Evaluation of body mass index, abdominal fat and prevalence of hypertension among people 20 to 65 of Sabzevar city, Iran 2016

Moeini Babak (1)
Hazavehei Mohamad Mahdi (2)
Mirmmosavi Seyed Jamal (3)
Karimi Shahanjarini Akram (4)
Moghimbeigi Abbas (5)
Delawari Heravi Maryam (6)

(1) Associate Professor of Health Education, Social Determinants of Health Research Center, Hamadan University of Medical Sciences, Hamadan, Iran.
(2) MD, MSc, PhD Student, School of Medicine, Sabzevar University of Medical Sciences, Sabzevar, Iran.
(3) Professor of Health Education, Research Center for Health Science and Department of Public Health, School of Health, Hamadan University of Medical Sciences, Hamadan, Iran.
(4) Associate Professor of Health Education, Social Determinants of Health Research Center, Hamadan University of Medical Sciences, Hamadan, Iran.
(5) Associate Professor of Biostatistics, Modeling of Non-communicable Disease Research Center and Department of Biostatistics. School of Public Health, Hamadan University of Medical Sciences, Hamadan, Iran.
(6) PhD student of Health Education and Promotion, Department of public health, School of Public health and Research Center for Health Sciences, Hamadan university of Medical Sciences, Hamadan, Iran.

Correspondence:
Delawari Heravi Maryam, PhD student of Health Education and Promotion,
Department of public health, School of Public health and Research Center for Health Sciences,
Hamadan university of Medical Sciences, Hamadan, Iran
Email: delavari27@yahoo.com

Abstract

Introduction: The prevalence of obesity has been rapidly increasing in recent years and is considered as the main nutritional-health problem in developing and developed countries. Obesity increases the risk of many diseases, such as diabetes, hypertension, stroke, cardiovascular disease and cancers (1). Inappropriate diet and lack of physical activity are main causes of overweight and obesity which predisposes non-communicable diseases such as HTN (hypertension) (2). Previous studies revealed that both total body fat and central fat distribution are closely related to hypertension (3). The objective of this study is to evaluate the status of obesity, body fat distribution, and blood pressure in people aged from 20 to 65 years old living in Sabzevar.

Method: This is a descriptive-analytic study conducted in Sabzevar, Khorasan Razavi (with a population of 320,000). The target population was people aged from 20 to 65 years old who were randomly selected through cluster sampling. 1,500 citizens (744 men and 708 women) participated in the study. Data was collected throughout the city with collaboration of selected and trained health volunteers. They measured systolic and diastolic blood pressure, waist and hip circumference, height, and weight.

Results: Most samples with systolic blood pressure less than 13.99 had a normal body mass index (564 samples). The results of ANOVA showed that there was a significant difference in BMI between two groups of high and low systolic blood pressure (significant level was 0.35 which is less than 0.05). In addition, the systolic blood pressure was higher in the group with BMI>11.88 (with age over 30) than other groups. Most samples (899 samples) with systolic blood pressure less than 13.99 had normal abdominal fat.

There was a significant difference in WHR index between the two groups of high and low systolic blood pressure (significant level was 0.001 and less than 0.05) and systolic blood pressure was higher in the group with high abdominal fat (11.86).

Discussions and Conclusions: According to the findings of this study, abdominal fat and weight should be reduced to prevent hypertension. Thus, the public educational planning is needed to consider programs for weight loss and reduction in fat intake. People with high blood pressure have more abdominal fat, and most people in Sabzevar are overweight and prone to hypertension.

Key words: hypertension, body mass index, abdominal fat, prevalence

Please cite this article as: Delawari Heravi Maryam. et al. Evaluation of body mass index, abdominal fat and prevalence of hypertension among people 20 to 65 of Sabzevar city, Iran 2016. World Family Medicine. 2018; 16(2): 60-65
DOI: 10.5742/MEWFM.2018.93245

Introduction

The prevalence of obesity is closely associated with increasing hypertension. Both disorders are main risk factors for cardiovascular disease. About 2 billion people in the world are overweight or obese (5). In 2014, more than 1.9 billion people aged 18 and over were overweight, while 600 million were obese. About 13% of adults in the world (11% of men and 5% of women) were obese in 2014. In the same year, 19% of adults aged 18 years and over (38% of men and 40% of women) were overweight. The prevalence of obesity in the world has doubled since 1980. Although obesity and overweight are the health problems of high-income countries, they are also rapidly expanding in middle and lower income countries (especially in urban areas). The rate of overweight and obesity in children living in economically-developing countries (categorized as low and middle income countries based on The World Bank) is 30% higher than those living in developed countries. Obesity and overweight are more associated with death than underweight. The majority of the world's population live in countries where obesity and overweight (and not underweight) kill people (6).

Obesity and overweight are the fifth cause of death in the world. At least 2.8 million adults each year die from complications of obesity and overweight. In addition, 44% of the burden of diabetes, 23% of the burden of ischemic heart disease, and about 7 to 41% of the burden of cancer is due to obesity and overweight (7).

An increase in BMI is the main risk factor for non-communicable diseases such as:
- Cardiovascular disease (especially heart attack), the most common cause of death in 2012.
- Musculoskeletal disorders (especially osteoarthritis, debilitating and degenerative diseases)
- Some cancers (endometrium, chest and colon)
- Hypertension (HTN), known as the main risk for cardiovascular disease in the world, accounting for half of coronary artery disease and about two thirds of cerebrovascular disease (4).

The objective of this study was to evaluate the status of obesity, body fat distribution, and blood pressure in people aged from 20 to 65 years old living in Sabzevar.

Method

This is a descriptive-analytic study conducted in Sabzevar, Khorasan Razavi (with a population of 320,000). The target population was people aged from 20 to 65 years old who were randomly selected through cluster sampling. 1,500 citizens (744 men and 708 women) participated in the study. They were selected with collaboration of active and experienced health volunteers working at health centers in Sabzevar. Volunteers were selected among those who had enough health information in identifying risk factors and preventing chronic diseases. They helped the author in identifying samples and gathering information. A total of 40 health volunteers participated in this study.

First, the number of samples were determined for each center. Then, volunteers visited the target cases in person and asked them if they would like to participate in the research project while noting that their information would be kept confidential. They finally gathered the information of all family members aged between 20 to 65 years old and who qualified through in person interviews.

Prior to starting this, health volunteers participated in training courses for 6 sessions (each session for 2 hours) held in the health department to enhance communication skills, learn how to monitor the completion of the questionnaire, how to measure blood pressure, height, weight, waist and hip circumference. These courses were taught by the researcher through lectures, role play and group discussions. Their ability was ultimately ensured.

The questionnaire was completed by citizens;, the blood pressure (using Beurer blood monitor) and then the body mass index (BMI) and waist to hip ratio (WHR) were measured. (The WHO regards a BMI of less than 18.5 as underweight, 18.5 to 24.9 as normal, 25 to 29.9 as overweight and more than 30 as obese).

Body mass index (BMI) was calculated as the weight (Kg) divided by square of the height (m2), and waist to hip ratio (WHR) as waist circumference (cm) divided by hip circumference (cm). BMI and WHR were evaluated based on the standard defined by WHO: BMI between 25.9 to 29.9 and more than 30 were regarded as overweight and abdominal obesity, respectively. The Content Validity of the Food Habitat Questionnaire was approved by professors and nutritionists. Cronbach's alpha coefficient was used to determine the internal consistency.

To measure blood pressure, people were asked to sit in a comfortable position and after a 5-minute rest, the blood pressure was measured twice by a digital monitor (with a two-minute lag) in the right arm. High blood pressure is defined as a blood pressure higher than 140 mmHg and diastolic blood pressure higher than 90 mmHg, according to the Ministry of Health and Medical Education. Measuring and recording the blood pressure was repeated after 5 minutes by the volunteers (8)

Anthropometric measurements and blood pressure: the weight was measured with a light set of clothes and no shoes using a digital scale (Swca840) and height using a tape meter measuring 0.1 cm. The hip circumference was measured at the widest part of the buttocks and waist circumference between the lower ribs and the ischial ridge at the level of the umbilicus at the end of a normal expiration by a tape meter. Blood pressure was measured after a minimum 5 minutes rest in a sitting position by a digital blood monitor (Beurer). Waist to hip ratio (WHR) and BMI were then calculated.

The most common method for determining obesity is to calculate BMI according to which a BMI of less than 25 is regarded as normal, 25.1 to 29.9 as overweight and over 30 as obese.Data collected from 1,452 samples was first saved in a computer and then analyzed using SPSS software. Data was analyzed based on independent and paired samples t-test, covariance analysis, and logistic regression.

This research was approved by the Ethics Committees of Medical Sciences in University of Hamedan and University of Sabzevar and has received the Code of Ethics. This study was financed by the two mentioned universities. The university ethics code number is IR.UMSHA.REC.1394.217.

Results

The mean age of the participants was 36.83 ± 10.53. The results of other demographic variables are listed in Table 1.

Table 1: Number and percentage of demographic variables

Percentage	Number		Variable
51.2	744	Male	Sex
48.8	708	Female	
17.9	258		Age
43.8	630		
25.9	373		
10.8	155		
1.6	23	Above 60	
3.4	50	Illiterate	Education
18.5	268	Elementary School	
15.6	227	Junior High	
34.0	494	Diploma	
17.1	248	Associate Degree	
11.4	165	Masters	
7.3	106	Single	Marital status
90.4	1311	Married	
1.4	20	Divorced	
1.0	14	Widow	
17.7	257	Employee	Occupation
20.3	295	Self-Employed	
20.5	297	Manual worker	
30.9	448	Housewife	
2.5	36	Retired	
5.3	77	Student	
2.9	42	Jobless	
100	1452		Total

According to the findings of this study, 744 (51.2%) of samples were male and 708 (48.8%) were female. Most of samples (630, 43.4%) were in the age group of 28-38 years old and 13 (0.9%) samples did not report their age. Most samples (1,311, 90.3%) were married. And most of the people under study (448, 30.9%) were housewife.

To investigate the correlation between systolic and diastolic blood pressure with BMI, one-way analysis of variance (ANOVA) was employed and the results are presented in Table 2.

Table 2: Analysis of the correlation between blood pressure and BMI

Test results	Diastolic blood pressure			Test results	Systolic blood pressure			Hypertension BMI index
	Average	≥8.99	<8.99		Average	≥13.99	<13.99	
		Number (percent)	Number (percent)			Number (percent)	Number (percent)	
F=1.196 P=0.310	7.55	15(15%)	86(85%)	F=2.873 P=0.035	11.51	1(1%)	100(99%)	15-18.49 (underweight)
	7.68	115(19%)	500(81%)		11.59	51(8%)	564(92%)	18.5-24.99 (normal)
	7.70	83(18%)	388(82%)		11.76	55(12%)	416(88%)	25-29.99 (overweight)
	7.82	63(24%)	202(76%)		11.88	39(15%)	226(85%)	Over 30 (obese)
	7.71	276(19%)	1176(81%)		11.68	146(10%)	1306(90%)	Total

As shown in Table 2 (blood pressure related to the BMI), a great percentage of population had a systolic blood pressure less than 13.99 (90%) and most of them had a normal body mass index (564 people). Also, 81% of the population had a diastolic blood pressure less than 8.99%. Most of the population with blood pressure less than 8.99 (500) and more than 8.99 (115) had a normal body mass index. As seen in Table 2, the ANOVA results revealed that there is a significant difference in BMI between two groups of high and low systolic blood pressure (significance level was 0.35 which is less than 0.05), and systolic blood pressure is highest in the group with BMI over 30 years (11.88). Comparing diastolic blood pressure, the results of ANOVA showed that there is no significant difference in BMI between two groups of high and low diastolic blood pressure and the four groups with different BMI were homogeneous for diastolic blood pressure (P = 0.854).

Table 3: Analysis of the correlation between blood pressure and BMI

Test result	Diastolic blood pressure				Test Results	Systolic blood pressure			
	Average	Over 11	8-11	Under 8		Average	Over 14	12-14	Under 12
		Number (percent)	Number (percent)	Number (percent)			Number (percent)	Number (percent)	Number (percent)
F=4.203 P= 0/006	7.23	0	21(2/29)	51(8/70)	F=2.557 P= 0.054	11.45	1(4/1)	18(0/25)	53(6/73)
	7.63	2(3/0)	216(1/34)	416(8/44)		11.77	39(2/6)	198(2/31)	397(6/62)
	7.75	4(8/0)	180(2/38)	287(9/60)		11.65	22(6/25)	134(5/28)	315(9/66)
	7.67	2(8/0)	86(8/32)	174(4/66)		11.87	24(2/9)	70(7/26)	168(1/64)
	7.66	8(6/0)	503(0/35)	928(5/64)		11.73	86(0/6)	420(2/29)	933(8/64)

As shown in Table 3 (blood pressure related to the BMI), a great percentage of the population had a systolic blood pressure less than 12 (64.8%) and most of them had a normal body mass index (397). Also, 29.2% of the population had a diastolic blood pressure between 12 and 14, and most of them (198) had a normal BMI. As seen in Table 2, the ANOVA results revealed that there is no significant difference in BMI between different groups of systolic blood pressure (significant level was 0.054 which is more than 0.05). A greater percentage of the population had a diastolic blood pressure less than 8 (64.5%) and most of them had a normal body mass index (416). Also, 35% of population had a diastolic blood pressure between 8 and 11, and most of them (216) had a normal BMI. As seen in Table 2, the ANOVA results revealed that there is 1 significant difference in BMI between different groups of systolic blood pressure (significance level was 0.006 which is less than 0.05).

To examine the correlation between systolic and diastolic blood pressure with WHR (waist to hip ratio or abdominal fat), independent 2-sample t-test was used and the results are shown in Table 4.

Table 4: Analysis of the correlation between blood pressure and WHR

Test Results	Diastolic blood pressure			Test Results	Systolic blood pressure		
	Average	≥8.99	<8.99		Average	≥13.99	<13.99
		Number (percent)	Number (percent)			Number (percent)	Number (percent)
T= -3.007 P=0.003	7.65	180(18%)	815(82%)	T= -3.381 P= 0/001	11.60	96(10%)	899(90%)
	7.85	96(21%)	361(79%)		11.86	50(11%)	407(89%)
	7.71	276(19%)	1176(81%)		11.68	146(10%)	1306(90%)

As shown in Table 4 (blood pressure related to abdominal fat), a great percentage of the population had a systolic blood pressure less than 13.99 (90%) and most of them had a normal body mass index (899). Also, 81% of the population had a diastolic blood pressure less than 8.99, and most of those with diastolic blood pressure less than 8.99 (815) and more than 8.99 (180) had a normal BMI. As seen in Table 4, the test (independent 2-sample t-test) results revealed that there is a significant difference in WHR between groups of high and low systolic blood pressure (significance level was 0.001 which is less than 0.05), and systolic blood pressure is highest in the group with BMI over 30 years (11.88). Comparing diastolic blood pressure, the results of t-test showed that there is a significant difference in WHR between two groups of high and low diastolic blood pressure and again, people with high abdominal fat had a higher mean blood pressure (7.85, p=0.003).

For the status of the population in terms of non-behavioral risk factors classified by age, Chi-square test was employed to evaluate abdominal fat (waist to hip ratio) by age in the two sexes. The difference in abundance of abdominal fat by age group was significant in both sexes. In the female group, most of population in the age group over 50 had an inappropriate level of abdominal fat. In addition, most women aged 39-49 years and over 60 years had an inappropriate level of abdominal fat.

Discussion

According to the results obtained in this study, the BMI index was significantly different in both high and low systolic blood pressure groups, which is consistent with the results of Chuang SY, stating that in all ranges of BMI, there is hypertension, but with an increase in the BMI, the possibility of hypertension also increases (9). Almost all studies showed that as weight of the general population decreases, the systolic blood pressure also decreases, even if the weight reduction is low (10). In this study, most of the population with a systolic blood pressure of less than 13.99 had a normal body mass index, and this finding is consistent with the results of the Winkelmayer study. In this study, a unit increase in body mass index (1 kg /m2) led to an 8% increase in risk of hypertension, and it was also stated that more than 75% of patients with high blood pressure had a BMI of more than 25 (11).

The results showed that the systolic blood pressure is higher in the group with high abdominal fat, as revealed by Niazi et al. who reported that abdominal obesity and its rate of increase, independent of the effect of general obesity, would lead to future high blood pressure (12). There is a significant difference in WHR index between the two groups of high and low systolic blood pressure, which is consistent with Fatahi et al. (2011). In this case a study, titled “The relationship between high blood pressure and body mass index, abdominal obesity and dietary habits” was conducted on 270 people aged from 25 to 65 years old. The results showed that there is a significant correlation between high blood pressure and factors such as carbonated-drinks consumption, abdominal obesity, and body mass index. There was a negative correlation between the consumption of wholegrain bread and having breakfast, with high blood pressure (13). In another study on high blood pressure in people with abdominal obesity, it was found that important factors in preventing hypertension are controlling abdominal obesity and waist circumference (11). Epidemiologic studies on obesity and blood pressure also showed that obese men and women are 3 times more prone to hypertension than men and women with a normal body mass index (14). Jonas et al. believed that age and BMI are associated with hypertension (15). Lee et al. (2010) conducted a study to assess the prevalence, awareness, treatment and control of hypertension and its associated risk factors. Awareness, treatment, and control were 60.1%, 91.7%, and 27.2%, respectively. Low BMI was associated with blood pressure control. In high-BMI women with a family history of diabetes, there was a direct relationship with awareness and treatment (16). Thawornchaisit et al. (2013) pointed out that hypertension is a major risk factor for heart attack and brain stroke, and cross-sectional studies revealed the increasing rate. Accordingly, a prospective study was conducted over a 4-year period (2005-2009) with the aim of identifying a number of risk factors for health behavior and lifestyle affecting the prevalence of chronic kidney

disease. Ebrahimi et al. (2010) conducted a study aimed to evaluate the prevalence of hypertension, treatment and control of social demographic factors through the National Monitoring Plan on Risk Factors for Non-communicable Disease In 2006 on a 29,972 sample population in the age group of 15-64 years old. About 45% of the population were overweight or obese, and 3.48% reported diabetes. About half of the population had high physical activity and about 11% were smokers. The prevalence of hypertension in Iranian population aged 15 to 64 was 17.37% and 33.35% of those with hypertension, received treatment (18).

References

1. World Health Organization (WHO). Obesity: preventing and managing the global epidemic: report of a WHO Consultation on Obesity. World Health Organ Tech Rep Ser 2000; 804: 1-253.
2. Bayati M. Physical inactivity and sedentary lifestyle. Iran J Endocrinol Metabol. 2012; 13(5): 537-9
3. Sağ, S., Nas, O.F., Öztürk, A., Yeşilbursa, D., Erdoğan, C. (2017). Bilateral perirenal fluid accumulation associated with tetralogy of fallot. European Journal of General Medicine;14(3):79–80
4. Al-Jiffri, O.H. (2016). Oxidative stress biomarkers among Saudi patients with non-alcoholic steatohepatitis versus chronic hepatitis C. European Journal of General Medicine;13(4):81–85
5. Azadbakht L, Esmaillzadeh A. Dietary diversity score is related to obesity and abdominal adiposity among Iranian female youth. Public Health 2011; 14(1): 62-
6. World Health organization. Obesity and overweight, 2015. Available at: VRL: http://www.who.int/mediacentre/factsheets/fs311/en
7. World Health Organization. Preventing Non-communicable Diseases in the Workplace through Diet and Physical Activity, WHO/World Economic Forum Report of a Joint Event 200
8. Tas, S., Cikman, O., Ozdil, A., Akgun, Y., Karaayvaz, M. (2017). Isolated omental panniculitis: two case reports and review of literature. European Journal of General Medicine;14(3):84–88.
9. Sargin, G., Senturk, T., Yavasoglu, I., Kacar-Doger, F. (2017). Extremely high serum ferritin level in a patient with Hemophagocytic Syndrome and Adult-Onset Still's disease. European Journal of General Medicine;14(3):81–83
10. Alptekin, H., Acar, T., Işık, H., Cengiz, T. (2016). Ultrasound prediction of spontaneous abortions in live embryos in the first trimester. European Journal of General Medicine;13(4):86–90
11. Winkelmayer WC, Stampfer MJ, Willett WC. and Curhan GC, Habitual caffeine intake and risk of hypertension in women JAMA 2005; 294: 2330-2335.
12. Niazi F, Farooghi MS, Munir SM. and Rizvi TJ. Effect of fiber bread on the management of diabetes mellitus. J Coll Physicians Surg Pak 2004; 14: 673 – 676.
13. Safari Moradabadi, A. Ghanbarnejad M. Nikparvar, S. Dadipoor, S. Fallahi. Prevalence of hypertension and respective risk factors in adults in Bandar Abbas, Iran. 2014; 8(3): 219227.
14. Jones JM. And Anderson JW. Whole grain intake is associated with reduced risk of chronic disease. Phys Sportsmed 2008; 36:18-33.
15. Jonas JB, Nangia V. Matin A, Joshi PP, Ughade SN. Prevalence, awareness, control, and associations of arterial hypertension in a rural central India population: the Central India Eye and Medical Study. American journal of hypertension, 2010; 23(4): 347-350.
16. Lee HS, Park YM, Kwon HS, Lee JH, Park YJ, Lim SY, Lee WC. "Prevalence, awareness, treatment, and control of hypertension among people over 40 years old in a rural area of South Korea: The Chungju Metabolic Disease Cohort (CMC) Study." Clinical and Experimental Hypertension, 2010, 32(3): 166-178.
17. Thawornchaisit P. de Looze F, Reid CM, Seubsman SA, Sleigh AC, Chokhanapitak J. McClur, R. Health risk factors and the incidence of hypertension: 4-year prospective findings
18. Ebrahimi M, Mansourain MA, Haghdoost AA, Abazari A, Aleaddini F, Mirzazadeh A, Yunesian M. "Social disparities in prevalence, treatment and control of hypertension in Iran: second National Surveillance of Risk Factors of Nan-Communicable Diseases, 2016." Journal of Hypertension, 2010; 28(8):1620-1629.