically significant positive predictors of participants' high CVD risk reduction behavioral practice. The presence of depressive symptoms though did not reach the statistically significant level (p = .053) and was a negative predictor of the high CVD risk reduction behavioral practice.

The odds of practicing high CVD risk reduction behaviors were three times higher on average for patients with no comorbidity as compared to the combined low and moderate category CVD risk reduction behavioral practice adaptors of patients with comorbidities. The odds of practicing high CVD risk reduction behaviors were almost three times higher on average for patients who visit the HTN clinic every three months as compared to the combined low and moderate category CVD risk reduction behavioral practice adaptors of patients who visits the clinic every four months or longer. The odds of practicing high CVD risk reduction behaviors were almost three times higher on average for patients who maintained normal body weight as compared to the combined low and moderate category CVD risk reduction behavioral practice adaptors of obese patients. The odds of practicing high CVD risk reduction behaviors were two times higher on average for patients with the HTN duration of 5-9 years as compared to the combined low and moderate category CVD risk reduction behavioral practice adaptors of patients with the HTN duration of 15 years or longer. The odds of practicing high CVD risk reduction behaviors were two times higher on average for young adult patients as compared to the

combined low and moderate category CVD risk reduction behavioral practice adaptors of old age adult patients. The below table (Table 4) depicts participants' findings of the ordinal logistic regression analysis.

Table 4. ***Ordinal logistic regression analysis of predictors of the high CVD risk reduction behavior practice of study participants***

Predictor variables		AOR	95% CI		p-value
			Lower	Upper	
Threshold	CVD-risk reduction behavior practice (Low)	**6.235**	**1.121**	**34.678**	**.037**
	CVD-risk reduction behavior practice (moderate)	**40.628**	**7.041**	**234.421**	**.000**
	CVD-risk reduction behavior practice (high)	**1**	**.**	**.**	
Age category	Young adult	**2.025**	**1.030**	**3.982**	**.041**
	Middle adult	1.062	.655	1.720	.808
	Older adult	1	.	.	
Monthly income in ETB	≤ 1000	1.046	.359	3.046	.934
	1001-3000	1.152	.405	3.281	.791
	3001-6000	2.664	.874	8.114	.085
	>6,000	1	.	.	
Comorbidity	No	**3.015**	**1.931**	**4.707**	**.000**
	Yes	1	.	.	
HTN duration (years)	1-4	1.263	.643	2.477	.498
	5-9	**2.091**	**1.059**	**4.130**	**.034**
	10-14	2.034	.983	4.211	.056
	15+	1			
Clinic visits for HTN and related problems	Monthly	1.227	.379	3.971	.733
	2 months	.1.114	.504	2.462	.789
	3 months	**2.682**	**1.040**	**6.916**	**.041**
	4 months and longer	1	.	.	
Hospitalization related to HTN	No	1.503	.886	2.551	.131
	Yes	1			
BMI Kg/M^2 category	Underweight	2.058	.538	7.882	.292
	Normal	**2.593**	**1.282**	**5.245**	**.008**
	Overweight	1.781	.891	3.558	.102
	Obese	1			
PHQ-9 (Scale)		.927	.858	1.001	.053

*AOR (adjusted odds ratio), CI (confidence interval) CVD (cardiovascular disease), ETB (Ethiopian Birr), HTN (hypertension), BMI (body mass index), Kg (kilo gram), M^2 (meter squared, PHQ (patient health questionnaire) *(Bold figures indicate significant findings).*

DISCUSSION

The present study examined the adult hypertensives' CVD risk reduction behavioral practice and its predictors among those attending follow-up care at a tertiary care outpatient cardiology clinic in Addis Ababa, Ethiopia. The major findings were low CVD risk reduction behavioral practice for the majority of participants. This suggests a higher rate of unmanaged risk factors for future adverse CVD events, and that high CVD risk reduction practice was significantly associated with the absence of comorbidity. Clinic visits every three months, normal BMI, HTN duration of 5-9 years, and young age adults were also predictors of higher CVD risk prevention behaviors.

The finding of low CVD risk reduction practice is consistent with several hypertensives' previous low self-care behavioral practice studies' in peripheral hospitals in Ethiopia (35,36), other African countries such as Tanzania (37), Asian countries such as Nepal (38), Indonesia (39), Pakistan (40), and West Bengal (41). However, compared to some previous individual and metanalyses study findings of 16%-44% positive risk reduction practices (42,43) in Ethiopia, the present finding

showed higher proportions of hypertensives had adopted the recommended lifestyle on CVD risk factors. In general, findings from the literature and the present study suggest low CVD risk reduction behavioral adoption among those at risk for adverse CVD events in Ethiopia. Adoption of healthy lifestyles is supposed to be the first line of management for hypertensives with further added benefits of reducing CVD risk (44). Although CVD risk stratification guideline is emerging for use at the primary health care level in Ethiopia (45), its availability is low in many Eastern SSA countries including Ethiopia (46).

Further examination of participants' specific CVD risk reduction behavior practices (Table 2) revealed some encouraging but also poor practices. Higher CVD reduction behaviors were observed regarding PA, no smoking, and medication adherence rates. However, for many CV protective behaviors: dietary salt restriction, servings of fruits and vegetables, stress management, and alcohol moderation, the rates of behavioral adoption were low.

In the ordinal logistic regression model, several participants' sociodemographic and clinical factors were identified to significantly influence their high CVD reduction behaviors.

Participants who have no comorbidities were three times more likely to have practiced the high CVD risk reduction behavior as compared to those with comorbidities. Although the impact of comorbidity on CVD risk reduction behavior has not been widely examined but may compete with other chronic conditions, it is more difficult to adhere to the recommended guidelines (47). Our finding is supported by previous studies findings that hypertensives with comorbidity were 72% less likely to have practiced CVD reduction (48,49). Furthermore, comorbidity such as depression was linked to poorer prognostic risk (49), which may be due to its deleterious effect and poor adherence to CVD risk reduction behaviors. Over two-thirds (70%) of our study participants had depressive symptoms indicating it should be routinely assessed in hypertensives. The high burden of comorbidities may reduce patients' motivation for risk reduction behavior due to its psychological and/or physical burdens. Contrary to our findings, however, earlier studies have shown that hypertensives with comorbidities had a considerably higher adherence rate to the necessary lifestyle adjustments than those with HTN alone (50). Comorbidities may incite patients to take their health seriously and engage in risk-reducing behavior, which may help to explain this discrepancy. Early comorbidity screening, HTN monitoring, risk factor evaluation, and intensive multifactorial lifestyle modification may help hypertensives experience less comorbidity development and its burden.

The observed significant associations between patients' high CVD reduction and every three-month clinic follow-up visit in the present study may suggest that patients had a reasonable concern for the reduction of adverse CVD outcomes based on their previous assessments and knowledge gained regarding risk factors and the required behavioral adjustment from the HCPs during the follow-up. Hypertensives may benefit from regular interval assessments (including analysis and interpretation of their current symptom experiences, physical examination, and laboratory work-up). Furthermore, obtaining advice and reinforcements on behavioral risk reduction (diet, PA, body weight control, medication adherence including monitoring of side effects and dose adjustments), as part of the routine health communication with their HCPs may have accounted for the high-risk reduction behavior of l practice. Even though studies on this topic have yielded few results, the frequency of clinic visits may be a reflection of patients with CVD's health-seeking behaviors, related to patients' perceptions that their BP and symptoms are under control, that clinic visits have been scheduled at regular intervals by doctors, or related to the COVID-19 pandemic season. According to the current HTN management guidelines (51), clinic visits every 2-4 months should be conducted for patients who have achieved the target BP control. However, only 14.1% of our study participants had every three months follow-ups visits, while nearly three-quarters (72.1%) of them, and in other studies, the majority of hypertensives (52,53) had the visit follow-up clinic scheduled monthly and/or bimonthly for HTN that may suggest patients were being monitored more closely to achieve BP control that required medication adjustment (based on patients' adherence and possible drug side effects) and evaluation of target organ disease and the co-existence of comorbid conditions. Hypertensives-HCP visits should go beyond BP monitoring and medication refills. Rather, the visit should provide the opportunity to improve the CVD risk reduction behavioral adoption and should be a key patient education goal during the clinic follow-up visits and is an area of future research.

Participants with normal body weight were nearly three times more likely to have high CVD risk reduction behaviors compared to obese participants. The present finding is supported by previous research that a normal BMI is a predictor of adequate self-care management among hypertensives (54) and that hypertensives with a normal BMI were more likely to adhere to self-management behaviors (55). The development of obesity is multifactorial including being sedentary, genetic predisposition, and environmental contributors (such as socioeconomic, behavioral, and epigenetics) (56). The finding that the majority (60%) of our study participants were overweight or obese indicates the importance of weight control in this population. (36,40,44). According to data from the SSA (57) obesity is a health concern, and certain African nations, like Nigeria, have higher rates of obese hypertensives (58). It was well documented that weight reduction among hypertensive adults was accompanied by BP reduction (59). Interventions that target patients' behaviors favoring for weight management in overweight and obese such as heart healthy diet and a low-salt diet along with continued BMI assessments during the clinic return visits are crucial to reduce the potential adverse CV risk, particularly for patients with additional signs of metabolic syndrome.

The significant association between the high CVD risk reduction behavior and the HTN length of 5-9 years as opposed to 15 years or longer seems appropriate. In the original and Framingham Heart Offsprings Study of a large sample of participants aged 40-89 years the progression from HTN to CHF and other CVD complications occurred on average at 14 years with a peak 5 years survival of only 24% of males and 31% of females (60). Due to the disease's asymptomatic progression and the potential late health and sickness behaviors of our study participants, complications could parallel the 5–9 years of HTN length in our participants with possible symptom experiences that could serve as a warning for patients to heavily engage in risk reduction behavior. We also noted a shorter mean and median HTN duration in the current study, which is consistent with several previous studies of hypertensives in Ethiopia (53,61). Furthermore, nearly two-thirds (63%) of our study participants had an HTN duration of < 10 years which conforms to previous research (52,53). All that is in support of the 5-9 years HTN length to match the likely time for appearances of HTN complications and may trigger patients for high CVD risk reduction behavior.

When depressive symptoms were present, the high CVD risk reduction behavioral practice was 9% less likely to happen; nonetheless, this finding was statistically insignificant despite having clinically substantial implications. The combination of depressive symptoms with HTN may operate as a deterrent to patients engaging in CVD risk-reduction activity, which could have detrimental effects and impair the clinical outcome of CVD (62,63). This finding can act as an important reminder for HCPs who monitor hypertensives, to use a depression screening tool to detect depressive symptoms as soon as possible and refer patients to get psychiatric guidance to improve CVD risk reduction behavior with the ultimate goal of preventing negative CV outcomes.

CONCLUSIONS

Hypertensives' practice of CV risk reduction behaviors was low, with a variety of unmanaged risk factors and few cardioprotective behaviors. The absence of co-morbidities, maintaining a healthy weight, having HTN for 5–9 years, scheduled clinic visits every three months, and being a young adult were predictive of high-risk reduction behaviors. HCPs may improve patients' CV risk reduction behavior through lifestyle changes and this needs to be addressed during the scheduled clinic return visits. Furthermore, patients' risk factors appraisal, early comorbidity assessment (including depressive symptoms) particularly among the elder, and adequate treatment or referral for better evaluation may help improve healthy lifestyle practices for improved prevention of future CV events in hypertensives. Lifestyle behaviors known to avert adverse CVD events such as reduced salt intake, adequate fruit and vegetables servings, glycemic control, overweight/obesity, and stress reduction measures are the key areas to focus on for HCPs during patients' follow-up clinic visits.

Limitations of the study

The study was a single-site cross-sectional that restricts the generalization of the findings to other hospital hypertensive attendees.

Authors contributions: BDM and GRA contributed to the conceptualization, data collection, analyses, and draft writing of the manuscript. GDY, YAW, and HMK contributed to the methodological design, critical revision, and edition of the final version. All authors have agreed on the final version of the manuscript.

Declaration of conflicting interests: The authors declare no potential conflicts of interest with respect to this research.

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