



Original Article

The prevalence, awareness and control rate of hypertension among elderly in northwest of Iran

Samad Ghaffari¹, Leili Pourafkari^{1,2}, Arezou Tajlil¹, Mohammad Hassan Sahebihagh³, Asghar Mohammadpoorasl³, Jafar Sadegh Tabrizi³, Nader D Nader², Akbar Azizi Zeinalhajlou^{3*}

¹Cardiovascular Research Center, Tabriz University of Medical Sciences, Tabriz, Iran

²University at Buffalo, Buffalo, New York, 14214, USA

³Health Services Management Research Center, Tabriz University of Medical Sciences Tabriz, Iran

Article info

Article History:

Received: 29 June 2016

Accepted: 28 November 2016

published: 30 December 2016

Keywords:

Hypertension in Elderly
Epidemiology
Gender Differences

Abstract

Introduction: Adequate treatment of hypertension is infrequent in older patients. Determining the prevalence of hypertension in older patients, identifying the pattern of the treatment in this age group and evaluating their awareness of the disease may help healthcare systems to devise appropriate programs for controlling the disease.

Methods: This descriptive cross sectional study included a sample from population of Tabriz, a large city in North-West of Iran, who were 60 years or older. Data collection and blood pressure measurements were conducted in the households of the participants from 1st June 2015 through 1st August 2015. Hypertension was defined as systolic and/or diastolic blood pressure (DBP) $\geq 150/90$ mm Hg or receiving anti-hypertensive medications. Prevalence and determinants of hypertension, awareness of patients about their diagnosis and prevalence of treatment and adequately controlled blood pressure were determined.

Results: The prevalence of hypertension was 68.0%. Among hypertensive patients 81.8% were aware of their diagnosis, 78.0% were receiving antihypertensive medications. Among treated patients, 46.2% were adequately controlled. In univariate analysis, prevalence of hypertension was significantly higher in women (74.0% vs. 60.7%, $P < 0.001$). Women were more likely to be aware of diagnosis and to receive antihypertensive medications; however, the prevalence of adequately controlled blood pressure was similar in treated men and women. Among included variables in logistic regression analysis, older age, lower number of family members in household, cardiac diseases, being on low salt low fat diet, higher Body mass index (BMI) and not being educated were independently associated with having hypertension.

Conclusion: Hypertension is highly prevalent among older population of Tabriz. Despite high rate of treatment, the rates of control are relatively low, indicating a demand for prevention and better management of hypertension in older individuals.

Please cite this article as: Ghaffari S, Pourafkari L, Tajlil A, Sahebihagh MH, Mohammadpoorasl A, Tabrizi JS, Nader ND, Azizi Zeinalhajlou A. The Prevalence, awareness and control rate of hypertension among elderly in northwest of Iran. *J Cardiovasc Thorac Res* 2016;8(4):176-182. doi: 10.15171/jcvtr.2016.35.

Introduction

Hypertension increases the risk for developing various non-communicable diseases and is a major risk factor for myocardial infarction, stroke and chronic kidney disease. Along with that, hypertension imposes substantial financial burden on health care systems.¹ However, hypertension is a preventable as well as a controllable disease, making it an important matter to consider when planning for public health policies.²⁻⁴

Although the global prevalence of hypertension is estimated to be about 22% in adult population of 18 years or higher, the prevalence differs between countries and among age groups.⁵ While the prevalence of hypertension is declining in higher income countries, lower income countries are encountering an increasing number of patients with hypertension.^{5,6} Since demographic and social changes in these societies contribute

to this issue, improving lifestyle and increasing the awareness of patients about the disease can help healthcare systems overcome the problem.⁵ On the other hand, developing countries encounter a growing number of aging populations. Even though prevalence of hypertension increases with age,^{7,8} adequate treatment is infrequent in older patients.² Consequently, identifying the pattern of disease prevalence and risk factors is essential for devising a targeted screening program and promoting the awareness of people about the modifiable risk factors of hypertension.

Regarding these facts, we devised a cross-sectional study focused only on older population to determine the prevalence of hypertension in Tabriz, the largest city in northwest of a middle-income country, Iran. The awareness of patients about their disease and prevalence of appropriate control of blood pressure and its determinant were also investigated in

*Corresponding Author: Akbar Azizi Zeinalhajlou, Email: akbarazizi55@gmail.com

our study.

Methods and Materials

Study population

This descriptive cross sectional study included a sample from Tabriz population, who were 60 years or older. Tabriz is the largest city in North-West of Iran, a middle-income country located in Middle East. Data collection and BP measurements were conducted in the households of the participants from first June 2015 through first August 2015.

Sample number and sampling methods

In accordance with the Cochran's sample size formula ($n = t^2 * p * q / d^2$) with 95% CI, $P = Q$ and $d = 0.03$, the sample size was calculated to be 1067 cases. Participants were selected by probability sampling and classified using multistage clustering and probability proportional to size (PPS) technique. The study comprises representative household surveys in Tabriz. Respondents were selected using a multistage, stratified, random cluster sampling design with every individual having a known non-zero probability of being selected. The primary sampling units were stratified by Municipal districts. The sample size was chosen according to the population of elderly in each municipality proportional to the population of whole city, Population data of the municipality and city blocks were obtained from statistical center of Iran and PPS method was used for selecting relevant blocks. Finally, 10 elderly people were selected from each city block randomly. If such a person was not available, the next sample was replaced from the right on the basis of available addresses. Validity and reliability of the study was evaluated by pilot study on 45 people (five from each municipal districts).

Study variables

To obtain demographic and health related information, trained health workers for interviewing older people, visited the participants in their homes. Interviewers filled out the prepared questionnaires. Demographic information included questions regarding age, city of born, marital status, number of children, number of household members, educational level and employment status. The participants were asked to provide subjective information about cardiovascular comorbidities including diabetes mellitus, smoking status, hyperlipidemia, history of coronary artery disease, and family history of hypertension. The information regarding the amount of physical activity and dietary habits, awareness about hypertension diagnosis and annual physician visits were also gathered. Medical history was gathered by asking from patients along with reviewing their prescriptions.

After volunteers rested for five minutes, trained interviewers measured their blood pressure from right and left arm, using sphygmomanometer and auscultatory method of measurement. While the arm of the patient was supported on the heart level, the bladder of appropriately sized blood pressure cuff was placed on midline over the brachial artery pulsation.

Definition of variables

Hypertension was defined as systolic blood pressure of 150 mm Hg or more and/or diastolic blood pressure of 90 mm Hg or more in right and/or left arm. Using anti-hypertensive medications for treatment of raised blood pressure was

also considered as having hypertension regardless of the level of blood pressure measured at the time of the study. Isolated systolic hypertension (ISH) was defined as systolic blood pressure (SBP) of 150 mm Hg or more and diastolic BP of less than 90 mmHg.

Participants who were on anti-hypertensive medications and their measured blood pressure was <150/90 mm Hg, were considered as the group with controlled blood pressure.

A person with hypertension was considered "aware" if he/she gave a positive response to the question, "Have you ever been told by a doctor or other health professional that you had hypertension, also called high blood pressure?" A person with hypertension was classified as "treated" if he/ she reported taking antihypertensive medication at the time of the survey. A treated person was considered "controlled" if his/her average SBP was <150 mm Hg and average diastolic blood pressure (DBP) was <90 mm Hg.

Diabetes mellitus was defined by a positive response to any of the questions, "Have you ever been told by a doctor that you have diabetes?"; "Are you now taking insulin?"; "Are you now taking diabetes pills to lower your blood sugar?"

Height was measured using a stadiometer and weight was measured using a weighing scale that was periodically calibrated. Body mass index (BMI) was calculated by dividing body weight in kilograms to square of height in meters.

Study design

The prevalence of hypertension was determined in study sample. Patients with and those without hypertension were compared and independent predictors of hypertension were determined by multivariate logistic regression analysis. Further, patients under treatment with anti-hypertensive medications were allocated into two groups and compared regarding appropriate control of blood pressure. The independent predictors of having controlled blood pressure were determined. To evaluate sex related differences, demographic and clinical data were compared between men and women with hypertension.

Statistical analysis

Data were analyzed using the statistical software SPSS-16 (Chicago, IL, USA). Categorical variables were expressed as frequencies and percentages and compared with chi-square test between groups. Continuous variables were described as mean \pm standard deviation (SD) and compared between two groups using independent t test. To evaluate the independent predictors presence of hypertension in study population multivariate logistic regression analysis was performed. The inclusion of variables in the final regression model was based on likelihood ratio test. A probability value of less than 0.05 was considered as statistically significant.

Results

General characteristics

The mean age of patients was 70.1 ± 8.2 years and 514 (48.0%) of 1071 patients were male. The place of born was a rural area in 526 (49.1%) and an urban area in 514 (48.0%) patients. The mean number of family members living in one household was 3.1 ± 1.6 persons. The majority of individuals were married (764 cases, 71.0%) and 278 (26%), 15 (1.4%), 7 (0.7%), 7 (0.7%) were widowed, divorced, single, in other

relationship status, respectively.

Prevalence of hypertension and awareness of the disease

Among 1071 individuals included in our survey, 724 (67.6%) had hypertension. The measured systolic blood pressure was 150 mm Hg or more in 241 patients (22.5%). Diastolic blood pressure of 90 mm Hg or more was present in 235 (32.5%) of 724 patients. In 172 (23.8%) of 724 patients both SBP and DBP was above 150/90 mm Hg threshold. Among 724 hypertensive patients, 585 (80.8%) were aware of their diagnosis and 565 (78%) were receiving antihypertensive medications but in just 261 patients (46.2%) out of 565 treated patients blood pressure was adequately controlled. The most common medication used by patients was beta-blockers, which was used by 306 (54.2%) of 565 patients, followed by angiotensin receptor blockers (ARBs) used by 281 patients (49.7%). Among patients under treatment with antihypertensive medications, 278 patients (49.2%) were using a single medication while 287 (50.8%) were using two antihypertensive medications or more.

Table 1 shows the differences between patients whose hypertension was adequately controlled and not adequately controlled with antihypertensive medications. As shown in the

table, age, sex, marital status and history of comorbidities are not different between two groups. Likewise, being aware of their diagnosis, BMI, being on low sodium low fat diet and physical activity were not significantly different between two groups. However, patients who had regular annual ophthalmologic and cardiovascular check-up visits and those who had higher level of education were more likely to have controlled blood pressure. Monotherapy was also significantly associated with lower chance of having controlled hypertension (Table 1).

Comparison of individuals with and without hypertension

Table 2 shows the differences between patients with and those without hypertension. Patients who fulfilled the criteria of having hypertension were older than non-hypertensive individuals. Hypertensive individuals were significantly more likely to be female. Among 724 patients with hypertension, 412 (56.9%) were female but among 347 non-hypertensive individuals, 145 (41.7%) were female ($P < 0.001$). Hypertensive individuals were more likely to be illiterate, to have sedentary lifestyle and to be overweight. Diabetes mellitus and cardiac diseases were more prevalent in hypertensive group. Patients in hypertensive group were more aware of their

Table 1. Adequately controlled blood pressure in hypertensive patients under treatment with antihypertensive medications

		Uncontrolled (n=304)	Controlled (n=261)	P value
Age (y)		70.9±8.0	70.4±7.9	0.518
Sex	Male	114 (37.5%)	109 (41.8%)	0.344
	Female	190 (62.5%)	152 (58.2%)	
Marital status	Single	2 (0.7%)	0 (0.0%)	0.316
	Married	198 (65.1%)	183 (70.1%)	
	Divorced	7 (2.3%)	2 (0.8%)	
	Widowed	95 (31.3%)	74 (28.4%)	
	Other	2 (0.7%)	2 (0.8%)	
	None	91 (30.7%)	79 (30.4%)	
Physical activity	15 Minutes a day	92 (31.1%)	68 (26.2%)	0.070
	30 Minutes a day	80 (27.0%)	64 (24.6%)	
	60 Minutes or More	33 (11.1%)	49 (18.8%)	
Diabetes mellitus		88 (28.9%)	78 (29.9%)	0.853
Cardiac disease		92 (30.3%)	100 (38.3%)	0.504
Asthma		21 (6.9%)	13 (5.0%)	0.434
Stroke		17 (5.6%)	14 (5.4%)	0.906
Anxiety disorders		36 (11.8%)	39 (14.9%)	0.432
Depression		36 (11.8%)	34 (13.0%)	0.776
Hyperlipidemia		24 (7.9%)	15 (5.7%)	0.402
Active smoking		24 (7.9%)	24 (9.2%)	
History of smoking		24 (7.9%)	31 (11.9%)	0.223
On low salt low fat diet		183 (65.1%)	179 (72.5%)	0.085
Annuals ophthalmologic and cardiovascular examinations		181 (65.1%)	181 (74.5%)	0.026
Dizziness		154 (52.9%)	127 (49.0%)	0.410
BMI classification	Underweight	44 (14.9%)	40 (16.4%)	0.530
	Healthy Weight	122 (41.4%)	109 (44.7%)	
	Overweight	129 (43.7%)	95 (38.9%)	
Literacy level	Illiterate	192 (63.2%)	139 (53.3%)	0.001
	Primary	79 (26.0%)	62 (23.8%)	
	Secondary	17 (5.6%)	38 (14.6%)	
Number of family members in household	Higher education	16 (5.3%)	22 (8.4%)	0.069
	1	48 (15.8%)	23 (8.8%)	
	2	95 (31.3%)	98 (37.5%)	
	3	135 (44.4%)	117 (44.8%)	
Awareness	4	26 (8.6%)	23 (8.8%)	0.125
		291 (96.05)	257 (97.1%)	
Monotherapy		167 (54.9%)	111 (42.5%)	0.004

blood pressure level and they were more likely to have annual ophthalmological and cardiovascular examinations and consume low-sodium low-fat diet. Waist circumference and waist to hip ratio were both higher in hypertensive group. Patients in non-hypertensive group were more likely to be active smoker and to have diagnosed cancer. The prevalence of asthma, hyperlipidemia, anxiety disorders and depression was similar in two groups (Table 2).

Independent predictors of hypertension in patients ≥ 60 years

Among included variables in logistic regression analysis, older age, lower number of family members in household, cardiac diseases, annual cardiovascular and ophthalmologic exam, being on low salt low fat diet, higher BMI and not being educated were independently associated with having hypertension (Table 3). However, sex, active smoking, diabetes, being

married and having more than 30 minutes of daily physical activity were not independently associated with having hypertension (Table 3)

Comparison of hypertensive males and females

Table 4 illustrate the differences between men and women with hypertension. Males were older than females (females: 69.6 ± 7.7 years vs. males: 71.7 ± 8.1 years, $P < 0.001$) with higher level of education. Males were more likely to be married and to live in a nuclear family. Compared to men, women were significantly more aware of their diagnosis (women: 87.8% vs. men: 77.9%, $P = 0.001$). Females were more likely to be under treatment with antihypertensive medications. (83.0% vs. 71.5%, $P < 0.001$). The prevalence of adequately controlled blood pressure in treated individuals was similar in males and females (44.4% vs. 48.9%, $P = 0.344$). Females had higher BMI level and lower physical activity level in com-

Table 2. Comparison of patients with and those without hypertension

		Non Hypertensive (n=374)	Hypertensive (n=724)	P
Age (y)		69.4 \pm 8.6	70.5 \pm 7.9	0.033
Sex	Male	202 (58.2%)	312 (43.1%)	<0.001
	Female	145 (41.8%)	412 (56.9%)	
The place of birth	Rural Region	162 (47.8%)	364 (51.9%)	0.236
	Urban Region	177 (52.2%)	337 (48.1%)	
Diabetes mellitus		52 (15.0%)	188 (26.0%)	<0.001
Cardiac diseases		58 (16.7%)	211 (29.1%)	<0.001
Asthma		13 (3.7%)	35 (4.8%)	0.517
Stroke		6 (1.7%)	31 (4.3%)	0.050
Anxiety disorders		35 (10.1%)	93 (12.8%)	0.229
Depression		29 (8.4%)	89 (12.3%)	0.089
Cancer		8 (2.3%)	3 (0.4%)	0.007
Hyperlipidemia		13 (3.7%)	42 (5.8%)	0.201
Active smoking	Never	256 (74.0%)	579 (80.4%)	0.019
	Active	54 (15.6%)	71 (9.9%)	
	Quitted	36 (10.4%)	70 (9.7%)	
Passive smoker		41 (12.2%)	96 (13.7%)	0.589
Medications for diabetes		38 (11.0%)	173 (23.9%)	<0.001
Oral Hypoglycemic agents		34 (9.8%)	154 (21.3%)	<0.001
Insulin		7 (2.0%)	24 (3.3%)	0.303
Aware of blood pressure		189 (55.3%)	531 (73.8%)	<0.001
Having medical insurance		320 (92.5%)	663 (91.7%)	0.748
Having complimentary health insurance		182 (53.5%)	347 (50.2%)	0.321
Double glazed windows in house		26 (7.5%)	35 (4.9%)	0.109
Marital status	Married	268 (77.2%)	496 (68.5%)	0.003
	None	71 (20.8%)	197 (27.6%)	
Physical activity	15-30 minutes	80 (23.4%)	213 (29.9%)	<0.001
	30-60 minutes	94 (27.5%)	186 (26.1%)	
	60 minutes or more	97 (28.4%)	117 (16.4%)	
On low fat low salt diet		161 (50.0%)	423 (62.8%)	<0.001
Annual ophthalmologic and cardiac examinations		155 (49.1%)	412 (61.6%)	<0.001
Chest pain		69 (20.2%)	247 (34.8%)	<0.001
Dizziness		122 (36.4%)	340 (48.2%)	<0.001
Being head of family		219 (64.2%)	421 (58.6%)	0.195
BMI classification	Underweight	94 (29.1%)	110 (16.1%)	<0.001
	Healthy Weight	150 (46.4%)	309 (45.2%)	
	Overweight	79 (24.5%)	264 (38.7%)	
Waist circumference (cm)		96.8 \pm 15.2	103.0 \pm 13.0	<0.001
Waist to hip ratio		0.95 \pm 0.09	0.97 \pm 0.07	0.024
Educational level	Illiterate	154 (44.4%)	431 (59.6%)	<0.001
	Primary	111 (32.0%)	176 (24.3%)	
	Secondary	56 (16.1%)	74 (10.2%)	
	Higher Education	26 (7.5%)	42 (5.8%)	

Table 3. Independent predictors of having hypertension in multivariate logistic regression analysis

	Odds Ratio	95% CI	P value
Age	1.027	(1.004-1.051)	0.021
Male sex	0.888	(0.599-1.317)	0.556
Number of family members (Continuous)	0.903	(0.820-0.994)	0.037
Diabetes	0.719	(0.482-1.072)	0.106
Cardiac disease	1.545	(1.050-2.275)	0.027
Low fat low salt diet	1.469	(1.066-2.025)	0.019
Annual cardiovascular and ophthalmologic exam	1.578	(1.141-2.182)	0.006
Body mass index (continuous)	1.096	(1.060-1.134)	<0.001
Being married	0.744	(0.490-1.128)	0.164
Active smoking	0.959	(0.605-1.519)	0.858
Activity more than 30 minutes a day	0.819	(0.585-1.146)	0.244
Educated	0.602	(0.428-0.846)	0.004

parison to males. The prevalence of diabetes mellitus was higher in females than in males. Females were more likely to receive monotherapy for treatment of hypertension 42.2% vs. 33.3%, $P < 0.001$). Waist to hip ratio was higher in females but waist circumference was similar in two groups. The rate of having health insurance was similar in males and females (90.8% of females vs. 92.9% of males, $P = 0.356$) but males were more likely to have supplemental health insurance plans 44.5% of females vs. 57.6% of males, $P = 0.001$).

Discussion

As shown in this study, the prevalence of hypertension, as a major cardiovascular risk factor is 67.6% in our elderly population and as expected the prevalence increases with age. Unlike our study, most studies in Iran have included different age groups with no special focus on elderly.⁹⁻¹⁴ In a report from North-East of Iran, hypertension defined as blood pressure $\geq 140/90$ mm Hg was present in 62% of individuals older than 60 years.⁹ In comparison, the prevalence of hypertension in elderly differs among low to middle income countries.^{6,15} Sought Africa is reported to have a very high prevalence of 78 %, while the prevalence of hypertension in older population is 59% in China and 32% in India. However, it should be noted that in all these studies, unlike our survey the threshold for defining high SBP is set to be 140 mm Hg.⁶ Although the rise of blood pressure as a result of aging is inevitable, due to greater risk of cardiovascular diseases in older adults, proper treatment of hypertension as a major cardiovascular risk factor is mandatory.^{2,16} In our survey, 78% of hypertensive patients were aware of their hypertension but only 52.8% were under treatment with anti-hypertensive medications. The awareness of diagnosis in our region is higher than previous reports from Iran. In a study from Northeast of Iran, only 42.6% of patients older than 60 years were aware of their diagnosis and 17.6% were under treatment with hypertensive medications.⁹ In a recent survey from south of Iran, only 22.1% of patients of 60-69 years and 11.6% of patients older than 70 years were aware of their diagnosis.¹⁰ In comparison to developed countries, the reported prevalence of awareness is generally lower in low to middle income countries. However, the Federation of Russia had a prevalence of 72%.⁶ The prevalence of awareness is higher in developed countries and is reported to be about 80% in United States.^{17,18} The increasing level of awareness in the United States as a result of national health programs and advocates for decreasing

cardiovascular diseases¹⁷ underscores the importance and efficacy of such health policies to detect and treat the affected individuals.

Among patients who were receiving anti-hypertensive medications, blood pressure was adequately controlled in only 46% of patients. This number is consistent with the results of a report from central regions of Iran, Isfahan, in which the prevalence of uncontrolled blood pressure was about 60% in patients older than 65 years.¹¹ In another report from southern parts of Iran including individuals of age 20-74 years, the prevalence of controlled blood pressure among treated patients of all age groups was 34%.¹⁴ In comparison, the rate of adequately controlled blood pressure in treated patients was 72.7% in a recent report from united states in which the blood pressure goal of $<150/90$ mm Hg was applied for defining at-goal blood pressure.¹⁹ Different underlying factors may contribute to successful treatment of hypertension in older patients. In our study, the higher level of education and annual visits for ophthalmologic and cardiovascular examinations were associated with better control of blood pressure. This may originate from better adherence and optimal prescription of medications in annual visits. Also, patients who were receiving a single antihypertensive medication was more likely to have uncontrolled blood pressure. Even though older patients are prone to experience adverse effects of anti-hypertensive medications, effective treatment of blood pressure in older ages is generally achieved with multi-pharmacy.^{20,21} However, physicians may tend to underuse anti-hypertensive medications to avoid side effects of medications and decrease the risk of hypoperfusion in older patients.^{19,22} Despite the fact that we used a threshold of 150/90 mm Hg for defining controlled blood pressure, the prevalence of uncontrolled blood pressure in treated patients is still high. Increasing the quality of care with optimum use of anti-hypertensive medications and promoting life-style changes in patients may help in lowering the prevalence of uncontrolled blood pressure in our region. In a systematic review including data from Iranian population, it is reported that many patients consider hypertension as a consequence of daily stresses and quit using medications after relief from common symptoms such as headache and dizziness.²³ Increasing the awareness of patients about the benefits of lowering blood pressure may also promote the rate of controlled blood pressure in our population. Another important finding of our study is the gender-related differences in prevalence of hypertension and associated

Table 4. Sex-related differences in hypertensive patients

		Male N=312	Female N=412	P value	
Age (Years)		71.7± 8.1	69.6±7.7	<0.001	
Place of Birth	Rural Area	156(52.0%)	208(51.9%)	0.973	
	Urban Area	144(48.0%)	193(48.1%)		
Marital Status	Single	1(0.3%)	2(0.5%)	<0.001	
	Married	279(89.4%)	217(52.7%)		
	Divorced	4(1.3%)	10(2.4%)		
	Widowed	24(7.7%)	181(43.9%)		
	Other	4(1.3%)	2(0.5%)		
Education	Illiterate	123(39.4%)	307(74.5%)	<0.001	
	Primary	101(32.4%)	75(18.2%)		
	Secondary	51(16.3%)	23(5.6%)		
Type of Family	Higher education	37(11.9%)	7(1.7%)	<0.001	
	Extended	181(58.0%)	229(55.6%)		
	Nuclear	115(36.9%)	98(23.8%)		
	Living Alone	15(4.8%)	81(19.7%)		
Number of Family Members	Other	1(0.3%)	4(1.0%)	<0.001	
	1	15(4.8%)	79(19.2%)		
	2	114(36.5%)	130(31.6%)		
	3	164(52.6%)	161(39.1%)		
Aware of Blood Pressure level	4	19(6.1%)	42(10.2%)	<0.001	
	Within a Week	128(42.2%)	176(44.9%)		
	Within a Month	83(27.4%)	119(30.4%)		
	Within Six Months	60(19.8%)	74(18.9%)		
Last Measurement of Blood pressure	Within a Year	32(10.6%)	23(5.9%)	0.131	
	Low Sodium, low Fat Diet	186(63.7%)	237(62.0%)		0.718
	None	45(14.5%)	152(37.8%)		
	15-30 Minutes	76(24.4%)	137(34.1%)		
Physical Activity	30-60 Minutes	104(33.4%)	82(20.4%)	<0.001	
	60 minutes or more	86(27.7%)	31(7.7%)		
	Annual Ophthalmologic and Cardiovascular Examination	186(62.2%)	226(61.1%)		0.828
Aware of Hypertension Diagnosis		233(77.9%)	352(87.8%)	0.001	
Head of Household		295(95.5%)	126(30.8%)	<0.001	
Health Insurance		290(92.9%)	373(90.8%)	0.356	
Supplemental Health Insurance Plans		174(57.6%)	173(44.5%)	0.001	
Smoking	None	192(62.1%)	387(94.2%)	<0.001	
	Active Smoking	57(18.4%)	14(3.4%)		
	Quitted	60(19.4%)	10(2.4%)		
Passive Smoker		35(11.7%)	61(15.1%)	0.243	
Diabetes Mellitus		68(21.8%)	120(29.1%)	0.013	
Cardiac Diseases		89(28.5%)	122(29.6%)	0.814	
Asthma		8(2.6%)	27(6.6%)	0.021	
Stroke		16(5.1%)	15(3.6%)	0.427	
Anxiety Disorders		33(10.6%)	60(14.6%)	0.140	
Depression		33(10.6%)	56(13.6%)	0.267	
Cancer		2(0.6%)	1(0.2%)	0.809	
Hyperlipidemia		14(4.5%)	28(6.8%)	0.248	
Other Chronic Diseases		70(22.4%)	105(25.6%)	0.396	
Family History of hypertension		84(100.0%)	128(100.0%)		
Body Mass Index Classification	Underweight	59(19.7%)	51(13.3%)	<0.001	
	Healthy Weight	167(55.7%)	142(37.1%)		
	Overweight	74(24.7%)	190(49.6%)		
Waist Circumference		102.1±12.4	103.7±13.5	0.120	
Waist to Hip Ratio		0.98±0.08	0.95±0.06	<0.001	
Awareness		233(77.9%)	352(87.8%)	<0.001	
Treatment with Anti-hypertensive medications	Untreated	89(28.5%)	70(17.0%)	<0.001	
	Treated	223(71.5%)	342(83.0%)		
Adequately Controlled Blood Pressure		109(48.9%)	152(44.4%)	0.344	
Mono Therapy		104(33.3%)	174(42.2%)	<0.001	

comorbidities in affected individuals. According to our results, women are more likely to suffer from hypertension in older age groups. In comparison to men with hypertension,

women are more likely to have concurrent diabetes mellitus, which further increases the risk of cardiovascular diseases.² One of the important modifiable gender-related differences

in our study population is lower level of physical activity in women compared to men. Along with increasing physical activity levels, reducing the sitting time with similar activity levels can also help in lowering the risk of cardiovascular diseases.²⁴ In addition, hypertensive women in our region are more likely to be overweight. Since higher BMI level is associated with increased risk of cardiovascular diseases,² increasing physical activity along with improving diet may also help patients to lose body weight and achieve lower BMI level. On the other hand, in comparison to women, men in our region are more likely to be unaware of their diagnosis. They are also less likely to receive anti-hypertensive medications. However, among treated patients, there is no significant difference in prevalence of controlled blood pressure. Our results regarding the sex-differences in prevalence of awareness and treatment with anti-hypertensive medications are in agreement with the results of the surveys took place in other regions of Iran^{9,10} as well as other low-middle income countries⁶ and United States.²⁵ Promoting the awareness about the diagnosis of hypertension and potential benefits of treatment is essential, particularly among men.

Conclusion

Prevalence of hypertension in older population is high in our region. Despite the fact that, awareness of the patients about their diagnosis is high, the prevalence of adequately controlled blood pressure in treated patients is low.

Ethical approval

This study was reviewed and approved by deputy of research ethics committee of Tabriz University of Medical Science. Informed consent was obtained from all participants.

Competing interests

Authors declare no conflict of interest in this study.

References

1. Organization WH. A global brief on hypertension: silent killer, global public health crisis: **World Health Day** 2013. 2013.
2. Eckel RH, Jakicic JM, Ard JD, de Jesus JM, Houston Miller N, Hubbard VS, et al. 2013 AHA/ACC Guideline on Lifestyle Management to Reduce Cardiovascular Risk: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. **J Am Coll Cardiol** 2014; 63: 25.
3. Elmer PJ, Obarzanek E, Vollmer WM, Simons-Morton D, Stevens VJ, Young DR et al. Effects of comprehensive lifestyle modification on diet, weight, physical fitness, and blood pressure control: 18-month results of a randomized trial. **Ann Intern Med** 2006; 144(7): 485-95.
4. Wald DS, Law M, Morris JK, Bestwick JP, Wald NJ. Combination therapy versus monotherapy in reducing blood pressure: meta-analysis on 11,000 participants from 42 trials. **Am J Med** 2009; 122(3): 290-300. doi: 10.1016/j.amjmed.2008.09.038.
5. World Health Organization (WHO). **Global status report on noncommunicable diseases**. Geneva, Switzerland: WHO; 2014.
6. Lloyd-Sherlock P, Beard J, Minicuci N, Ebrahim S, Chatterji S. Hypertension among older adults in low- and middle-income countries: prevalence, awareness and control. **Int J Epidemiol** 2014; 43(1): 116-28. doi: 10.1093/ije/dyt215.
7. Vasani RS, Beiser A, Seshadri S, Larson MG, Kannel WB, D'Agostino RB, et al. Residual lifetime risk for developing hypertension in middle-aged women and men: The Framingham Heart Study. **JAMA** 2002; 287(8): 1003-10.
8. Vasani RS, Larson MG, Leip EP, Kannel WB, Levy D. Assessment of frequency of progression to hypertension in non-hypertensive participants in the Framingham Heart Study: a cohort study. **Lancet** 2001; 358(9294): 1682-6.
9. Malekzadeh MM, Etemadi A, Kamangar F, Khademi H, Golozar A, Islami F et al. Prevalence, awareness and risk factors of hypertension in a large cohort of Iranian adult population. **J Hypertens** 2013; 31(7): 1364-71. doi: 10.1097/HJH.0b013e3283613053.
10. Yazdanpanah L, Shahbazian H, Shahbazian H, Latifi SM. Prevalence, awareness and risk factors of hypertension in southwest of Iran. **J Renal Inj Prev** 2015; 4(2): 51-6.
11. Gharipour M, Khosravi A, Sadeghi M, Roohafza H, Hashemi M, Sarrafzadegan N. Socioeconomic characteristics and controlled hypertension: evidence from Isfahan healthy heart program. **ARYA Atheroscler** 2013; 9(1): 77-81.
12. Khosravi A, Pourheidar B, Roohafza H, Moezzi M, Mousavi M, Hajiannejad A, et al. Evaluating factors associated with uncontrolled hypertension: Isfahan cohort study, Iran. **ARYA Atheroscler** 2014; 10(6): 311-8.
13. Esteghamati A, Abbasi M, Alikhani S, Gouya MM, Delavari A, Shishehbor MH, et al. Prevalence, awareness, treatment, and risk factors associated with hypertension in the Iranian population: the national survey of risk factors for noncommunicable diseases of Iran. **Am J Hypertens** 2008; 21(6): 620-6.
14. Namayandeh S, Sadr S, Rafiei M, Modares-Mosadegh M, Rajaefard M. Hypertension in Iranian urban population, epidemiology, awareness, treatment and control. **Iran J Public Health** 2011; 40(3): 63-70.
15. Sarki AM, Nduka CU, Stranges S, Kandala NB, Uthman OA. Prevalence of hypertension in low- and middle-income countries: a systematic review and meta-analysis. **Medicine (Baltimore)** 2015; 94(50): e1959. doi: 10.1097/MD.0000000000001959.
16. Armstrong C. JNC 8 Guidelines for the Management of Hypertension in Adults. **Am Fam Physician** 2014; 90(7): 503.
17. Yoon SS, Gu Q, Nwankwo T, Wright JD, Hong Y, Burt V. Trends in blood pressure among adults with hypertension: United States, 2003 to 2012. **Hypertension** 2015; 65(1): 54-61. doi: 10.1161/HYPERTENSIONAHA.114.04012.
18. McDonald M, Hertz RP, Unger AN, Lustik MB. Prevalence, awareness, and management of hypertension, dyslipidemia, and diabetes among United States adults aged 65 and older. **The Journals of Gerontology Series A: Biological Sciences and Medical Sciences** 2009; 64A(2): 256-263.
19. Miedema MD, Lopez FL, Blaha MJ, Virani SS, Coresh J, Ballantyne CM, et al. Implications of the Eighth Joint National Committee Guidelines for the Management of High Blood Pressure for Aging Adults: Atherosclerosis Risk in Communities Study. **Hypertension** 2015; 66(3): 474-80. doi: 10.1161/HYPERTENSIONAHA.115.05560.
20. Gu Q, Burt VL, Dillon CF, Yoon S. Trends in antihypertensive medication use and blood pressure control among United States adults with hypertension: the National Health and Nutrition Examination Survey, 2001 to 2010. **Circulation** 2012; 126(17): 2105-14.
21. Benetos A, Rossignol P, Cherubini A, et al. Polypharmacy in the aging patient: Management of hypertension in octogenarians. **JAMA** 2015; 314(2): 170-180. doi: 10.1001/jama.2015.7517.
22. Aronow WS. Treating hypertension and prehypertension in older people: When, whom and how. **Maturitas** 2015; 80(1): 31-36.
23. Marshall IJ, Wolfe CD, McKeivitt C. Lay perspectives on hypertension and drug adherence: systematic review of qualitative research. **BMJ** 2012; 345: e3953.
24. Biswas A, Oh PI, Faulkner GE, Bajaj RR, Silver MA, Mitchell MS et al. Sedentary time and its association with risk for disease incidence, mortality, and hospitalization in adults: a systematic review and meta-analysis. **Ann Intern Med** 2015; 162(2): 123-32. doi: 10.7326/M14-1651.
25. Egan BM, Zhao Y, Axon R. US trends in prevalence, awareness, treatment, and control of hypertension, 1988-2008. **JAMA** 2010; 303(20): 2043-2050. doi: 10.1001/jama.2010.650.