Prevalence, awareness, treatment and control of hypertension in Turkey (the PatenT study) in 2003

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Objective **To determine the distribution of blood pressure (BP) and prevalence, awareness, treatment and control of hypertension in Turkey (PatenT).**

Design **A population-based cross-sectional epidemiology survey was carried out in 2003.**

Setting **Twenty-six cities from seven geographical provinces of Turkey, with proportional representation of urban and rural populations.**

Participants **A two-stage stratified sampling method was used to select a sample of the adult population over 18 years of age. The total number of participants was 4910.**

Interventions **Data collection and BP measurements were conducted by specifically trained physicians in the households of the participants.**

Main outcome measures **The mean systolic and diastolic BP levels, distribution of blood pressure, prevalence of hypertension (mean systolic BP ≥ 140 mmHg or mean diastolic BP ≥ 90 mmHg, or previously diagnosed and/or taking antihypertensive drugs), awareness, treatment and control of hypertension were assessed.**

Results **The overall age-adjusted and sex-adjusted prevalence of hypertension in Turkey was 31.8%, and it was higher in women than in men (36.1 versus 27.5%, $P < 0.001$). In the whole group, 32.2% had never had their BP measured. Overall, 40.7% of those with hypertension were aware of their diagnosis, only 31.1% were receiving pharmacologic treatment and only 8.1% had their BP under control. The subjects who were aware and treated had a control ratio of 20.7%.**

Conclusions **PatenT data indicate that hypertension is a highly prevalent but inadequately managed health problem in Turkey. There is an urgent need for population-based strategies to improve the prevention, early detection and control of hypertension.** ***J Hypertens*** **23:1817–1823 © 2005 Lippincott Williams & Wilkins.**

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Introduction

Hypertension (HT) is the most widely recognized modifiable risk factor for stroke, myocardial infarction, congestive heart failure, peripheral vascular disease and end-stage renal disease [1]. The high prevalence of HT has been consistently reported in numerous epidemiological studies, with prevalence estimates of 25–55% in the adult population samples in most industrialized countries [2]. Much of the international variation in the prevalence of HT in adults may be attributed to differences in environmental factors, genetic susceptibility and variations in study protocols. Over the past two decades, international and national initiatives and programs have been remarkably successful in increasing the awareness, treatment and control of hypertension in developed countries [3]. On the other hand, there is a paucity of information and epidemiological data regarding HT in developing countries. The emerging epidemic of cardiovascular diseases requires increased awareness and surveillance in those areas [4]. The epidemiological transition being observed in developing countries will lead to an increase in the prevalence of HT as a result of increased life expectancy and rapid urbanization [5].

Turkey is a developing Eurasian country located in the Eastern Mediterranean region, spanning between the

Middle East and the Balkan Peninsula of Europe. Turkey has a population of ~70 million, with a characteristic dominance of young age (54% of the population is under the age of 30 years). Nevertheless, cardiovascular disease is the leading cause of death in Turkey, with the highest estimated age-adjusted coronary heart disease death rate in Europe [6]. However, little is known about the nationwide distribution of HT. There have been only a few studies carried out in specific towns or cities of Turkey [7–9]. A nationwide study designed with a particular aim to assess global cardiovascular risk in adults (Turkish Adult Risk Factor Study) has found a HT prevalence of 36% in men and of 49% in women aged over 30 years [10].

Preventive strategies directed toward earlier detection of elevated blood pressure (BP) and its control are likely to offer the greatest promise for reducing the incidence of vascular disease and its associated mortality. This is especially noteworthy because of the relatively young age of Turkey's adult population. The prevalence, awareness, treatment and control of hypertension in Turkey (PatenT) study was therefore carried out in a large cohort of the Turkish adult population, aged over 18 years. The aim of this study was to assess current data on the nationwide prevalence of HT and the corresponding level of awareness, treatment and control rates in Turkey.

Methods

The PatenT study was designed, directed and supported by the Turkish Society of Hypertension and Renal Diseases as a part of an ongoing project to collect current figures and facts about HT in Turkey and to increase public awareness in HT and related disorders, with a particular emphasis on renal involvement.

The PatenT study used a two-stage stratified sampling method to select a nationally representative sample of the adult population over 18 years of age. Turkey has seven geographical provinces, and the sampling process was first stratified by province and then by urban versus rural areas. Strata were selected by a proportional sampling method according to postal-code lists in urban areas, and town and village lists 80 km away from city centers in rural areas. Each stratum has a proportional size to the selected city or village population. Age and gender sampling for each stratum were performed by a quota-sampling method in order to determine the required sample size according to the estimated prevalence of HT in each age group. The estimated sample size with 0.05 α-error and 0.20 β-error was 4967 persons based on the 2000 Turkey census data (67.8 million). There was a 6.9% drop out (majority in the rural areas) where the household owners did not agree to participate in the survey. The questionnaires were applied to everyone living in the participating households, except those with cognitive dysfunction and visitors coming from outside the particular quota. A total of 4992 persons (2019 men and 2973 women, 65% urban and 35% rural residents) were randomly selected from 26 cities, and they all completed the survey and the examination. Eighty-two pregnant women were excluded from the final analysis as pregnancy has a significant effect on systolic and diastolic BP readings independent of the age of the participant (data not shown). The final sample was 4910 persons, consisting of 98.9% of the original cohort selected.

Data collection and BP measurements were conducted in the households of the participants during June 2003–November 2003. A total of 16 physicians (general practitioners or family physicians) were specifically trained about the aims of the study and oriented for survey technique and BP measurement. Physicians were given detailed instructions on administration of the questionnaire and participated in special training sessions on the use of a standardized BP measurement protocol [11]. A pilot study was carried out both in an urban and a rural setting in order to observe the effects of training and to pre-determine difficulties related to the survey and examination before starting the study. During home visits, physicians administered a standard questionnaire that included information on demographic and lifestyle data, diagnosis and treatment of HT, and social and economic impacts of HT. Blood pressure was measured at the beginning, in the middle and at the end of the interview. A quality assurance program was carried out during the whole study period in order to increase the validity of the collected information.

Blood pressure was determined using standardized methods and conditions in accordance with the British Hypertension Society recommendations [11]. Random-zero mercury sphygmomanometers and appropriate-sized adult cuffs were used. Initially, each participant's BP was measured after 30 min of rest in a sitting position. If the reading was higher in one arm, that arm was used for future measurements. The measurement was repeated once more at least 10 min after on the arm with the higher BP. If readings varied by > 10 mmHg, additional readings were taken until two were close. None of the participants had alcohol or tea/coffee intake or had smoked within 30 min preceding the measurement. The Korotkoff phase I (appearance) and phase V (disappearance) were recorded for the systolic and diastolic BP, respectively. To calculate prevalence estimates, the mean of three BP measurements was used in 4152 participants (84.6%), the mean of four BP measurements was used in 653 participants (13.3%) and the mean of two measurements was used only in 105 participants (2.1%).

The participants were considered as hypertensive if they had average systolic BP $\geq$ 140 mmHg or average diastolic BP $\geq$ 90 mmHg, or if they had been previously diagnosed and/or were taking antihypertensive drugs regardless of

the BP readings. Isolated systolic hypertension (ISH) was defined as average systolic BP $\geq$ 140 mmHg and average diastolic BP $<$ 90 mmHg. Isolated diastolic hypertension was described as average systolic BP $<$ 140 mmHg and average diastolic BP $\geq$ 90 mmHg. Awareness of HT was described as any prior diagnosis of HT by a health professional among the population defined as having HT. Treatment of HT was defined as use of antihypertensive medication at the time of the interview. Control of HT was defined as systolic BP $<$ 140mmHg and diastolic BP $<$ 90 mmHg, and was ascertained by direct measurement of BP. The control rates among patients receiving antihypertensive medication were also recorded.

Statistical methods

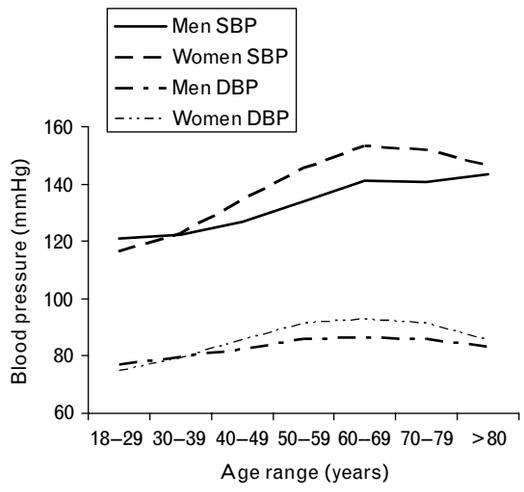
The overall prevalence of HT, the distributions of BP, awareness, control, treatment and treatment recommendations, as well as the descriptives of BP measurements were calculated using sampling weights to reflect the age and gender distribution of the total Turkish population over 18 years of age. Where appropriate the chi-squared test was used to compare proportions, while Student's *t*-test was used to compare normally distributed numeric variables. $P < 0.05$ was considered significant. All data were analysed using SPSS version 10.0 for Windows (SPSS Inc., Chicago, Illinois, USA).

Results

Mean BP levels and prevalence

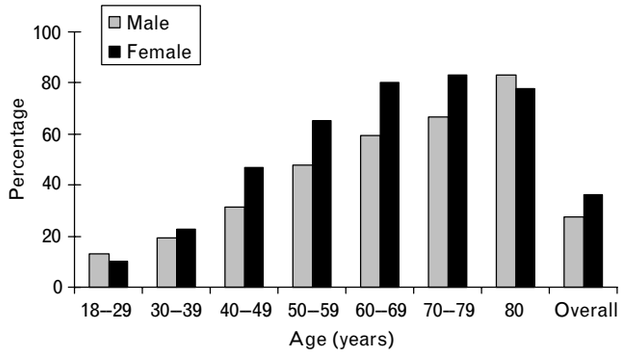
The mean systolic BP was 127.9 mmHg and it increased with age in both genders, being higher among women than men in all age groups except 18–29 years old. The mean diastolic BP was 81.4 mmHg, and it was again higher among women, but only over 40 years of age (Fig. 1). The overall age-adjusted and sex-adjusted prevalence of HT in Turkey was 31.8%, and it was higher in women than in men (36.1 versus 27.5%, $P < 0.001$). The HT prevalence increased with age, and for every age group from 40 to 79 years women had a higher age-specific rate of HT than men (Fig. 2). There was no difference in the prevalence among rural and urban inhabitants (32.9 versus 31.1%, $P > 0.05$).

Fig. 1



Distribution of systolic blood pressure (SBP) and diastolic blood pressure (DBP) among men and women in Turkey.

Fig. 2



Prevalence of hypertension in Turkey by age and gender.

The prevalence of ISH (systolic BP $\geq$ 140 mmHg and diastolic BP $<$ 90 mmHg) was 4.8% and was similar in men (4.8%) and in women (4.7%). The prevalence of ISH increased with age, reaching a maximum of 28.6% in subjects over 80 years of age. Isolated diastolic hypertension was present in 7.1% of the subjects and was slightly higher in men compared with women (7.8 versus 6.5%).

Distribution of BP

The BP distribution in Turkey according to the recent classification system recommended by the European Society of Hypertension/European Society of Cardiology 2003 categories [12] were as follows: 26.1% had optimal BP (systolic BP $<$ 120 mmHg and diastolic BP $<$ 80 mmHg), 29.9% had normal (systolic BP = 120–129 mmHg or diastolic BP = 80–84 mmHg) and 14.7% had high-normal (systolic BP = 130–139 mmHg or diastolic BP = 85–89 mmHg) readings. The prevalence of stage 1 HT (systolic BP = 140–159 mmHg or diastolic BP = 90–99 mmHg), stage 2 HT (systolic BP = 160–179 mmHg or diastolic BP = 100–109 mmHg) and stage 3 HT (systolic BP $\geq$ 180 mmHg or diastolic BP $\geq$ 110 mmHg) was 17.3, 7.5 and 4.5%, respectively.

The distribution of BP (according to the European Society of Hypertension/European Society of Cardiology 2003) among normotensives and hypertensives is presented in Tables 1 and 2. The distribution of BP among normotensives showed that 37.3% had optimal BP, whereas 41.6 and 21.1% had normal and high-normal BP, respectively. In the hypertensive group (old or new

Table 1 Age-specific and gender-specific distribution (%) of blood pressure in normotensives in Turkey

	Age							
	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	80+ years	Total
Men (*n*)	465	330	273	166	86	42	4	1366
Optimal (SBP < 120 mmHg, DBP < 80 mmHg)	35.7	31.2	30.8	28.3	18.6	16.7	–	31.0
Normal (SBP, 120–129 mmHg; DBP, 80–84 mmHg)	49.9	49.4	47.6	38.6	45.3	40.5	50.0	47.4
High-normal (SBP, 130–139 mmHg; DBP, 85–89 mmHg)	14.4	19.4	21.6	33.1	36.1	42.8	50.0	21.6
Women (*n*)	662	520	318	157	47	25	11	1740
Optimal (SBP < 120 mmHg, DBP < 80 mmHg)	52.7	44.4	30.8	24.2	29.8	16.0	18.2	42.3
Normal (SBP, 120–129 mmHg; DBP, 80–84 mmHg)	35.5	39.0	39.3	34.4	25.5	44.0	45.5	37.1
High-normal (SBP, 130–139 mmHg; DBP, 85–89 mmHg)	11.8	16.6	29.9	41.4	49.7	40.0	36.3	20.6

SBP, systolic blood pressure; DBP, diastolic blood pressure.

Table 2 Age-specific and gender-specific distribution (%) of blood pressure in hypertensives in Turkey

	Age							
	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	80+ years	Total
Men (*n*)	67	82	126	155	120	83	20	653
Under control (SBP < 140 mmHg, DBP < 90 mmHg)	3.0	–	3.2	7.1	14.2	15.7	25.0	8.0
Stage 1 HT (SBP, 140–159 mmHg; DBP, 90–99 mmHg)	82.1	70.7	69.8	54.2	42.5	54.2	60.0	60.2
Stage 2 HT (SBP, 160–179 mmHg; DBP, 100–109 mmHg)	14.9	22.0	19.8	22.6	28.3	19.3	15.0	21.6
Stage 3 HT (SBP ≥ 180 mmHg, DBP ≥ 110 mmHg)	–	7.3	7.2	16.1	15.0	10.8	–	10.3
Women (*n*)	72	160	280	303	179	127	30	1151
Under control (SBP < 140 mmHg, DBP < 90 mmHg)	2.8	7.5	7.8	8.5	8.4	10.2	13.3	8.2
Stage 1 HT (SBP, 140–159 mmHg; DBP, 90–99 mmHg)	77.8	58.1	49.7	38.9	37.4	40.2	50.0	46.8
Stage 2 HT (SBP, 160–179 mmHg; DBP, 100–109 mmHg)	19.4	21.3	28.2	28.4	27.4	28.3	16.7	26.3
Stage 3 HT (SBP ≥ 180 mmHg, DBP ≥ 110 mmHg)	–	13.1	14.3	24.1	26.8	21.3	20.0	18.7

SBP, systolic blood pressure; DBP, diastolic blood pressure.

diagnosis, treated or not treated) the BP distribution showed that only 8.1% had readings under 140/90 mmHg; 51.7% had stage 1 HT, 24.6% had stage 2 HT and 15.6 % had stage 3 HT.

HT: awareness, treatment and control

In the whole group, 1577 subjects among 4910 (32.2%) had never had their BP measured (41.4% of men and 25.8% of women). The highest rate of non-measurement was in the age group 18–29 years (51.3%). Of those who had previously had their BP measured, 67.8% had it measured in the past 6 months but 14.5% had their measurements at least 2 years ago.

The age-specific and gender-specific distribution of awareness, treatment and control among those with HT is presented in Table 3. Among 1804 subjects with HT, 1070 subjects (59.3%) were not aware of their HT. Women were more aware than men (47.9 versus 27.9%, $P < 0.05$). Awareness increased with increasing age, but men were less aware than women in each age group. Overall, 40.7% of those with HT were aware of their diagnosis, only 31.1% (20.7% men and 37.0% women) were receiving pharmacologic treatment and only 8.1% (8.0% men and 8.2% women) had their BP under control. Despite being more frequently aware and having higher treatment rates than older men (over 60 years of age), older women had lower control of their HT ($P < 0.05$). The subjects who were aware and treated had a control ratio of 20.7%. The proportion of treated and controlled subjects was higher among men than women (31.1 versus 17.4%, $P < 0.05$). Women aged 18–39 years had the highest levels of control rates compared with men in the same age group, but after the age of 50 years men had significantly higher control rates among treated hypertensives ($P < 0.05$).

Table 3 Age-specific and gender-specific distribution of awareness, treatment and control among hypertensives in Turkey

	Age							
	18–29 years	30–39 years	40–49 years	50–59 years	60–69 years	70–79 years	80+ years	Total
Men (*n*)	67	82	126	155	120	83	20	653
Awareness (%)	7.5	7.3	18.3	29.1	46.7	44.6	50.0	27.9
Treatment (%)	2.9	3.6	9.5	19.3	40.8	34.9	50.0	20.7
Control (%)	2.9	–	3.2	7.1	14.2	15.7	25.0	8.0
Treated and controlled (%)	–	–	16.6	26.6	34.7	34.5	50.0	31.1
Women (*n*)	72	160	280	303	179	127	30	1151
Awareness (%)	12.5	23.1	41.8	56.4	60.3	69.3	73.3	47.9
Treatment (%)	5.5	12.5	28.9	44.5	48.6	62.2	66.7	37.0
Control (%)	2.8	7.5	7.8	8.5	8.4	10.2	13.3	8.2
Treated and controlled (%)	25.0	30.0	16.0	16.3	17.2	16.5	20.0	17.4

Treatment recommendations

Subjects with a prior diagnosis of HT were asked about the use of the following recommendations of their physicians: regular use of antihypertensive medications, weight control or weight loss, salt reduction in the diet, increase in exercise, reducing alcohol intake, ceasing smoking, reducing dietary fat and avoiding stress. Most participants were told to use their medications regularly (92.4%) and to reduce dietary salt (91.4%). Current use of these recommendations was 74.2 and 66.3%, respectively. Among women, the current use of weight control and increase in exercise were less common (43.2 and 35.1%) than among men (56.5 and 54.7%, respectively) ($P < 0.05$).

The BP distribution among hypertensive patients who were aware and treated was similar to those who were not treated. Aware and treated patients had BP readings falling into stage 1, stage 2 and stage 3 in 28.3, 27.1 and 23.9% of cases, whereas aware but not-treated patients showed 25.4, 26.0 and 31.3% of cases, respectively. Among 561 patients who were on antihypertensive medication, 68.4, 26.2 and 5.4% were receiving one drug, two drugs and three or more drugs, respectively. Among those receiving monotherapy, 15% admitted an irregular use of the medication (on an as-needed basis).

Discussion

The PatenT study presents current information on the prevalence, awareness, treatment and control status of HT in Turkey. All the data were collected by trained physicians and the quality assurance programs were employed during data collection. Using three BP measurements for most participants and taking the mean of all measurements, detailed information on the history of HT and on the non-pharmacological and pharmacological treatment provided an accurate and precise estimate of hypertension in Turkey.

The PatenT study showed that there were approximately 15 million hypertensives in the adult population in Turkey, and only 40% was aware of their condition. Thirty-one percent of hypertensives were taking antihypertensive medicine and only 8% of all hypertensives and 20% of pharmacologically treated patients had BP $< 140/90$ mmHg. Beside the high prevalence, low awareness, and low control, there are 21 million people in Turkey with normal and high-normal BP who are at high risk of developing HT [13].

The Turkish adult population is relatively young and approximately one-third of the adult population is between 18 and 30 years old, whereas only 15% is above the age of 60. In the PatenT study, consistent with the universal data, the prevalence of HT increases with age, reaching 70–80% after age 60. However, split analysis showed that only 35% of hypertensives were above 60 years of age. The remaining 53% of hypertensives were in the middle age group and a non-negligible proportion of 12% was in the 18–29 years age group. These findings suggest that the middle age group is bearing the burden of HT despite an age-related increase in prevalence. In terms of prevention, it is also important to note that more than one-fifth of the normotensive adult population and more than 40% of the normotensive young adult population (18–29 years of age) had high-normal BP. A major preventive effort should be initiated to encourage those having high risk of HT, mainly young adults, towards health-promoting lifestyle modifications. Otherwise, progression of BP with age to hypertensive levels in this population [12] will result in a rapid increase in the prevalence of HT during the next decades.

In the PatenT study, the prevalence of HT in women was higher than in men and the difference between men and women is present at all ages, except for under 30 and over 80 years of age. These findings are consistent with previous surveys in Turkey [7–10]. In the last cohort of the Turkish Adult Risk Factor study, the prevalence of HT between 30 and 80 years of age was 49% in women and 36% in men [10]. In a local regional HT survey undertaken in the South eastern part of Turkey (AYDIN-HIP), the prevalence of HT in those over 18 years of age was 31.1% in women and 23.7% in men [8].

The most striking finding related to awareness of HT in Turkey was the unacceptably high percentage of people (32.2%) who had never had their BP checked. The highest 'non-measurement' rate was seen in the age group 18–29 years, in which 51.3% of the subjects had never had a BP measurement. Most prevalence studies did not refer to 'non-measurement' rates, but it was only 2% in Canada [14] and less than 1% in the United States [15]. According to the British Hypertension Society 2004 report, all adults should have their BP measured routinely at least every 5 years: those with high-normal BP (systolic BP = 130–139 mmHg or diastolic BP = 85–89 mmHg) and those who have had high readings at any time previously should have annual re-measurements [16]. The high 'non-measurement' rates in Turkey thus have critical importance for public health and the health care system, as BP had never been measured in nearly one-third of the Turkish adult population over 18 years of age (representing $\sim$ 16 million persons).

Control of HT by antihypertensive drug therapy was quite low in the PatenT study. More than 90% of all hypertensives and almost 80% of pharmacologically treated hypertensive patients still had BP above 140/90 mmHg. Interestingly, no great difference was observed in the control rate and BP distribution of pharmacologically treated and untreated patients. Among non-pharmacological treatment modalities, salt restriction, reducing dietary fat and avoiding stress were the first-line recommendations to hypertensive patients. According to patients' reports, more than two-thirds use the advice concerning salt restriction, dietary fat reduction and reduction in alcohol intake. The least common used recommendation is an increase in exercise ($\sim$ 40%). Despite relatively high rates of non-pharmacological approaches, BP control was still very low. Recent evidence from large clinical trials suggests that the majority of hypertensive patients require two or more antihypertensive agents in order to reach their target BP [12]. In the PatenT study, two-thirds of the pharmacologically treated hypertensive patients were receiving only one drug. Therefore, reinforcing lifestyle modifications, increasing the number of antihypertensive drugs in treatment and better follow-up for compliance to therapy will improve control rates.

The prevalence, awareness, treatment and control of HT in Turkey showed some similarities and differences compared with other countries. The prevalence is higher than East Mediterranean countries but lower than many European countries [3]. The level of awareness is similar (40%) to many economically developing countries, but worse than many European countries, the United States and Canada [2]. The overall treatment rate of HT in Turkey (31%) is higher than Egypt (23%) [17], similar to England (31%) [18] but significantly lower than the USA (59%) [15]. However, among hypertensive patients who are aware of their condition, the rate of treatment in Turkey (76%) is higher than in England (68%) and Egypt (60%) but lower than in the USA (84%). These findings suggest that low awareness is the most important determinant for the low rate of treatment in hypertensives in Turkey. On the other hand, the control rate of HT in Turkey (8%) is similar to England (9%) and Egypt (8%) and is lower than the USA (34%). The low control rate is not only related to low awareness, but also to inadequate non-pharmacological and pharmacological treatments.

The PatenT data indicate that almost one-third of the adult population is hypertensive in Turkey. Despite the high prevalence of HT, less than one-third of hypertensives are pharmacologically treated and less than 10% of hypertensives had their BP under control. More worrisome, one-third of the adult population had never had their BP measured and almost one-fifth of normotensives had high-normal BP. The PatenT data underscore the urgent need for specific nationwide programs to improve the awareness, treatment and control of HT. Moreover, special preventive efforts should be targeted on lifestyle modifications of the population in order to reduce the average BP, and the prevalence of HT.

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