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Uncontrolled hypertension and associated factors among hypertensive patients in primary health care centers in Jazan Region, Saudi Arabia: A cross-sectional study

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ABSTRACT

Background: Hypertension is a serious public health problem that affects people of all ages. Hypertensive patients are at risk for several complications, including stroke and heart disease. Around one billion individuals are living with uncontrolled hypertension globally. In recent years, there has been increasing interest in the control of hypertension. This study determined the uncontrolled hypertension prevalence and associated factors among patients with hypertension in primary health care centers in Jazan Region, Saudi Arabia. *Methods:* We carried out an analytical cross-sectional study with a multistage sampling technique from January–March 2022. Data were collected using an interviewer-administered semi-structured questionnaire. Data was entered into and cleaned by IBM SPSS version 25. The Chi-square test was used to test for the presence of any statistically significant variation of the study variables. Multivariate analysis was performed for associated factors for uncontrolled hypertension. *Results:* We enrolled 354 participants and found that patients who were older, female, and obese, had lower physical activity, had stress and had lower levels of education were at higher risk of uncontrolled hypertension. *Conclusion:* These findings suggest that interventions to improve hypertension control should focus on these groups of patients and increase the effort of preventive services by establishing more preventive clinics in primary health care centers.

Keywords: Uncontrolled hypertension, Risk Factors, Saudi Arabia.

1. INTRODUCTION

As of the year 2010, estimations done worldwide suggest that 1.39 billion people or 31.2% of the adults in the entire world, had hypertension (Chockalingam et al., 2006). Hypertension was higher among adults in Low-

Income Countries (LICs) with 1.04 billion people compared to 349 million people in High-Income Countries (HIC) (Mills et al., 2020). This makes Hypertension one of the leading causes of premature deaths around the world. The global average blood pressure (BP) has stayed constant due to the widespread use of antihypertensive drugs compared to previous years. However, this is not a cure for hypertension (Chockalingam et al., 2006).

Though prevention is better, several factors contribute to hypertension worldwide, including age, stress and blood sugar levels which are major causes of hypertension in addition to obesity, unhealthy diet, and physical inactivity (Ondimu et al., 2019). Uncontrolled hypertension remains the main public health problem among hypertensive patients both in developed and developing countries (Wang & Vasan, 2005), though the goal is to decrease hypertension prevalence by 25% by 2025 globally (Cohen et al., 2014). People living in low-income areas, including the Middle East, are the most likely to have hypertension, and major contributing factors are obesity, excessive smoking rates, sedentary lifestyle, and lack of awareness, to name a few (Abboud & Karam, 2022). It was found that middle-eastern hypertensive patients have a higher non-adherence rate to medications than diabetics, which might be attributed to the asymptomatic nature of hypertension sickness or differing perceptions of the importance of the condition (Al-Qasem et al., 2011).

In Saudi Arabia, the overall hypertension prevalence is lower than in Oman, Bahrain, and Qatar but close to the United Arab Emirates (Aljefree & Ahmed, 2015). The World Health Organization (WHO) reported a 0.62% rise in death rates from hypertension in Saudi Arabia and the adjusted age death rate of 4.28/100,000 people (Şahin & İlgün, 2022).

This study aimed to identify the uncontrolled hypertension prevalence and associated factors among patients with hypertension in primary health care centers in the Jazan Region, Saudi Arabia.

2. METHODS

Study design and setting

An analytical, cross-sectional study was carried out from January 2022 to March 2022 at six primary health care centers (PHCS) chronic diseases clinics in Jazan Region, Saudi Arabia. Jazan is the second smallest region of Saudi Arabia and stretches 300 km along the Red Sea's southern coast, covering 11,671 km² with a population of 1,637,361 as of the 2019 census.

Target population

The target population of this study was hypertensive patients attending chronic disease clinics in PHCS, Jazan, Saudi Arabia.

Inclusion and exclusion criteria

Patients were eligible if they were hypertensive adults and were excluded if they were less than 18 years, pregnant females with hypertension, or hypertensive with complications.

Sample size

A sample size of 354 patients for this study was determined using the formula $n = P(1-P) \times Z\alpha^2/d^2$, where n is the calculated sample size, and P is the expected proportion of the population. The prevalence of hypertension is 36%, based on a study conducted in the Jazan. Z is the z-value for the selected level of confidence (95%), and d is the absolute error or precision (0.05) (Hobani et al., 2015). The 5% precision catered for the non response rate.

Sampling method

Samples were enrolled using a Multistage random cluster sampling technique: Stage 1: Two sectors were randomly selected using a lottery method from six sectors. Using simple random sampling, three clusters (with six primary health care centers each) were selected from two sectors. The three clusters were stratified according to functions to choose chronic disease clinics. Stage 2: We used simple random sampling to select hypertensive patients from the original population.

Data collection and tool

Data were collected using an interviewer-administered semi-structured questionnaire. The questionnaire contains 5 sections. Section 1:anthropometric measurement (height, weight, BMI, BP) Section 2: Socio-demographic characteristics (gender, age, level of education, residency, occupation, income) Section 3 consists of questions to measure the percentage of patients with controlled hypertension attending primary health care centers in the Jazan region. Section4 consists of questions to identify hypertensive patient compliance with antihypertensive medication using the Morisky 4-Item Medication Adherence scale (Morisky et al., 1986).

Section 5: consists of questions to identify uncontrolled hypertension-associated factors, such as a family history of hypertension, physical activity, weight reduction, sault reduction, smoking, Khat chewing, and diabetic control. Dyslipidemia contraceptive use, corticosteroid use, and body mass index.

Blood pressure and body mass index measurement

Blood pressure (BP) was measured using a standardized automated unattended office sphygmomanometer (regular adult, large or thigh) in the sitting position after 5 minutes of rest, no smoking, coffee/tea, exercise, and stress at least 30 minutes before examination. Two consecutive blood pressure readings were taken on the same arm; the mean of the 2 measures was used for analysis.

According to Joint National Committees (JNC) eight hypertension guidelines, hypertension was defined as high BP (SBP≥140 mmHg or DBP≥90 mmHg) and/or the use of antihypertensive medications. Uncontrolled hypertension was defined by using JNC's eight hypertension guidelines. The BP target is SBP<140 mmHg or DBP<90 mmHg among adults younger than 60 years, and a BP goal of SBP<150 mmHg and DBP<90 mmHg in the general population aged≥60 years (James et al., 2014).

The body mass index (BMI) corresponded to the ratio between weight and height squared and the following were considered: low weight ≤ 18.5 kg/m^2; healthy weight BMI ≥ 18.5 and < 25 kg/m^2, overweight BMI ≥ 25 and < 30 kg/m^2, and obesity BMI ≥ 30 kg/m^2 (Nuttall, 2015).

Adherence to anti hypertension medication

Adherence to medication was assessed by applying the Morisky scale with four questions ("Have you forgotten to take your medication?", "Are you careless when taking your medication?", "When you feel better, sometimes you stop to take your medication?", "Sometimes, if you feel worse when you take the medication, do you stop taking it?").

Data presentation & analysis

Data were analyzed using IBM SPSS Statistics for Windows, Version 25.0. Descriptive frequencies were presented as numbers and percentages, while, the prevalence of the control and uncontrolled level of the hypertensive patient was analyzed using descriptive statistics and reported as a percentage. Affirmative answers received zero points and negative ones received one point. Then, we summed the answers, and the higher the score, the better the adherence. The adherence variable was categorized into high (scores between two and four) and low (scores between zero and one). The Chi-square test was used to test for the presence of any statistically significant variation of the study variables. The final model with multiple logistic regression analysis was created for associations and factors for uncontrolled hypertension.

3. RESULTS

Socio-demographic characteristics

A total of 354 adults were enrolled in this study. Most participants, 183(51.7%), were females (Table 1). We found that in the age group of 18-39, the hypertension rate is 10.5%, and in the age group of 40-49, the percentage increases to 20.1%, for the age group of 50-59, the percentage increase further to 33.9% and above 60 years of age, the percentage increases to 35.6%.

Table 1 Sociodemographic characteristics of hypertensive patients associated with controlled and uncontrolled hypertension attending PHCS, Jazan Saudi, Arabia (n=354)

Variable	Category	<140/90 controlled N (%)	>140/90 uncontrolled N (%)	Total Number N (%)	p-value
Gender	Male	79 (46%)	92 (56%)	171 (48.3%)	0.026
	Female	65(35%)	118 (64.4%)	183 (51.7%)	
Age	18-39	26 (70%)	11 (29.7%)	37 (10.5%)	0.000
	40-49	34 (48%)	37 (52%)	71 (20.1%)	
	50-59	41(34%)	79 (65%)	120 (33.9%)	
	>60	43(34%)	83 (66%)	126 (35.6%)	
Body Mass Index	Underweight	5 (71%)	2 (28%)	7 (2%)	0.000

	Healthy Weight	49(64.4%)	28 (36%)	76 (21.5%)	
	Overweight	42(40%)	65 (62.5%)	104 (29.4%)	
	Obese	47 (29%)	116 (72%)	162 (45.8%)	
Marital Status	Single	15 (44.1%)	19 (55%)	34 (9.6%)	0.648
	Married	105 (42%)	145 (58%)	250 (70.6%)	
	Divorced	5 (38%)	8 (61%)	13 (3.7%)	
	widowed	19 (33.3%)	38 (66%)	57 (16.1%)	
Residence	Village	117 (40%)	176 (60%)	293 (82.8%)	0.568
	City	27 (44.2%)	34 (55%)	61 (17.2%)	
	No education	57 (33%)	116 (67.0%)	173 (48.9%)	
Levels of Education	Primary	18 (42%)	24 (57%)	42 (11.9%)	0.002
	Secondary	8 (29%)	19 (70%)	27 (7.6%)	
	university\higher	61 (54%)	51(45%)	112 (31.6%)	
	employee	51(57%)	38(42%)	89(25.1%)	
Occupation	unemployed	54(32%)	114 (68%)	168 (47.5%)	0.000
	Retired	39(40.2%)	59(60%)	97(27.4%)	
Income	satisfactory	85(38%)	136(61%)	221(62.4%)	0.315
	unsatisfactory	59 (44.3%)	74	133(37.6%)	

The majority of patients were obese (46%) (Figure 1). Most participants were married, living in villages, uneducated, unemployed, and satisfied with their income (70.6%, 82.8%, 49%, and 62.4%, respectively). As shown in Table 2, the majority (54.5%) of hypertensive patients did not do medical follow-up, while 46% adhered to follow-up schedules. Regarding adhering to antihypertensive medication, 54% of hypertensive patients did not adhere to treatment, while 46% adhered to treatment. The proportion of patients who maintained the target BP was 40.1% and on the other hand, 49% didn't. The majority (37.0%) of the participants reported living with hypertension for more than 10 years, higher than 28.8% of patients who have lived with hypertension for less than 5 years. The majority (70.3%) of the patients didn't have accessibility difficult to PHCS, while 27.1% had difficulties. Regarding the family history of hypertension, 82.8% of the patients agreed that they had a family history of hypertension.

Table 2 Factors of hypertensive patients associated with controlled and uncontrolled hypertension attending PHCS Jazan Saudi Arabia (n=354)

Variable	Category	<140/90 controlled N (%)	>140/90 uncontrolled N (%)	Total Number N (%)	p-value
Family history of hypertension	Agree	127(43%)	168 (57%)	295(83.3%)	0.108
	Disagree	13(27%)	35(72%)	48(13.6%)	
	unknown	4(36%)	7(63%)	11(3.1%)	
Physical Activity	Agree	75(39%)	115 (60%)	190(53.7%)	0.006
	Disagree	60(40%)	94(61%)	154(43.5%)	
	Unknown	9(90%)	1(10%)	10(2.8%)	
Weight loss	Agree	71(40%)	106(60%)	177(50.0%)	0.135
	Disagree	67(40%)	102(60%)	169(47.7%)	
	unknown	6(75%)	2(25%)	8(2.3%)	
Salt reduction	Agree	101(40%)	147(59%)	248(70.1%)	0.152
	Disagree	34 (36%)	58(63%)	92(26.0%)	
	unknown	9(64%)	5(36%)	14(4.0%)	
Smoking	Agree	29(51%)	27(48%)	56(15.8%)	0.017
	Disagree	112(38%)	183(62%)	295(83.3%)	
	unknown	3(100%)	0(0%)	3(0.8%)	

Khat Chewing	Agree	38(45%)	47(56%)	83(23.4%)	0.087
	Disagree	105(39%)	163(60%)	268(75.7%)	
	unknown	3(100%)	00(0%)	3(0.8%)	
Shammah chewing	Agree	46(40%)	67(59%)	113(31.9%)	0.109
	Disagree	95(40%)	143(60%)	238(67.2%)	
	unknown	3(100%)	0(0%)	3(0.8%)	
Dyslipidemia	Agree	48(35%)	86 (62%)	137(38.7%)	0.143
	Disagree	64(46%)	73(53%)	137(38.7%)	
	unknown	32(40%)	48(60%)	80(22.6%)	
Diabetes mellitus Control	Agree	41(33%)	83(66%)	124(35.0%)	0.061
	Disagree	89(43%)	115(56%)	204(57.6%)	
	unknown	14(53%)	12(46%)	26(7.3%)	
Stress	Agree	72(36%)	128 (64%)	200(56.5%)	0.006
	Disagree	63(44%)	80(56%)	143(40.4%)	
	unknown	9(81%)	2(18%)	11(3.1%)	
Corticosteroids Use	Agree	3(33%)	6(66%)	9(2.5%)	0.809
	Disagree	138(41%)	198(59%)	336(94.9%)	
	unknown	3(33%)	6(66%)	9(2.5%)	
Contraceptive use	Agree	3(20%)	12(80%)	15(4.2%)	0.029
	Disagree	138(41%)	198(58%)	336(94.9%)	
	unknown	3(100%)	0(0%)	3(0.8%)	
Lots of Follow-up	Agree	59 (40%)	86 (60%)	145(41.0%)	0.059
	Disagree	74 (38%)	119 (62%)	193(54.5%)	
	unknown	11 (68%)	5 (31%)	16(4.5%)	
Target Blood Pressure	Agree	60(42%)	82(57%)	142(40.1%)	0.036
	Disagree	62(36%)	112 (64%)	174(49.2%)	
	unknown	22(58%)	16(42)	38(10.7%)	
Hypertension Duration	<5	50(49%)	52(50%)	102(28.8%)	0.097
	5-10	48(39%)	73(60%)	121(34.2%)	
	>10	46(35%)	85(65%)	131(37.0%)	
Difficult Accessibility to PHCS	Agree	37(38%)	59(61%)	96(27.1%)	0.868
	Disagree	103(41%)	146(58%)	249(70.3%)	
	unknown	4(44%)	5(55%)	9(2.5%)	
Adherence to drug	High	63(39%)	100(61%)	163(46%)	0.515
	Low	81(42%)	110(57%)	191(54%)	
Total	Blood pressure	144(40.7%)	210(59.3%)	354 (100%)	

Most participants tried weight loss and salt reduction at 50%, and 70%, respectively. Smoking, Khat, and Shammah chewing habits were prevalent among 16%, 23.4%, and 32% of the study participants, respectively. The uncontrolled diabetes prevalence was found among 58% of participants, in addition to dyslipidemia among 38.7% of participants. Of all participants, 56.6% reported having stress and 40.4% didn't. Medications, such as corticosteroids and contraceptives, were prevalent among 2.5% and 4.2% of the study participants, respectively.

The overall prevalence of uncontrolled hypertension in the study was 59.3%. Uncontrolled hypertension was 56% and 64.4%, respectively among males and females. Females had a statistically higher prevalence of uncontrolled hypertension than their male counterparts ($p = 0.026$). Participants aged above 60 were found to have a statistically significantly higher rate of uncontrolled hypertension than those in other age groups ($p = 0.000$). Obese participants had a statistically significantly higher rate of uncontrolled hypertension than those in other BMI groups ($p=0.000$). Uneducated patients had a statistically significant higher rate

of uncontrolled hypertension compared to those in other levels of educational groups (0.002). Unemployed patients also had a statistically significant higher rate of uncontrolled hypertension compared to those in other groups (p = 0.000).

As shown in Table 2, participants who disagreed with achieving target BP had a statistically significant higher rate of uncontrolled hypertension than those who achieved it (p=0.036). Participants who did not exercise had a statistically significantly higher rate of uncontrolled hypertension than those who did (p=0.006). Participants who had stressful life had a statistically significantly higher rate of uncontrolled hypertension than those who did not (p=0.006).

There were no statistically significant associations between uncontrolled hypertension and marital status, residence, income, follow-up, hypertension duration, accessibility to PHCS, adherence to medications, family History of hypertension, salt reduction, weight loss, dyslipidemia, diabetic control, corticosteroids use, contraceptive use, smoking, Shammah or Khat chewing.

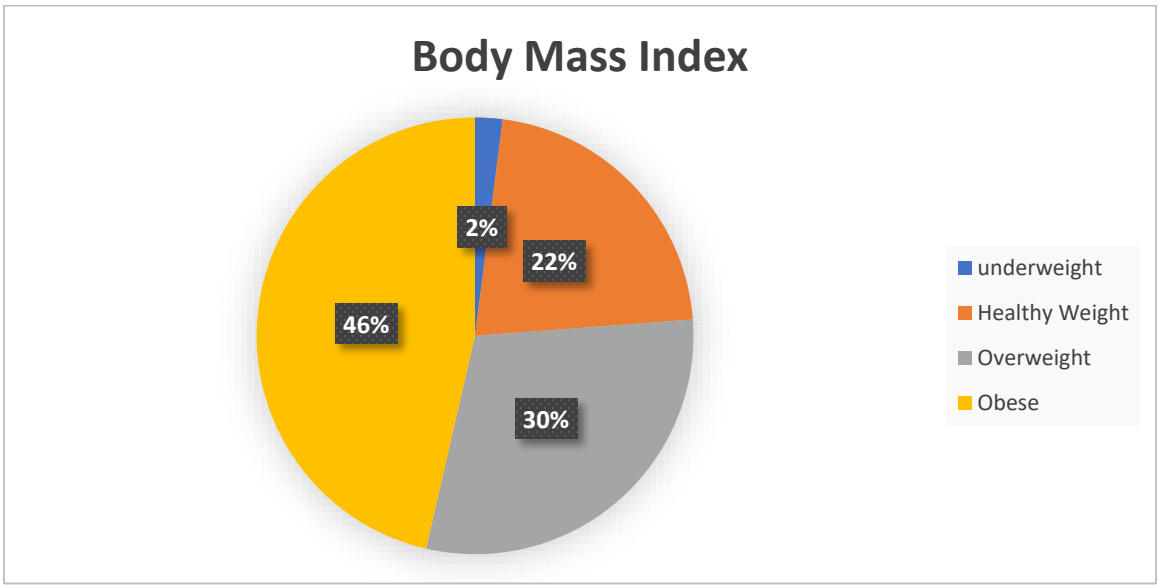

Figure 1 Percent of BMI among hypertensive patients (n=354)

Table 3 demonstrates the correlation between controlled blood pressure, the target of blood pressure, physical activity, stress and BMI group. The findings indicate that control blood pressure had a statistically significant negative correlation with stress (r = 0.138, p < 0.007), yet with a positive, statistically significant correlation with BMI groups (r = 0.280, p < 0.000). Besides that, the target of BP had a significant positive correlation with stress (r = 0.152, p < 0.004). Furthermore, physical activity had a significant negative correlation with BMI (r = 0.177, p < 0.001).

Table 3 Correlation between Blood Pressure, Target Blood Pressure, physical, activity, Stress and Body Mass Index group among hypertensive patients (n=354).

variables	BP	Target of BP	Physical activity	Stress	BMI group
BP	1				
Target of BP	-0.036-	1			
Physical activity	-0.080-	0 .064	1		
Stress	-0.138-**	0.152**	-0.001-	1	
BMI group	0.280**	-0.051-	-0.177-**	-0.087-	1

**Correlation is significant at the 0.01 level (2-tailed). BP=blood pressure. BMI=body mass index

The logistic regression analysis showed that the rest of the sociodemographic characteristics were lesser predictors except the age, which was a statistically strong predictor of uncontrolled hypertension (OR = 1.509, p = 0.005, 95% C.I: 1.129-2.018) (Table 4). The BMI was still found to be a statistically strong predictor of uncontrolled hypertension (OR = 1.90, p = 0.000, 95% C. I: 1.441-2.527). On the other hand, hypertension duration, family, salt reduction and smoking were found to be less predictors of effective of uncontrolled hypertension (OR = 1.038, p = 0.38, 95% C. I: .752 -1.433), (OR = 1.33, p = 0.416, 95% C. I: .839-1.530). (OR = 1.33, p = 0.215, 95% C. I: .847-2.089.), (OR = 1.41, p = 0.313, 95% C. I:.722-2.766), respectively.

Table 4 Logistic regression model predicting uncontrolled hypertension among the participants (n=354)

Variables	B	S.E.	Wald	p-Value	OR	95% C.I.for EXP(B)	
						Lower	Upper
Gender	.306	.274	1.251	.263	1.359	.794	2.324
Age	.412	.148	7.710	.005	1.509	1.129	2.018
Occupation	.171	.198	.743	.389	1.186	.805	1.748
Target of B	-.083-	.190	.191	.662	.921	.635	1.335
HTN Duration	.038	.164	.052	.819	1.038	.752	1.433
Family of HTN	.125	.153	.661	.416	1.133	.839	1.530
Physical Activity	-.332-	.234	2.021	.155	.717	.454	1.134
Stress	-.496-	.217	5.207	.022	.609	.398	.932
BMI	.646	.143	20.351	.000	1.908	1.441	2.527
Salt Reduction	.285	.230	1.535	.215	1.330	.847	2.089
Smoking	.346	.343	1.018	.313	1.413	.722	2.766
Constant	-3.550-	1.053	11.369	.001	.029		

R: Odds ratio; CI: Confidence interval; $p < 0.05$ (significant) BP=blood pressure; HTN=hypertension; BMI=body massindex

4. DISCUSSION

The prevalence found of uncontrolled BP of 59.3%demonstrates the challenges faced by the PHCS in Jazan in monitoring and following up on hypertensive patients. This high rate represents important information for managers and health professionals regarding the demands of care for the Jazan population. This prevalence was higher than what was reported by a Saudi national survey conducted in 2013, showing that 19.1% and 22 % of males and females, respectively, had uncontrolled BP (Saeed & Al-Hamdan, 2013). We identified the following factors positively associated with the lack of BP control: advanced age, increased BMI, lower educational level, irregular physical activities, and stressful life. We found that people older than 60 years have higher risks of having uncontrolled BP, which is similarly evident in another previous study (Wolf-Maier, 2003). Our study shows that female participants are more likely to have uncontrolled BP than male participants, similar to what was reported by previous epidemiological studies (Hicks et al., 2004). In contrast, some other studies suggested no association between uncontrolled BP and gender (Chew et al., 2012). Hence, a study is needed to investigate whether sex hormones play a role in gender differences in BP regulation (Egan et al., 2011).

The present study included obesity as another prognostic factor influencing BP regulation, in agreement with the various existing studies (Dua et al., 2014). BMI is an independent determinant of uncontrolled BP in obese patients (Abebe et al., 2015; Chorin et al., 2015). Uncontrolled BP was even more prevalent among uneducated participants aligning with previous studies (Feyissa & Miressa, 2021). It is clear that the majority suffer from uncontrolled hypertension due to illiteracy and subsequent lack of information. This indicates that the higher the education level, the greater the awareness of uncontrolled Hypertension and its causes; hence, the easier the prevention. In agreement with similar studies conducted previously (Liew et al., 2019), our results have shown a significantly higher risk of uncontrolled BP among unemployed participants. This could be a result of just staying home, with no exercise, in addition to challenges associated with unemployment increasing the risk of having hypertension.

Our findings have shown significantly higher risks of uncontrolled BP among participants who couldn't achieve the target BP, as seen in previous studies (Izzo et al., 2000). Physical inactivity was associated with uncontrolled hypertension, similar to the study done in Ethiopia, which found a lack of physical activity to be associated with uncontrolled hypertension (Gebremichael et al., 2019). Participants with stressful lives had a statistically significantly higher rate of uncontrolled hypertension compared with those with comfortable lives, similar to a study conducted in Indonesia (Dharmapatni et al., 2020). Stress in life could result from several issues, perhaps social issues, mental or family issues, increasing the likelihood of suffering from uncontrolled hypertension. Participants above 60 years old and obese were more likely to develop uncontrolled hypertension. Most patients didn't know their lipid levels, leading to the unknown status of dyslipidemia.

Future studies should examine the most effective strategies for BP control in this population, increasing the preventive clinic effort and focusing on both pharmacological and non-pharmacological management.

Limitations

The dataset sample was only generated from a single location, which may affect the generalization of the results in other locations.

5. CONCLUSION

Hypertension is a global calamity. Uncontrolled hypertension is still high in Jazan. The high number of individuals suffers from hypertension rendering their lives at risk. Most people should take a different lifestyle route or rather try to live a healthy lifestyle. This can be achieved by doing certain basic little things such as working out, avoiding stress, having a healthy diet and weight control. We found several factors that could lead to uncontrolled hypertension and how they affect hypertensive patients. Therefore, control and prevention strategies should be implemented in PHCS and raise of awareness is needed to improve the lifestyle of individuals to achieve blood pressure control.

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Authors' contributions

Nada M. Hakami designed the study's conceptual framework and drafted the research proposal also did data collection and analysis. Then he wrote the manuscript draft.

Prof Mona H. Elmahdy contributed to designing the study's conceptual framework and supervised the research conduction and manuscript writing.

Ethic statement

The study was approved by the Jazan Research Committee (IRB Registry. #H-10-Z-073) with ethical approval number: 023-2019. Written informed consent was also obtained from all participants.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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