Original Article
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Medical Journal of the Islamic Republic of Iran (MJIRI)
Iran University of Medical Sciences

Evaluation of personnel blood pressure and its risk factors in university affiliated medical centers: Iran's Health Day 2013

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Received: 19 Oct 2013 Accepted: 27 Jan 2014 Published: 21 May 2014

Abstract

Background: Hypertension is a risk factor for life threatening diseases such as cerebrovascular accidents, coronary artery diseases, congestive heart failure and chronic renal failure. The prevalence of non-communicable diseases such as hypertension and diabetes including obesity has increased over the past few years in Iran. The first step for modification of cardiovascular diseases in a defined population is to assess the prevalence of their risk factors. This study was conduceted to assess personnel blood pressure and its risk factors in one of the medical universities of Tehran in the Health Day of 2013.

Methods: This cross sectional study was performed from May 19, 2013 to May 24, 2013 (I.R. of Iran's Health Weak) in one of the medical universities of Tehran. Participants completed voluntarily a researcher-made questionnaire which composed of demographic characteristics and variables about risk factors and preventive factors of cardiovascular diseases such as smoking, history of diabetes, history of hypertension, physical exercise status and so on. Blood pressure was measured by mercury sphygmomanometer and weight and height were measured by a ground analogue scale.

Results: Of 195 persons participated in this study, 180 persons (92.3%) were male. The mean age of participants was 33.75 (±9.87) yr. The mean of systolic and diastolic blood pressure was 114.44 (±8.67) mmHg and 73.06 (±8.45) mmHg, respectively. The prevalence of overweight, obesity, prehypertension and hypertension was 41.7%, 17.8%, 40.4% and 11.7% respectively. Only 8 persons (5.6%) were cigarette smokers.

Conclusion: Despite the low prevalence of hypertension in our samples, the high prevalence of prehypertension and overweight need great attention. Interventions like life style modification could be effective in prevention of hypertension.

Keywords: Heart, Blood Pressure, Risk Factors, Hypertension.

Cite this article as: Saberi Isfeedvajani M, Karimi Zarchi A.A, Musavi Heris A, Sajjadi F, Mehrabi Tavana A. Evaluation of personnel blood pressure and its risk factors in university affiliated medical centers: Iran's Health Day 2013. *Med J Islam Repub Iran* 2014 (21 May). Vol. 28:36.

Introduction

One of the leading causes of death are non-communicable diseases (NCDs), killing more people each year than all other causes combined. It has been reported that nearly 80% of NCD deaths occur in low- and middle- income countries. It has been estimated that about one fourth of global NCD-related deaths take place before the age of 60(1-4).

It has been indicated that the prevalence of non-communicable diseases such as hypertension and diabetes including obesity has increased over the past few years in

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Iran(1, 4). The prevalence of hypertension, diabetes, obesity and overweight in big cities in Iran was 14%, 13%, 27% and 20% respectively(1).

Hypertension is a risk factor for life threatening diseases such as cerebrovascular accidents (CVA), coronary artery diseases (CVD), congestive heart failure (CHF) and chronic renal failure (CRF) (3-13). Based on National Health and Nutrition Examination Survey (NHANES) database in United States, the prevalence of hypertension was 24.5% and 28.4% in 1988-1994 and 1999-2000 respectively (11, 12).

The prevalence of hypertension in the capital city of big provinces of Iran was 11%.(1) Also, in Zabol city in south east of Iran, the prevalence of hypertension was 13.9% among adults (4). In Semnan province, the prevalence of hypertension was 24.1% and 24.8% in urban and rural area respectively.(5) In Tehran, the prevalence of hypertension among taxi drivers was 35.4% (7).

Based on phase 1 of Isfahan Healthy Heart Study, the prevalence of hypertension in female and male were 15.6% and 18.8% respectively. The prevalence of hypertension was higher in women than in men, except in under 25-year age group. Overall 26.7% of hypertensive male and 47.7% of hypertensive female were on anti-hypertensive pharmacological treatment among which BP was under control in 6.4% of the male and 13.8% of the female (8).

NCD risk factors can be categorized as "modifiable" and "non-modifiable". Modifiable parameters include factors that can be altered such as individual and community influences, living and working conditions and socio-cultural factors. Non-modifiable parameters include those factors that are beyond the control of the individual, such as age, sex and genetic factors (1, 4). Diabetes mellitus, cardiovascular diseases, cancer, and chronic obstructive pulmonary diseases are linked by common preventable risk factors related to lifestyle (unhealthy diet, physical inactivity, obesity and overweight, and tobacco use) (1). Also, four behavioral risk factors that are pervasive aspects of economic transition, rapid urbanization and 21st-century lifestyles are tobacco use, unhealthy diet, insufficient physical activity and the harmful use of alcohol. These risk factors affect low- and middle- income countries, and on poorer people within all countries, mirroring the underlying socioeconomic determinants. There is a fact that poverty exposes people to behavioral risk factors for NCDs and, in turn, the resulting NCDs may become an important driver to the downward spiral that leads families towards poverty (1).

It has been shown that a major reduction in the burden of NCDs will come from population-wide interventions, which are cost effective and may even be revenue-generating. However, it has been reported effective interventions, such as tobacco control measures and salt reduction, are not implemented on a wide scale because of inadequate political commitment, insufficient engagement of non-health sectors, lack of resources, vested interests of critical constituencies, and limited engagement of key stakeholders (1).

According to global status report on non-communicable diseases 2010, about 6 million people die from tobacco use each year. Smoking is estimated to cause about 71% of lung cancer, 42% of chronic respiratory disease and nearly 10% of cardiovascular disease. It has been demonstrated that adequate consumption of fruit and vegetables reduces the risk for cardiovascular diseases, stomach cancer and colorectal cancer. Moreover, most populations consume much higher levels of salt than recommended by World Health organization (WHO) for disease prevention; high salt consumption is an important determinant of high blood pressure and cardiovascular risk. High consumption of saturated fats and trans-fatty acids is linked to heart disease. Unhealthy diet is rising quickly in lower-resource settings. In addition, it has been indicated that raised blood pressure is estimated to cause 7.5 million deaths, about 12.8% of all deaths. It is a major risk factor for cardiovascular disease. The prevalence of raised blood pressure is similar across all income groups, though it is generally lowest in high-income populations (1).

It has been illustrated that at least 2.8 million people die each year as a result of being overweight or obese. Also, it is estimated that raised blood pressure cause about 7.5 million deaths, about 12.8% of all deaths.(2, 6) Risks of heart disease, strokes and diabetes increase steadily with increasing body mass index (BMI). Prevalence of overweight is over 50% in the WHO European Region, the Eastern Mediterranean Region and the Region of the Americas (1).

Physical inactivity is a risk factor of NCDs that causes 3.2 million people die each year. It has been reported that people who are insufficiently physically active have a 20% to 30% increased risk of all-cause mortality. Moreover, regular physical activity reduces the risk of cardiovascular disease including high blood pressure and diabetes (1).

According to the Alma Ata Declaration, it is obvious that in effective management of diseases, three aspects should be considered. The first aspect was promotive intervention that includes policy actions and intersectoral local actions. The second aspect was preventive intervention which includes personal and behavioral actions and education to encourage behavioral modification. The third aspect was curative and rehabilitative intervention that includes services focusing on individuals who are already diagnosed, to prevent complications (1).

The first step of planning and policy making for intervention and modification of cardiovascular diseases in a defined population is to assess the prevalence of their risk factors. Therefore, this study performed to assess personnel blood pressure and its risk factors in one of the medical universities of Tehran in te Health Day of 2013.

Methods

This cross-sectional study was performed from May 19, 2013 to May 24, 2013 (I.R. of Iran's Health Weak) in one of the medical universities of Tehran. Participants were personnel of the university that completed a researcher-made questionnaire voluntarily; the questionnaire composed of demographic variables such as sex, age and variables about risk factors and preventive factors of cardiovascular diseases such as smoking, history of diabetes, history of hypertension, physical exercise status and so on. The mercury sphygmomanometer was used for blood pressure measurement by well-trained personnel. Systolic and diastolic pressures were measured after the participants had rested in a quiet area for 5 minutes. The subject's arm was placed at heart level in a sitting position. Participants were advised to avoid exercise for at least 30 minutes before their blood pressure measurement. The Korotkoff phase I (appearance) and phase V (disappearance) were recorded for the systolic blood pressure (SBP) and diastolic blood pressure (DBP) respectively (least of 3 readings taken on 1 occasion). Participant weight and height were measured using a ground analogue scale.

Statistical Analysis

The data was analyzed using SPSS 18.0. The level of significance was set at $p< 0.05$ for all analyses. One-Sample Kolmogorov-Smirnov Test used to check normal distribution of quantitative variables. Chi Square test used to analyze association between qualitative variables. One way ANOVA test used to analyze association between BMI and hypertension status. Binary logistic regression used to analyze relationship between hypertension status and its risk factors.

Results

Of 195 persons participated in this study, 180 persons (92.3%) were male. The majority of participants lived in Tehran (82.1%). Most Tehran residents (13.9%) lived in district No. 4 of the city. Only 30 participants (16.0%) lived in campus hous-

Table1. Age, duration of employment, weight, height and BMI (Body Mass Index), systolic and blood pressure of participants

	Mean	Standard Deviation	Min	Max
Age (year)	33.75	9.87	19	64
Duration of employment (year)	11.96	9.32	1	34
Weight (Kg)	79.56	12.99	54	126
Height (cm)	173.61	7.12	150	189
BMI (Body Mass Index) (Kg/(m^2)	26.37	3.88	18.51	42.10
Systolic blood pressure (mmHg)	114.44	8.67	90	140
Diastolic blood pressure (mmHg)	73.06	8.45	50	90

es. More than 80 percent of participants had academic degrees. More than 80 percent of participants worked at the university's main building. Table 1 shows age, duration of employment, weight, height, body mass index (BMI) and systolic and blood pressure. Only 8 persons (5.6%) were cigarette smokers and 26 persons (14.9%) were hookah smokers. Table 2 shows status of fruit, fast food and snak use. Table 3 shows the history of some diseases in participants and first-degree relatives. Among hypertensive cases (18 persons), only 7 cases used antihypertensive drugs. Most of the patients (87.0%) used 1-2 cups of tea per day. Among participants, only 29 persons (15.8%) attended healthy life style classes. Of participants, only 75 persons (40.5%) had normal BMI (Table 4).

Figure 1 shows classification of blood pressure based on the seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure (JNC 7 category) (14).

Table 5 shows relationship between demographic and other factors among normal, pre-hypertensive and hypertensive groups based on JNC7 categories.

According to binary logistic regression analysis, (Enter Model), there was a significant relationship between pre-hypertension or hypertension status with first relatives cardiovascular history (p= 0.029). Backward Stepwise (Conditional Model) confirmed this significant relationship. However, Forward Conditional Model showed no significant relationship between pre-hypertension or hypertension status and its risk factors.

Discussion

The result of our study showed that only

Table 2. Status of fruit, fast food and snak use

	Frequency (%)	
	Yes	No
Fruit use per day	175 (91.6)	16 (8.4)
Fast food use per week	82 (44.3)	103 (55.7)
Snake use per week	70 (38.3)	113 (61.7)

Table 3. History of some diseases in participants and first-degree relatives

	Frequency (%)	
	Yes	No
Diabetes	3 (1.6)	181 (98.4)
Renal diseases	11 (6.9)	148 (93.1)
Cardiovascular diseases	5 (2.8)	176 (97.2)
Hyperlipidemia	14 (8.9)	144 (91.1)
Hypertension	18 (10.1)	161 (89.9)
Cardiovascular diseases in first-degree relatives	45 (24.7)	137 (75.3)
Diabetes in first-degree relatives	26 (14.0)	160 (86.0)

Table 4. Obesity status of participants

	BMI	Frequency (%)
Underweight	<18.5	0 (0.0)
Normal	18.5-24.9	75 (40.5)
Overweight	25.29.9	77 (41.7)
Obesity class I	30-34.9	29 (15.7)
Obesity Class II	35-39.9	3 (1.6)
Morbid Obesity	>=40	1 (0.5)

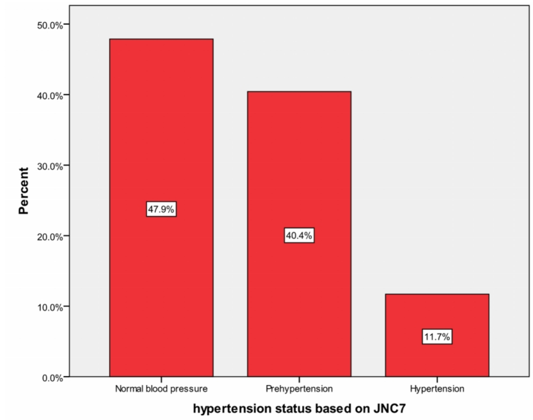

Fig.1. Hypertension status based on JNC7

40.5% of samples had a normal BMI. The mean of BMI was 26.37 (SD=3.88). The prevalence of morbid obesity was 0.5%. Although overweight and obesity are risk factors of hypertension, diabetes and other NCD, it could be modified by life style intervention such as physical activity promotion.

Yarahmadi and his colleagues' study showed that the prevalence of overweight and obesity was 27.0% and 20.0% respectively (1). Based on global status report on non-communicable diseases 2010, the age-adjusted prevalence of overweight in Bahrain and Egypt was 70.3% and 69.8% respectively. In addition, the age-adjusted prevalence of obesity in Bahrain and Egypt was 32.6% and 34.6% respectively (2). Godarzi and his colleagues' study showed that the prevalence of obesity in male and female was 64% and 70% in male and female respectively (4).

Demirchi and Mehrabani's study showed that the prevalence of overweight and obesity was 26.6% and 40.6% respectively (7). Sadeqi and her colleagues' study showed that the prevalence of BMI> 25 in male and female was 41.9% and 59.0% respectively.(8) Ahmadi and his colleagues' study showed that the prevalence of obesity in hypertensive and control group was 21.7% and 14.2% respectively (10). Ong and

Table 5. Relationship between demographic and other factors among normal, prehypertensive and hypertensive groups based on JNC7 categories

Group / Variables		Normal	Pre-hypertension	Hypertension	p value
Age (SD: Standard Deviation)		26.16 (4.11)	26.40 (3.70)	27.42 (3.75)	0.42
Sex (%)	Male	82 (91.1%)	74 (97.4%)	19 (86.4%)	0.12
	Female	8 (8.9%)	2 (2.6%)	3 (13.6%)	
BMI (kg/m$^{2)}$		33.20 (9.46)	33.57 (9.40)	37.36 (13.05)	0.20
Fruit use per day (%)	Yes	80 (89.9%)	67 (91.8%)	21 (95.5%)	0.70
	No	9 (11.1%)	6 (8.2%)	1 (4.5%)	
Fast food per week (%)	Yes	41 (47.1%)	27 (38%)	11 (52.4%)	0.37
	NO	46 (52.9%)	44 (72%)	10 (47.6%)	
Snake use per week (%)	Yes	36 (42.9%)	24 (34.3%)	7 (31.8%)	0.45
	NO	48 (57.1%)	46 (65.7%)	15 (68.2%)	
Diabetes history (%)	Yes	0 (0.0%)	0 (0.0%)	3 (15.8%)	<0.0001
	NO	86 (100.0%)	42 (100.0%)	16 (84.2%)	
Renal diseases history (%)	Yes	5 (6.6%)	3 (5.1%)	3 (16.7%)	0.24
	NO	71 (93.4%)	56 (94.9%)	15 (83.3%)	
Cardiovascular diseases history (%)	Yes	0 (0.0%)	1 (1.4%)	4 (20.0%)	<0.0001
	NO	84 (100.0%)	70 (98.6%)	16 (80.0%)	
Hyperlipidemia history (%)	Yes	5 (6.4%)	5 (8.2%)	4 (26.7%)	0.04
	NO	73 (93.6%)	56 (91.8%)	11 (73.3%)	
Cardiovascular diseases in first-degree relatives (%)	Yes	15 (17.9%)	18 (26.1%)	8 (36.4%)	0.15
	NO	69 (82.1%)	51 (73.9%)	14 (63.6%)	
Diabetes in first-degree relatives (%)	Yes	12 (13.8%)	8 (11.4%)	6 (27.3%)	0.18
	NO	75 (86.2%)	62 (88.6%)	16 (72.7%)	
Attending healthy life style classes (%)	Yes	12 (13.8%)	13 (18.8%)	3 (14.3%)	0.68
	NO	75 (86.2%)	56 (81.2%)	18 (85.7%)	

his/her colleagues' study showed that the mean of BMI (SE) was 27.81 (0.22), 27.87 (0.16) and 27.99 (0.13) in 1999-2000, 2001-2002 and 2003-2004 respectively based on NHNES database (11).

In 2001, the prevalence of obesity (BMI>= 30) was 20.9% versus 19.8% in 2000. The prevalence of morbid obesity in 2001 was 2.3% (15). Saeedi study showed that the prevalence of obesity was 56.5% and 25.0% in diabetic female and male respectively (16). McNiece and his/her colleagues' study showed that the prevalence of overweight was 18.1% in adolescent (17). Tazi and his colleagues' study indicated that the prevalence of obesity in non-hypertensive and hypertensive adult was 11.1% and 23.6% respectively. Also, the prevalence of overweight in non-hypertensive and hypertensive adult was 24.7% and 32.8% respectively (18). Fukuda and his/her colleagues' study showed that the mean BMI (SD) of male and female employees was 22.6 (2.4) and 21.2 (2.9) respectively (19). Based on a report from a community-based cohort study in Taiwan, mean BMI in normotensive, pre-hypertensive, stage 1 hypertensive and stage 2 hypertensive group were 22, 23.2, 24 and 24.3 respectively.(20) (20) Steyn and his/her colleagues' study showed that the prevalence of obesity in male and female adult was 11.1% and 23.6% respectively (21).

Singh and his/her colleagues' study indicated that the prevalence of overweight and obesity (BMI>23 Kg/m2) in normotensive, pre-hypertensive and hypertensive female and male was 14.3%, 82.3%, 83.2%, 16.4%, 70.7% and 71.3% respectively.(22) Ishikawa and his/her colleagues' study showed that the mean BMI (SD) of normotensive, prehypertensive and hypertensive male and female was 22.0 (2.5), 23.0 (2.8), 23.8 (3.0), 22.1 (2.7), 23.3 (3.1) and 24.3 (3.4) respectively (23).

Egan and his/her colleagues' study showed that the prevalence of obesity was 21.8%, 29.5%, 29.6%, 31.4%, 33.4% and 33.2% in 1988-1994, 1999-2000, 2001-2002, 2003-2004, 2005-2006 and 2007-2008 based on NHNES database respectively (24).

A prevalence study in Iranian military personnel showed that about 20% of participants were overweight (25).

Our results showed that the prevalence of norm tension, prehypertension and hypertension was 47.9%, 40.4% and 11.7% respectively. Also, there was a significant difference between cardiovascular diseases and diabetes history and hypertension status based on JNC7 categories.

Yarahmadi and his colleagues' study showed that the prevalence of hypertension was 14.0% in the capital city of 6 big provinces of Iran (1). Based on global status report on non-communicable diseases 2010, the age-adjusted prevalence of hypertension in Bahrain and Egypt was 43.7% and 38.1% respectively (2).

Godarzi and his colleagues' study showed that the prevalence of hypertension was 13.9% among Zabol city adults (4). Another study showed that the prevalence of hypertension was 24.1% and 24.8% in urban and rural area respectively (5). A study on taxi drivers' blood pressure showed that the prevalence of hypertension was 35.4%. This study concluded that hypertension prevalence are correlated positively with age increase, physical activity decrease, cardiovascular diseases history, obesity, low level of education, income increase and family member increase (7). Sadeqi and her colleagues showed that the prevalence of hypertension was 15.6% and 18.8% in male and female respectively. Moreover, the prevalence of hypertension was higher in female than in men, except in under 25-year age group (8).

Gu and his colleagues indicated that the prevalence of hypertension was 27.2% in Chinese adult population (13). In addition, Tazi and his colleagues' study showed that the prevalence of hypertension was 37.2% and 41.3% in male and female respectively. Also, the prevalence of hypertension was 30.6%, 46.5% and 58.1 in normal, overweight and obese samples respectively.

(18) Singh and his/her colleagues' study indicated that the prevalence of female and male prehypertension and hypertension in five Indian cities was 27.2%, 27.2%, 30.0 and 30.6% respectively (22). Ishikawa and his/her colleagues' study showed that the prevalence of the prevalence of normotension, prehypertension and hypertension was 32.7%, 33.0% (34.8% in males and 31.8% in females), 34.3% (36.8% in males and 32.7% in females) respectively (23).

A prevalence study in Iranian military personnel showed that 58% and 49.4% of participants had systolic and diastolic pre hypertension respectively. Additionally, the prevalence of systolic and diastolic hypertension was 9.4% and 22.2% respectively (25).

Based on Mustafavi and Zare study the prevalence of hypertension was 66.4% and 10.1% in elderly and young population respectively (26). Angell et al showed that the prevalence of hypertension among NYC adults was 25.6% (95% CI 23.4% to 27.8%) and was similar for men and women (Men: 25.5 (22.5–28.7), female: 26.0 (23.5–28.8)) (27). Kearney and his/her colleagues' study indicated that 26.4% of the adult population in 2000 had hypertension (26.6% of men and 26.1% of women), and 29.2% were projected to have this condition by 2025 (29.0% of men and 29.5% of women) (28)

Based on NHANES database in United States, the prevalence of hypertension was 24.5% and 28.4% in 1988-1994 and 1999-2000 respectively.(11, 12, 24, 29, 30) Also, the prevalence of hypertension was 26.0% and 29.3% in 2001-2002 and 2003-2004 respectively (11, 24, 29).

Based on Jaipur Heart Watch in India, the prevalence of hypertension in JHW-R, JHW-1, JHW-2, JHW-3 and JHW-4 studies in men was 21.6%, 29.1%, 29.6%, 42.5% and 45.1% and in women 15.7%, 21.7%, 25.5%, 35.2% and 38.2% respectively (31).

A survey by Wolf-Maier and colleagues showed that the age- and sex-adjusted prevalence of hypertension was 28.0% in North American countries and 44.0% in the European countries based on JNC7 categories (32). Our study showed that only 8 persons (5.6%) were cigarette smokers. Based on Global status report on noncommunicable diseases 2010, the age-adjusted prevalence of current daily cigarette smoking in Bahrain and Egypt was 14.3% and 16.5% respectively (2). Godarzi and his colleagues showed that the prevalence of tobacco and cigarette smoking in male and female was 36.0% and 15.0% respectively (4). Sadeqi and her colleagues' study showed that the prevalence of current daily cigarette smoking in male and female was 29.0% and 1.6% respectively (8). Based on Ahmadi and his colleagues' study, the prevalence of current daily cigarette smoking in hypertensive and normal population was 9.4% and 14.2% respectively (10).

Tazi and his colleagues showed that the prevalence of current smoking in non-hypertensive and hypertensive samples was 16.4% and 9.1% respectively (18). Based on a report from a community-based cohort study in Taiwan, the prevalence of smoking in normal blood pressure, pre-hypertensive, stage 1 hypertensive and stage 2 hypertensive men was 72.1%, 69.9%, 70.1% and 75.4% respectively. These percentages in women were 5.3%, 3.8%, 7.0% and 6.5% respectively (20).

Based on Singh and his colleagues' study, the prevalence of tobacco use in normotension, prehypertension and hypertension group of men and women was 35.7%, 30.5%, 30.8%, 9.2%, 10.2% and 10.7% respectively (22).

Based on the Jichi Medical School Cohort Study, the prevalence of current smoking in normotension, prehypertension and hypertension group was 57.2%, 51.1% and 44.4% respectively (23).

Based on Jaipur Heart Watch in India, the prevalence of smoking in JHW-R, JHW-1, JHW-2, JHW-3 and JHW-4 studies in men were 50.0%, 38.7%, 35.7%, 27.1% and 59.9% respectively (31).

Conclusion

Despite the low prevalence of hypertension in our samples, the high prevalence of prehypertension and overweight needs great attention. Interventions like lifestyle education, life style modification such as increasing time of physical activity programs per week, dietary modification and low caloric diet and avoiding junk and fast foods could be effective.

Acknowledgements

We thank the deputy of health of Baqiyatallah University of Medical Sciences and Baqiyatallah Hospital for their administrative supports.

References

1. Yarahmadi S, Etemad K, Hazaveh A, Azhang N. Urbanization and non-communicable risk factors in the capital city of 6 big provinces of iran. Iranian journal of public health. 2012;42(Supple1):113-8.
2. Alwan A. Global status report on noncommunicable diseases 2010: World Health Organization; 2011.
3. Ataei N, Aqamohammadi A, Ziaei V, Hosseini M, Dehsara F, Rezanezhad AA. The prevalence of hypertension among Iraniaqn students between 13 to 18 years old. Iranian Journal of Pediatrics. 2007;17(2):237-42.
4. Godarzi M, Badakhsh M, Masinaeinezhad N, Abbaszadeh M. The determination of hypertension prevalence among adults over 18 years in Zabol city. Razi Journal of Medical Sciences. 2005;11(43): 821-8.
5. Qorbani R, Iskandarian R, Malek M, Rashidipour A. The study of hypertension prevalence among adult population of Semnan province. Iranian Journal of Endocrinology and Metabolism. 2009;10(5): 495-503.
6. Mousavi Nasl Khaamene A, Hosseini Isfahani F, Safarkhani M, Mirmiran P, Azizi F. The trend of overweight and hypertension prevalence between tehran adolescents during 3 cross-sectional studies of Tehran sugar and lipid study. Iranian Journal of Endocrinology and Metabolism. 2011;12(5):483-92.
7. Damirchi A, Mehrabani J. Overweight and hypertension and their risk factors among adult males. Olympic quarterly. 2009;17(3):87-103.
8. Sadeqi M, Roohafza H, Sadri G, Bahonar A, Saeedi M, Asgari S, et al. The prevalence of hypertention and its relationship with other cardiovascular risk factors. The Journal of Qazvin University of Medical Sciences. 2003;7(2):46-52.
9. Salem Z. The study of hypertension prevalence and its relationship with anthropometric indexes among female adulescents of Rafsanjan city in 2007. Journal of Rafsanjan University Of Medical Sciences. 2010;8(4):273-86.
10. Ahmadi A, Hasanzadeh J, Rajaeifard A. The study of effective factors on hypertension in Koohrang city- Chaarmahal and Bakhtiyari province in 2007. Iranian Journal of Epidemiology. 2008; 4(2):19-25.
11. Ong KL, Cheung BM, Man YB, Lau CP, Lam KS. Prevalence, awareness, treatment, and control of hypertension among United States adults 1999–2004. Hypertension. 2007;49(1):69-75.
12. Fields LE, Burt VL, Cutler JA, Hughes J, Roccella EJ, Sorlie P. The burden of adult hypertension in the United States 1999 to 2000 a rising tide. Hypertension. 2004;44(4):398-404.
13. Gu D, Reynolds K, Wu X, Chen J, Duan X, Muntner P, et al. Prevalence, awareness, treatment, and control of hypertension in China. Hypertension. 2002;40(6):920-7.
14. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, 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.
15. Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales VS, et al. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. JAMA: the journal of the American Medical Association. 2003;289(1):76-9.
16. Saeedi M. The metabolic syndrome and hypertension among diabetics patients. Iranian Journal of Endocrinology and Metabolism. 2009; 11(1):11-6.
17. McNiece KL, Poffenbarger TS, Turner JL, Franco KD, Sorof JM, Portman RJ. Prevalence of hypertension and pre-hypertension among adolescents. The Journal of pediatrics. 2007; 150(6):640-4. e1.
18. Tazi M, Abir-Khalil S, Lahmouz F, Arrach M, Chaouki N. Risk factors for hypertension among the adult Moroccan population. Eastern Mediterranean health journal. 2009;15(4).
19. Fukuda H, Haruyama Y, Nakade M, Muto T. Relationship between lifestyle and change of cardiovascular risk factors based on a five-year follow-up of employees in Japan. Industrial Health. 2007;45(1):56-61.
20. Chien K-L, Hsu H-C, Sung F-C, Su T-C, Chen M-F, Lee Y-T. Incidence of hypertension and risk of cardiovascular events among ethnic Chinese: report from a community-based cohort study in Taiwan. Journal of hypertension. 2007;25(7):1355-61.
21. Steyn K, Bradshaw D, Norman R, Laubscher R. Determinants and treatment of hypertension in South Africans: the first Demographic and Health Survey. South African Medical Journal. 2008; 98(5):376-80.
22. Singh RB, Fedacko J, Pella D, Macejova Z,

Ghosh S, De AK, et al. Prevalence and risk factors for prehypertension and hypertension in five Indian cities. Acta cardiologica. 2011;66(1):29.

23. Ishikawa Y, Ishikawa J, Ishikawa S, Kayaba K, Nakamura Y, Shimada K, et al. Prevalence and determinants of prehypertension in a Japanese general population: the Jichi Medical School Cohort Study. Hypertension Research. 2008;31(7):1323-30.

24. Egan BM, Zhao Y, Axon RN. US trends in prevalence, awareness, treatment, and control of hypertension, 1988-2008. JAMA: the journal of the American Medical Association. 2010;303(20):2043-50.

25. Karimi Zarchi A, Gahangiri M. Prehypertension and Hypertension in Iranian Military Personel: Prevalence According to Some Related Factors. World Applied Science Journal. 2010; 11(5):541-7.

26. Mustafavi H, Zare N. The study of hypertension prevalence in elderly population of Shiraz. Medical Journal of Tabriz University of Medical Sciences & Health Services. 2004; 38(61):55-8.

27. Angell SY, Garg RK, Gwynn RC, Bash L, Thorpe LE, Frieden TR. Prevalence, awareness, treatment, and predictors of control of hypertension in New York City. Circulation: Cardiovascular Quality and Outcomes. 2008;1(1):46-53.

28. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. The Lancet. 2005; 365(9455):217-23.

29. Cutler JA, Sorlie PD, Wolz M, Thom T, Fields LE, Roccella EJ. Trends in hypertension prevalence, awareness, treatment, and control rates in United States adults between 1988–1994 and 1999–2004. Hypertension. 2008;52(5):818-27.

30. Hajjar I, Kotchen TA. Trends in prevalence, awareness, treatment, and control of hypertension in the United States, 1988-2000. JAMA: the journal of the American Medical Association. 2003; 290(2): 199-206.

31. Gupta R, Gupta V. Hypertension epidemiology in India: lessons from Jaipur heart watch. Current science. 2009;97(3):349-54.

32. Wolf-Maier K, Cooper RS, Banegas JR, Giampaoli S, Hense H-W, Joffres M, et al. Hypertension prevalence and blood pressure levels in 6 European countries, Canada, and the United States. JAMA: the journal of the American Medical Association. 2003;289(18):2363-9.