Trends in prevalence of prehypertension and hypertension, awareness, treatment, control and cardiovascular risk factors in relatively large sample of Iranian menopausal women: 2001-2016

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Abstract

Background prehypertension and hypertension are risk factors for cardiovascular disease. Despite its importance, hypertension is often underestimated and undiagnosed, especially in women. This study was designed to determine trends in prevalence of prehypertension and hypertension, awareness, treatment, control and cardiovascular risk factors among the Iranian menopausal women. Methods This repeated Cross-sectional study was conducted on 8073 individuals which 1013 of these subjects were menopausal women older than 40, in Iran, in the years of 2001, 2007 and 2016. Samples were selected through random, multistage, cluster sampling. The data collected by the questionnaire included clinical information and blood pressure was determined via arm digital blood pressure monitors. Results The prevalence of hypertension was in the years 2001, 2007 and 2016, respectively % 52.6, % 49.0 and % 51.6, no significant changes were observed ($p=0.628$). The prevalence of Prehypertension over these years (% 56.6, % 53.3 and % 42.2) was significantly decreased ($p=0.006$). The Trends of awareness ($p=0.015$), treatment ($p=0.009$) and control ($p<0.001$) of hypertension in menopausal women with high blood pressure has significantly increased. Despite the increasing trends of drug treatment for hypertension, hypertension is uncontrolled in more than a third of subjects. Hyperlipidemia, diabetes mellitus and Body mass index increased significantly from 2001 to 2016 among the menopausal women. Conclusions The results showed that hypertension and Prehypertension are highly prevalent among Iranian menopausal women and markedly increased with age. Interventional population-based approaches are needed to improve knowledge and efficient practice that may help lower the risk for hypertension and CVD among this at risk population.

Background

Hypertension is a major risk factor for cardiovascular diseases. According to the World Health Organization (WHO), in 2012, one out of every 3 adults in the world has high blood pressure and it is predicted that this number will escalate to more than 1.56 billion by the year 2025 (1). In addition to hypertension, prehypertension is also known as another important risk factor for cardiovascular diseases (2, 3). In recent years, several studies have reported the increased risk of cardiovascular diseases in people with prehypertension (4-6). Before menopause, the prevalence of hypertension in women is much lower than in men, however, its prevalence increases significantly in postmenopausal women and equates to men (5). Postmenopausal women are at increased risk of hypertension and around 50% suffer from high blood pressure (7). Recent studies showed that 25% of women worldwide and more than 75% of women over the age of 60 in the United States have hypertension (4, 8). In a 3-year study in 4,680 perimenopause Spanish women, 27.3% of those who had normal blood pressure before menopause were prehypertensive in the postmenopausal period. This finding confirms the increase of prehypertension in postmenopausal period (9). With the growth of the world's older population, about 25 million women reach menopause every year, and with an increase of 47 million new cases annually, this figure is predicted to reach 1.2 billion in 2025 (10). menopause is a normal, natural event, defined as the final menstrual period(6) and usually occurs at the age of 45-55(11) Postmenopausal women were defined as not having experienced a period for 12 months or more(6).

Studies on the causes of hypertension in postmenopausal women indicate that a combination of factors such as the reduced vasodilator effect of endogenous estrogens, increased arterial sclerosis, increased salt sensitivity, decreased production of endothelial vascular nitric oxide, and increased receptor responses to angiotensin II may contribute to the increased systolic blood pressure (12). Furthermore, postmenopausal women are more predisposed to other cardiovascular risk factors such as dyslipidemia, diabetes mellitus and obesity (5).

Hypertension is usually asymptomatic but can be detected without needing advanced diagnostic equipment and can be easily treated and controlled with adherence to healthy lifestyle and medication recommendations (13). According to the WHO, less than 50% of people with hypertension are aware of their condition, 25% receive treatment, and less than 12.5% of such individuals manage the disease effectively (14). Considering the increasing global prevalence of hypertension and given the fact that most people with hypertension are not aware of their condition and poorly manage their disease, and also given the increasing population of older people and postmenopausal women, and the risk of hypertension in this period, this study aimed to determine the prevalence of prehypertension, hypertension, awareness, treatment, and control of hypertension, and risk factors for cardiovascular diseases among postmenopausal women in Isfahan, one of the major metropolises of Iran.

The results of this study would be helpful in planning effective community interventions for primary and secondary prevention of hypertension.

Methods

At this repeated cross-sectional study, the data from three independent samples in 2001, 2007 and 2016 were used to determine a trend over 15-year of prevalence of HTN and prehypertension, awareness, treatment and control of HTN in the menopausal women of Isfahan. The random cluster sampling was used for selection of study's participants. A total of 8627 individuals participated in these three studies. After the integration of data related to these three studies, management and processing of data were performed. Then, errors and data inconsistencies were eliminated, and the final file was prepared for data analysis. Finally, the data obtained from 8073 individuals were used to determine trends of HTN. In Isfahan healthy heart program in 2001, 2007 and 2016, 3703(1655 female – 1772 male), 2660(1252 female – 1287 male) and 2107(1017 female – 1090 male) adult residents of Isfahan, Iran were interviewed respectively. But, only 397, 298 and 318 women was menopause.

The inclusion criteria were: women over 40 years old, who have not been menstruating for at least 12 months, and being menopausal confirmed by a physician. Exclusion criteria include: fasting or having a diet either for obesity or for weight loss at the time of the study, and having a known comorbidity such as kidney failure and cancer. Methods for the sample size estimation and sampling; the procedures for measuring the blood pressure, height and weight; and data collection methods of the cross-sectional studies have been fully described in the earlier published articles(15-18)

2.4. Definitions

Definitions Following JNC-7 report guidelines, hypertension was defined as a systolic blood pressure (SBP) ≥ 140 mmHg, and/or diastolic blood pressure (DBP) ≥ 90 mmHg, and/or use of antihypertensive medications (19). Prehypertension was defined as not being on antihypertensive drugs and having an SBP of 120–139 mm Hg and/or DBP of 80–89 mm Hg. Body mass index (BMI) was calculated as the weight in kilograms divided by height in meters squared (kg/m^2). Prevalence of awareness of hypertension was defined as the proportion of women with hypertension who had a self-report of any previous diagnosis of hypertension by a health care professional. Treatment of hypertension was defined as self-reported use of antihypertensive medications with regular, irregular and non-intake of medication, among hypertensive participants who were aware of being hypertensive. Prevalence of Control of hypertension was defined as the proportion of women with hypertension who had a systolic BP < 140 mm Hg and a diastolic BP < 90 mm Hg in hypertensive women who were under treatment (20).

2.5 Data collection, variables, and tools

We used the Data collection, variables, and tools previously described by Eghbali in 2018(18)

2.6 Statistical analysis

Data was presented as mean $\pm$ standard deviation for continuous variables and frequency (percentage) for categorical variables. In order to achieve the research results; the collected data were coded and were analyzed using. One way ANOVA was used for comparing continuous normally distributed data between three time points and Bonferroni post hoc test was used for pairwise comparisons Chi-square test was used for comparing the prevalence of pre and hypertension risk factors between study time points. Multiple binary logistic regressions were used to evaluate the risk factors of pre and hypertension. SPSS software (version 18.0, SPSS Inc., Chicago, IL, USA), was used for data analysis and p-values less than 0.05 were considered to be statistically significant.

Results

A total of 1013 menopausal women older than 40 years participated in this study. The minimum and maximum menopausal ages in the years 2001, 2007, and 2016 were 27 and 67, 29 and 60, and 28 and 65 years, respectively.

Moreover, the mean age of menopause (permanent cessation of menstruation) was 46.95 ± 5.63 , 47.06 ± 5.62 , and 48.31 ± 6.26 years at 2001, 2007 and 2016, respectively. The mean BMI of the participants for the respective years was also 28.80 ± 5.07 , 28.65 ± 4.41 , and 29.93 ± 4.62 . Furthermore, the mean systolic blood pressure of the participants in the respective years were 131.22 ± 22.63 , 124.09 ± 20.59 and 126.64 ± 19.32 mm Hg, while their mean diastolic blood pressures were 81.87 ± 13.93 , 77.23 ± 11.66 , and 10 ± 74.24 mm Hg, respectively. The demographic and clinical characteristics of the participants for the three respective years are presented and compared in the Table 1.

The prevalence of diabetes mellitus was 15.9%, 15.8% and 27%, in 2001, 2007, and 2016, while the prevalence of hyperlipidemia was 29.2%, 35.6% and 49.4% in the same years, respectively. Moreover, the prevalence of positive family history of hypertension among the participants in the three respective years was 31.2%, 51.7%, and 66.7%. All the three variables showed a significant increase in menopausal women (($P = 0.001$)). However, the use of saltshaker showed a significant decrease during these years ($P = 0.001$).

As presented in table 2, the prevalence of prehypertension in menopausal women shows a decreasing trend from the 2001 to the 2016 survey so that it was 59.6% in 2001 but respectively decreased to 53.3% and 42.2% in 2007 and 2016. However, the prevalence of hypertension in menopausal women did not significantly change during the three respective years so that it was 52.6%, 49% and 51.6%, in 2001, 2007, and 2016, respectively. Furthermore, during the three respective years, the prevalence of hypertension significantly increased with age, with the highest prevalence among women over the age of 70 years (Fig. 1).

Table 3 shows that the prevalence of hypertension awareness among the menopausal women was 74.6% in 2001, but significantly increased to 77.4% and 86.6% in 2007 and 2016, respectively. Consistently, the prevalence of well-controlled hypertension was 28.8% in 2001 and significantly increased to 50.4% and 62.0% in 2007 and 2016, respectively. Moreover, in 2001, 73.7% of menopausal women who were under medical treatment for hypertension used their medications regularly. This rate was 71.9% in 2007 and significantly increased to 86.6% in 2016.

Table 4 illustrated the prevalence of cardiovascular risk factors among hypertensive menopausal women in the three respective years. The prevalence of diabetes mellitus in menopausal women was 19.6% in 2001 and respectively increased to 21.9% and 34.8% in 2007 and 2016 ($P = 0.002$). Moreover, the prevalence of hyperlipidemia was 34.4% in 2001 and respectively increased to 43.6% and 57.9% in 2007 and 2016. The, prevalence of positive family history of hypertension was also 39.2% in 2001 and respectively increased to 53.4% and 68.5% in 2007 and 2016 ($P < 0.001$). Logistic regression (Table 5) showed that each year increase in age of menopausal women resulted in an increase of 7.7%, 7.0% and 12.5% in the prevalence of hypertension during the three respective years. Also, in 2001 every unit increase in BMI was associated with an increase of 6.7% in the chance of having hypertension. This rate was decreased to 6.0% and 5.9% in 2007 and 2016, respectively. Furthermore, in 2001 the chance of having hypertension was 143.3% in menopausal women with a positive family history of hypertension. This rate was increased to 153.4% in 2016. Besides, in 2016, the risk of having hypertension was 84.8% for diabetics, as compared with non-diabetic menopausal women.

Discussion

Age at menopause in our studied sample is similar to previous estimates reported for other Iranian populations .In a cross-sectional study on 960 menopausal women in 2015 in Isfahan mean and median of natural menopause age were 48.66 and 48 years, respectively (22). In the present study, the mean age at permanent cessation of menstrual periods has significantly been increased and reached by 48 years in 2016. This finding was consistent with two earlier Iranian studies published in 2008 and 2013 (14, 15). Consistently, a meta-analysis published in 2011 evaluated the mean age of menopause in a number of countries and reported that the mean age of menopause was 48.2 in Iran, 47.16 in Pakistan, 47.3 in the United Arab

Emirates, 47.8 in Turkey, 48.22 in India, 49 in Russia, 50 in Sweden, 50.9 in the Netherlands, 51 in Finland, 51.7 in Spain, 52 in France, and 52.6 in the United States. Given these data, and compared with other countries in the region, the mean age of menopause seems suitable in Iran although it is lower than in advanced countries. This study has not only shown the trend of increasing age at menopause over time, but it also suggested that factors such as increased women's life expectancy, improved people's diet and public health may play important roles in this trend (23). It seems that a combination of factors such as genetics, ethnicity, smoking behavior, socioeconomic status, and fertility history may affect the age of menopause. The present study showed a significant increasing trend both in BMI and in the risk of hypertension in postmenopausal women. An earlier study also showed that the mean women's BMI was 22.1 kg /m² in 1975 and increased to 24.4 in 2014 (24). There is also more evidence of the increasing trend of BMI in many societies and on its direct association with the incidence of prehypertension and hypertension (25). In this regard, a study reported that –compared to those with a BMI<25- the risk of hypertension would respectively be increased by 67% and 150% in subjects with a BMI of 25-30 and a BMI> 30 (26). Another study on the prevalence of cardiovascular risk factors in Russian patients with hypertension also reported hypertriglyceridemia, hyperglycemia, and obesity as the major risk factors associated with hypertension (27).

The present study showed that the mean systolic and diastolic blood pressures of postmenopausal women were significantly lower in 2016 than in 2001. Consistently, a study on the prevalence of hypertension in adult population of the United States showed that -from 1999 to 2010- the mean SBP and DBP decreased both in men and women, and this decline was specially greater in women (28). Several studies in Central and Eastern Europe, Latin America and the Caribbean area, Central Asia, the Middle East and North Africa have also confirmed the slight decline in the mean blood pressure among women during the recent decades (29).

The present study showed an increasing trend in the prevalence of diabetes and hyperlipidemia in postmenopausal women from 2001 to 2016. Moreover, in 2016, the risk of hypertension was higher in diabetic patients than non-diabetics. Studies on the global incidence of diabetes mellitus have also shown that the incidence of diabetes in women has increased from 5% in 1980 to 7.9% in 2014 (24). The prevalence of hyperlipidemia has also increased in China (25). It has also been shown that the chances of developing cardiovascular diseases will respectively increase up to 107% and 48% in postmenopausal women with diabetes and hyperlipidemia (26).

The results of this study revealed an increase in the positive family history of hypertension in postmenopausal women from 2001 to 2016, and in 2016 nearly two-thirds of postmenopausal women had a positive family history of HTN in one of their first-degree relatives (i.e. parents and siblings). Moreover, as presented in the current study, in 2001 and 2016 the chance of having hypertension was higher in women with a positive family history of HTN than those without a family history. Consistently, Zhou et al., have also reported that the risk of CVD will be increased by 56% in postmenopausal women with a positive family history of HTN (26).

The results of the present study showed that salt intake decreased in menopausal women from 2001 to 2016, and over time, a smaller percentage of postmenopausal women used a saltshaker while eating. These results are consistent with two earlier studies that investigated the use of salt by Iranian women. The first study was conducted in 2006 and reported that 55% of women in Rasht city and 46% of women in Qazvin city added salt to their meal (30). However, the second study conducted in 2011 and showed that 13.5% of women referring to the healthcare centers in Yazd city used a saltshaker during their meal (31). These findings show that the percentage of Iranian women who add table salt to their foods has a decreasing trend.

The results of this study indicated that from 2001 to 2016, the prevalence of hypertension increased with age, and the highest prevalence was observed in those over 70 years of age. Moreover, the risk of getting HTN increased for every year of increase in age between 7% - 12%. A recent study also found that every one year increase in age of postmenopausal women was associated with a 7% increased risk of CVDs (26).

The present study showed that the prevalence of hypertension did not change significantly from 2001 to 2016, but the prevalence of prehypertension in postmenopausal women has been decreased, especially in the age group of 40 to 60 years. Contrary to expectations and despite the unchanged prevalence of hypertension in postmenopausal women during the 15

study years, over 50% of postmenopausal women in this study were hypertensive in all three surveys. Also, despite the decreased prevalence of prehypertension, still more than one-third of postmenopausal women were prehypertensive. In a study in China in 2014, the prevalence of hypertension was 43.6%, 62.3%, and 75.5% among postmenopausal women in the age groups of 45-54, 55-64, and over 65 years old (32). A recent study also showed that the prevalence of hypertension among postmenopausal women was 47.1% in Argentina (33). Also a study showed that 55.84% of Japanese women over 50 had prehypertension (35). Studies in Iran also reported that 65.5% and 33.9% of Iranian postmenopausal women were hypertensive in 2008 and 2013, respectively (14, 15).

According to the results of this study, the prevalence of hypertension awareness, regular use of medications, and well-controlled hypertension were constantly significantly increasing from 2001 to 2016. In another study on people with hypertension in Isfahan, Iran, the prevalence of hypertension of awareness, regular use of medications, and well-controlled hypertension were 69.2%, 92.4% and 59.9% respectively (35). Our findings are also consistent with a study on the American adult population in which the prevalence of hypertension awareness and well-controlled hypertension has been significantly increased between the years 1999 and 2010 (28). Surprisingly, a study in Canada has reported that the prevalence of hypertension did not significantly change in the last two decades. Although, in 1992, the rates of hypertension awareness, and good treatment and control were 56.9%, 34.6% and 13.2%, and then in 2009 increased to 82.5%, 79.8% and 64.6%, respectively (36). In a cross-sectional study on the data of cohort studies published from 2004 to 2008, the prevalence of awareness and risk factors of high blood pressure in 50045 Iranian people aged 40-75 years living in Golestan province in northeastern Iran (20% of those living in urban areas and 80% living in rural areas), after adjusting for age, the overall prevalence of hypertension was 41.8%. The prevalence of hypertension was significantly higher in women than in men (44.1% vs. 33.1%). Of those with hypertension, 46.2% were aware of their illness and 17.6% had received antihypertensive drugs. Among those who were under medical treatment, 32.1% could control their disease. The rate of hypertension awareness was higher in women, older adults, those who were overweight and obese, and those with higher levels of wealth. High blood pressure was directly associated with female gender, increased body mass index, Turkmen ethnicity and physical inactivity, but it was inversely correlated with black tea drinking and wealth (37).

The present study showed that the rate of regular medication intake was 73.7% in 2001 and increased to 86.6% in 2016. Moreover, the rates of well controlled hypertension and hypertension awareness in postmenopausal women have respectively increased from 28% to 62% and 75% to 87% from the first to the third survey. These significant increasing trends might be attributed a number of factors such as improvements in women's education and employment status, improved attitudes toward health maintenance, and increased accessibility to healthcare and medical facilities in the country. Moreover, as Sabouhi et al., (2011) reported, an increase in multimodal and communitywide health promotion and health education programs, free screening projects, community-based health interventions, and increase in the number of healthcare centers might have contributed in this regard(38).

Besides, as the present study showed, during the last two decades Iranian women (including postmenopausal women) became more educated, gained higher levels of financial independence and increased their community participation which may consequently affect their awareness, treatment and control of their blood pressure. A study in the United States examined 10-year trends in the prevalence, treatment, and control of hypertension showed that the rate of hypertension awareness and hypertension control in men and women were 69.7% and 80.7% and 43% and 56%, respectively. These trends have also been increased from 1999 to 2010 (28).

Limitations and strengths

The limitations of this study are fully described in another article (35). In addition to these, other limitations of this study are: age at menopause was self-reported and may be subject to recall bias. And finally, women with a history of hysterectomy were not excluded. The strengths of the study include observing the standard conditions for measuring blood pressure.

Conclusions

This study showed that about half of postmenopausal women in the rural areas of Iran had hypertension and more than 42% of them were prehypertensive in 2001-2016. These findings signify the need for effective preventive, educational and screening interventions in this group. Given the fact that women make up half of the population and the age of the population is rising, and as the number of postmenopausal women is constantly rising, and due to the relatively high prevalence of hypertension and cardiovascular risk factors in these women, it is crucial to implement prevention, treatment, screening, and follow up programs in postmenopausal women. Moreover, as the study revealed, postmenopausal women in our community are obese are more confronted with diabetes mellitus, hyperlipidemia, prehypertension and hypertension. Then, policymakers should implement some strategies in order to improve the women's lifestyle.

Abbreviations

WHO: world health organization

JNC-7: The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure

SBP: Systolic Blood Pressure

DBP: Diastolic Blood Pressure

BMI: Body mass index

HTN: Hypertension

Declarations

- **Ethics approval and consent to participate**

The ethical code of this research project is IR.MUI.REC.2016.3.790 approved by Isfahan University of Medical Sciences. Presence in research environments was done by obtaining and presenting an introduction letter from the cardiovascular research institute of Isfahan, Iran and HTN Research Centre. Written informed consent was obtained from each participant. All ethical standards were performed.

- **Consent for publication**

Written informed consent for publication of their clinical details was obtained from the clients. A copy of the Consent form is available for review by the review of BMC Public Health journal.

- **Availability of data and material**

The data that support the findings of this study are available from Isfahan Cardiovascular Research Center, Isfahan University of Medical Sciences but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Isfahan Cardiovascular Research Center, Isfahan University of Medical Sciences.

- **Competing interests**

Authors have no compete of interests.

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- **Authors' contributions**

M.E, A.K, N.S, H. A: Designed and directed the project and developed the theoretical framework.

1. E, A. K, N. S, H. A: Implemented, data collected and performed the measurements,

M.E, A.K, N.S: Were involved in planning and supervised the work.

1. E, N.K, A. F: Analyzed the data.
2. E, A. K, N.K and A. F: Wrote the article.
3. E, A. K, N. S, N.K, A. F and H. A: Aided in interpreting the results and worked on the manuscript. All the authors approved the final version of the manuscript.

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Tables

Table 1: Demographic characteristics, Clinical Basis Information and Cardiovascular risk factors in postmenopausal women between 2000 and 2001, 2006 to 2007, 2015 to 2016

Year		2000-2001 N=397	2006-2007 N=298	2015-2016 N=318	p- value*
Characteristics					
Age (years)		59.86±8.77	61.15±9.49	60.53±8.34	0.165
Age of Menstrual cessation(years)		46.95±5.63	47.06±5.61	48.28±6.17	0.006
BMI(kg/m2)		28.80±5.07	28.65±4.41	29.93±4.62	0.001
SBP(mm/Hg)		131.22±22.63	124.09±20.59	126.64±19.32	<0.001
DBP(mm/Hg)		81.87±13.93	77.23±11.66	74.24±10.83	<0.001
p- value					
Education	0-5 year	339(85.6%)	215(72.1%)	204(64.2%)	<0.001
	6-12 year	48(12.1%)	71(23.8%)	92(28.9%)	
	>12 year	9(2.3%)	12(4%)	22(6.9%)	
					p- value**
Occupation	Employed	12(3%)	7(2.3%)	14(4.4%)	0.002
	Retired	4(1%)	17(5.7%)	19(6%)	
	Homemaker	381(96%)	247(91.9%)	285(89.5%)	
Marital status	Never married/Divorced or separated/widowed(others)	126(31.8%)	39(23.1%)	81(25.5%)	0.052
	Married	270(68.2%)	130(76.9%)	237(74.5%)	
Smoking	Yes	14(3.5%)	5(1.7%)	6(1.9%)	0.217
	NO	383(96.5%)	293(98.3%)	311(98.1%)	
Diabetes	Yes	63(15.9%)	47(15.8%)	86(27%)	<0.001
	NO	334(84.1%)	250(84.2%)	232(73%)	
Hyperlipidemia	Yes	116(29.2%)	106(35.6%)	157(49.4%)	<0.001
	NO	281(70.8%)	192(64.4%)	161(50.6%)	
Family history of hypertension)In first-degree relatives(	Yes	124(31.2)	154(51.7)	212(66.7)	<0.001
	NO	273(68.8)	144(48.3)	106(33.3)	
general health questionnaire)psychological distress(	0-3(low stress)	---	177(59.6%)	185(58.2%)	0.721
	>4 (High stress)	---	120(40.4%)	133(41.1%)	
Add salt to food when eating	Never	253(63.7)	197(66.1)	257(69.8)	<0.001
	When food is less salt	101(25.5)	81(27.2)	58(23.7)	
	I always add salt before taste	43(10.8)	20(6.7)	3(6.5)	

Data was presented as mean ± standard deviation for continuous variables and frequency (percentage) for categorical variables. P-values were derived from one way ANOVA for continuous variables and chi-square test for categorical variables as appropriate

Table 2: Trend of hypertension and prehypertension in age category menopausal women between 2000 and 2001, 2006 to 2007, 2015 to 2016

Year	2000-2001 N (%)		2006-2007 N (%)		2015-2016 N (%)		p-value 2000-2016	
Age group (years)	Pre.HTN	HTN	Pre.HTN	HTN	Pre.HTN	HTN	Pre.HTN	HTN
Total	112(59.6)	209(52.6)	81(53.3)	146(49.0)	65(42.2)	164(51.6)	0.006	0.628
< 60	66(55.9)	80(40.4)	44(47.3)	46(33.1)	33(31.4)	59(36.0)	0.001	0.374
60-70	31(62.0)	88(63.8)	22(57.9)	56(59.6)	25(67.9)	60(61.9)	0.686	0.811
>70	15(75.0)	41(67.2)	15(71.4)	44(67.7)	7(58.3)	45(78.9)	0.597	0/284
p-value	0.253	<0.001	0.109	<0.001	<0.001	<0.001		

Data was presented as frequency (percentage). P-values were derived from chi-square test

Table 3: The process of awareness, treatment and control of hypertension in menopausal women with hypertension

Year		2000-2001	2006-2007	2015-2016	P VALUE	POST HOC BON...
Awareness	YES	156(74.6%)	113(77.4%)	142(86.6%)	0.015	–
	NO	53(25.4%)	33(22.6%)	22(13.4%)		2001-2007 2007-2016
Pharmacological treatment	Regular use	154(73.7%)	105(71.9)	142(86.6)	0.009	–
	Irregular use	42(20.1%)	33(22.6)	20(12.2)		2001-2016 2007-2016
	NO	13(6.2%)	8(5.5)	2(1.2)		2001-2016 2007-2016
HTN control	YES	45(28.8%)	57(50.4%)	88(62.0%)	<0.001	2001-2007 2007-2016
	NO	111(71.2%)	56(49.6%)	54(38.0%)		–

Data was presented as frequency (percentage) for categorical variables. P-values were derived from chi-square test and post hoc, bonferroni for categorical variables as appropriate

Table 4: Cardiovascular risk factors in postmenopausal women with hypertension

Year		2000-2001	2006-2007	2015-2016	P VALUE	POST HOC BONFERONI
Age (years)		61.97(8.55)	63.99(8.74)	63.53(8.15)	0.058	-----
BMI (kg/m2)		29.45(5.12)	29.09(4.43)	30.38(4.79)	0.051	-----
Diabetes	Yes	41(19.6%)	32(21.9%)	57(34.8%)	0.002	2001-2016 2007-2016
	No	168(80.4%)	114(78.1%)	107(65.2%)		2001-2016 2007-2016
Hyperlipidemia	Yes	72(34.4%)	64(43.8%)	95(57.9%)	<0.001	2001-2016 2007-2016
	No	137(65.6%)	82(56.2%)	69(42.1%)		2001-2016 2007-2016
Family history of hypertension)In first-degree relatives(	Yes	81(38.8)	79(54.1)	116(70.7)	<0.001	2001-2007 2007-2016
	No	128(61.2)	67(45.9)	48(29.3)		-----
Smoking	Yes	8(3.8%)	2(1.4%)	2(1.2%)	0.176	-----
	No	201(96.2%)	144(98.6%)	161(98.8%)		-----

P-values were derived from One way ANOVA for continuous variables and chi-square test and post hoc, bonferroni test for categorical variables as appropriate

Table 5: Association between hypertension and related risk factors in menopausal women hypertension

Year		2000-2001				2006-2007				2015-2016			
		P value	OR	95% C.I.for OR		P value	OR	95% C.I.for OR		P value	OR	95% C.I.for OR	
				Lower	Upper			Lower	Upper			Lower	Upper
Age (years)		<0.001	1.077	1.049	1.106	<0.001	1.070	1.040	1.101	<0.001	1.125	1.086	1.167
BMI (kg/m2)		.005	1.067	1.020	1.117	.048	1.060	1.001	1.122	.044	1.059	1.002	1.119
Diabetes	Yes	.188	1.518	.815	2.829	.069	1.938	.950	3.956	.045	1.848	1.014	3.367
	No (Ref)												
Hyperlipidemia	Yes	.250	1.337	.815	2.191	.175	1.453	.847	2.493	.163	1.450	.860	2.444
	No (Ref)												
Family history of hypertension)In first- degree relatives(	Yes	<0.001	2.433	1.501	3.943	.110	1.520	.909	2.541	.001	2.534	1.434	4.476
	No (Ref)												

P-values were derived from Logistic regression

Figures

Figure 1

The prevalence of hypertension & prehypertension, among the menopausal women, Isfahan, Iran, 2016. Note: The error bars indicate 95% CIs for the prevalence.