Hypertension prevalence and risk factors among adult population in Afyonkarahisar region: a cross-sectional research

Afyonkarahisar ilinde erişkinlerde hipertansiyon sıklığı ve etkileyen faktörler: Kesitsel bir çalışma

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ABSTRACT

Objective: Hypertension is a major public health problem worldwide with increasing prevalence. The purpose of this study was to examine the prevalence of hypertension and related risk factors among adult population in Afyonkarahisar region.

Methods: In this cross-sectional research, regarding the population distribution totally 2035 subjects, randomly selected from 75 different parts of our city, both the urban and the rural areas, were included in this epidemiologic research. After the administration of a questionnaire to the subjects, blood samples were taken and physical examinations were performed. Socio-demographic features, diabetes mellitus (DM), hypertension, family history of hypertension, coronary heart disease (CHD), smoking, and number of births were evaluated as possible risk factors for hypertension. Statistical analysis was performed using Student's t-test, Chi-square test and binary logistic regression analysis.

Results: The overall prevalence of hypertension was 24.2% (31.3% in women, 14.1% in men, p<0.001). Its prevalence increased with age (from 2.2% to 50.4%, p<0.001). Age, gender, DM, family history of hypertension, body mass index (BMI), CHD and income levels were significant risk factors. Diabetic patients had 2.35 times (95%CI 1.70-3.25: p<0.0001) more risk, people who had positive family history 2.23 times (95%CI 1.62-3.07: p<0.0001) more risk and those with high BMI 2.15 times (95%CI 1.66-2.78: p<0.0001) more risk to develop HT than who did not have these factors. In addition, women have 2.74 times (95%CI 2.08-3.62: p<0.0001), more risk than men for HT. We determined CHD and low income as other risk factors for HT (OR=2.32, 95%CI 1.48-3.64: p<0.0001) and OR=1.47, 95%CI 1.08-2.02: p=0.016 respectively).

Conclusion: Hypertension is an important health problem in our region. We think that it is possible to reduce the hypertension prevalence with lifestyle changes and educating people, regarding the risk factors. *(Anadolu Kardiyol Derg 2012; 12: 47-52)*

Key words: Hypertension, logistic regression analysis, risk factors, prevalence

ÖZET

Amaç: Hipertansiyon gittikçe artan prevalansı ile Dünya'da önemli bir halk sağlığı sorunudur. Bu çalışmanın amacı Afyonkarahisar ilinde hipertansiyon prevalansı ve buna bağlı risk faktörlerini irdelemektir.

Yöntemler: Şehrin 75 farklı bölgesinden, nüfus dağılımı göz önüne alınarak toplam 2035 birey, randomize olarak hem kent hem de kırsal bölgeden seçilerek bu epidemiyolojik kesitsel çalışmaya dahil edildi. Bireylerden anket uygulamasının ardından kan örneği alındı ve fizik muayene yapıldı. Sosyodemografik özellikler, diyabetes mellitus (DM), hipertansiyon, ailede hipertansiyon öyküsü olması, koroner kalp hastalığı (KKH), sigara, doğum sayısı gibi hipertansiyon için muhtemel risk faktörleri değerlendirildi. İstatistiksel analiz Student t-testi, Ki-kare testi ve lojistik regresyon analizi ile yapıldı.

Bulgular: Hipertansiyonun genel prevalansı %24.2 idi (kadınlarda %31.3, erkeklerde %14.1, p<0.001). Yaş ilerledikçe prevalansı artış gösterdi (%2.2'den %50.4'e, p<0.001). Yaş, cinsiyet, DM, ailede hipertansiyon öyküsü, vücut kitle indeksi (VKİ), KKH ve gelir düzeyi önemli risk faktörleriydi. Diyabetik hastalar 2.35 kez (%95GA 1.70-3.25: p<0.0001), kadınlar 2.74 kez (%95GA 2.08-3.62: p<0.0001), pozitif aile öyküsü olanlar 2.23 kez (%95GA 1.62-3.07: p<0.0001), yüksek VKİ olanlar 2.15 kez (%95GA 1.66-2.78: p<0.0001), KKH olanlar 2.32 kez (%95GA 1.48-3.64: p<0.0001) ve düşük gelir düzeyi olanlar yüksek olanlara göre 1.47 kez (%95GA 1.08-2.02: p=0.016) daha fazla HT riskine sahipti.

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Sonuç: Hipertansiyon bölgemizde önemli bir sağlık sorunudur. Risk faktörleri dikkate alınarak, yaşam tarzı değişiklikleri ve insanların eğitilmesi ile hipertansiyon prevalansının azaltılacağını düşünüyoruz. *(Anadolu Kardiyol Derg 2012; 12: 47-52)*
Anahtar kelimeler: Hipertansiyon, lojistik regresyon analiz, risk faktörleri, prevalans

Introduction

Hypertension (HT) is estimated to cause 4.5% of the current global disease burden and is as prevalent in many developing countries, as it is in the developed world. Worldwide it is estimated to cause 7.1 million premature deaths, whereas the treatment of HT has been shown to prevent cardiovascular diseases and to extend and enhance life (1-4). In 2000, 26.4% of the adult population had HT (26.6% in men, 26.1% in women). The estimated total number of adults in the world, who had HT in 2000 was 972 million; 333 million in economically developed countries and 639 million in economically developing countries. In addition, the number of adults with HT in 2025 was predicted to increase by about 60% (3). While the prevalence of HT in different studies was reported as 8.6-42.1% (5-9), population-based studies carried out in Turkey have shown that HT is a common disease, with the prevalence in the range of 24.4-44% (10-14), It is known that HT is important not only because of its high frequency, but also because it is a major modifiable risk factors for cardiovascular diseases (6, 8).

HT is common, especially in individuals aged 40 years and over (13, 15, 16). This study aimed to determine the prevalence of HT among adults, in Afyonkarahisar region and to examine its related risk factors in a sample of the Turkish adult population. In addition, this research would be the first population-based epidemiologic study in Afyonkarahisar region.

Methods

Study design

The study was conducted in Afyonkarahisar, a middle Anatolian city, between November 2005 and February 2006. The study planned as a cross-sectional research. The present study was approved by the Afyon Kocatepe University, Faculty of Medicine Clinical Research Ethics Committee and written, informed consent was obtained from all participants. A total of 2035 people, from 75 different screening regions (18 urban, 57 villages) of our city were detected according to the population records of the year 2000, which represent the population of the area appropriately. A total of 7000 km of roadway was driven for the research by a team of 15 physicians, 1 nurse and a driver. The records of the regional health institutions were used in order to determine the subjects.

Study population and sampling

In this study, people older than 18 years were grouped together, as were 19-29 years old, 30-39 years old, 40-49 years old, 50-59 years old, 60-69 years old, 70 and over. According to the 2000 census of the Turkish Statistical Institute, the total population of the city was 812.416 (403.105 women and 409.311 men). Ratios of the district to the total population, sex and age factors were taken into account to determine the sample population. Our research is a part of a comprehensive study in which the individuals were selected regarding the age groups (0-18 years old, 19-40 years old, 41-64 years old, 65 and over) and gender.

Using the formula $n=NZ^2_{\alpha}P(1-P)/[N-1)d^2 + Z^2_{\alpha}P(1-P)]$ with the precision level (d) 0.02, error level (α) 0.05, and the prevalence value of 50.0% (P) the number of the study group was determined as 2387 people. Excluding the 0-18 age group, the number of sample was 1990. Although we determined the minimum number of people as 1990 (when d=0.02), at the end of the study we reached a number of 2035 people. The study group selected haphazardly from the “Family Cards” of the primary health centers, regarding the gender and ages. Only one person from one family was included the study.

The subjects were informed about the study by telephone interviews one night before, their approvals were obtained and their transport to the health institutions, where the study would be conducted, was provided. The data were collected by a questionnaire using face- to-face survey performed by the physicians.

Questionnaire

The questionnaire included two main sections. The first section included questions about sociodemographic characteristics. The second section included questions about the risk factors related with hypertension.

Blood pressure measurement

Systolic blood pressure (SBP) and Diastolic blood pressure (DBP) were measured after the participant had been seated and rested for 5 minutes. Two measurements were taken at an interval of minimum one hour between readings, and the average of the 2 recordings was accepted as the subject’s blood pressure. Participants were advised to avoid cigarette smoking, alcohol, caffeinated beverages and exercise for at least 30 min before their blood pressure measurement.

Definitions

BMI was categorized in three groups as $\leq$24.99 kg/m^2, 25-29.99 kg/m^2 and $\geq$30 kg/m^2. BMI value $\geq$30kg/m^2 was accepted as obesity. Blood pressure categories were defined according to the JNC-7 guidelines report: HT was defined as SBP $\geq$140 mmHg or DBP $\geq$90 mmHg, for both men and women (17).

CHD patients were determined by a positive history of the disease. According to the American Diabetes Association report criteria people who had fasting glucose level $\geq$126 mg/dl were accepted as DM (18).

Statistical analysis

All statistical analyses were performed with the SPSS 13.0 for Windows (SPSS, Inc., Chicago, USA). The comparisons of prevalence between dichotomous categories were made using Chi-square test. Student's t-test was used for comparison of continuous variables. Continuous variables are expressed as mean±standard deviation. Epidemiological data were analyzed by using binary logistic regression models to evaluate possible risk factors associated with the presence of HT. In the logistic regression, HT (positive, negative) was a dependent variable and age groups, gender, level of education, household income, BMI, DM, family history HT, cigarette use and CHD were independent variables. Forward Wald stepwise elimination of all non-significant variables was applied to obtain a minimal model containing only significant variables. Odds ratios (OR) and 95% confidence interval (CI) were estimated. A $p<0.05$ was considered as statistically significant.

Results

Prevalence of HT

In this study, the data obtained from 2035 subjects were analyzed. The mean age was 47.8±13.1 years. There were 1194 women (58.7%) and 841 men (41.3%). The average ages of women and men were similar (47.9±12.8 and 47.8±13.5, respectively, p=0.881). Characteristics of the study population are provided in Table 1.

The overall prevalence of HT was 24.2%, which was higher in women (31.3%) when compared to men (14.1%) ($p<0.05$). HT prevalence was significantly higher in low educated subjects and the prevalence decreased with higher education ($p<0.05$). There was a negative significant association between household income and HT prevalence. As income level increased, the prevalence of HT decreased ($p<0.05$) (Table 1).

Information on BMI was available for 1946 adults, 35.9% (n=700) of whom were overweight and 31.7% (n=617) of them were obese. A greater proportion of women were obese compared to men (χ^2=87.6, $p<0.001$), and also the prevalence of HT in obese women (41.9%) was higher than the obese men (24.0%) (χ^2=17.1, $P<0.001$). In the all age groups, the prevalence of obesity among women is higher than men (Fig. 1).

There was a significant association between HT and smoking. The prevalence of HT was higher in nonsmokers than the smokers ($p<0.001$) (Table 1).

We found a significant association between HT and family history of HT. Among all subjects, family history of HT was 17.7%. A total of 29.9% people who had positive family history of HT also had HT [35.0% (n=86) women, 19.1% (n=22) men]. There were 127 subjects who had both DM and HT (70.1%, n=89 women; 29.9%, n=38 men). In our study, 134 subjects had CHD. Among these patients 44.8% (n=60) also had HT (55%, n=33 women, 45.0%, n=27 men).

A linear association was observed between the number of births and the prevalence of HT, in women ($p<0.001$). The prevalence was increased with the number of births.

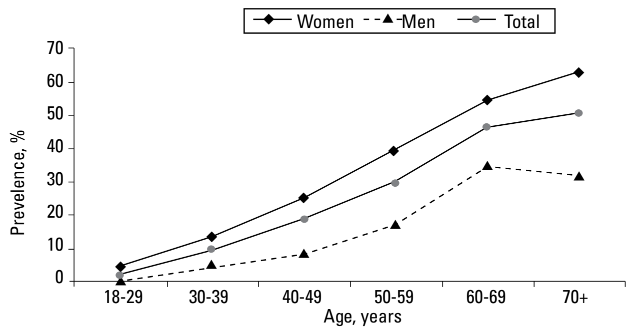
Table 1. Prevalence of hypertension in adult Turkish subjects according to gender, BMI, educational level, income, tobacco use, family history, DM, CHD and parity (for women)

Variables	Normal n (%)	HT n (%)	Total n (%)
Gender (χ^2=79.27, p<0.0001)			
Men	722 (85.9)	119 (14.1)	841 (41.3)
Women	820 (68.7)	374 (31.3)	1194 (58.7)
BMI, kg/m^2 (χ^2=91.9, p<0.0001)			
<25	536 (85.1)	94 (14.9)	630 (32.4)
25-29	559 (80.0)	140 (20.0)	699 (35.9)
>30	389 (63.0)	228 (37.0)	617 (31.7)
Education level (χ^2=116.7, p<0.0001)			
Illiterate and literate	368 (61.1)	234 (38.9)	602 (29.6)
Primary	809 (79.0)	215 (21.0)	1024 (50.3)
Secondary	135 (90.0)	15 (10.0)	150 (7.4)
High school	153 (88.4)	20 (11.6)	173 (8.5)
University	77 (89.5)	9 (10.5)	86 (4.4)
Income (χ^2=19.4, p<0.0001)			
Low	1045 (73.7)	373 (26.3)	1418 (75.1)
Middle	340 (82.7)	71 (17.3)	422 (21.8)
High	53 (88.3)	7 (11.7)	60 (3.2)
Smoker (χ^2=67.7, p<0.0001)			
Yes	444 (89.5)	52 (10.5)	496 (24.7)
No	1079 (71.3)	435 (28.7)	1514 (75.3)
Family history of HT (χ^2=7.7, p=0.005)			
Yes	253 (70.1)	108 (29.9)	361 (17.7)
No	1289 (77.0)	385 (23.0)	1674 (82.3)
DM (χ^2=94.23, p<0.0001)			
Yes	137 (51.9)	127 (48.1)	264 (13.0)
No	1045 (79.3)	366 (20.7)	1771 (87.0)
CHD (χ^2=33.0, p<0.0001)			
Yes	74 (55.2)	60 (44.8)	134 (6.6)
No	1468 (77.2)	433 (22.8)	1901 (93.4)
Parity (number of births) (χ^2=61.1, p<0.0001)			
1	41 (87.2)	6 (12.8)	47 (4.4)
2	150 (79.4)	39 (20.6)	189 (17.6)
3	197 (74.9)	66 (25.1)	263 (24.4)
4	136 (67.3)	66 (32.7)	202 (18.8)
5+	200 (53.3)	175 (46.7)	375 (34.9)

Data are presented as proportions (precentages)
Chi-square test
BMI- body mass index, CHD- coronary heart disease, DM- diabetes mellitus, HT - hypertension

Risk factors for HT

The results of binary logistic regression analysis, including OR for each of the demographic factors, socioeconomic factors, lifestyle factors and family history of HT are presented in Table 2. Significant risk factors were related to age, gender, and family history of HT, BMI, DM, CHD and income. Compared with the age groups, we found that HT risk increased with the age (p<0.0001). Diabetic patients have 2.35 times (95%CI 1.70-3.25, p<0.0001) more HT risk than healthy people do. In addition, people with family history of HT (OR=2.23, 95%CI 1.62-3.07, p<0.0001) were more likely to have HT than people who did not have a family history of HT. The factors; to have low household income and having CHD caused respectively 1.47 (95%CI 1.08-2.02, p=0.016) and 2.32 (95%CI 1.48-3.64, p<0.0001) times more HT risk. People with obesity were more likely to have HT than people with normal weight (OR=2.15, 95%CI 1.66-2.78, p<0.0001). In addition, women were more likely to have HT than men (OR=2.74, 95% CI 2.08-3.62, p<0.0001).



HT n (%)

Age group, years	19-29 n (%)	30-29 n (%)	40-49 n (%)	50-59 n (%)	60-69 n (%)	70+ n (%)	Total n (%)
Men	0/87 (0.0)	7/129 (5.4)	21/242 (8.7)	38/227 (16.7)	37/106 (34.9)	16/50 (32.0)	119/841 (14.1)
Women	4/93 (4.3)	25/193 (13.0)	93/369 (25.2)	122/312 (39.1)	83/152 (54.6)	47/75 (62.7)	348/1194 (31.3)
Total	4/180 (2.2)	32/322 (9.9)	114/611 (18.7)	160/539 (29.7)	120/258 (46.5)	63/125 (50.4)	493/2035 (24.2)

Figure 1. Prevalence of hypertension in different groups in men and women

Table 2. Significant independent variables (risk factors) for hypertension according to binary logistic regression analysis (final model)

Variables	OR	95% CI	p
Gender (men, women)	2.74	2.08-3.62	<0.0001
Age, years old			<0.0001
18-29	-	-	1
30-39	2.87	0.96-8.53	0.058
40-49	6.66	2.38-18.65	<0.0001
50-59	12.26	4.38-34.35	<0.0001
60-69	26.58	9.31-75.86	<0.0001
70+	37.71	12.61-112.74	<0.0001
BMI, kg/m^2 (<30, 30)	2.15	1.66-2.78	<0.0001
DM (no, yes)	2.35	1.70-3.25	<0.0001
CHD (no, yes)	2.32	1.48-3.64	<0.0001
Family history HT (no, yes)	2.23	1.62-3.07	<0.0001
Household income (high, low)	1.47	1.08-2.02	0.016

BMI - body mass index, CHD - coronary heart disease, CI - confidence interval, DM - diabetes mellitus, HT - hypertension, OR - odds ratio

Discussion

According to the results of our study, we found that positive family history of HT, age, gender, economical status, BMI, DM and CHD are the risk factors for HT development in our studied population. Although the prevalence of HT varies among different populations, it is a worldwide and currently rising health problem.

Studies on HT from developed countries have shown the prevalence to be higher as compared to developing countries (4, 8). In men, the prevalence is 32.2% in developing countries and 40.8% in developed countries. It is 30.5% in developing countries and 33.0% in developed countries for women (4). Turkey as a developing country is also under risk of an increasing number of hypertensive patients. In our study, we reported the overall prevalence of HT among young adults as 24.2%, but, as our population is cosmopolitan and there are many different groups who have different genetic and nutritional features, the prevalence range is large. In Turkey, HT prevalence is found as 31.8% in a study by Altun et al. (19). In TURDEP study, which was conducted in 540 centers across the nation, the prevalence of hypertension was 29% (20). In another study, which was conducted in İzmir, where the Mediterranean diet and lifestyle is dominating, the hypertension prevalence was 19.5% in males and 13 % in females who were aged between 20-39 years (21). Our results are also in these ranges and we think it would be higher if we consider the study in older age groups.

Although in various studies conducted in Turkey and other countries have shown that, the prevalence of HT was higher in women than men (7, 10, 12, 13, 22, 23) in some other studies HT prevalence is more prevalent in men than women (8, 24). In our study, gender was a significant risk factor for HT; women had more HT risk than men (31.3% in women, 14.1% in men). However regarding also the age factor, at young ages the prevalence of HT were higher in men than in women, especially in the 20-30 years age group, whereas in older people the results were reversed as a higher prevalence in women (3, 8, 10). In our study, HT prevalence in women was higher than men in all age groups. This variation may be explaned by the high prevalence of obesity, the sedentery life style (most of them housewives) and the unhealthy diet of women in our region.

In our research, the prevalence of hypertension increased as the number of parity increased. Erem et al. (10) obtained similar results in their study, in Trabzon.

Blood pressure increases with age in both men and women. In many studies, the prevalence of HT increased with age in a wide range; while it was 5.2% in 20-30 years ages, the ratio was 70.6%

in >60 years old (7, 16, 23, 25). Similar results have also been reported in studies conducted in Turkey (10, 12, 13, 22). HT prevalence was higher in older ages also in the studies conducted by Arslantaş et al. (22) (>50 years old, 59.5%), and Lai et al. (26) (>60 years old; 53.09% in men, 56.06% in women). Therefore, like in many studies, in our study age is also a significant risk factor for HT (6-8, 10, 11, 13, 23).

The relation of HT and obesity has been known for many years. In our study and several other studies, it was found that obesity is a strong risk factor for the development of HT (5-7, 10, 11, 13, 16, 23-27). In many studies, obese people have 1.68-4.94 times higher HT risk than normal weight people (OR=4.94 (10), OR=2.22 (13), OR=3.62 (7), OR=2.2 (8), OR=1.68 (16), OR=1.97 (23). In our study, this ratio was 2.15. HT prevalence in obese people was 37.0%. In other studies, it was found as 22.3% (16) and 52.6% (13). These results indicate the importance of the body weight of a hypertensive patient and the importance of informing the patients about this relationship. All physicians, especially those who work in primary care centers should pay attention to the BMI of their hypertensive patients and encourage them to lose weight.

In some studies like Costa et al. (7) there is no difference between income and HT; on the other hand other studies showed that low household income is associated with a higher prevalence of HT (10). In our study, it is also an important risk factor for HT with an OR of 1.47. In our region, families with low income consume more bread and the foods made of flour/wheat which makes people feel full, but causes them to put on weight. In addition, most of these people who live in villages don't have regular jobs, especially in winter. Therefore, people not caring about their physical appearance, their unwillingness to change their lifestyle and its reflection as obesity result as high prevalence of HT. On the other hand, most of these hypertensive patients cannot reach a modern and well equipped health centers for their treatment because of having low income.

According to our study, HT prevalence decreased with higher education. This result also had been demonstrated in several studies (6, 11, 21, 24). High prevalence of HT in low educated group might be the result of low tendency of these people to pay attention to their health and not being informed enough about the things to do or not to do for HT. Also low education usually accompanies low income, which causes a further barrier to getting the medication.

In our study, family history of HT was shown as one of the important risk factors for HT. It has a significant effect on HT with an OR of 2.23. Also in other studies, significant association between HT and positive family history has been observed (5, 23, 28). Although genetic codes had not been founded and substantial environmental factors affecting blood pressure variability, it is known that heritability of blood pressure is around 15 to 40%. This genetic tendency is supported by our study, too. According to our study, having a positive history of HT in first-degree relatives causes higher risk for HT (29-31).

According to our results, current smoking habit was less frequent among hypertensive individuals as it was with some other studies (6, 11). It is known that after each cigarette a transient (30 minutes) blood pressure occurs and then it is lower because of the vasodilator effect of cotinine, which is the major metabolite of nicotine (32). While in some studies (33, 34) the habitual smokers have lower blood pressure than nonsmokers, in some other studies the results are the opposite (35). We think that the lower body weight in smokers may cause a mild reduction in blood pressure (36). Support for this observation is the higher body weight and increased blood pressure among former smokers versus that observed among never-smokers (37). We can explain the reverse relation of hypertension and smoking. In addition, educated hypertensive patients probably would take care of their cardiovascular health by not smoking, which causes lower prevalence of smoking among hypertensives.

Hypertension prevalence was significantly high in subjects with DM (24) and CHD. Type II diabetes develops almost 2.5 times more in persons with hypertension than normotensives (38). In our study, DM (OR=2.35) and CHD (OR=2.32) were also principal risk factors for development of HT, and a total of 127 of 264 diabetics have HT (48.1%) which indicated the DM as a risk factor, similarly with other studies (5, 8, 11). Therefore, to control the DM would help the cardiovascular complications.

This research is one of the largest population-based studies on HT in our region, in which the prevalence of HT, and associated risk factors were analyzed for the first time.

Study limitations

As in many population-based studies on HT, BP was based on the average of two measurements at a single visit. The "white-coat effect" had not been eliminated. Measurement that is more accurate is needed, such as 24-hour ambulatory measurements. BP measurements would be useful to evaluate the differences between day and night and to exclude any subjective or measuring biases. However, this may not be practical in a large population health survey and so we accepted the people as hypertensive whose BP were high in our measurements and the people who had positive HT history (without regarding the BT measurements).

Another weak part of our study was not reaching the allocation units where less than 20.000 people live. In addition, we couldn't exclude the effects of nutritional habits on BP.

Conclusion

Hypertension is an important health problem in our region. According to the logistic regression analysis, age, gender, family history of HT, BMI, DM, CHD and economical status are risk factors for HT. We think that it is possible to control or reduce the HT prevalence with lifestyle changes and educating people, regarding these risk factors. All health care professionals, especially the physicians, should pay attention to inform their patients about these risk factors and to assist them in making lifestyle changes.

Conflict of interest: None declared.

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