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Investigating high blood pressure, type-2 diabetes, dislipidemia, and body mass index to determine the health status of people over 30 years

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Abstract:

INTRODUCTION: Over the past decades, the pattern of diseases in human societies had changed from infectious diseases to noncommunicable diseases (NCDs), and according to the report by the World Health Organization, the highest burden of disease is attributed to NCDs. The study was conducted to determine the status of hypertension, type-2 diabetes, lipid disorders, and body mass index (BMI) among the patients aged over 30 years admitted to health centers of Karaj, Iran.

MATERIALS AND METHODS: In this cross-sectional study, the population included 2947 men and women aged 30 years and above admitted to six health-care centers in Karaj. The questionnaire includes demographic characteristics and had the questions on hypertension, diabetes and their risk factors, like lipid disorders and BMI was administered. The data were analyzed in SPSS, version 23, software using descriptive (frequency, percentage, mean, and standard deviation) and analytical (Chi-square and analysis of variance) tests ($P < 0.01$).

RESULTS: About 10% of the participants had diabetes and 15% of the participants had hypertension. About 32% of the participants had dyslipidemia and 87% of the participants were overweight or obese and over 35% were obese. Furthermore, with the increase in BMI, the prevalence of lipid disorder, hypertension, and type-2 diabetes increased in the studied population ($P < 0.01$).

CONCLUSION: According to the results, a high percentage of people had hypertension, type-2 diabetes, hyperlipidemia, and BMI in the population. Gender segregation showed that lipid disorders, overweight, and obesity in women were more than in men and percentage of people with hypertension among male were significantly higher than in females. In the case of type-2 diabetes, the results showed no statistically significant differences between men and women. The results may be helpful in developing educational strategies and prevention and control of these diseases.

Keywords:

Blood pressure, body mass index, health status, lipid disorder, type-2 diabetes

Introduction

Over the past decades, the pattern of diseases in human societies has altered from infectious diseases to noncommunicable diseases (NCDs).[1,2] According to the report by the World Health Organization (WHO), the highest burden of diseases is attributed to NCDs[3] like diabetes mellitus (DM). The prevalence of type-2 diabetes is reported to be on the rise worldwide, and the number of people with type-2 diabetes in the world is estimated to reach 330 million in 2025, and by 2030, at least 366 million people are expected to live with DM.[4-10] In Iran, more than 3 million people are affected by DM, with an

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average of 500,000 people added to this statistic annually.[11] In a study conducted in Babol, 23.4% of people had DM.[12]

Hypertension is among the NCDs that are easy to identify and treat concomitantly. Given its high prevalence and associated cardiovascular diseases, hypertension is a health problem in industrialized and developing countries. In industrialized countries, 25% of adults and 60% of the elderly suffer hypertension.[13] In the Middle East, hypertension is one of the NCDs that increased dramatically in recent years.[14] Studies in Iran showed a high prevalence of hypertension so that the latest studies showed a 23.3% prevalence of the disease.[15] In a study conducted in Babol, 23.9% of people had high blood pressure.[12]

In the literature, obesity and overweight are associated with many chronic diseases such as hyper lipidemia,[15-17] hypertension,[13,16] type-2 diabetes,[18,19] cardiovascular diseases and their risk factors,[16] gallstone,[20] hormonal disorders,[21,22] cancer,[23] and metabolic syndrome.[24] The prevalence of overweight and obesity in the world has increased by 27.5% from 1980 to 2013 among the adults and 47.1% among the children, and the number of obese and overweight people has increased from 857 million in 1980 to 2.1 billion people in 2013.[25] Previous studies had shown that lipid disorders are the most important factors in the pathogenesis of cardiovascular diseases and type-2 diabetes.[26-28] Blood lipid disorders are defined as increased total cholesterol and low-density lipoprotein (LDL), high levels of triglycerides (TGs) and the reduction in high-density lipoprotein (HDL) concentrations alone or in combination.[29] The global prevalence of hyperlipidemia is 15.2%. According to a study conducted in Iran, the prevalence of hypercholesterolemia in individuals over 15 years had been reported to be 11.1%.[30]

With age, the risk of morbidity one or more chronic diseases increases.[12,31] In Iran, due to the population structure that is aging and also given the significance of hypertension, type-2 diabetes, lipid disorders, and body mass index (BMI), especially among adults, this study aims to determine the status of hypertension, type-2 diabetes, lipid disorders, and BMI among the patients aged over 30 years admitted to health centers of Karaj, Iran.

Materials and Methods

Participants and setting

In this cross-sectional study, the population included participants aged 30 years and above admitted to health-care centers in Karaj. Six health centers were randomly selected from among 12 health-care centers in the Mahdasht region of Karaj. Then, all the participants admitted to the health-care centers (3040 people) who gave consent for the study were included in the study. Of these, 93 people had incomplete information leaving a total of 2947 participants.

The study tool was a comprehensive questionnaire made by the Ministry of Health and completed by the health-care providers in health-care centers for screening blood pressure, lipids, type-2 diabetes, and BMI. Prior to the administration of the questionnaire, participants were given informed consent letters and informed about the purpose of the study. Furthermore, they were also instructed that decision to participate or withdraw from the study was optional at any time.

The questionnaire included demographic characteristics like the age, gender, marital status, education level, and occupation. The other part of the questionnaire had questions on hypertension and diabetes and their risk factors, such as lipid disorder and BMI. In the demographic information section, age was classified as 30–39, 40–49, 50–60, 60–69, and 70 and over years of age. Marital status was as follows: single, married, divorced, and widow. Educational status was coded as illiterate, elementary, guidance, high school, and university, while occupation was classified as unemployed, housekeeper, worker, self-employed, employee, and retired.

Blood pressure for all patients was recorded using the mercury sphygmomanometer. Blood pressure was measured after 5 min of resting and from the right arm at least twice. The following criteria were met: patients had not smoked, drunken tea, and did not have severe physical activity for at least half an hour before measuring blood pressure. Thus, those with a blood pressure equal to or >140/90 mmHg were considered to have hypertension.

The weight of the participants was measured by health-care provider with a precision of 100 g and height by a tape measure with an accuracy of 0.5 CM. Using BMI, the person's status was checked to be normal, overweight, and obese. In this questionnaire, BMI was defined as BMI <25 (normal), BMI <30 ≥25 (overweight), and BMI ≥30 (obese).

To measure blood glucose and lipids, individuals were referred to the nearest laboratory and were advised to be on fasting to the laboratory. Fasting blood sugar (FBS) was classified as FBS <100 (healthy), FBS <126 ≥100 (pre-diabetic), and FBS ≥126 (diabetic). Dyslipidemia (fat disorder) was classified as cholesterol ≥200, LDL ≥150, HDL ≤40 (in males), HDL ≤50 (in women), and TG ≥200.

Statistical analysis

The data were analyzed using the SPSS Statistics software (version 23.0, SPSS Inc., Chicago, IL, USA), software

using descriptive (frequency, percentage, mean, and standard deviation) and analytical (Chi-square and analysis of variance) tests.

Results

The results of the analysis of the collected data from 2947 samples were such that 2240 participants were women (76%) and 707 were men (24%), with 61% of the participants under 50 years of age [Table 1].

According to Table 1, more than half of the females had elementary education and only 1% of them had a university education. Nearly 6% of the males had a university education and most of them were illiterate. About 6% of the unemployed were men and more than 50% were self-employed, while the majority of females (nearly 99%) were housekeepers. According to the marital status, 97% of the participants were married.

Table 2 shows that 87% of the participants were overweight and obese and over 35% were obese. Gender separation showed that the percentage of overweight and obesity among women was significantly higher than males (P = 0.000) and nearly 10% of the total studied population had a blood glucose level above FBS <126 (unit); however, Chi-square test showed no statistically significant differences between men and women (P = 0.357). Furthermore, 15% of the participants were hypertensive. The results of Fisher's exact test showed that the percentage of people with hypertension among male was significantly higher than in females (P = 0.000). Concerning lipid disorders, data from the table showed that 32% of the subjects had dyslipidemia. Gender segregation showed that lipid disorders in women were more prevalent than in men (P = 0.010).

Table 3 shows that 25% of the people with a BMI more than BMI <30 (unit) were diabetic, and the percentage for individuals with overweight and normal BMI was 1.5% and 0%, respectively. The Chi-square test showed that this difference was statistically significant (P < 0.000). In addition, the data from the table showed that with an increase in BMI, the prevalence of lipid disorder increased in the studied population. The Chi-square test showed that this increase was statistically significant (P < 0.000). In the case of hypertension, the table showed that with an increase in BMI, the prevalence of hypertension increased, which was confirmed by the Chi-square test, as well (P < 0.000).

Table 1: Frequency distribution of variables of educational level, occupation, age, and marital status in the studied subjects

Variable	Gender, frequency (%)		Total, frequency (%)
	Women	Male	
Education level			
Illiterate	506 (22.6)	267 (37.8)	773 (26.2)
Elementary	1297 (57.9)	55 (7.8)	1352 (45.9)
Guidance	325 (14.5)	171 (24.2)	496 (16.8)
High school	89 (4.0)	174 (24.6)	263 (8.9)
University	23 (1.0)	40 (5.7)	63 (2.1)
Occupation			
Unemployed	0 (0)	43 (6.1)	43 (1.5)
Housekeeper	2213 (98.8)	0 (0)	2213 (75.1)
Worker	7 (0.3)	59 (8.3)	66 (2.2)
Self-employed	4 (0.2)	406 (57.4)	410 (13.9)
Retired	9 (0.4)	153 (21.6)	162 (5.5)
Employee	7 (0.3)	46 (6.5)	53 (1.8)
Marital status			
Single	21 (0.9)	7 (1.0)	28 (1.0)
Married	2177 (97.2)	687 (97.2)	2864 (97.2)
Divorced	14 (0.6)	0 (0)	14 (0.5)
Widow-widower	28 (1.3)	13 (1.8)	41 (1.4)
Age			
30-39	756 (33.8)	112 (15.8)	868 (29.5)
40-49	700 (31.3)	231 (32.7)	931 (31.6)
50-59	483 (21.6)	161 (22.8)	644 (21.9)
60-69	210 (9.4)	126 (17.8)	336 (11.4)
≥70	91 (4.0)	77 (10.9)	168 (5.7)
Total	2240 (100)	707 (100)	2947 (100)

Table 2: Frequency distribution of body mass index, fasting blood sugar, lipid disorders, and hypertension among the participants

Variable	Gender, frequency (%)		Total, frequency (%)
	Women	Male	
BMI			
BMI <25	195 (8.7)	185 (26.2)	380 (12.9)
25≤ BMI <30	1189 (53.1)	336 (47.5)	1525 (51.7)
BMI ≥30	856 (38.2)	186 (26.3)	1042 (35.4)
Chi-square test (P)		0.000	
FBS			
FBS <100	1859 (83.0)	594 (84.0)	2453 (83.2)
100≤ FBS <126	168 (7.5)	42 (5.9)	210 (7.1)
FBS ≥126	213 (9.5)	71 (10.0)	284 (9.6)
Chi-square test (P)		0.357	
Hypertension			
Have	308 (13.8)	140 (19.8)	446 (15.2)
Have not	1931 (86.2)	567 (80.2)	2501 (84.8)
Fisher's exact test (P)		0.000	
Lipid disorder			
Have	745 (33.3)	198 (28.0)	943 (32.0)
Have not	1495 (66.7)	509 (72.0)	2004 (68.0)
Fisher's exact test (P)		0.010	
Total	2240 (100)	707 (100)	2947 (100)

FBS=Fasting blood sugar, BMI=Body mass index

Discussion

According to the results of the study, 15% of the participants in the study were hypertensive. The results of the Fisher's exact test showed that the percentage of hypertensive patients in men was significantly higher than that in women. In the study by Jamshidi and Seif

Table 3: Frequency distribution of the study participants according to blood glucose levels, lipid disorder, and blood pressure in relation to BMI status

Variable	BMI, frequency (%)			Total, frequency (%)
	BMI <25	25 ≤BMI<30	BMI ≥30	
FBS				
FBS <100	380 (100)	1396 (91.5)	677 (65.0)	2453 (83.2)
100 ≤ FBS <126	0 (0)	106 (7.0)	104 (10.0)	210 (7.1)
FBS ≥126	0 (0)	23 (1.5)	261 (25.0)	284 (9.6)
Chi-square test (*P*)		0.000		
Lipid disorder				
Have	11 (2.9)	360 (23.6)	572 (54.9)	943 (32.0)
Have not	369 (97.1)	1165 (76.4)	470 (45.1)	2004 (68.0)
Chi-square test (*P*)		0.000		
Hypertension				
Have	9 (2.4)	168 (11.0)	271 (26.0)	448 (15.2)
Have not	371 (97.6)	1357 (89.0)	770 (74.0)	2498 (84.8)
Chi-square test (*P*)		0.000		
Total	380 (12.9)	1525 (51.7)	1042 (35.4)	2947 (100)

FBS=Fasting blood sugar, BMI=Body mass index

in Hamadan, the prevalence of hypertension in men was higher than that of women.[32] Lower hypertension in women than in men in the present study can be due to sex hormones, as well as lower control of blood pressure by men and less adherence to treatment in men than women. In a cross-sectional study on people over 19 years of age in the city of Isfahan in Iran, Sadeghi *et al*. found that 15.6% of men were hypertensive.[33] In the study by Chaman *et al*., the prevalence of hypertension was reported to be 18.4%, and women were more affected than men.[34] In developing countries, the prevalence of hypertension has been reported in adults to be 10%–20%.[35]

The results showed that nearly 10% of the total population had a blood glucose level equal to or over 126 mg/dl. The Chi-square test showed no statistically significant differences between men and women. In the study by Meraci *et al*. in Isfahan, 6.6% of the population was diabetic, with a significant relationship between gender and diabetes.[36] In a population-based study in Germany, the prevalence of known diabetes was 8.4% in the population aged 74–75 years and diabetes was 8.2%.[37] Overall, the incidence of diabetes in adults in the world is about 4.7% to 8.5%.[38]

Concerning lipid disorders, data from the study showed that 32% of the participants had dyslipidemia. In a meta-analysis study in Portugal, the prevalence of hypercholesterolemia was more than or equal to 240% and 31.7%, respectively.[39] In some European countries, such as England and Portugal, the incidence of hypercholesterolemia was more than 240 mg/dl (35.2% and 23.4%, respectively).[40,41] According to the sex, lipid disorders in women were more prevalent than in males, which was similar to findings in Bushehr that reported higher rates of high blood fats in women more than males.[42] Our finding is also in line with those of Jamshidi and Seif in Hamadan, showing that LDL and TG levels in women are more prevalent than in males.[32] In the study by Moghaddas and Khamnian, the prevalence of high blood lipid in women was higher than in men.[43] Perhaps, the reason for the high blood lipids in women compared to men in these studies is the inactivity and the presence of more adipose tissue in women.

Our study showed that 87% of the population were overweight and obese, and over 35% of obese people said that the reason for them being overweight or obese was due to the lack of knowledge, inadequate nutrition, and sedentary lifestyle. Furthermore, because the study was performed on adults, they were more sedentary. In the study by Moghaddas and Khamnian in 2018, the prevalence of overweight and obesity was estimated to be 73%,[43] with the results close to the present study. In a national study conducted by Janghorbani *et al*., the prevalence of overweight in men and women was 57% and 42.8%, respectively.[44] Golestan cohort study was a population-based study of 8998 men and women, aged 35–81 years, from urban and rural areas. In this cohort study, the prevalence of overweight was 62.6%.[45] In the study by Ayatollahi and Ghoreshizadeh in Shiraz, the prevalence of overweight and obesity in men and women was 63.9% and 49.7%, respectively.[46] Overall, the prevalence of obesity in the world varies from 2% to 80%.[47] According to the sex, the percentage of overweight and obese women was significantly higher than that of men, which was in line with the study by Moghaddas *et al*.,[48] Cohort study,[45] Healthy Heart Program,[49] and the studies in Saudi Arabia.[50,51] However, in developed countries like America and many European countries, the prevalence of overweight and obesity in men was more than women, which was opposed to the results of this study.[52,53] The results

showed that with the increase in BMI, the prevalence of diabetes increased as well, which was in line with the results of the study by Meraci *et al*.[36] and the study of Odegaard *et al*.[54] Moreover, the results showed that with an increase in BMI, the prevalence of hypertension among the studied population increased, which was in line with the study by Meraci *et al*. in Isfahan and Azizi *et al*. in Kermanshah,[13] similar to the results obtained by Wilson in the United States. Wilson found that BMI ≥25 was associated with a high risk of hypertension in both genders.[55] The results showed that the increase in BMI increased the prevalence of lipid disorders, which was in line with the study of lipid and glucose in Tehran, showing that overweight or obesity increases the likelihood of lipid disorders. According to the study of lipid and glucose, high levels of serum cholesterol and TG and low HDL were related to high BMI.[56]

The limitations of this study are the lack of cooperation of some people. There was also a lack of easy access to the laboratory for blood tests. Overall, the results showed that the prevalence and incidence of overweight and obesity in Karaj were significant. As obesity and overweight are related to hypertension, blood lipid disorder, and DM, precise planning should be done for changing this trend throughout the community, especially for adults. It is recommended that more studies should be conducted on the underlying causes and methods of controlling this process as well as the prevention of related diseases.

Conclusion

According to the results, a high percentage of people had hypertension, type-2 diabetes, hyperlipidemia, and BMI in the population. Gender segregation showed that lipid disorders, overweight, and obesity in women were more than in men, and percentage of people with hypertension among male was significantly higher than in females. In the case of type-2 diabetes, the results showed no statistically significant differences between men and women. Furthermore, the results showed that with an increase in BMI, the lipid disorder, hypertension, and type-2 diabetes increased in the studied population. Thus, more efforts are needed to raise the awareness about the clinical and economic consequences of these diseases at the community level. The results may be helpful in developing educational strategies and prevention and control of these diseases.

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Conflicts of interest

There are no conflicts of interest.

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