Disease and Diagnosis

Dis Diagn. 2023; 12(2):57-62

doi 10.34172/ddj.2023.431

Original Article

Blood Pressure Status and Its Indicators in Individuals Covered by Integrated Health Centers in Bandar Abbas, Iran

Soghra Fallahi[1], Shideh Rafati[2], Hesamaddin Kamalzadeh[3], Teamur Aghamolaei[2], Hossein Farshidi[1], Masoud Dadras[4], Seyedeh Masoumeh Mousavinejad[1], Farideh Dastsouz[1], Marzieh Nikparvar[1*]

[1]Cardiovascular Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.
[2]Social Factors in Health Promotion Research Center, Hormozgan Health Research Institute, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.
[3]Department of Social Medicine, School of Medicine, Hormozgan University of Medical Sciences, Bandar Abbas, Iran.
[4]Education and Promotion Department of Hormozgan Health Center, Hormozgan University of Medical Science, Bandar Abbas, Iran.

***Correspondence to**
Marzieh Nikparvar,
Email: nikparvarheart1@gmail.com

Abstract

Background: Controlling hypertension is a key component in the management of cardiovascular risk factors and is an essential part of the prevention strategy.

Materials and Methods: This descriptive cross-sectional study was conducted in seven integrated health centers covering most families in Bandar Abbas from July 2019 to February 2020. The sample size was estimated to include 968 individuals. Independent samples t-test and Chi-square test were used to compare groups. In addition, some factors affecting uncontrolled blood pressure were identified using logistic regression.

Results: In this study, 68.4% and 31.6% were women and men, respectively, of whom 136 cases were single, while 756 cases were married. With an increase in age, the prevalence of uncontrolled hypertension in both genders showed a significant increase ($P<0.001$). Univariate logistic regression (crude odds ratios, ORs) demonstrated that age over 60 years, smoking, diabetes mellitus, physical inactivity, and the use of salt were the most important factors influencing the presence of uncontrolled hypertension. According to the results of the multivariable logistic regression model, smoking was the most important factor affecting the inability to control hypertension since controlling the effect of other variables triggered the chance of not controlling hypertension in smokers as 2.76 times higher than in non-smokers (adjusted OR: 2.76, 95% confidence interval: 1.05-7.26).

Conclusion: Since using table salt, a sedentary lifestyle, and smoking count as risk factors for cardiovascular diseases, necessary prevention and treatment planning are strongly recommended to control modifiable risk factors in this city through public education.

Keywords: Hypertension, Community health center, Bandar Abbas, Cardiovascular risk factors

Received: June 28, 2022, Accepted: August 1, 2022, ePublished: April 1, 2023

Introduction

Hypertension is an important risk factor for cardiovascular diseases (1). The aging population and the developing world predict an increase in the prevalence of hypertension so that the prevalence of hypertension will grow by approximately 10% between the years 2000 and 2025, and about 560 million people will be added to the hypertension group (2,3). Considering the significant increase in the number of patients with hypertension, planning for early detection is essential, and the implementation of early detection approaches in health care centers is a key step in cardiovascular disease prevention strategies (4). Prevention and successful treatment of high blood pressure play a key role in reducing the burden of the disease and increasing life expectancy in people (5). A review of the results of one of the European registers has shown that on average, only about 39% of patients with hypertension receive adequate blood pressure control in health centers (6).

There are several reasons for uncontrolled hypertension, including late or ineffective treatment, lack of awareness about proper lifestyle, smoking, and lack of physical activities. These factors can lead to severe and irreversible changes in the cardiovascular system (7).

Several studies have supported the notion that early control of blood pressure by a regular schedule at health centers, a healthy diet, regular physical activity, and lifestyle changes all reduce blood pressure more steadily, resulting in a decline in the incidence of cardiovascular diseases. However, there is still no clear and consensus

opinion about an alternative treatment strategy at health centers (8).

Some previous studies have focused on the relationship between hypertension and anthropometric indices in adults (9), as well as the study of cardiac risk factors in patients with diabetes in Bandar Abbas based on the level of literacy, knowledge, and awareness of diabetes-related behavior (10).

Objectives

Considering the importance of blood pressure and its close relationship with daily lifestyle and health centers dispersal in different areas of Bandar Abbas, Iran to provide health services, including hypertension control, the current study aimed to examine the status of hypertension and depending variables in this city.

Materials and Methods

This cross-sectional study was performed to record the data of patients with hypertension in Bandar Abbas, Iran. Data recording began from July 2019 to February 2020 in seven integrated health centers with the covering capacity of most families as the representatives of all health centers with referrals of the patients with hypertension. The study included all patients referred to seven integrated health service centers in Bandar Abbas. Based on the formula $\frac{Z^2 p(1-p)}{d^2}$ and values d = 0.0315, p = 0.5, and z = 1.96, the sample size was estimated at 968 individuals. Patients referred to these centers were included in the study based on the inclusion criteria and the whole process of completing the information and performing their examinations; referrals were under the supervision of a physician and experts from integrated health centers.

Data Recording Process

The collected data about participants were designed as online checklist questions and completed by the experts of the integrated health centers of each database. This checklist contained 35 questions associated with the patients' demographic characteristics, blood pressure, number and type of the applied drug, related risk factors, diet and physical activity, patient's clinical symptoms, and possible consequences of hypertension. Overall, 15 questions concerning the patients' demographic information were completed by the very health center experts where 20 questions were related to information, history, and clinical examinations of the patients and responded by assistants under the physicians' supervision. All these questions were designed online, which could be facilitated by the special App installed on the computers of the centers under study. The experts and doctors of these centers were easily accessible, and the related data about the patients under study were recorded on the online checklist. According to the latest Joint National Committee VII (JNC-VII) guidelines (11), hypertension is defined as systolic blood pressure ≥ 140 or diastolic blood pressure ≥ 90 mm Hg (Table 1).

The variables of the study, which were all qualitative, were reported as frequencies and percentages. The study variables (gender, age group, marital status, education, job, type of consumed oil, sports [walking], use of table salt, and smoking) were compared between hypertensive groups (controlled and uncontrolled) the using chi-square test. This test was also used to compare the relationship between underlying disease and hypertension groups. Further, some factors affecting uncontrolled blood pressure were identified by logistic regression. This test investigated the relationship between age, marital status, family history, diabetes mellitus, sport (walking), smoking, use of table salt, and time for diagnosis with uncontrolled hypertension. Variables whose *P* value for crude odds ratio (OR) was less than 0.2 were entered into multivariate logistic regression. The area under the ROC curve (AUC) was used to measure the diagnostic ability of factors to predict patients with uncontrolled hypertension. A model with AUC = 1 perfectly discriminates individuals as patients with controlled or uncontrolled hypertension. Meanwhile, an AUC = 0.5 implies that there is no difference between the values of independent variables in the two groups. The AUC values were divided into 0.5-0.6, 0.6-0.8,0.8-0.9, and 0.9-1.0 as poor, fair, good, and excellent performance, respectively (12).

Results

In this study, 968 patients out of a bulk of the population from Bandar Abbas were divided into four age groups less than 40 years, 40-49 years, 50-59 years, and more than or equal to 60 years with a mean age (± SD) age of 58.03 (± 12.91). Of these, 606 (68.4%) cases were women, while 280 (31.6%) cases were men; in addition, 136 and 756 cases were single and married, respectively. With respect to the age status of the participants, the mean age of men (60.30 ± 14.61) significantly differed ($P = 0.002$) from that of women (57.10 ± 11.95). The prevalence of uncontrolled hypertension was 90 (17.8%) in women and 60 (11.9%) in men; however, with increasing age, the prevalence of uncontrolled hypertension in both genders represented a significant increase ($P < 0.001$) (Table 2).

The prevalence of other risk factors and some

Table 1. Blood Pressure Classification Based on JNC-VII Guidelines

Blood Pressure Status	Blood Pressure (mm Hg)
Normal	Systolic blood pressure less than 120 and diastolic blood pressure less than 80
Pre-hypertension	Systolic blood pressure 139-120 or diastolic blood pressure 89-80
Stage 1 hypertension	Systolic blood pressure 159-140 or diastolic blood pressure 99-90
Stage 2 hypertension	Systolic blood pressure ≥ 160 or diastolic blood pressure ≥ 100

Note. JNC-VII: Joint National Committee VII.

Table 2. Demographic Characteristics and Behavioral Habits of the Patients Based on Controlled or Uncontrolled Hypertension

Variable		No. (%)	Blood Pressure		*P* Value*
			Uncontrolled	Controlled	
			No. (%)	No. (%)	
Gender	Women	606 (68.4)	90 (17.8)	220 (43.6)	0.37
	Men	280 (31.6)	60 (11.9)	135 (26.7)	
Age group (y)	<40	90 (10.2)	8 (1.6)	55 (11)	<0.001
	40-49	142 (16.1)	18 (3.6)	68 (13.6)	
	50-59	250 (28.3)	37 (7.4)	100 (20)	
	≥60	400 (45.3)	86 (17.2)	129 (25.7)	
Marital status	Single	136 (15.2)	21 (4.1)	35 (6.9)	0.11
	Married	756 (84.8)	129 (25.4)	323 (63.6)	
Education	0-6 years	589 (66.3)	107 (21.1)	202 (39.8)	0.003
	7-12 years	269 (30.3)	40 (7.9)	140 (27.6)	
	More than 12 years	30 (3.4)	2 (0.4)	16 (3.2)	
Job	Employed	27 (3.1)	3 (0.6)	15 (3)	0.06
	Housewife	580 (65.5)	91 (18)	213 (42.1)	
	Unemployed	33 (3.6)	10 (2)	8 (1.6)	
	Retired	89 (10.1)	16 (3.2)	31 (6.1)	
	Other	154 (17.5)	30 (5.9)	89 (17.6)	
Type of consumed oil	Sesame	107 (12.1)	11 (2.2)	30 (6)	0.33
	Solid vegetable oil	75 (8.5)	14 (2.8)	44 (8.8)	
	Liquid vegetable oil	588 (66.7)	104 (20.8)	212 (42.5)	
	Animal butter or oil	112 (21.7)	21 (4.2)	63 (12.6)	
Sport (walking)	Yes	444 (50.9)	75 (15)	234 (46.9)	<0.001
	No	429 (49.1)	71 (14.2)	119 (23.8)	
Use of table salt	Yes	184 (20.1)	18 (3.6)	95 (19.1)	<0.001
	No	695 (79.1)	127 (25.5)	258 (51.8)	
Smoking	Yes	153 (21.4)	20 (5.4)	82 (22)	0.01
	No	563 (78.6)	86 (23.1)	184 (49.5)	

Note. *Chi-square test result.

comorbidities in patients (men and women) is provided in Table 3. Of the total participants, 29 (5.1%), 34 (5.9%), and 315 (36.3%) cases had a heart attack, kidney disease, and diabetes mellitus, respectively, and 534 individuals (61.2%) reported a family history of hypertension. There was also a significant relationship between the incidence of comorbidities, including heart attack, kidney disease, and history of diabetes mellitus, with blood pressure control respectively ($P=0.003$, $P<0.001$, and $P<0.016$), (Table 3).

Table 4 presents the findings of the logistic regression model for identifying factors related to uncontrolled blood pressure in the adult population referred to the selected health centers for the investigation in Bandar Abbas. Based on raw OR values in univariate regression, the age group ≥ 50 years, diabetes mellitus, the use of salt, and smoking could increase the chance of uncontrolled blood pressure. The chance of uncontrolled blood pressure for people in the age group 50-59 years and ≥ 60 years was 2.54 ($P=0.028$) and 4.58 ($P<0.001$) times more than that of the age group < 40 years. Furthermore, the chances of uncontrolled blood pressure for people with diabetes mellitus and people without physical activities were 0.59 ($P=0.024$) and 0.86 ($P=0.002$) times more than their counterparts, respectively. Additionally, for one unit increase at the time of diagnosis for hypertension, the chance for uncontrolled hypertension increased by 0.005 ($P=0.015$). Moreover, smoking and using salt increased the chances of uncontrolled blood pressure by 1.91 ($P=0.021$) and 2.59 ($P<0.001$) times.

Based on the AUC of 0.71, it is clear that the logistic model could predict patients with uncontrolled hypertension (Figure 1).

Discussion

Currently, hypertension is a major health problem in

Table 3. Frequency of Comorbidities and Related Factors of Hypertension and its Relationship With Blood Pressure Control

Underlying Disease		No. (%)	Blood Pressure		*P* Value*
			Uncontrolled	Controlled	
			No. (%)	No. (%)	
Heart attack	Yes	29 (5.1)	16 (2.8)	13 (2.3)	0.003
	No	545 (94.9)	154 (27)	387 (67.9)	
Cerebrovascular accident	Yes	7 (1.2)	3 (0.5)	4 (0.7)	0.43
	No	573 (98.8)	170 (29.5)	399 (69.3)	
Kidney disease	Yes	34 (5.9)	20 (3.5)	14 (2.5)	<0.001
	No	539 (94.1)	151 (26.5)	384 (67.50	
History of diabetes mellitus	Yes	315 (36.3)	58 (11.9)	103 (21.1)	0.01
	No	552 (63.7)	85 (17.5)	241 (49.5)	
History of dyslipidemia	Yes	263 (30.1)	41 (8.3)	97 (19.6)	0.44
	No	610 (69.9)	102 (20.6)	255 (51.5)	
Family history of hypertension	Yes	534 (61.2)	113 (22.8)	240 (48.5)	0.06
	No	338 (38.8)	35 (7.1)	107 (21.6)	

Note. * Chi-square test result.

Table 4. Univariable and Multivariable Logistic Regression Results for Investigating Factors Related to Uncontrolled Hypertension

Independent Variables		Uncontrolled Hypertension			
		Crude OR (95% CI)	*P*-value	Adjusted OR (95% CI)	*P*-value
Age (reference: <40 years)		-	-	-	-
40-49 years		1.82 (0.73, 4.50)	0.19	2.96 (0.66, 13.25)	0.15
50-59 years		2.54 (1.10, 5.84)	0.02	1.65 (0.34, 7.93)	0.53
≥60		4.58 (2.08, 10.10)	<0.001	3.41 (0.70, 16.62)	0.12
Marital status	Reference: Married	-	-	-	-
	Single	1.50 (0.84, 2.67)	0.16	0.56 (0.16, 1.97)	0.37
Family history		1.44 (0.92, 2.24)	0.10	1.01 (0.46, 2.21)	0.96
Diabetes mellitus		1.59 (1.06, 2.39)	0.02	0.98 (0.45, 2.13)	0.97
Sport (walking)	Reference: Walking	-	-	-	-
	None	1.86 (1.25, 2.75)	0.002	1.41 (0.64, 3.08)	0.38
Smoking		1.91(1.10, 3.32)	0.02	2.76 (1.05, 7.26)	0.03
Use of table salt		2.59 (1.50, 4.48)	<0.001	1.41 (0.52, 3.83)	0.49
Time to diagnosis of hypertension		1.005 (1.001, 1.010)	0.01	1.002 (0.99, 1.01)	0.49

Note. OR: Odds ratio; CI: Confidence interval.

developed countries. Accordingly, developing accurate preventive and management programs for early diagnosis and appropriate treatment of hypertension plays an important role in early prevention, diagnosis, and treatment before the onset of costly and challenging symptoms and complications (13). In this study, a significant relationship was found between poorly controlled or uncontrolled hypertension and lack of physical activities.

Aging is considered another incriminating factor for hypertension. The mean age of men referring to integrated health databases under the study significantly differed from that of women. In addition, uncontrolled hypertension was observed in 17.8% and 11.9% of women and men, and the prevalence of uncontrolled hypertension in both genders represented a significant increase with increasing age (14). Due to the imposed pressures and tensions in the work environment and situations, people are exposed to stress, anxiety, and various diseases, which had more impacts on women than men (15). The results of variables such as education, physical activity, salt, and smoking on uncontrolled hypertension demonstrated a significant increase (16). It was also revealed that the use of salt and smoking increased the chances of uncontrolled blood pressure by 2.59 and 1.91 times, respectively. Based on the results of multiple logistic regression, smoking is heavily incriminated as the major factor affecting poorly controlled or uncontrolled hypertension because controlling the effect of other variables triggered the chance for the lack of hypertension control in smokers

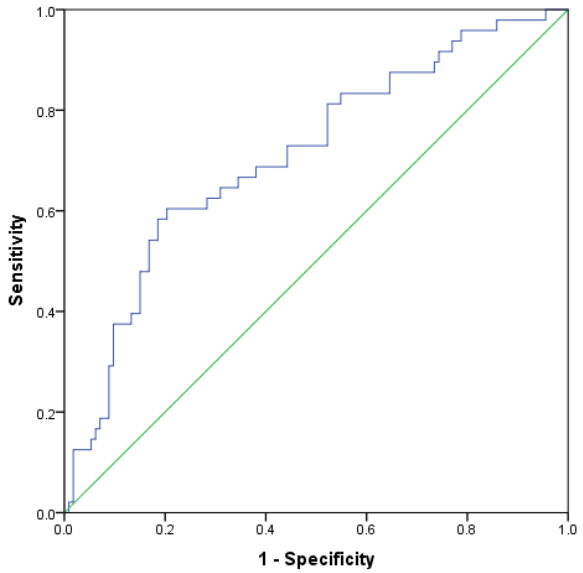

Figure 1. ROC Curve for the Evaluation of the Predictive Performance of the Logistics Model. *Note*. AUC: Area under the ROC curve. The green line is AUC = 0.5, and the blue curve is AUC = 0.71

2.79 times more than that in non-smokers. Therefore, bad habits in life are also risk factors for health. Smoking increases the risk of heart disease by 2.5 times. Systolic and diastolic blood pressures are 5.7 and 3.4 times more, respectively, in smokers than in non-smokers. There is an important relationship between smoking and blood pressure (17). Exercise has a significant role in reducing cardiovascular diseases by dwindling obesity and stress. On the other hand, the level of stress is lower in people with higher education. This could be attributed to the fact that education helps people cope with stressful conditions or that educated people have better financial security and social status (18).

One of the limitations of the present study is laid in administrative coordination with the officials of integrated health databases, the staff of health centers in each area, and the cooperation with patients due to the coronavirus disease 19 pandemic.

Conclusion

The prevalence of uncontrolled hypertension in a population covered by seven integrated health centers in Bandar Abbas was high and related to salt use, sedentary lifestyle, and positive family history of hypertension, smoking, and other risk factors. Thus, it is strongly recommended that necessary prevention and treatment planning be implemented to control modifiable risk factors in this city through public education.

Acknowledgments

We would like to thank the Deputy of Research and Technology, the staff of the integrated Health Centers, and the Health Center of Bandar Abbas who cooperated with us during the study.

Author's Contribution

The idea of this research: Marzieh Nikparvar, Hossein Farshidi, and Teamur Aghamolaei; Data collection: Soghra Fallahi, Masoud Dadras, and Seyedeh Masoumeh Mousavinejad; Original draft preparation: Marzieh Nikparvar and Soghra Fallahi; Final approval of the article: Marzieh Nikparvar; Data analysis: Shideh Rafati and Hesamaddin Kamalzadeh. final edition and submission: Farideh Dastsouz.

Competing Interests

The authors declare no conflict of interests.

Ethical Approval

This study was approved by the Ethics Committee of Hormozgan University of Medical Sciences (IR.HUMS.REC.1398.121).

Disclaimer

The expressed views are those of the authors and do not necessarily reflect the views of the Ministry of Health and Medical Education.

Funding

This study received financial support from the Department of Science and Technology of Bandar Abbas University of Medical Sciences.

Informed Consent

All participants showed their written informed consent after receiving explanations about the study objective and methodology.

References

1. Thomopoulos C, Parati G, Zanchetti A. Effects of blood pressure lowering on outcome incidence in hypertension. 1. Overview, meta-analyses, and meta-regression analyses of randomized trials. J Hypertens. 2014;32(12):2285-95. doi: 10.1097/hjh.0000000000000378.
2. Poulter NR, Prabhakaran D, Caulfield M. Hypertension. Lancet. 2015;386(9995):801-12. doi: 10.1016/s0140-6736(14)61468-9.
3. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. Lancet. 2005;365(9455):217-23. doi: 10.1016/s0140-6736(05)17741-1.
4. Benjamin EJ, Blaha MJ, Chiuve SE, Cushman M, Das SR, Deo R, et al. Heart disease and stroke statistics-2017 update: a report from the American Heart Association. Circulation. 2017;135(10):e146-e603. doi: 10.1161/cir.0000000000000485.
5. Blood Pressure Lowering Treatment Trialists' Collaboration. Blood pressure-lowering treatment based on cardiovascular risk: a meta-analysis of individual patient data. Lancet. 2014;384(9943):591-8. doi: 10.1016/s0140-6736(14)61212-5.
6. Redon J, Mourad JJ, Schmieder RE, Volpe M, Weiss TW. Why in 2016 are patients with hypertension not 100% controlled? A call to action. J Hypertens. 2016;34(8):1480-8. doi: 10.1097/hjh.0000000000000988.
7. ALLHAT Officers and Coordinators for the ALLHAT Collaborative Research Group. The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial. Major outcomes in moderately hypercholesterolemic, hypertensive patients randomized to pravastatin vs usual care: the Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial (ALLHAT-LLT). JAMA. 2002;288(23):2998-3007. doi: 10.1001/jama.288.23.2998.
8. Julius S, Kjeldsen SE, Weber M, Brunner HR, Ekman S, Hansson L, et al. Outcomes in hypertensive patients at high cardiovascular risk treated with regimens based on valsartan or amlodipine: the VALUE randomised trial.

Lancet. 2004;363(9426):2022-31. doi: 10.1016/s0140-6736(04)16451-9.
9. Farshidi H, Zare SH, Boushehri E. Association between blood pressure changes and obesity in over-18 population of Bandar Abbas. Hormozgan Med J. 2006;10(2):116-24. [Persian].
10. Shahab Jahanlou AR, Sobhani A. The effect of cardiovascular risk factors in diabetic patients based on literacy level, knowledge and behavior related diabetic disease. Hormozgan Med J. 2011;14(4):290-6. [Persian].
11. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al. The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. JAMA. 2003;289(19):2560-72. doi: 10.1001/jama.289.19.2560.
12. El Khouli RH, Macura KJ, Barker PB, Habba MR, Jacobs MA, Bluemke DA. Relationship of temporal resolution to diagnostic performance for dynamic contrast enhanced MRI of the breast. J Magn Reson Imaging. 2009;30(5):999-1004. doi:10.1002/jmri.21947
13. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al. Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. Hypertension. 2003;42(6):1206-52. doi: 10.1161/01.HYP.0000107251.49515.c2.
14. Barikani A, Saeedi f. Prevalence of hypertension among women aged 30+in Minoodar region of Qazvin in 2009. J Qazvin Univ Med Sci. 2010;14(1):41-8. [Persian].
15. Azadbakht L, Esmaillzadeh A. Dietary and non-dietary determinants of central adiposity among Tehrani women. Public Health Nutr. 2008;11(5):528-34. doi: 10.1017/s1368980007000882.
16. Nasermoaddeli A, Sekine MK, Kagamimori S. Relationship of sense of coherence to a 4-year blood pressure change. Iran J Epidemiol. 2008;4(2):27-34. [Persian].
17. Pejhan A, Najjar L, Heydari A, Hajeezadeh S, Rakhshani M. The status of blood pressure in urban population of Sabzevar in 2003. J Rafsanjan Univ Med Sci. 2005;4(2):95-102. [Persian].
18. Yadegarfar G, Alinia T, Gharaaghaji Asl R, Allahyari T, Sheikhbagloo R. Study of association between job stress and cardiovascular disease risk factors among Urmia petrochemical company personell. J Isfahan Med Sch. 2010;28(112):665-80. [Persian].