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Population-based cardiovascular risk factors in the elderly in Turkey: a cross-sectional survey

Research Article

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Abstract: Hypertension, diabetes, hyperlipidaemia, obesity and smoking are known to be the most important modifiable risk factors for cardiovascular disease (CVD). Because the elderly population has been increasing globally, CVD may become a more important public health problem in the future. This report examines the prevalence of cardiovascular risk factors in the elderly in Ankara, Turkey. This was a cross-sectional survey and included a total of 2720 individuals living in the Ankara district. Trained research staff administered a standard questionnaire in the participants' homes and worksites. The questionnaire collected information on clinical and demographic characteristics and a self-reported medical history, including past history of hypertension, diabetes, hyperlipidemia, coronary artery disease, coronary artery by-pass graft operation, and cerebrovascular accident. The mean age of the study participants was 69.5 ± 7.2 years. The study identified 1298 women (78.1%) and 753 men (71.2%) with hypertension, and the overall prevalence of hypertension was 75.4%. A total of 739 (27.2%) people had diabetes mellitus, and, of these people, 603 (81.6%) were hypertensive. A total of 1361 people had hyperlipidemia, and 1103 of these patients were also hypertensive. The overall prevalence of obesity was 27.2%. A total of 553 (20.3%) people were smokers. Our findings indicate that cardiovascular risk factors are very common in the elderly. To maximize risk reduction, physicians must take aggressive measures to decrease cardiovascular risk factors.

Keywords: *Hypertension • Diabetes • Prevalence • Risk factors • Elderly • Antihypertensive therapy • Cardiovascular mortality*

1. Introduction

Cardiovascular diseases (CVD) are the leading cause of morbidity and mortality in industrialized countries [1]. Hypertension, diabetes, dyslipidemia and smoking are known to be the most important modifiable CVD risk factors. Control of the major cardiovascular risk factors has been extensively demonstrated to reduce the risk of CVD [1-5]. The prevalence of hypertension has been widely reported in various regions of the world, has been shown to increase with age, and is especially high among individuals over 50 years of age [2,6-11]. Because the elderly population has been increasing globally, CVD may become a more important public health problem in the future.

The epidemiological properties of hypertension and diabetes can vary in different populations, and population-based or national programs have been undertaken to detect, treat, and control hypertension in many countries [2,9,12]. Also, changes in lifestyle and diet along with increasing life expectancy have increased the prevalence of the major cardiovascular risk factors in developing countries. In addition, genetic, socio-cultural, and economic factors may affect the prevalence of hypertension, diabetes, and hyperlipidaemia. Accordingly, each country's own data have a great importance for prevention and control of cardiovascular risk factors. Turkey is a developing country that has also had an increase in life expectancy and rapid changes in lifestyle. Hypertension is relatively prevalent among

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Table 1. Distribution of the participants by age and sex.

	Total (n=2720)		Males (n=1057)		Females (n=1663)	
	Number	Percentage	Number	Percentage	Number	Percentage
Age group (years)						
60-65	951	35	364	34.5	587	35.3
66-70	662	24.3	288	27.2	374	22.5
71-75	488	17.9	195	18.4	293	17.6
76-80	427	15.7	151	14.3	276	16.6
81+	192	7.1	59	5.6	133	8

Turkish people, and it is estimated that there are approximately 15 million hypertensives in Turkey [11]. In the last decades, the rate of tobacco consumption has been also increasing in Turkey [13]. Furthermore, the prevalence of diabetes is increasing worldwide. Although few national or regional studies have been undertaken on the prevalence of hypertension in Turkey, a high prevalence of hypertension has been reported (29.6% to 33.4%) in the adult population [6,11,14]. However, there is little data on the prevalence of hypertension and other cardiovascular risk factors in the elderly. This report examines the prevalence of cardiovascular risk factors in the elderly in Ankara, Turkey.

2. Material and methods

2.1.Study Population

This was a cross-sectional survey and included a total of 2720 individuals (age range, 60–101 years) living in the Ankara district. All participants were recruited by random selection between October 2005 and January 2007. To be eligible, participants had to be over 60 years of age and currently living in the community. A multistage cluster sampling method was used to select a representative sample for Ankara. Screening was conducted in the city center and in two towns and two villages from both the west and east sides of the city centre.

All participants were previously enrolled in and attended the health center of their area. A total of 5000 persons were randomly selected from 24 primary sampling units (street districts in urban areas, or townships in rural areas) and were invited to participate. A total of 2720 persons (1663 women and 1057 men) completed the survey and examination. The overall response rate was 54.4%. The main reason given for refusal to participate was unable to get time away from work to participate.

2.2. Data collection

A manual was developed to train the interviewers (community health nurses) to carry out field procedures and common protocols for the measurement of blood pressure and anthropometric variables. Trained research staff administered a standard questionnaire in the participants' homes and worksites. Clinical and demographic characteristics for all participants including age, sex, weight, height, marital status, educational level and smoking status were collected. A self-reported medical history was also obtained relating to past history of hypertension, diabetes, hyperlipidemia, coronary artery disease, coronary artery by-pass graft operation (CABG) and cerebrovascular accident (CVA). The questionnaires were administered elderly living in Ankara district. Persons unable to answer the questions because of cognitive dysfunction and visitors coming from other districts were excluded.

During each interview, the blood pressure was measured twice by a nurse using an appropriate-sized arm cuff and mercury sphygmomanometer with the patient in a sitting position after a 10-min rest. The first and fifth Korotkoff sounds were used to identify systolic and diastolic values, respectively. Participants were considered hypertensive if they had either high blood pressure on examination (> 140/90 mmHg) or if they were using an antihypertensive drug or both. Participants without a past or present history of high blood pressure but using drugs that can be used for the management of CVD independently of their blood pressure-lowering effect were not considered hypertensive. Medications used regularly for the control of hypertension during the month before interview were also recorded. The participants who used oral antidiabetics or insulin were considered diabetic. Participants were considered hyperlipidemic if they had used an antihyperlipidemic drug. Body mass index (BMI) was calculated as the body weight (reported) in kg divided by height (reported) in m^2. The BMI was stratified as follows: 18-25, 26-30, 31-35, 36-40 and ≥41 kg/m^2. Smoking status was classified as 'smoker' or 'non-smoker'.

2.3.Data analysis

All statistical analysis were performed using the SPSS program, version 11.5 (SPSS Inc., Chicago, IL, USA) for Windows XP. Unless otherwise stated, values are expressed ± standard deviation. The means between

Figure 1. Prevalence of hypertension by age and sex.

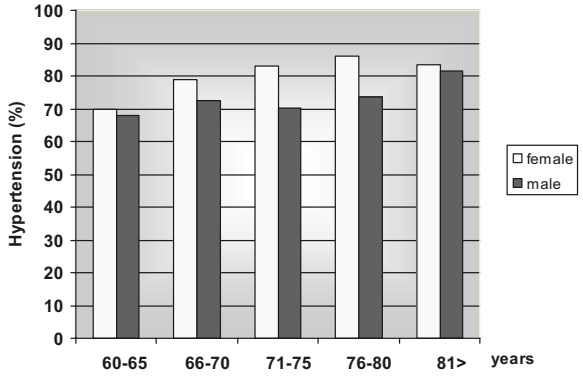
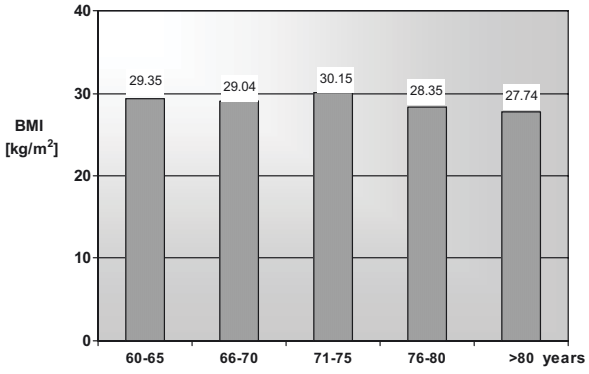


Figure 2. Distribution of body mass index (BMI) according to age.



groups were compared with Student's t-test, and a χ^2 test was used for categorized data. Values of $p<0.05$ were considered to indicate statistical significance. To determine differences in cardiovascular risk factors between men and women, all calculations were made for men and women separately.

3. Results

3.1. General characteristics

In the present study, the mean age of the study participants was 69.5 ± 7.2 years. The mean age (69.8 ± 7.5) of the women was slightly higher than that of the men (69.1 ± 6.8). Five classes of age were defined: 60-65, 66-70, 71-75, 76-80 and ≥81 years. The distribution of the participants by age and sex is shown in Table 1. Thirty percent of the population had graduated from university, and men had a higher university education level than women (430 vs. 360). The majority of the population (924 of the women and 887 of the men) were married. There were 614 widows and 117 widowers.

3.2. Distribution of cardiovascular risk factors

A total of 2051 people, including 1298 women (78.1%) and 753 men (71.2%), with hypertension were aware of their hypertensive status, and the overall prevalence of hypertension was 75.4% in both sexes of the elderly population aged 60-101 years. The overall prevalence of hypertension was significantly higher among women than men (63.3% vs. 36.7%, $p<0.001$), and this difference was valid for all age groups. The prevalence of hypertension by age and sex is shown in Figure 1. A total of 168 people had one or more CVA attack, and of these people, 145 were hypertensives. A total of 493 people had coronary artery disease, and of these people, 426 were hypertensives. One hundred and twenty-five patients had had a CABG operation, and 107 of them were hypertensives. We found only 24.6% of participants with normal blood pressure. Moreover, we found that 75.2% of the participants were taking antihypertensive medication. A total of 650 patients were not receiving antihypertensive therapy. The distribution of antihypertensive medications as follows: 622 patients were using a beta-blocker, 579 patients were using a calcium channel blocker, 568 patients were using an angiotensin converting enzyme inhibitor, 858 patients were using an angiotensin receptor inhibitor, 148 patients were using an alpha-blocker, and 913 patients were using a diuretic treatment.

A total of 739 (27.4%) people had diabetes mellitus, and there were slightly more diabetic men than women, but the difference was not statistically significant (29.2% vs. 26.2%, respectively). Four hundred and thirty (15.8%) patients were receiving oral antidiabetic, 51 (1.9%) patients were receiving insulin therapy, and the remaining diabetics were being treated by diet alone. Of these diabetic patients, 603 (81.6%) were hypertensives, and there was a significant association between diabetes and hypertension ($p<0.001$). A total of 446 diabetic patients also had hyperlipidemia, and the association was significant ($p<0.001$). One hundred and eighty-one diabetic patients had coronary artery disease, 54 had had a CABG operation, and 64 patients had CVA. The association between diabetes and coronary artery disease or CABG operation or CVA was also significant ($p<0.001$).

A total of 1361 (50.7%) people had hyperlipidemia, and only 638 patients were using statin therapy for hyperlipidemia. Of these 1361, 1103 were also hypertensive. There was a significant association between hyperlipidemia and hypertension ($p<0.001$). Two hundred and sixty-eight patients were also smoking, but we did not find an association between hyperlipidemia and smoking.

A total of 553 (20.3%) people were currently smoking, and smoking was more frequent in men than women (293 vs. 260, respectively). Hypertension was more

Table 2. Distribution of cardiovascular risk factors and cardiovascular disease by sex.

	Total (n=2720)		Males (n=1057)		Females (n=1663)	
	Number	Percentage	Number	Percentage	Number	Percentage
Hypertension	2051	(75.4%)	753	(71.2%)	1298	(78.1%)
Diabetes Mellitus	739	(27.2%)	432	(29%)	307	(26%)
Hyperlipidemia	1361	(50.7%)	461	(43.6%)	900	(54.1%)
Smoking status						
Current smoker	553	(20.3%)	293	(27.7%)	260	(15.6%)
Non-smoker	2167	(79.7%)	764	(72.3%)	1403	(84.4%)
CAD	493	(18.1%)	263	(24.9%)	230	(13.8%)
CVA	168	(6.2%)	94	(7%)	74	(5.7%)
CABG	125	(4.6%)	75	(7.1%)	50	(3%)

CAD, coronary artery disease; CVA, cerebrovascular accident; CABG, coronary artery by-pass graft

prevalent in smokers than nonsmokers, and the difference was statistically significant (398 vs. 155, $p<0.05$). One hundred thirty-seven diabetic patients were smoking, and there was no association between diabetes and smoking. We observed that smoking status decreased with age, and individuals 81 years and over had a prevalence of smoking of 5.2%. The distribution of cardiovascular risk factors and cardiovascular disease is shown in Table 2. There was no statistical association between education status or hypertension and diabetes mellitus ($p>0.1$ for both).

We defined five classes of BMI, with 55 people (2%) in class I, 659 (24.2%) in class II, 1267 (46.6%) in class III, 555 (20.4%) in class IV, and 184 (6.8%) in class V. The overall prevalence of obesity was 27.2%. Forty people were hypertensive in class I, 476 were hypertensive in class II, 934 were hypertensive in class III, 442 were hypertensive in class IV, and 159 were hypertensive in class V. There was a significant positive association between hypertension and BMI ($p<0.001$). The distribution of diabetes according to BMI was as follows: 16 people in class I, 142 in class II, 325 in class III, 193 in class IV, and 63 in class V. There was also a significant positive association between diabetes and BMI ($p<0.001$). The distribution of BMI according to age is shown in Figure 2.

4. Discussion

Age, sex, blood pressure, plasma lipid levels, presence of diabetes mellitus, and status of smoking are used for stratification of cardiovascular risk. In the present study, we examined the epidemiological properties of cardiovascular risk factors in our university region. Our major findings are as follows: i) the prevalence of hypertension was 75.4% in the elderly (71.2% and 78.1% among men and women, respectively); ii) the prevalence of diabetes was 27.4% (29.2% and 26.2% among men and women, respectively); iii) the prevalence of hyperlipidemia 50.7% (44.1% and 55.0% among men and women, respectively); iv) 20.3% of the participants were currently smokers.

In developing countries, rapid economic growth and socio-economic changes have resulted in an increase of cardiovascular risk factors including diabetes, hypertension, and obesity. Hypertension is a well-known risk factor for the progression of renal disease and cardiovascular morbidity and mortality. In the present study, the prevalence of hypertension was 75.4% in the elderly, which is consistent with most previous studies conducted in different parts of Turkey [6,10,11]; however, this is higher than found in some previous studies. Cetinarslan et al. found that 50.8% of men and 52.5% of women were hypertensive by using the level of 160/90 mm Hg in subjects ≥ 60 years of age in a different part of Turkey (15). In another study from Turkey, 30.1% of men and 51.4% of women older than 60 years of age were found to be hypertensive [14].

It has been well known that the prevalence of hypertension increases with age. Our data also showed that, consistent with previous studies, the prevalence of hypertension increases with age and that women have higher prevalence of hypertension than men. In the TEKHARF study, Onat et al. found that 39.3% of women and 30.1% of men are hypertensive; however, in a cardiovascular risk factor survey of adults, the prevalence of hypertension was 84.6% in women and 68.3% in men 65 years and over according to a threshold of 140/90 mm Hg for hypertension [10]. In the PatenT study, Altun et al. found the overall age- and sex-adjusted prevalence of hypertension in Turkey was 31.8%, and more than 70% of the people over 80 years of age were hypertensive [11]. Overall, these data indicate that hypertension is one of the most important health

problems in the elderly. Thus, substantial preventive effort should be initiated to reduce the progression of blood pressure with age in young adults who are at high risk of developing hypertension.

The association between diabetes mellitus and hypertension is well known. In the present study, the prevalence of diabetes mellitus was 27.4%, and it was slightly higher in men than women, although the difference was not statistically significant. Of diabetic patients, 81.6% were also hypertensive, and there was a significant association between diabetes and hypertension. In the TURDEP study, the prevalence of diabetes was 7.2% in the general population in Turkey, and diabetes was more common in women than in men [16]. Additionally, in the same study, the frequency of hypertension was 29% in the general population. Thus, our findings indicate that diabetes is more common in the elderly than in the general population.

According to National Institute of Health, a BMI more than 30 kg/m^2 is described as obesity [17]. The prevalence of obesity has increased worldwide, particularly in developed countries. The overall prevalence of obesity in adults in Turkey was 18.6% in 1990, but 10 years later, the prevalence was 21.9% [18]. Satman et al. found that the frequency of obesity was 22% in the general population in Turkey [16]. In this study, we found a higher prevalence of obesity in the elderly (27.2%).

An interesting finding of this study was that the prevalence of hyperlipidemia was 50.7% and that hyperlipidemia was more prevalent in women than men (54.1% vs. 43.6%, respectively). In the TEKHARF study, the prevalence of hypercholesterolemia was more than 40% in women and more than 25% in men over 50 years of age [10]. In this study, although we could not find an association between hyperlipidemia and BMI, we found a significant association between BMI and hypertension or diabetes mellitus.

Smoking is another important risk factor for CVD. It is well known that the risk of coronary heart disease decreases more than 50% after stopping smoking [19]. In a previous study in Turkey, 15.6% of the participants (26.9% men and 9.4% women) were found to be smokers [20]. Our data indicate that 20.3% of the participants were currently smokers and that smoking was more common in men than women. Additionally, we could not find an association between educational status and cardiovascular risk factors.

Changes in the major cardiovascular risk factors, including a decrease in high BP levels, serum lipid levels, tobacco consumption, stricter glycemia regulation, and reduced body weight are making essential contributions to the decline of CVD. The international preventive guidelines generally focus on only a single risk factor such as hypertension, diabetes, or dyslipidemia. However, guidelines focus on multiple risk factors concomitantly. Decreasing CVD will require not only decreasing blood pressure but may also depend on guidelines that contain more comprehensive approaches for reducing cardiovascular risk factors.

There are some limitations to our study. First, the present study is based on data collected by a questionnaire. Therefore, the data patients reported underestimates the true prevalence of cardiovascular risk factors. Second, no laboratory data presented are in this study. In addition, there are marked differences in the epidemiology of cardiovascular disease between Turkey and the United States or European countries. Further research in a larger sample of Turks and in the other racial populations in Turkey is needed to confirm that these findings can be generalized to the entire population of Turkey.

In conclusion, our findings indicate that hypertension and other cardiovascular risk factors are very common in the elderly in Ankara, Turkey. To maximize the reduction of risk for cardiovascular disease, physicians must take aggressive measures to decrease risk factors, and they must focus on encouraging those with multiple risk factors to make lifestyle changes. Furthermore, greater efforts are needed to develop national strategies for prevention and treatment of CVD risk factors.

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