

Urban and rural differences in hypertension risk factors in Turkey

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ABSTRACT

Objective: Existing literature shows considerable regional differences in terms of hypertension (HT) prevalence in Turkey. The purpose of this study was to analyze some of the known HT risk factors contributing to the variations between urban and rural areas of Turkey in HT development.

Methods: We used data from the 2011 Chronic Diseases and Risk Factors Survey that was conducted by the Turkish Ministry of Health on a representative sample of the Turkish adult population aged 20 years or more (n=16.227). HT was defined as having at least one of the following: a mean systolic/diastolic blood pressure of at least 140/90 mm Hg, a previously diagnosed disease, or use of antihypertensive medication. Step-wise multiple logistic regression analysis was used to estimate HT risk factors in urban and rural settings.

Results: Although the HT prevalence was higher in rural areas (28.4%) than in urban areas (23.9%), in this study, urbanization was found to be a contributing factor in multivariate regression analysis. Furthermore, separate regressions for urban and rural settings revealed that age, obesity, diabetes, hyperlipidemia, and smoking were independently and positively associated (p<0.05) with HT in both settings, while marital status, employment type, mental health, and lifestyle patterns; nutritional habits; and amount of physical activity and sedentary time (p<0.05) were risk indicators in urban areas only.

Conclusion: The findings of our study demonstrate that contributory factors show some variations between urban and rural settings, and on gender within each setting. Taking into account the variations between urban and rural areas in HT development may provide greater insight into the design of prevention strategies. (*Anatol J Cardiol* 2017; 18: 39-47)

Keywords: hypertension, urban, rural, risk factor, Turkey, logistic regression

Introduction

The prevalence of hypertension (HT) is increasing globally, and it is a major risk factor for cardiovascular diseases (CVDs), associated with mortality and morbidity globally. Worldwide, 7.6 million or 13.5% deaths have been associated with HT, the leading cause of CVDs (1).

The estimated HT prevalence for the population aged 20 and over was 26.4% globally in 2000 (26.6% for men and 26.1% for women), and there is a projected increase in the HT prevalence to 29.2% for both men and women by 2025 (2). Although the importance of blood pressure is recognized as a risk factor for CVDs, and inexpensive treatments are available, the HT prevalence is dramatically increasing in low- and middle-income countries (3).

The factors of age, sex, and race are well established in the explanation of the differences in the HT prevalence (4). Moreover, research in different continents, countries, regions, and populations within the same countries all indicate significant regional variations (5, 6). These variations may indicate differences

in the demographic and epidemiological changes in various regions around the world; for example, studies conducted between 2005 and 2011 showed considerable regional differences in terms of the HT prevalence across regions in Turkey (7, 8). As a developing country, Turkey's urban population has almost doubled in the last 30 years, from 41% in 1980 to 77% in 2010 (9). Between 1991 and 2014, the regional variation in the prevalence of elevated blood pressure ranged from 16.5% to 67% (7, 8).

Exploring the regional differences and an in-depth analysis of the urban and rural variations in prevalence may provide important insight into the underlying determinants of the increasing HT prevalence. This study reviews and attempts to account for any distinctions in the HT prevalence in urban and rural settings of Turkey. The main purpose is to examine some of the known HT risk factors contributing to the variations in HT rates between the urban and rural areas, employing the most recent nationally representative epidemiological data—the 2011 Chronic Diseases and Risk Factors Survey, conducted by the Turkish Ministry of Health.

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Methods

Design, sampling, and data collection

Chronic Diseases and Risk Factors Survey study has been reported in detail previously (10). Briefly, a multi-stratified proportional sampling procedure was used to select a nationally representative sample of the adult population aged 15 years and over ($n=18,477$). For the current analyses, excluding those under 20 years, a sample of 16,227 was employed. After excluding non-responses and missing information data, a total of 12,971 participants were used in multiple regression analyses, and data from a total of 4,084 hypertensive participants was used in multivariate associations. Data collection and measurements were performed by family physicians and trained family health staff. Each of 20,044 family physicians interviewed 2 individuals selected by the Turkish Statistical Institute (TURKSTAT) through a random sampling method. Anthropometric variables were measured using standard equipment and procedures (11). The blood pressure values of the individuals were obtained with a single measurement, taken after resting for at least 15 min. Participants were advised to avoid smoking, caffeinated drinks, alcohol, and exercise for at least 30 min before measurement. Measurement was taken from the unclothed right arm of the person in a sitting position. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured using a stethoscope and a sphygmomanometer (11). This study was approved by the Ethics Committee of the Ministry of Health of Turkey.

Definitions

Based on the classification of blood pressure from the JNC-7 (12), HT was defined as having an SBP of at least 140 mm Hg and/or DBP of at least 90 mm Hg, or if the individual was on antihypertensive medication.

Regarding education, participants were categorized into three levels: no schooling (illiterate/literate), primary/secondary school, and high school/university education. Marital status was coded as single, married, or widow/divorced; occupational status as employed or unemployed; alcohol consumption as drinker or non-drinker; cigarette smoking as current smoker (at least one per day), former smoker, and non-smoker. Sedentary lifestyle was considered as having over 5 h of sedentary lifestyle activities daily. Physical activity was coded as exercising at least once a week. Fruit and vegetable consumption was coded as adequate (3 or more portions daily) or insufficient (less than 3). Type of oil/butter consumption was classified as margarine/sunflower oil/corn oil or olive oil/butter consumption. Mental disorder was coded as major or minor depression, somatoform disorder, or panic disorder.

Body mass index (BMI) was determined from measured weight in kilograms divided by height in meters (squared). BMI ≥ 25 – 29.99 kg/m² was classified as overweight and BMI ≥ 30 kg/m² as obese (13). Abdominal obesity was defined by waist circumferences, ≥ 102 cm in men and ≥ 88 cm in women (14).

Individuals who had fasting glucose levels ≥ 126 mg/dL or who were on antidiabetic medication were considered as having diabetes (DM), in line with the American Diabetes Association criteria (13). Respondents with LDL-cholesterol levels of at least 160 mg/dL or on antihyperlipidemic medication were classified as having hyperlipidemia. Family histories of DM, stroke, or heart attack were assessed via self-reports.

Statistical analysis

All statistical analyses were performed using SPSS 18.0 for Windows (SPSS, Inc., Chicago, USA). Age-standardized prevalence rates and means for SBP and DBP for all the states were computed using TURKSTAT age standards. For prevalence calculations by gender and age, the distribution in Turkey in 2011 was employed for standardization. In the preliminary analysis, χ^2 test was used for the comparisons of prevalence between dichotomous categories.

To explore HT risk factors, multiple logistic regression analyses by urban–rural residency were conducted between the dependent variable (being hypertensive) and independent variables. Being hypertensive was defined as having an SBP of at least 140 mm Hg and/or DBP of at least 90 mm Hg, or if the individual was on antihypertensive medication. The independent variables were selected based on the existing empirical literature and data availability. The variables included in the analyses were age categories (20–34, 35–49, 51–64, and 65+ years), education categories (no schooling, schooling for 1–8 years, and schooling for >8 years), occupation categories (unemployed and employed), marital status categories (married, single, and divorced/widowed), sedentary time categories (<5 h a day and 5+ h a day), physical activity categories (none/insufficient and sufficient), TV viewing (<4 h a day and 4+ h a day), fruit and vegetable consumption categories (<3 portions a day and 3+ portions a day), smoking categories (non-smoker/quitter and current smoker), salt use, alcohol use, white bread consumption, unhealthy fat consumption, BMI categories (normal/underweight, overweight, and obese), DM, mental disorder, family history of heart attack, and family history of DM.

Gender is a well-established factor explaining the variations in the HT prevalence; therefore, taking gender into account may provide greater insight in understanding the variations in HT development between urban and rural areas. Thus, four multiple regression analyses were performed by urban–rural settings and by gender (urban-male, urban-female, rural-male, and rural-female). Stepwise regression analysis was performed to test the fit of the models and select the final multivariate models. Accuracy of the models and their goodness of fit were checked by computing Hosmer-Lemeshow goodness of the model fit tests (p values for all the tests >0.05) and Nagelkerke R-square values (ranging between 0.63 and 0.79). The main objective was to perform a comparison of risk factors between urban and rural settings; therefore, variables significant in the final model were incorporated into the other model, despite the fact that in this

model, these variables were not significant. These insignificant variables included into the final regression models did not lead to significant changes in likelihood ratio test results, goodness of fit tests, or in magnitudes of other coefficients. Furthermore, the results were likely to suffer from a selection bias because selection of urban or rural residency is unlikely to be random. To avoid this bias, a full set of interaction terms between urban–rural residency and other independent variables was incorporated into the multiple regression models. Odds ratios (ORs) and 95% confidence interval (CI) were estimated. A *p* value <0.05 was considered significant.

Results

The descriptive statistics of the study sample by urban–rural residencies are shown in Supplementary Table 1. A total of 16,227 (53% women and 47% men) subjects were included in the analyses. Overall, the mean age was 44±15.8 years. About 77% reported their level of education as primary school or lower. No schooling rate was 28% among rural dwellers compared with the rate of 14% among urban dwellers. Of all subjects, 77% were married and 62% were currently working. The prevalence of obesity, DM, or hyperlipidemia was comparable between the two settings. Sedentary time was higher and physical activity level was lower in rural settings. Urban dwellers were more likely to smoke and drink than rural dwellers. The majority of the population consumed white bread, unhealthy fat, and insufficient level of fruit and vegetables.

Figures 1 and 2 show prevalence of hypertension by gender in urban and rural settings. Table 1 shows univariate association of hypertension with various factors among urban and rural residents. The overall (age adjusted) prevalence of hypertension was 24.9%, and was higher in rural (28.4%) than in urban areas (23.9%) (*p*<0.001). Women were more likely to be hypertensive in rural areas than in urban areas (*p*<0.05). The prevalence of hypertension increased with age in both urban and rural settings (*p*<0.001). Further, the prevalence of hypertension in individuals over 50 was higher for urban residents. The prevalence of hypertension was significantly higher in those (in both settings) with low education, insufficient physical activity, more sedentary time, and mental problems, and also in those who were non-smokers, obese, diabetic, or hyperlipidemic (*p*<0.05). Moreover, prevalence rates were higher in urban compared to rural areas for the following categories: high school/university graduates, illiterate/literates, retired, participants who watched at least 4 hours of TV daily, non-smokers, and non-drinkers.

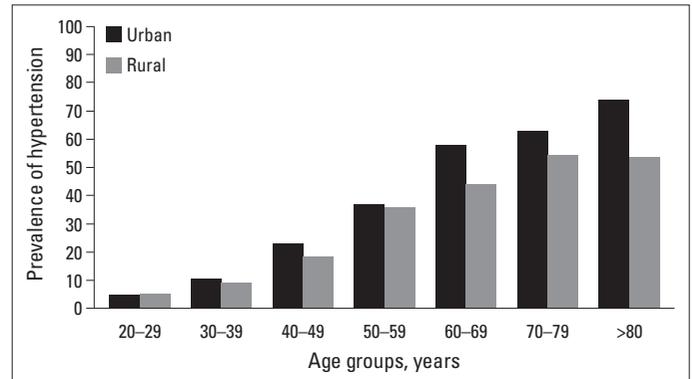
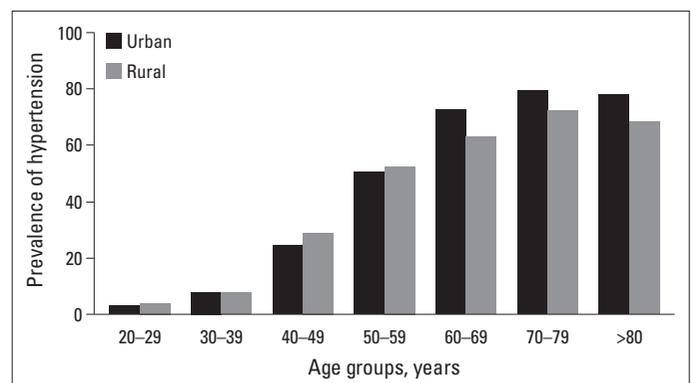
Although the prevalence rate was higher in rural areas in this study, urbanization was found to be a contributing factor in multivariate regression analysis, after controlling for factors such as age and gender (OR=1.24, *p*=0.011; OR=1.20, *p*=0.030; for men and women, respectively) (data now shown). Furthermore, being female was found to be a significant risk factor in urban settings only. This suggests that analyzing HT risk factors ac-

Table 1. Multivariate association of hypertension with various factors among urban and rural residents

Variables	Percentage of HT			
	Rural, n (%)	Urban, n (%)	<i>P</i>	Total, n (%)
Gender				
Men	537 (24.7)	1179 (24.2)		1716 (24.3)
Women	799 (34.5)	1569 (27.6)	0.105	2368 (29.6)
<i>P</i>	<0.001	<0.001		
Age				
20–34	59 (4.6)	180 (4.9)		239 (4.8)
35–49	246 (19.3)	696 (19.4)		942 (19.4)
50–64	523 (45.9)	1094 (49.1)		1617 (48)
65+	507 (62.6)	778 (70.9)	<0.001	1285 (67.3)
<i>P</i>	<0.001	<0.001		
Education				
No schooling	596 (48.2)	773 (51.4)		1369 (49.9)
1–8 years	654 (24.7)	1397 (25.3)		2051 (25.1)
9 or higher	82 (13.6)	572 (16.2)	<0.001	654 (15.9)
<i>P</i>	<0.001	<0.001		
Occupation				
Unemployed	61 (16.4)	114 (13.3)		175 (14.2)
Housewife	679 (40.1)	1177 (34.8)		1856 (36.6)
Worker	203 (16.7)	260 (11.4)		463 (13.2)
Professional	20 (11.7)	137 (12.9)		157 (12.8)
Tradesman	26 (17.6)	142 (19.5)		168 (19.2)
Retired	220 (46.9)	720 (51.2)		940 (50.2)
Out of labor	124 (31.8)	173 (23.2)	<0.001	297 (26.1)
<i>P</i>	<0.001	<0.001		
Marital status				
Married	1029 (29.3)	2112 (26.1)		3141 (27.1)
Single	272 (57.7)	535 (53.4)		807 (54.8)
Divorced	33 (6.5)	99 (6.7)	0.140	132 (6.7)
<i>P</i>	<0.001	<0.001		
TV categories				
<4 h	1025 (29.2)	1923 (23.9)		2948 (25.5)
≥4 h	198 (29.6)	655 (33.2)	0.036	853 (32.3)
<i>P</i>	0.853	<0.001		
Physical exercise				
1 day or less a week	877 (31.3)	1497 (29.6)		2374 (30.2)
≥1 day a week	273 (24.8)	973 (21.2)	<0.001	1246 (21.9)
<i>P</i>	<0.001	<0.001		
Fruit/Veg. portion				
<3	624 (31.2)	1375 (68.8)		1902 (28.3)
≥3	704 (34.1)	1358 (65.9)	0.048	2139 (26.1)
<i>P</i>	0.145	<0.001		
Cigarette				
Non-smoker	720 (36.5)	1228 (30.2)		1948 (32.3)

Continued Table 1. Multivariate association of hypertension with various factors among urban and rural residents

Variables	Percentage of HT			
	Rural, n (%)	Urban, n (%)	P	Total, n (%)
Former smoker	131 (38.1)	303 (41.4)		434 (40.3)
Second-hand smoker	277 (27.4)	625 (27)		902 (27.1)
Current smoker	202 (17.6)	579 (17.2)	<0.001	781 (17.3)
P	<0.001	<0.001		
Alcohol				
Yes	93 (19.2)	306 (19.7)		399 (19.5)
No	1231 (30.9)	2418 (27.1)	<0.001	3649 (28.2)
P	<0.001	<0.001		
White bread				
Yes	1135 (29.5)	2099 (23.7)		3234 (25.5)
No	197 (31.5)	624 (38.7)	<0.001	821 (36.7)
P	0.376	<0.001		
Salt use				
Yes	190 (24.7)	373 (19.1)		563 (20.7)
No	1126 (30.7)	2341 (27.6)	0.561	3467 (28.5)
P	0.001	<0.001		
Oil/butter consumption				
Unhealthy	522 (30.6)	1035 (29.1)		1557 (29.6)
Healthy	808 (29.2)	1700 (24.4)	0.390	2508 (25.7)
P	0.310	<0.001		
Diabetes				
Yes	855 (25.1)	1743 (20.9)		2598 (22.1)
No	316 (62.2)	749 (64.1)	0.061	1065 (63.5)
P	<0.001	<0.001		
Mental disorder				
Yes	267 (37.6)	561 (31.1)		828 (32.9)
No	1064 (28.2)	2177 (24.9)	0.771	3241 (25.9)
P	<0.001	<0.001		
Hyperlipidemia				
Yes	283 (58)	756 (53.7)		1039 (54.8)
No	832 (26.1)	1632 (20.9)	<0.001	2464 (22.4)
P	<0.001	<0.001		
BMI categories				
Normal	235 (14.1)	427 (11.1)		662 (12)
Overweight	441 (28.3)	925 (24.4)	0.332	1366 (25.6)
Obese	585 (50.2)	1236 (45.1)		1821 (46.6)
P	<0.001	<0.001		
Family history of stroke/Heart attack				
Yes	312 (36.4)	735 (30.9)		1047 (32.4)
No	1014 (28.2)	1993 (24.6)	0.020	3007 (25.7)
P	<0.001	<0.001		
P values on the columns indicate χ^2 test results between urban and rural individuals in terms of analyzed variables. P values on the rows are χ^2 test results of each variable within each hypertensive urban or rural residents. HT - hypertension				

**Figure 1.** Prevalence of hypertension by age groups in urban and rural areas in Turkey, for men**Figure 2.** Prevalence of hypertension by age groups in urban and rural areas in Turkey, for women

cording to gender may provide greater insight in understanding the variations in HT development between urban and rural areas. Thus, four multiple regression analyses were performed by urban-rural settings and by gender (urban-male, urban-female, rural-male, and rural-female).

Multiple logistic regression analyses were performed between HT as the dependent variable and the independent variables of personal factors, demographic factors, and risk behaviors in order to identify differences in the determinants of HT between urban and rural areas (Tables 2, 3). A full set of interaction terms between urban-rural residency and other independent variables was incorporated into the multiple regression models in order to avoid sample selection bias. Stepwise regression analysis was performed to test the fit of the models and to select the final multivariate models. As stated, the main objective of the study was to investigate HT risk factors and perform a comparison between urban and rural settings. In order to make comparisons, the variables that were significant in the final model of one of the rural or urban regression analysis were added to the other model, despite being insignificant. Stepwise regression analysis to observe HT risk factors in urban settings showed that the variables retained in the final models were age, education, occupation, marital status, sedentary time, physical activity, TV hours, vegetable/fruit consumption, smoking, salt use, alcohol use, white bread use, unhealthy fat use, BMI categories, DM, mental

Table 2. Stepwise multiple logistic regression analysis of risk factors for HT in urban areas, by gender

Variables	Urban					
	Men			Women		
	OR	95% CI	P	OR	95% CI	P
Age, 20–34	1			1		
Age, 35–49	2.427	1.765–3.338	<0.001	3.764	2.680–5.287	<0.001
Age, 50–64	4.568	3.196–6.529	<0.001	13.445	9.433–19.163	<0.001
Age, 65+	11.885	7.638–18.494	<0.001	32.773	20.984–51.186	<0.001
Education, no schooling	1			1		
Education, 1–8 years	0.709	0.509–0.986	0.088	0.741	0.584–0.941	0.014
Education, >8 years	0.824	0.541–1.255	0.366	0.681	0.490–0.947	0.022
Occupation, unemployed	1			1		
Occupation, employed	0.564	0.447–0.710	<0.001	0.571	0.415–0.784	<0.001
Marital status, married	1			1		
Marital status, single	1.238	1.007–1.522	0.091	0.633	0.407–0.984	0.042
Marital status, divorced	1.077	0.668–1.735	0.762	0.822	0.680–0.994	0.091
Sedentary time, <5 h	1			1		
Sedentary time, ≥5 h	1.046	0.805–1.358	0.738	1.268	1.011–1.591	0.085
Physical activity, no/insufficient	1			1		
Physical activity, sufficient	0.982	0.800–1.205	0.860	0.808	0.672–0.972	0.024
TV, <4h	1			1		
TV, ≥4 h	1.003	0.752–1.338	0.985	1.227	1.033–1.457	0.020
Vegetable & Fruit, ≥3 portions	1			1		
Vegetable & Fruit, <3 portions	0.858	0.737–0.998	0.048	0.842	0.685–1.036	0.104
Non-smoker/quitter	1			1		
Current smoker	0.762	0.604–0.962	0.022	0.981	0.742–1.298	0.896
Salt use, yes	1.219	1.015–1.464	0.076	0.733	0.559–0.960	0.059
Alcohol, yes	1.218	1.012–1.465	0.080	1.130	0.680–1.879	0.637
White bread, yes	1.514	1.181–1.941	<0.001	1.257	1.046–1.510	0.015
Unhealthy fat, yes	1.221	1.039–1.435	0.015	0.964	0.774–1.202	0.747
Normal/underweight	1			1		
Overweight	1.727	1.372–2.173	<0.001	1.584	1.203–2.086	<0.001
Obese	3.428	2.632–4.464	<0.001	3.720	2.839–4.875	<0.001
Diabetes	2.366	1.808–3.097	<0.001	3.195	2.438–4.187	<0.001
Mental disorder	1.072	0.760–1.511	0.693	1.331	1.126–1.572	<0.001
Family history of heart attack	1.157	0.916–1.462	0.222	1.285	1.028–1.606	0.027
Family history of diabetes	1.166	0.958–1.420	0.126	1.187	1.011–1.394	0.080
	Nagelkerke R square: 0.77 Hosmer-Lemeshow P: 0.64			Nagelkerke R square: 0.79 Hosmer-Lemeshow P: 0.67		
Stepwise regression analysis was performed to test the fit of the models and select the final multivariate models. Accuracy of the models and their goodness of fit were checked by computing Hosmer-Lemeshow goodness of the model fit tests and Nagelkerke R-square values. To perform comparisons between urban and rural, the variables that were significant in the final model of one of the rural or urban regression analysis were added to the other model, despite being insignificant. CI - confidence intervals; OR - odds ratios. P<0.05 was considered as significant						

disorder, and family histories of heart attack and DM ($p<0.05$). Stepwise regression analysis in rural settings, however, showed that the only variables retained in the final models were age, edu-

cation, occupation, physical activity, smoking, BMI categories, and DM ($p<0.05$). These independent relations were confirmed using multiple logistic regression analyses.

Table 3. Stepwise multiple logistic regression analysis of risk factors for HT in rural areas, by gender

Variables	Rural					
	Men			Women		
	OR	95% CI	P	OR	95% CI	P
Age, 20–34	1			1		
Age, 35–49	2.482	1.441–4.275	<0.001	4.659	2.376–9.137	<0.001
Age, 50–64	6.107	3.462–10.775	<0.001	19.157	9.613–38.179	<0.001
Age, 65+	11.281	5.963–21.342	<0.001	35.821	16.664–77.001	<0.001
Education, no schooling	1			1		
Education, 1–8 years	0.830	0.530–1.299	0.415	0.454	0.210–0.984	0.045
Education, >8 years	1.148	0.637–2.070	0.646	0.857	0.377–1.952	0.714
Occupation, unemployed	1			1		
Occupation, employed	0.920	0.668–1.268	0.610	0.386	0.206–0.726	0.003
Physical activity, no/insufficient	1			1		
Physical activity, sufficient	0.727	0.551–0.959	0.059	0.904	0.669–1.220	0.509
Non-smoker/quitter	1			1		
Current smoker	0.655	0.502–0.853	0.002	1.198	0.664–2.163	0.548
Normal/underweight	1			1		
Overweight	1.835	1.317–2.555	<0.001	2.019	1.327–3.073	<0.001
Obese	4.121	2.773–6.126	<0.001	3.940	2.618–5.929	<0.001
Diabetes	2.373	1.569–3.590	<0.001	3.101	2.055–4.680	<0.001
Family history of heart attack	1.429	1.041–1.963	0.065	1.172	0.908–1.513	0.224
	Nagelkerke R square: 0.63 Hosmer-Lemeshow P: 0.37			Nagelkerke R square: 0.66 Hosmer-Lemeshow P: 0.35		
Stepwise regression analysis was performed to test the fit of the models and to select the final multivariate models. Accuracy of the models and their goodness of fit were checked by computing Hosmer-Lemeshow goodness of the model fit tests and Nagelkerke R-square values. To perform comparisons between urban and rural, the variables that were significant in the final model of one of the rural or urban regression analysis were added to the other model, despite being insignificant. CI - confidence intervals; OR - odds ratios. P<0.05 was considered as significant						

It was observed that the HT risk increased with age for both urban and rural residents in Turkey, and ORs were higher for women. In urban areas the HT risk was lower among women and men with at least primary level education than in the literate/illiterate. Education at primary level or above decreased women's HT risk in rural settings only. Interestingly, the odds of HT were higher for single men, but lower for single women, in urban areas only. The HT risk was lower for workers or those with professional occupations in all settings but higher for housewives in urban settings only.

The HT risk was higher among those who consumed white bread or added salt without first tasting food in urban areas only. For men, in urban settings, lower levels of risk were found among consumers of healthy fat, non-drinkers, and smokers. For women, in urban setting, lower risk was found among those who watched less than 4 h of TV daily or spent less sedentary time.

Although there was no significant difference in BMI categories between urban and rural dwellers, obesity ORs were significant in both settings but were greater in rural areas. DM or hyperlipidemia brought higher HT risks for both urban and rural

residents. However, women with mental health disorders in urban areas only had a significantly higher HT risk.

Discussion

HT is a very common health problem globally, and its prevalence is increasing steadily in developing countries. It affects 1 billion people and is associated with 9.5 million deaths worldwide (15, 16). The HT prevalence varies greatly according to factors such as age, gender, lifestyle, and degree of urbanization. As a developing country, Turkey is seriously affected by HT, and the HT prevalence depends on various factors. In light of this study, it was found that the setting, urban or rural, affected the degree to which factors contributed to the HT development.

Turkey's large rural population traditionally outnumbered those in urban areas. However, in the half century, this trend has been reversed, and most regions have urbanized rapidly. The urban population increased from 29% in 1960 to 53% in 1990 and 77% in 2011 (9). Few studies, however, have compared HT prevalence rates in urban and rural settings in Turkey, and of those, most found no significant difference between urban and rural settings

with respect to HT (7, 17–21). However, a small number of recent studies showed that the HT prevalence was higher in rural areas than in urban areas (22, 23). This may be explained by the increasing age of rural residents because young people tend to migrate from rural areas to cities, and there is a corresponding trend for retirees to move to rural areas, making rural residents statistically older than urban dwellers. Accordingly, this study found a higher HT prevalence in rural areas (28.4%) than in urban areas (23.9%). Despite this trend, in this study, urbanization was found as a contributing factor to HT in multivariate regression analysis after controlling for factors such as age and gender (OR=1.24, $p=0.011$; OR=1.20, $p=0.030$; for males and females, respectively) (data not shown). Living in urban areas was also positively associated with HT in several previous studies (24, 25). Urbanization influences lifestyle patterns, leading to a decrease in physical activity, changes in food consumption, and increased stress (24). Furthermore, changing from an active rural lifestyle to an urban sedentary lifestyle leads to more weight problems and obesity, which may predispose individuals to diseases such as HT (26). Therefore, the main purpose of this study was to analyze some of the known HT risk factors contributing to HT development focusing on variations between urban and rural areas in Turkey, employing a recent nationally representative health dataset, Chronic Diseases and Risk Factors Survey, prepared by the Turkish Ministry of Health.

Throughout the literature, age and gender are well-established factors explaining the variations in HT prevalence (4, 5). Our findings were consistent with those of other studies indicating that increasing age was an associated risk factor, for both genders in both settings (27, 28). Being over 65 years increased the HT risk by 20 times in urban areas and by 17 times in rural areas. This finding is concordant with those of studies that showed blood vessels lose elasticity with increasing age, contributing to HT development (29). In line with almost all studies (30, 31), this study found that HT prevalence is higher in women than in men in Turkey. However, while being female increased the HT risk by 1.7 times in urban settings only, it was not a risk factor in rural areas. Therefore, a specific gender focus in the analysis of HT risk factors may provide a greater insight into the variables determining prevalence rates between urban and rural settings.

This study found that some of the risk factors associated with HT, such as low education level, obesity, DM, hyperlipidemia, and smoking were evident both in rural and urban settings. In particular, findings of this study showed that education level was negatively associated with the HT prevalence and that low education increased the HT risk among all urban residents and female rural residents, consistent with the findings of studies conducted in Turkey (32, 33) and other countries (30, 34, 35). Lower education levels might result in a lack of awareness regarding HT risks and protective measures, which in turn may lead to an unhealthy lifestyle. In addition, higher education levels were only associated negatively with HT for women in urban settings. Urban females with secondary or tertiary education were less likely to have high blood pressure than their less educated coun-

terparts. The relationship between education and HT may be explained by the risk factors of unhealthy nutritional habits, stress, poor working conditions, or inadequate access to appropriate medical services (36).

Obesity and being overweight were recognized as the major risk factors for non-communicable diseases, such as HT (37). In this study, obesity and being overweight were associated with significantly increased likelihood of HT among both women and men in urban and rural areas. Moreover, DM, hyperlipidemia, and family history of strokes were found to be significant risk indicators for both genders in rural and urban areas. The results of this study indicated that HT was less frequent in male but not female current smokers, both in rural and urban areas. It is suggested that after each cigarette, a transient (30-min) increase in blood pressure occurs, and then it gets lowered due to the vasodilator effect of cotinine, the major metabolite of nicotine (38). In order to clarify this unexpected outcome, tobacco consumption levels and the total number of years smoking in months were included in this study's multiple logistic regression. These more detailed findings showed that excessive smoking or smoking over long periods significantly increased the risk of being hypertensive among men in both urban and rural settings.

This study found that certain factors associated with HT were effective in only urban settings: marital status, employment type, and lifestyle patterns such as sedentary time and diet. In this study, marital status was found to be a predictor of HT only for urban residents, having no effect in rural areas, and it impacted women and men differently; marriage was found to increase the likelihood of HT occurrence in women but decrease it among urban males. This inverse association between HT and the single urban male may be explained by poor dietary habits and psychological factors, such as stress and lack of social support (39). Married urban women, on the other hand, were found to have higher ORs of HT, possibly due to marital transition, which involves lifestyle changes that may negatively affect physical health and increase the risks for certain diseases (40, 41).

Being employed was found as a predictor of HT in this study. Unemployed urban residents had a greater likelihood of having high blood pressure than the employed. However, in rural settings, being unemployed was not associated with HT, possibly because of the greater energy expenditure in daily routines. However, this study observed that in both settings, manual labor was associated negatively with HT prevalence for both men and women. Also, being a housewife was an associated risk factor in urban areas but not in rural areas. Furthermore, in this study, lifestyle patterns, namely sedentary lifestyles lacking sufficient physical activity were negatively associated with HT for urban women only, in line with previous studies showing an inverse association between daily physical activity and HT (36, 42). These may be attributed to the relatively less active lifestyles of urban women. Women in rural areas are more involved with housework, and it is known that physical activity generally lowers blood pressure and leads to better HT management (43).

Furthermore, the results of this study are consistent with those of previous studies showing a relationship between unhealthy dietary habits and high blood pressure (44). The present study indicated that salt intake and white bread consumption were risk indicators in HT prevalence for both genders in urban settings. Moreover, inadequate fruit and vegetable consumption, alcohol intake, and unhealthy oil consumption were found to correlate negatively only for men in urban settings.

Associations between HT and various psychological symptoms have been uncovered in previous studies (45). In this study, common mental disorders such as major or minor depression, somatoform disorder, or panic disorder were found to be associated risk factors for the HT development among urban women only. Urbanization affects mental health through the impact of increased stressors. Moreover, anxiety, depression, and socio-economic stress are more common among women than among men in urban areas (46).

Study limitations

This study has both strengths and limitations. The strengths comprise the population-based, multistage stratified sampling design, allowing a generalization of the findings to the whole Turkish population, providing an opportunity to compare trends with the earlier national epidemiological studies. The main limitation is its cross-sectional design. As in many population-based studies, the definition of HT in this study is based on a single blood pressure. Furthermore, the cross-sectional design prevents any inferences about causality.

Conclusion

In Turkey, a developing country, HT is one of the major health problems, and its prevalence is affected by various factors. This study revealed that the contribution of various factors is influenced by whether the setting is rural or urban. Within each setting, the relative contribution of the factors is affected by gender. In light of this study, it was found that factors contributing to the HT development showed some variations based on urban and rural settings and on gender within the same setting. Age, obesity, DM, hyperlipidemia, and smoking were independently and positively associated with HT in both urban and rural settings, while risk indicators in urban areas only were marital status; employment type; mental health; and lifestyle patterns including physical activity, sedentary time, and nutritional habits. Therefore, taking into account urban and rural variations in the HT development may provide greater insight into the design of prevention strategies. Preventive measures should be implemented accordingly, based on a variety of personal, socio-economic/demographic, and health-related aspects. On the other hand, in urban settings, in addition to the aforementioned factors, special attention should be paid to women, especially to those who are married, engaged in sedentary lifestyles, have common mental health problems, or are housewives. Urban

Turkish women should be encouraged to lead more active lives with reduced sedentary time. This study indicates that a diet rich in fruit and vegetables combined with a reduction of salt, white bread, and alcohol intake has the potential to reduce the risks among urban men, especially unmarried ones. Unemployed urban dwellers, in particular, require more frequent monitoring for early HT detection.

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References

1. Lawes CM, Vander Hoorn S, Rodgers A. Global burden of blood-pressure-related disease, 2001. *Lancet* 2008; 371: 1513-8. [CrossRef]
2. World Health Organization, Global Status Report on Noncommunicable Diseases 2010, WHO, Geneva, Switzerland, 2011.
3. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet* 2005; 365: 217-23. [CrossRef]
4. Conen D, Glynn RJ, Ridker PM, Buring JE, Albert MA. Socioeconomic status, blood pressure progression, and incident hypertension in a prospective cohort of female health professionals. *Eur Heart J* 2009; 30: 1378-84. [CrossRef]
5. Levine DA, Lewis CE, Williams OD, Safford MM, Liu K, Calhoun DA, et al. Geographic and demographic variability in 20-year hypertension incidence: the CARDIA study. *Hypertension* 2011; 57: 39-47.
6. Erceg M, Kern J, Babic-Erceg A, Ivcevic-Uhernik A, Vuletic S. Regional differences in the prevalence of arterial hypertension in Croatia. *Coll Antropol* 2009; 33: 19-23.
7. Altun B, Arıcı M, Nergizoğlu G, Derici U, Karatan O, Turgan C, et al. Prevalence, awareness, treatment and control of hypertension in Turkey (the PatenT study) in 2003. *J Hypertens* 2005; 23: 1817-23.
8. Süleymanlar G, Utaş C, Arınsoy T, Ateş K, Altun B, Altıparmak MR, et al. A population-based survey of Chronic Renal Disease In Turkey-the CREDIT study. *Nephrol Dial Transplant* 2011; 26: 1862-71.
9. Özdemir H. Türkiye’de İç Göçler Üzerine Genel bir Değerlendirme. *Akademik Bakış Dergisi* 2012; 30: 1-18.
10. Ünal B, Ergör G, Horasan GD. Türkiye Kronik Hastalıklar ve Risk Faktörleri Sıklığı Çalışması. Ankara: Sağlık Bakanlığı; 2013.
11. T.C. Sağlık Bakanlığı Türkiye Halk Sağlığı Kurumu. Türkiye Kronik Hastalıklar ve Risk Faktörlerinin Sıklığı Çalışması. Ankara: 2013. <http://sbu.saglik.gov.tr/Ekutuphane/kitaplar/khrrfat.pdf> Access date: 12/03/2016.
12. Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. The Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. *JAMA* 2003; 289: 2560-72. [CrossRef]
13. James WP, Ferro-Luzzi A, Waterlow JC. Definition of chronic energy deficiency in adults. Report of a working party of the International Dietary Energy Consultative group. *Eur J Clin Nutr* 1988; 42: 961-81.
14. Willet WC, Dietz WH, Colditz GA. Guidelines for healthy weight. *N Engl J Med* 1999; 341: 427-34. [CrossRef]

15. Kearney PM, Whelton M, Reynolds K, Whelton PK, He J. World-wide prevalence of hypertension: a systematic review. *J Hypertens* 2004; 22: 11-9. [\[CrossRef\]](#)
16. Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010 : a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012; 380: 2224-60. [\[CrossRef\]](#)
17. Onat A. Türkiye’de erişkinlerde Kalp Hastalığı and Risk Faktörleri Sıklığı Taraması (TEKHARF). *Türk Kardiyoloji Derneği Arşivi* 1991; 19: 169-77.
18. Tugay Aytekin N, Pala K, Irgül E, Akış N, Aytekin H. Distribution of blood pressures in Gemlik District, north-west Turkey. *Health Soc Care Community* 2002;10:394-401. [\[CrossRef\]](#)
19. Sanisoğlu SY, Öktenli C, Haşimi A, Yokuşoğlu M, Uğurlu M. Prevalence of metabolic syndrome-related disorders in a large adult population in Turkey. *BMC Public Health* 2006; 6: 92. [\[CrossRef\]](#)
20. Satman I, Ömer B, Tütüncü Y, Kalaca S, Gedik S, Dinççağ N, et al. Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults. *Eur J Epidemiol* 2013; 28: 169-80.
21. Şengül S, Akpolat T, Erdem Y, Dericci U, Arıcı M, Sindel S, et al. Changes in hypertension prevalence, awareness, treatment, and control rates in Turkey from 2003 to 2012. *J Hypertens* 2016; 34: 1208-17. [\[CrossRef\]](#)
22. Satman I, Yılmaz T, Şengül A, Salman S, Salman F, Uygur S, et al. Population-based study of diabetes and risk characteristics in Turkey: results of the Turkish diabetes epidemiology study (TURDEP). *Diabetes Care* 2002; 25: 1551-6. [\[CrossRef\]](#)
23. Metintaş S, Arıkan İ, Kalyoncu C. Awareness of hypertension and other cardiovascular risk factors in rural and urban areas in Turkey. *Transac R Soc Trop Med Hyg* 2009; 103: 812-8. [\[CrossRef\]](#)
24. BeLue R, Okoror TA, Iwelunmor J, Taylor KD, Degboe AN, Agyemang C, et al. An overview of cardiovascular risk factor burden in sub-Saharan African countries: a socio-cultural perspective. *Global Health* 2009; 22: 5-10. [\[CrossRef\]](#)
25. Poulter NR, Khaw KT, Hopwood BE, Mugambi M, Peart WS, Rose G, et al. The Kenyan Luo migration study: observations on the initiation of a rise in blood pressure. *BMJ* 1990; 300: 967-72. [\[CrossRef\]](#)
26. Carrera-Bastos P, Fontes-Villalba M, O’Keefe JH, Lindeberg S, Cordain L. The western diet and lifestyle and diseases of civilization. *Research Reports in Clinical Cardiology* 2011; 2: 15-35. [\[CrossRef\]](#)
27. Danon-Hersch N, Marques-Vidal P, Bovet P, Chiolerio A, Paccaud F, Pe’coud A, et al. Prevalence, awareness, treatment and control in high blood pressure in a Swiss city general population: the CoLaus Study. *Eur J Cardiovasc Prev Rehabil* 2009; 16: 66-72. [\[CrossRef\]](#)
28. Guessous I, Bochud M, Theler JM, Gaspoz JM, Peche`re-Bertschi A. 2009 Trends in prevalence, unawareness, treatment and control of hypertension in Geneva, Switzerland. *PLoS One* 2012; 7: e39877.
29. Anderson GH. Effect of age on hypertension: analysis of over 4,800 referred hypertensive patients. *Saudi J Kidney Dis Transpl* 1999; 10: 286-97.
30. Choi KM, Park HS, Han JH, Lee JS, Lee J, Ryu OH, et al. Prevalence of prehypertension and hypertension in a Korean population: Korean National Health and Nutrition Survey 2001. *J Hypertens* 2006; 24: 1515-21. [\[CrossRef\]](#)
31. Steyn K, Bradshaw D, Norman R, Laubscher R. Determinants and treatment of hypertension in South Africans: the first Demographic and Health Survey. *S Afr Med J* 2008; 98: 376-80.
32. Erem C, Hacıhasanoğlu A, Koçak M, Değer O, Topbaş M. Prevalence of prehypertension and hypertension and associated risk factors among Turkish adults: Trabzon Hypertension Study. *J Public Health* 2009; 31: 47-58. [\[CrossRef\]](#)
33. Hacıoğlu N, Güraksın A, İnandı T. Gümüşhane ili Torul merkez sağlık ocağı bölgesi 30 yaş ve üzeri nüfusta hipertansiyon prevalansı ve ilgili etmenler. *Türkiye Klinikleri J Med Sci* 1999; 19: 200-8.
34. Gee ME, Campbell NR, Bancej CM, Robitaille C, Bienek A, Joffres MR, et al. Perception of uncontrolled blood pressure and behaviours to improve blood pressure: findings from the 2009 Survey on Living with Chronic Diseases in Canada. *J Hum Hypertens* 2012; 26: 188-95. [\[CrossRef\]](#)
35. Stamler J, Liu K, Ruth KJ, Pryer J, Greenland P. Eight-year blood pressure change in middle-aged men: relationship to multiple nutrients. *Hypertension* 2002; 39: 1000-6. [\[CrossRef\]](#)
36. Önal AE, Erbil S, Özel S, Açıkşarı K, Tümerdem Y. The prevalence of and risk factors for hypertension in adults living in Istanbul. *Blood Press* 2004; 13: 31-6. [\[CrossRef\]](#)
37. Ng SW, Zaghoul S, Ali HI, Harrison G, Popkin BM. The prevalence and trends of overweight, obesity and nutrition related non communicable diseases in the Arabian Gulf States. *Obes Rev* 2011; 12: 1-13. [\[CrossRef\]](#)
38. Gropelli A, Giorgi DM, Omboni S, Parati G, Mancia G. Persistent blood pressure increase induced by heavy smoking. *J Hypertens* 1992; 10: 495-9. [\[CrossRef\]](#)
39. Lipowicz A, Lopuszanska M. Marital differences in blood pressure and the risk of hypertension among Polish men. *Eur J Epidemiol* 2005; 20: 421-7. [\[CrossRef\]](#)
40. Wang H. Effects of marital status and transition on hypertension in Chinese women: a longitudinal study. Presented at the 2005 Annual Meeting of the Population Association of America Philadelphia Pennsylvania March 31-April 2 2005.
41. Lee S, Cho E, Grodstein F, Kawachi I, Hu F, Colditz G. Effects of marital transitions on changes in dietary and other health behaviours in US women. *Int J Epidemiol* 2005; 34: 69-78. [\[CrossRef\]](#)
42. Tugay Aytekin N, Pala K, Irgül E, Akış N, Aytekin H. Distribution of blood pressures in Gemlik District, North-west Turkey. *Health Soc Care Community* 2002; 10: 394-401. [\[CrossRef\]](#)
43. Caspersen CJ, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Rep* 1985; 100: 126-31.
44. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. *Circulation* 2001; 104: 2746-53. [\[CrossRef\]](#)
45. Rutledge T, Hogan BE. A quantitative review of prospective evidence linking psychological factors with hypertension development. *Psychosom Med* 2002; 64: 758-66. [\[CrossRef\]](#)
46. Srivastava K. Urbanization and mental health. *Ind Psychiatry J* 2009; 18: 75-6. [\[CrossRef\]](#)