



Regional Differences in the Prevalence of Hypertension in Turkey

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Abstract

Hypertension is the leading cause of death among the different cardiovascular risk factors. Studies have found that differences in the prevalence of hypertension exist depending on gender, age, race, socio-demographic characteristics and geographical location. In this study, we aimed to determine the prevalence of hypertension according to gender and regional distribution during the last five years in Turkey. The diagnosis of essential hypertension in individuals was determined from across the country based on data from 2009-2013 obtained from Social Security Insurance. From the data of this study, the prevalence of hypertension was found to be significantly greater for both sexes in the Black Sea Region for all the years surveyed. The prevalence of hypertension in women was found to be higher than men in all geographic areas ($p<0.05$). Hypertension maintains its importance as one of the most significant health problems in Turkey. In light of this data, regional variation has been determined for the prevalence of hypertension in Turkey.

Key Words: Regional, prevalence, hypertension, Turkey

(Rec.Date: Feb 17, 2015 Accept Date: Feb 26, 2015)

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Introduction

Hypertension resulting in mortality and morbidity is one of the most important risk factors of cardiovascular disease [1]. Despite the availability of effective treatments and dramatic advances in the treatment of hypertension during the last 30 years, effective prevention and control of high blood pressure, which is crucial for the prevention of myocardial infarction, stroke, cardiac and renal failure, is still insufficient [2,3].

Hypertension is a very common health problem worldwide, in parallel with aging. Articles published between 1980 and 2003 show that the prevalence of hypertension in developed countries has remained stable or has decreased while it is still increasing in developing countries [4]. Surveys conducted in different continents, countries, regions and also populations in the same countries (e.g. Austria, Germany, the United States, China, France, Croatia) have reported significant geographic variations in blood pressure levels [5-11]. As of the year 2000, 26.4% of the adult population over the age of 20 has hypertension around the world [4]. According to the results of the American National Health and Nutrition Examination Survey (NHANES III), about 20% of the adult population (18-74 years) is hypertensive [12]. A similar study conducted in six European countries found that hypertension was present in 44% of the population over the age of 35 [6].

Studies published in 2005 and 2011 (patenT and CREDIT) showed that there were significant differences between regions in terms of the incidence of hypertension in Turkey [13,14]. In this trial, we aimed to investigate changes in the prevalence of hypertension on the basis of provinces and regions in the last five years.

Materials and Methods

This study was approved by the local ethics committee for clinical research (2014/05-128). Patients registered with the social security institution from 81 cities and 7 regions in Turkey with a diagnosis of essential hypertension (ICD I-10) in the years 2009, 2010, 2011, 2012 and 2013 were screened based on data obtained from the Republic of Turkey Social Security Institution (SSI) (10.03.2014-3919727). In this study, groups identified with essential hypertension were compared to the total population registered in the SSI. The total number of

male and female individuals registered in the SSI according to years and in different geographic regions are shown in Table-1.

Table 1. The regional distribution of males and females registered in the social security institutions of Turkey for 2009-2013 years

	2009		2010		2011		2012		2013	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Mediterranean	3.270.78 8	3.218.714	3.575.60 0	3.502.896	3.831.78 6	3.797.946	4.083.838	4.056.272	3.897.12 8	3.862.307
Eastern Anatolia	2.176.09 1	2.097.548	2.324.37 4	2.268.955	2.538.30 8	2.431.473	2.685.738	2.583.994	2.514.40 6	2.436.066
Aegean	3.343.54 5	3.331.289	3.675.83 6	3.605.750	3.891.76 4	3.892.160	4.138.500	4.144.317	3.932.00 2	3.931.691
Southeastern Anatolia	2.531.65 3	2.469.784	2.736.41 0	2.711.968	3.051.18 8	2.970.462	3.280.413	3.193.044	3.120.93 7	3.054.301
Central Anatolia	4.071.48 0	4.097.235	4.422.60 1	4.449.613	4.792.71 2	4.821.512	5.096.803	5.134.801	4.837.44 1	4.876.737
Black Sea	2.624.94 4	2.659.921	2.816.66 2	2.846.969	2.993.14 1	3.039.667	3.171.392	3.221.305	2.988.66 0	3.027.876
Marmara	7.554.37 1	7.443.352	8.274.43 4	8.166.807	9.058.30 1	8.929.477	9.690.560	9.572.168	9.277.59 1	9.157.627
The total number of the population	25.572.8 73	25.317.844	27.825.9 18	27.552.958	30.157.1 99	29.882.696	32.147.243	31.905.901	30.568.1 65	30.346.606

Statistical Analysis

Data were analyzed using the SPSS 15.0 software program. The Kruskal-Wallis test was used for the determination of regional differences. The Mann-Whitney U test was used for gender differences. A p value <0.05 was considered statistically significant.

Results

Individuals registered in the SSI between the years 2009-2013 in Turkey were the population for this study. The number of patients registered in the SSI with ICD I-10 and the percentage of these patients (obtained from the ratio of the entire population of these individuals) are

shown in tables 2 and 3. The prevalence of hypertension has been increasing during these years for both sexes along with population growth (Female/Male ratios were 1.74 in 2009, 1.69 in 2010, 1.66 in 2011, 1.68 in 2012, and 1.66 in 2013) (table 2 and 3). HT prevalence was higher for both sexes in all years in the Black Sea Region. The prevalence of hypertension in women was higher than men in all geographic areas ($p<0.05$) (Figures 1 and 2). The prevalence of hypertension by geographical regions and provinces in Turkey are presented in figures 3 and 4.

Table 2. The regional distribution of individuals registered in Social security institutions with the diagnosis of ICD I10 for 2009-2013 years

	2009		2010		2011		2012		2013	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Mediterranean	189.498	308.374	189.498	308.374	256.412	398.540	282.152	450.956	289.067	456.590
Eastern Anatolia	73.953	130.105	98.490	169.494	98.264	169.909	132.519	235.488	124.566	220.408
Aegean	193.534	337.622	261.245	440.252	285.502	472.169	306.912	511.814	326.560	535.895
Southeastern Anatolia	70.419	128.012	98.526	172.767	108.440	185.003	153.765	273.116	160.817	283.921
Central Anatolia	273.947	489.898	362.233	619.892	354.608	600.036	360.264	617.941	381.743	642.767
Black Sea	196.966	346.113	286.366	487.416	296.977	499.367	323.356	546.940	322.695	543.758
Marmara	467.691	812.862	594.359	1.000.868	607.188	1.007.478	616.437	1.012.891	636.143	1.026.707
The total number of the patients	1.466.008	2.552.986	1.890.717	3.199.063	2.007.391	3.332.502	2.175.405	3.649.146	2.241.591	3.710.046

*:The incidence of hypertension is significantly higher in women than men in all regions ($p<0.05$).

Table 3. The percentages of the individuals diagnosed with ICD I10 for the years 2009-2013 based on the data from Social security institutions for each region

	2009		2010		2011		2012		2013	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Black Sea	7,50	13,01	10,17	17,12	9,92	16,43	10,20	16,98	10,80	17,96
Aegean	5,79	10,13	7,11	12,21	7,34	12,13	7,42	12,35	8,31	13,63
Central Anatolia	6,73	11,96	8,19	13,93	7,40	12,44	7,07	12,03	7,89	13,18
Mediterranean	5,79	9,58	5,30	8,80	6,69	10,49	6,91	11,12	7,42	11,82
Marmara	6,19	10,92	7,18	12,26	6,70	11,28	6,36	10,58	6,86	11,21
Southeastern Anatolia	2,78	5,18	3,60	6,37	3,55	6,23	4,69	8,55	5,15	9,30
Eastern Anatolia	3,40	6,20	4,24	7,47	3,87	6,99	4,93	9,11	4,95	9,05

*: All numbers are expressed in %.

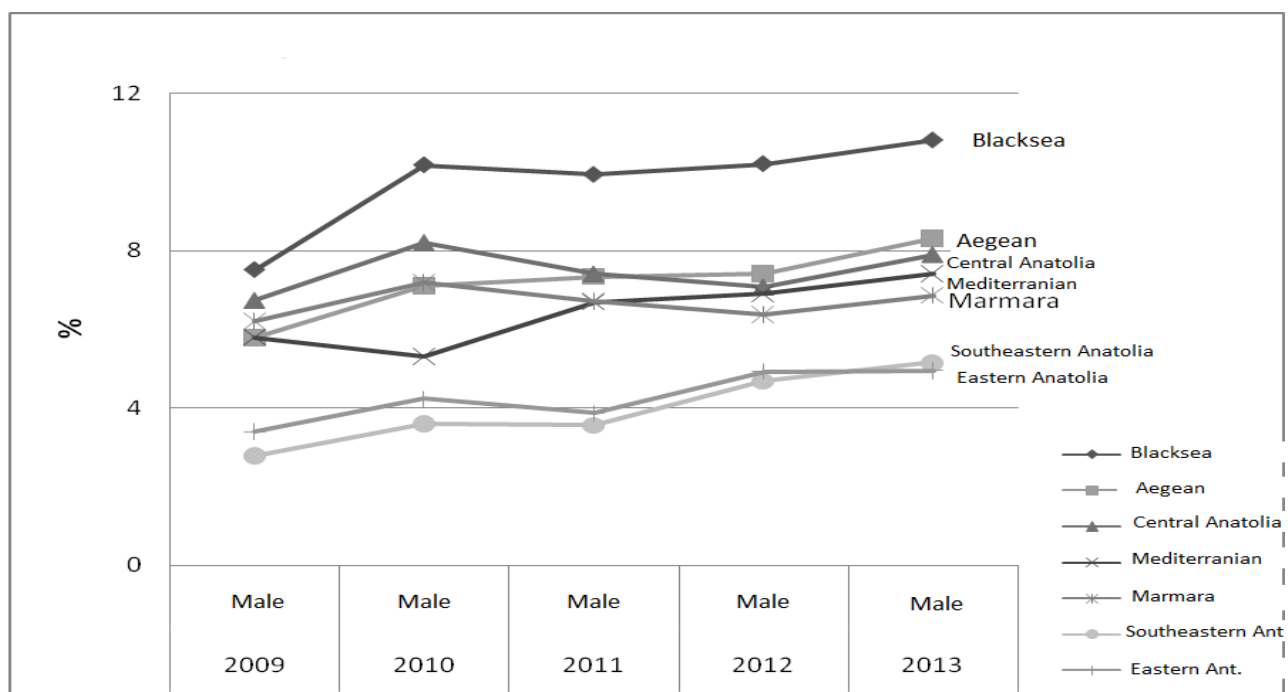
**Figure 1.** The Percentage distribution of the male population diagnosed with ICD I10 according to the years and regions based on the data from Social security institutions



Figure 2. The Percentage distribution of the female population diagnosed with ICD I10 according to the years and regions based on the data from Social security institutions

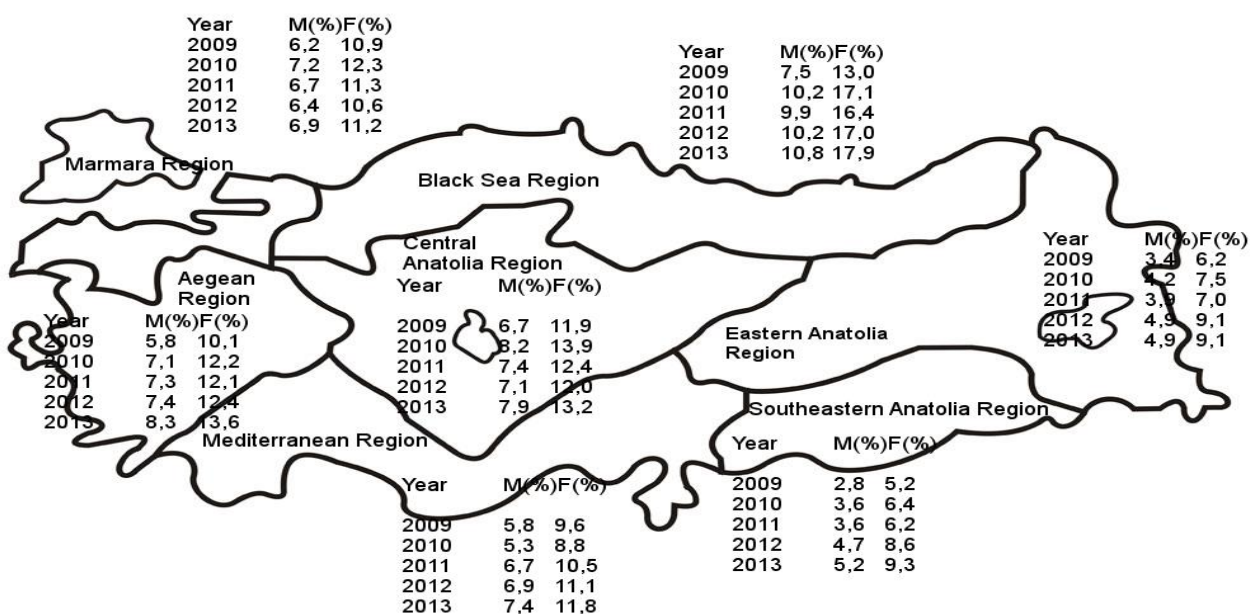


Figure 3: The regional distribution of hypertension in Turkey (On the database of 2013)

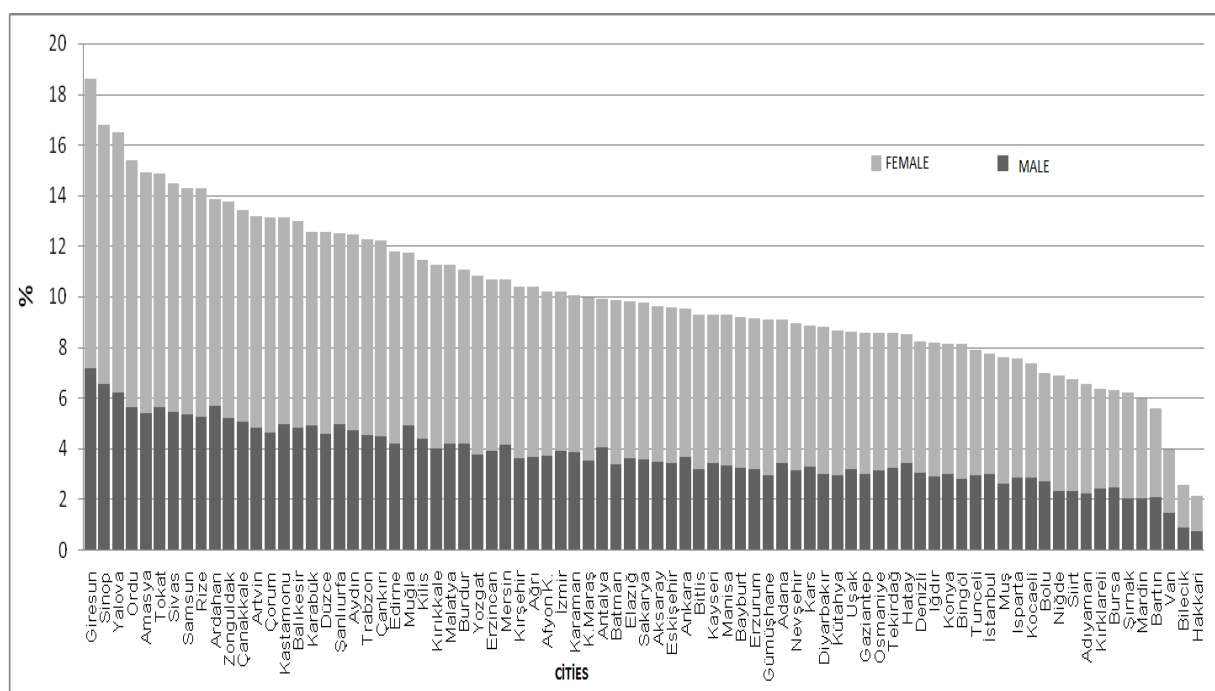


Figure 4. The distribution of hypertension in each sex for cities on the database of 2013, Turkey

Discussion

This trial showed that there were regional differences in the prevalence of hypertension in Turkey based on the most recent national data (2009-2013) registered in the Social Security Institution. When compared with other geographic areas, the prevalence of hypertension was significantly higher for both men and women in the Black Sea region. The climatic conditions are not supposed to be effective in high prevalence of hypertension in the black sea region. Because climates of the Black Sea and Marmara regions are similar, though their hypertension prevalence are different. Nutritional habits in Black Sea region including salty foods might be effective in this high hypertension prevalence. Previously, published articles in 2005 and 2011 also showed that there were significant differences between regions of Turkey in terms of the frequency of hypertension. The PatenT trial found that hypertension was most commonly seen in the central Anatolia region (38.5%) and also in the eastern Anatolia region (28%) [13]. In the study of CREDIT, hypertension was most frequently detected in the Black Sea Region [14]. Also in our study, hypertension was most common in the Black Sea region and also in the South East and East Anatolia Region.

“Developing health for a better future and ensuring all citizens access to healthy programs” has been given strong emphasis from 2009-2013, being part of the health promotion and development activities of the second five-year action plan of the ministry of health in the Republic of Turkey. Although access to preventive medicine activities, healthcare organizations, doctors and medicines is easier than previously in Turkey (table 4), the data obtained from this study indicate that despite a declining speed of increase, hypertension continues to be prevalent in both sexes (Figure 1 and 2).

Table 4. The total number of health institutions, patients admitted to the health care professionals and antihypertensive drug consumption by years in Turkey.

Parameters / Year	2009	2010	2011	2012
Total number of health institutions	1.389	1.439	1.453	1.483
Total Number of Primary Care Organizations	17.648	32.692	34.248	36.474
Total number of patients admitted to the health care professionals (million people)	527.6	539.1	611.2	621.8
Total number of antihypertensive drug consumption (million box)	80,3	95,5	106,3	112,9

Study Limitations

The study population included people under SSI insurance in Turkey. However, people in lower income levels not covered by SSI were not included. Also, Turkey has a relatively young population (about 50% of the population under 30 years year old) and an actively working young population often neglects regular health checkups, so they may live a long time without being diagnosed with hypertension. Diagnosing hypertension may be too late when examining elderly people due to other health problems. Also, this study included patients diagnosed with hypertension in any health care institution, however, those who have not yet been diagnosed with hypertension among hypertensive individuals in Turkey were not

included. This is why the prevalence of hypertension determined in this study may have been low.

Conclusion

Hypertension continues to be one of the most important health problems in Turkey. In light of the data presented from 2009-2013, the prevalence of hypertension is continuously increasing, though at a decreased rate. Beginning with the region where a high prevalence of hypertension is present, it is necessary to institute high priority preventive measures at the community level and to create health policies that are consistently applied in a continuous manner in order to increase awareness and improve treatment and screening to prevent the development of hypertension throughout the country. Thereby, it will be possible to reduce cardiovascular morbidity, mortality and complications associated with hypertension.

Acknowledgments

The authors acknowledge with gratitude the cooperation of the staff that was responsible for keeping up with the database of the study center.

Conflict of interest

All the authors disclose no financial relationship with a biotechnology manufacturer, a pharmaceutical company, or other commercial entity that has an interest in the manuscript.

Funding Sources

None

References

1. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet*. 2005;365(9455):217-23.
2. Lenfant C. Reflections on hypertension control rates: a message from the director of the National Heart, Lung, and Blood Institute. *Arch Intern Med*. 2002;162(2):131-2.
3. Bramlage P, Böhm M, Volpe M, Khan BV, Paar WD, Tebbe U, Thoenes M. A global perspective on blood pressure treatment and control in a referred cohort of hypertensive patients. *J Clin Hypertens (Greenwich)*. 2010;12(9):666-77.

4. Kearney PM, Whelton M, Reynolds K, Whelton PK, He J. Worldwide prevalence of hypertension: a systematic review. *J Hypertens.* 2004;22(1):11-9.
5. Levine DA, Lewis CE, Williams OD, Safford MM, Liu K, Calhoun DA, Kim Y, Jacobs DR Jr, Kiefe CI. Geographic and demographic variability in 20-year hypertension incidence: the CARDIA study. *Hypertension.* 2011;57(1):39-47.
6. Wolf-Maier K, Cooper RS, Banegas JR, Giampaoli S, Hense HW, Joffres M, Kastarinen M, Poulter N, Primatesta P, Rodríguez-Artalejo F, Stegmayr B, Thamm M, Tuomilehto J, Vanuzzo D, Vescio F. Hypertension prevalence and blood pressure levels in 6 European countries, Canada, and the United States. *JAMA.* 2003;289(18):2363-9.
7. Stein KV, Rieder A, Dorner TE. East-West gradient in cardio-vascular mortality in Austria: how much can we explain by following the pattern of risk factors? *Int J Health Geogr.* 2011;10:59-70.
8. Meisinger C, Heier M, Völzke H, Löwel H, Mitusch R, Hense HW, Lüdemann J. Regional disparities of hypertension prevalence and management within Germany. *J Hypertens.* 2006;24(2):293-9.
9. Reynolds K, Gu D, Muntner P, Wu X, Chen J, Huang G, Duan X, Whelton PK, He J; InterASIA Collaborative Group. Geographic variations in the prevalence, awareness, treatment and control of hypertension in China. *J Hypertens.* 2003;21(7):1273-81.
10. Wagner A, Sadoun A, Dallongeville J, Ferrières J, Amouyel P, Ruidavets JB, Arveiler D. High blood pressure prevalence and control in a middle-aged French population and their associated factors: the MONA LISA study. *J Hypertens.* 2011;29(1):43-50.
11. Erceg M, Kern J, Babic-Erceg A, Ivicviv-Uhernik A, Vuletic S. Regional differences in the prevalence of arterial hypertension in Croatia. *Coll Antropol.* 2009;33(1):19-23.
12. National High Blood Pressure Education Program. NIH publication no 93-2669. Bethesda, MD: U.S. Department of Health and Human Services, National Heart, Lung, and Blood Institute; 1993. National High Blood Pressure Education Program working group on primary prevention of hypertension. 1993;153(2):186-208
13. Altun B, Arici M, Nergizoğlu G, Derici U, Karatan O, Turgan C, Sindel S, Erbay B, Hasanoğlu E, Çağlar S; Turkish Society of Hypertension and Renal Diseases. Prevalence, awareness, treatment and control of hypertension in Turkey (the PatenT study) in 2003. *J Hypertens.* 2005;23(10):1817-23.
14. Süleymanlar G, Utaş C, Arinsoy T, Ateş K, Altun B, Altiparmak MR, Ecder T, Yilmaz ME, Çamsarı T, Başçi A, Odabas AR, Serdengeçti K. A population-based survey of Chronic RENal Disease In Turkey--the CREDIT study. *Nephrol Dial Transplant.* 2011;26(6):1862-71.