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ORIGINAL ARTICLE

Treatment and control of hypertension in Turkish population: a survey on high blood pressure in primary care (the TURKSAHA study)

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Although the management and the control rates of hypertension are generally low throughout the world, there are substantial differences between the countries. The aim of this study was to determine the control rate of blood pressure and the characteristics of the patients who have been admitted to primary care units in Turkey. Our study included 16 270 patients aged above 18 years who were diagnosed as hypertensive in representative nationwide sample of 1000 primary care units in Turkey. The mean age of the patients was 60 ± 11 years (60.1% women). Of 16 270 patients, 15 187 (93.3%) were on an antihypertensive treatment, whereas 1083 (6.7%) were receiving no treatment. The patients who were women, diabetic, smoker, obese, and those who had a concomitant cardiovascular disease (CVD) had a higher rate of antihypertensive treatment. Of 15 187 treated patients, 4912 (30.2%) had a controlled systolic blood pressure, 7063 (43.4%) a controlled diastolic blood pressure, and in 3931 (24.2%), both were under control. A logistic regression analysis demonstrated that age (OR 1.33), diabetes (OR 4.96), body mass index (OR 1.41) and the presence of a CVD (OR 1.19) were predictors for blood pressure being under control. The blood pressure control rates ranged between 16.6 and 30.5% among seven geographical regions. In the primary care units in Turkey, the blood pressure control rate is consistently low in treated hypertensive patients. In addition, there are differences between the geographical regions in both the proportion of those receiving medications and the blood pressure control rates.
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Introduction

High blood pressure is the most common cardiovascular risk factor, and antihypertensive treatment is known to reduce cardiovascular events. Despite all efforts, awareness, treatment and control rate of hypertension are continuously low.[1] However, the blood pressure control rate varies between different countries, and may also differ according to the socioeconomic status or geographical regions in a country.[2–5] Based on the data from the Turkish Adult Risk Factor study, the prevalence of hypertension is 33.7% in Turkey.[6] The treatment rate of hypertension gradually increased in Turkey, from 33% in 1995 to 48% in 2002.[7,8] In Turkey, a large percentage of general population consults the Ministry of Health-affiliated regional health centres, which serve as primary care units. Also, most hypertensive patients are followed by these health centres. However, there is lack of sufficient data on the treatment of hypertensive patients served by primary care units in Turkey. The aim of this study was

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to determine patient characteristics and the blood pressure control rates among the hypertensive patients consulting primary care units.

Methods

Study design
The TURKSAHA study is a cross-sectional study that aimed to investigate the demographic characteristics, co-morbid conditions and the status of pharmacological and non-pharmacological treatment of the hypertensive patients consulting regional health centres, which serve as the most common Ministry of Health-affiliated primary care units. The study population includes male and female hypertensive patients aged above 18 years who use primary care units in all seven regions of Turkey.

Questionnaire form
The study's core steering committee comprised one coordinator, seven cardiologists working in universities of various cities across seven geographical regions of Turkey and one biostatistician. Before preparing the questionnaire, all proposed question topics were assessed by the committee, and then the committee studied to determine the format of the questions and choices. After the committee had reached a consensus, the questionnaire forms were subjected to a trial, and tested for applicability on 50 patients in a hospital in Istanbul.

The questionnaire investigated the general risk factors, previous cardiovascular diseases (CVD) (stroke, coronary artery disease, etc.), the exercise, the nutritional and educational status, and the medications used by the patient. First seven questions were related to the socio-demographic status of the patients, and the remaining composed of 25 close- and one open-ended questions (date of birth) about the medical history. The final section is reserved for the medical findings to be written by the physician at the end of his/her assessment and examination.

Survey
The study was conducted in 1000 primary care units that are representative of primary care in Turkey. One physician from each centre participated in the study. The physicians were informed about the aim of the study and the methodology to be used, in a 1-day meeting held with the participation of the steering committee member who was responsible for that region. In this meeting, the physicians were trained in blood pressure measurements to standardize the assessment of blood pressure. In case the physicians experienced difficulty in deciding while completing the questionnaire forms, they got support by calling the responsible person. The screening included patients aged above 18 years who were previously diagnosed as hypertensive. The screening period was between 16 and 27 February 2004, and the patients coming first in the morning and afternoon in each health centre were included in the study during a period of 10 days.

Blood pressure measurement and hypertension criteria
After the patients had rested at least 10 min at the end of the interview, blood pressure was measured with a mercury sphygmomanometer on the right arm at the level of the heart while patients were sitting. After 5 min, the measurement was repeated, and then these two values were used to calculate the mean blood pressure. Patients' height, weight and abdominal circumference were also measured. The patients were considered hypertensive if blood pressure was $\geqslant$140/90 mm Hg, or receiving antihypertensive therapy. For the patients who were on antihypertensive treatment, blood pressure was considered as 'controlled' if it was below 140/90 mm Hg. In patients with diabetes mellitus, the level of blood pressure control was defined as $<$130/80 mm Hg. Although it was possible that some patients would have a controlled blood pressure as a result of a non-pharmacological treatment, individuals who had a normal blood pressure without taking any medication were excluded from the study even if they stated they were hypertensive.

Statistical analysis
Considering the distribution of each city's population and regional health care centres to individual urban and rural provinces, the sample size was estimated, provided that one physician would be selected from at least one health centre of each rural/urban area in a city, and a hypertensive patient quota would be 16–20 per physician. As there was no suggested rate in terms of the study objectives when the sample size was estimated, the rate that is valid for the 'situations where the rate for the population to be investigated not known' was used ($P=0.50$). Based on this rate, we estimated a sample size of 8120 required for a sensitivity to detect a difference of at least 0.02 with 95% power and 95% confidence. In order to keep the desired power, calculated sample size, 8120 was multiplied by 2, which is the recommended proper coefficient for cluster design. We reached 16 270 patients at the end of the study.

Continuous variables were shown as mean $\pm$ s.d., and categorical variables as percentage. Student's *t*-test was used to compare continuous variables, and χ^2 test to compare categorical variables. Logistic regression analysis was used to assess the variables related to the blood pressure control rates. Logistic regression analysis included age, sex, smoking, diabetes, body mass index (BMI) and CVD. Statistical analyses were performed using SPSS software (version 11.0). $P<0.05$ was considered significant.

Results

Of 20 000 forms distributed to the physicians, 3730 were not included in the analysis, and therefore the study was conducted with the remaining 16 270 patients. The reasons for excluding from the analysis were as follows: basic demographics not specified (age and sex not specified by 327 and 2760 patients, respectively), blood pressure values not reported (304 patients), not stating whether any medication was used or not (95 patients) and normal blood pressure despite no medication received (244 patients).

Demographic characteristics of the patients included in the study are given in Table 1. The proportion of female patients was higher compared to male patients, and approximately one-third of the patients were elderly ($\geqslant$65 years). BMI was substantially higher in female patients than male patients (30.1 ± 5.3 vs 27.9 ± 4.0, $P<0.001$). Figure 1 shows the mean systolic (SBP) and diastolic blood pressures (DBP) by age groups. With advanced age, SBP showed an increase whereas DBP showed a decreasing.

Of 16 270 patients in the study, 15 187 (93.3%) were receiving antihypertensive treatment, whereas 1083 (6.7%) did not receive any medications. The percentage receiving medications was higher in women ($P=0.001$), elderly ($P<0.001$), diabetics ($P<0.001$), non-smokers ($P<0.001$) and those having a concomitant CVD ($P<0.001$) (Figure 2). The percentage receiving medications was highest in the Aegean region (95.9%), which was followed by the Mediterranean (94.5%), Marmara (93.9%), Central Anatolian (93.8%), Black Sea (93.7%), East Anatolian (88.9%) and Southeastern Anatolian (85.7%).

Of 15 187 patients who were on a treatment, 4912 (30.2%) had a controlled SBP, 7063 (43.4%) a controlled DBP, and in 3931 (24.2%) both were under control. When the control level in diabetics was also taken as $<$140/90 mm Hg rather than $<$130/80 mm Hg, the values were 5398 (33.2%), 8026 (49.3%) and 4478 (27.5%), respectively. Despite the higher number of drugs used, the rate of blood pressure control in patients on combination therapy was not different from those on monotherapy (26.3 vs 25.7%, $P<0.05$). The distribution of the control rates according to SBP, DBP and both was given in Table 2 by sex, age groups, diabetes, smoking status, BMI and the presence of CVD. The SBP control rates were similar between men and women, whereas the DBP control rates were lower in women than in men. In the elderly, the SBP and SBP/DBP control rates were lower whereas the DBP control rate was higher. In diabetics and obese patients, the SBP, DBP and both control rates were substantially lower. In the patients with a concomitant CVD (coronary artery disease and/or stroke), the blood pressure control rate was similar to those with no concomitant CVD. Figure 3 shows the blood pressure control rates by age groups. The SBP control rate decreased with advanced age, whereas the DBP control rate tended to increase after 50 years.

Logistic regression analysis showed that age, diabetes, BMI and CVD were predictors for SBP, DBP and both being under control (Table 3). Smoking was a predictor for DBP only. Diabetes was the strongest among these predictors. Age was a negative predictor for the SBP and SBP/DBP control, whereas it was a positive predictor for the DBP control.

Figure 4 shows the blood pressure control rates by the geographical regions of Turkey. Control rates were similar in general for six geographical regions, whereas it was significantly lower in the Southeastern Anatolian region than in other regions.

Table 1 Demographic characteristics of the study patients

Mean age (years)	60 ± 11
Age groups (n (%))	
$<$65	10 446 (64.2)
$\geqslant$65	5824 (35.8)
Gender (n (%))	
Female	9772 (60.1)
Male	6498 (39.9)
BMI (kg/m2)	29.2 ± 4.9
Smoking (n (%))	
Smokers	3271 (20.2)
Non-smokers	10 912 (67.3)
Ex-smokers	2042 (12.6)
Concomitant disease (n (%))	
Diabetes	2912 (17.9)
CAD	2956 (18.7)
Stroke	771 (4.7)
Hyperlipidemia	3498 (21.5)

Abbreviations: BMI, body mass index; CAD, coronary artery disease.

Discussion

Our findings demonstrate that in Turkish population, the hypertensive patients followed up by primary care unit have low blood pressure control rates (Table 4). According to the conventional 'halves principle', the blood pressure can be controlled in half of those receiving therapy. In contrast, the blood pressure can be controlled in approximately one-fourth of the patients who are on therapy in the primary care unit in Turkey.

Based on the Turkish Adult Risk Factor Study's follow-ups over time, the blood pressure control rate among the patients receiving antihypertensive therapy increased over years, from 18 to 28%, according to the control level of 140/90 mm Hg.[7,8] According to the control level used in our study (140/90 mm Hg), the blood pressure control rate was similar to that of the Turkish Adult Risk Factor Study. The control rate observed in primary care

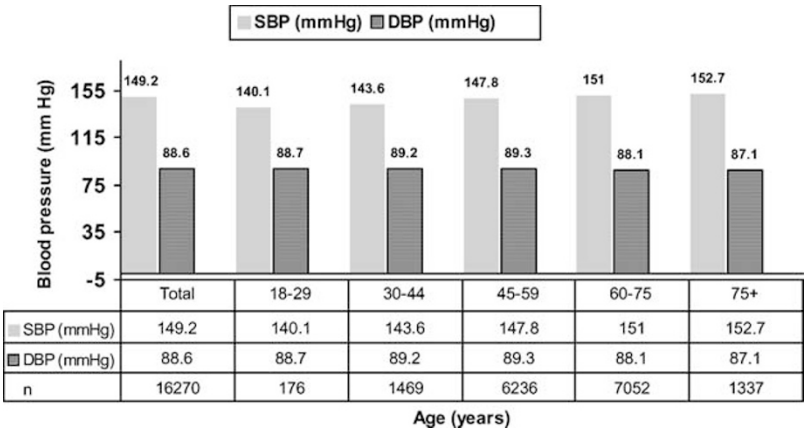

Figure 1 Distribution of systolic and diastolic blood pressure levels according to the age strata ($n = 16\,270$).

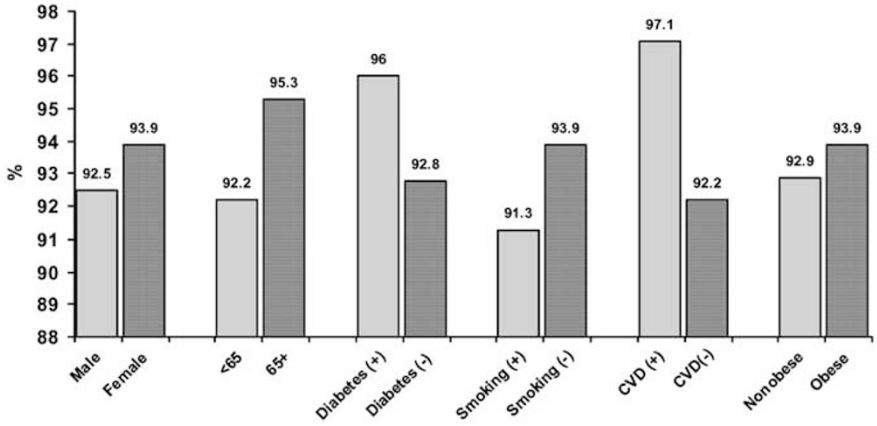

Figure 2 Antihypertensive drug use according to gender, age, diabetes, smoking, cardiovascular disease (CVD) and obesity (gender, $P = 0.001$; obesity, $P = 0.068$; others, $P < 0.001$).

unit in Turkey is comparable in general with that observed in similar age groups in primary care units of European countries.[2,9–11] For example, two studies conducted in France have demonstrated the control rate to be 24 and 32.8% among the hypertensive patients receiving therapy, according to the control level of 140/90 mm Hg.[9,10] Similarly, the control rate according to the control level of 140/90 mm Hg is lower than 30% among the hypertensive patients treated in primary care unit in Germany.[11] However, among the hypertensives receiving treatment in general practice in Poland, the blood pressure control rate is lower than 10% according to the control level of 140/90 mm Hg.[12] Although varying figures are presented for the blood pressure control rate among hypertensive patients receiving treatment in primary care services in USA,[13–14] overall they are higher than those reported for European countries. Maue *et al.*[13] have reported BP control rate according to the level of 140/90 mm Hg to be 41% (36% according to the 130/85 level for diabetics) in USA primary care services, compared with the approximate 50% reported by Ornstein *et al.*[14]

There are marked differences for the blood pressure control rates among hypertensives between different countries. The developmental level of the countries may be important for differences between the blood pressure control rates. However, it appears impossible to explain these differences with the developmental level alone. In a recent analysis comparing the blood pressure control rates between five European countries (United Kingdom, Germany, Italy, Spain and Sweden), Canada and USA, according to the level of 140/90 mm Hg, the blood pressure control rate among patients receiving antihypertensive treatment ranges from 18.7 and 40.3% in European countries, whereas it is 47.3% in Canada and 54.5% in USA.[2] One reason for the differences may be the number of blood pressure measurements or the setting where blood pressure is measured. For example, in NHANES III, six measurements were

performed, and a mean value of these measurements was calculated.[1] With the increasing number of BP measurements, the number of patients whose blood pressure is controlled will be higher. Similarly, the blood pressure control rate is expected to be higher when measuring blood pressure at home.

The blood pressure control rate may differ with some demographics and concomitant conditions.[8,15–18] Similar to our findings, Turkish Adult Risk Factor Study has shown that the percentage of taking medication is higher in women than in men, whereas the control rate among those receiving medication is higher in men than in women (34.6 vs 24.2%).[8] Other studies have also shown a low control rate among women.[16,17] However, sex is not an independent predictor for the blood pressure control rate. This can be explained by the fact that female patients have higher BMI.

Even in those receiving antihypertensive treatment, the blood pressure control rate remains low, especially for SBP. An uncontrolled blood pressure is caused by uncontrolled SBP rather than uncontrolled DBP, a finding consistent with literature.[17–19] There is a reverse correlation between age and the SBP/DBP or SBP control rate.[17,18,20] However, DBP control is better in the elderly patients.[17] There are also some studies suggesting that blood pressure control rates are better among the female and the elderly patients.[15,18] Similar to previous studies, our study also demonstrated that the blood pressure control was worse among diabetics and those with a high BMI.[16,17,21] In the multivariate analysis, the presence of concomitant CVD showed a negative association with high blood pressure, a finding being consistent with literature.[16]

As with many countries, there are differences between geographic regions for the developmental level in Turkey, and the blood pressure control rate may vary between the geographic regions of Turkey and according to the status of socioeconomic level. For example, the blood pressure control rate according to the level of 140/90 mm Hg ranges from 28.5 to 36.6% among different regions of France.[10] The blood pressure control rate among the patients receiving antihypertensive treatment in USA differs with the socioeconomic status, race and ethnic groups.[3–5] In our study, the blood pressure control rate was lowest in the Southeastern Anatolian region, which is the least developed region of Turkey.

Table 2 Blood pressure control rates (systolic blood pressure, diastolic blood pressure or both) among patients treated with medication

	SBP<140	P	*DBP<90*	P	*<140/90*	P
Total	30.2		43.4		24.2	
Gender						
Male	32.4		46.7		26.4	
Female	31.6	NS	43.8	0.001	25.5	NS
Age						
<65 years	34.6		44		27.7	
⩾65 years	27.1	<0.001	46.6	0.002	22.7	<0.001
Diabetes						
Present	14.7		18.6		7.9	
Absent	35.8	<0.001	50.9	<0.001	29.9	<0.001
Smoking						
Smoker	35.2		44.8		27.9	
Non-smoker	31		44.7		25.3	
Ex-smoker	31.8	<0.001	46.8	0.236	25.8	0.019
BMI						
<25 kg/m²	37.4		52.6		31.5	
⩾25 kg/m²	30.8	<0.001	43.4	<0.001	24.8	<0.001
CVD						
Present	31.9		45.1		26.2	
Absent	31.9	NS	45.1	NS	25.8	NS

Data are given as percentages. Abbreviations: BMI, body mass index; CVD, cardiovascular disease; DBP, diastolic blood pressure; NS, nonsignificant; SBP, systolic blood pressure.

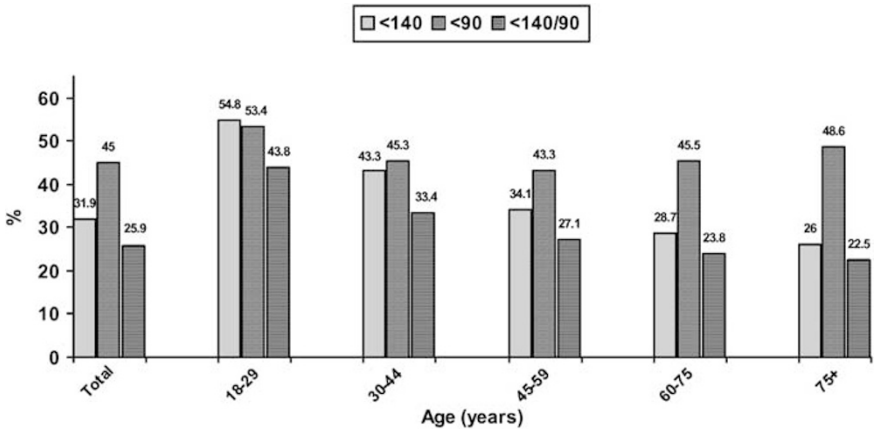

Figure 3 Blood pressure control rates in treated patients (systolic blood pressure (SBP), diastolic blood pressures (DBP) or both) according to the age strata.

Table 3 Predictors of the lack of control to SBP goal, DBP goal or both among treated hypertensives

	Odds ratio (95% CI)					
	SBP>140	P	*DBP>90*	P	*SBP/DBP >140/90*	P
Age⩾65 years (vs <65 years)	1.46 (1.35–1.58)	<0.001	0.88 (0.82–0.95)	0.001	1.33 (1.22–1.44)	<0.001
DM present (vs absent)	3.20 (2.85–3.59)	<0.001	4.75 (4.26–5.29)	<0.001	4.96 (4.27–5.76)	<0.001
BMI⩾25 kg/m² (vs <25)	1.38 (1.26–1.51)	<0.001	1.39 (1.27–1.52)	<0.001	1.41 (1.28–1.55)	<0.001
CVD present (vs absent)	0.86 (0.79–0.94)	0.001	0.90 (0.83–0.98)	0.018	0.84 (0.76–0.92)	<0.001
Smoking yes (vs no)			0.93 (0.87–0.99)	0.025		

Abbreviations: BMI, body mass index; CVD, cardiovascular disease; DBP, diastolic blood pressure; DM, diabetes mellitus; SBP, Systolic blood pressure.

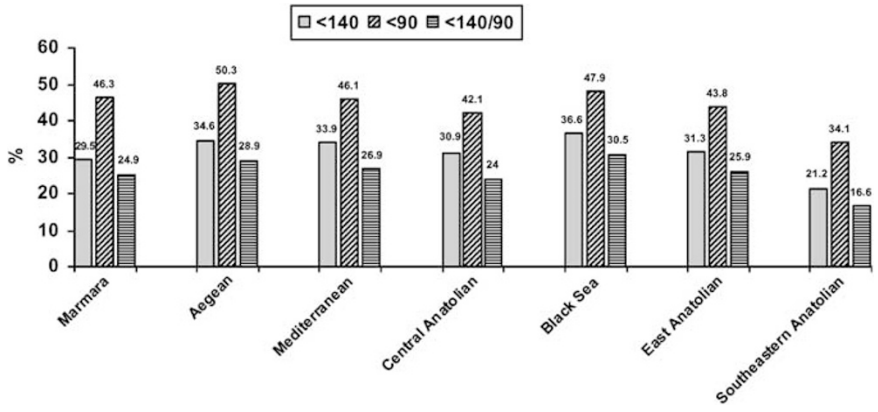

Figure 4 Blood pressure control rates (systolic blood pressure (SBP), diastolic blood pressures (DBP) or both) according to the geographical regions.

Table 4 What is known on the topic and what this study adds

What is known on the topic
- The blood pressure control rates are generally low and there are marked differences in the blood pressure control rates among hypertensives between different countries[2–5]
- The blood pressure control rate among patients receiving antihypertensive treatment ranges from 10 to 40.3% in European countries[2,9–12]

What this study adds
- The blood pressure control rate (24.3%) is consistently low among hypertensives receiving antihypertensive medication in primary care unit in Turkey, and is similar in general to that observed in primary care units in European countries
- The blood pressure control was worse among diabetic patients and those with a high body mass index
- The blood pressure control rate varies between the geographic regions of Turkey

Study limitations

Our study had some limitations. Although blood pressure was measured twice, performing a single-case measurement makes the blood pressure control rates lower. Blood pressure is measured by auscultation method using a mercury sphygmomanometer in many epidemiologic and treatment trials. However, it is becoming increasingly clear that there are major shortcomings. Observer bias is a major limitation of the auscultatory method. An inappropriate excess in the recording of 'zero' as the terminal digit is particularly common when the observer recognizes a specific threshold value for blood pressure. Although we requested that the blood pressure to the nearest 2 mm Hg should be read, some patients may be misclassified. It should be noted that our study does not represent the general population in Turkey. The blood pressure control rates may be higher among those served by secondary and tertiary care health services.

In conclusion, the blood pressure control rate is consistently low among hypertensives receiving antihypertensive medication in primary care unit in Turkey. In our country, the 'halves principle' is not valid even for hypertensives receiving treatment in primary care units. Moreover, there are regional differences in both the percentage of taking medication and the blood pressure control rate.

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