Influence of short-term follow-up on cardiovascular risk status among high-risk hypertensive patients in Turkey: an observational study

Türkiye'de kısa dönem takibin yüksek-riskli hipertansiyonlu hastalarda kardiyovasküler risk üzerine etkisi: Gözlemsel bir çalışma

Ömer Kozan, M.D., and RISKMAN Study Group

Department of Cardiology, Dokuz Eylül University Faculty of Medicine, İzmir, Turkey

ABSTRACT

Objective: The present study was designed to evaluate clinical practice of cardiovascular (CV) risk management and the influence of follow-up on risk profile among hypertensive patients.

Methods: Of the 1023 patients enrolled in the cross-sectional phase, data from 397 high-risk patients (mean [SD] age, 59.2 [11.5] years; 62.5% female) who had attended at least 1 follow-up visit within 9 months of (longitudinal phase) enrollment were included in the present non-interventional study of CV risk factors, 10-year coronary heart disease (CHD) risk estimate, risk level, and risk management.

Results: Ten-year CHD risk (p<0.001), and percentages of patients with high risk (20.7 *vs* 13.4%) and very high risk (19.6 *vs* 6.6%) significantly decreased upon follow-up (p<0.001). Significant reductions in systolic and diastolic blood pressure (BP), and low-density lipoprotein (LDL) cholesterol (p<0.001 for each), and an increase in high-density lipoprotein (HDL) cholesterol (p=0.007) were associated with a positive shift in risk grouping (42.8%). The shift toward lower-risk grouping was more prominent in patients with diabetes (5.5% *vs* 41.1%) and metabolic syndrome (19.2% *vs* 34.2%; p<0.001 for each). Achievement of target BP significantly improved upon follow-up, particularly in lower-risk groups (p<0.001).

Conclusion: Results indicate better CV risk management in hypertensive patients, with a pronounced decrease in 10-year CV risk estimate and a switch to lower-risk grouping, particularly in patients with diabetes mellitus and metabolic syndrome, associated with close follow-up.

ÖZET

Amaç: Bu çalışma hipertansiyonlu hastalarda kardiyovasküler (KV) risk yönetimine dair klinik uygulamaların ve hasta takibinin risk profili üzerine etkisini değerlendirmek üzere tasarlandı.

Yöntemler: Girişimsel olmayan bu çalışmada, enine kesitli fazda kayıtlı 1023 hastadan, 9 ay içerisinde (uzunlamasına faz) en az bir defa hasta takip ziyaretine gelmiş 397 yüksek riskli hastanın (ortalama [SS] yaş, 59.2 [11.5] yıl; %62.5 kadın) KV risk faktörleri, 10 yıllık koroner kalp hastalığı (KKH) riski tahmini, risk düzeyi ve risk yönetimi verileri sunuldu.

Bulgular: Takip sonrasında, 10 yıllık KKH riskinde (p<0.001) ve çok yüksek (%19.6 ve %6.6) ve yüksek risk (%20.7 ve %13.4) taşıyan hastaların yüzdelerinde anlamlı azalma görüldü (p<0.001). Sistolik ve diyastolik kan basıncı ve LDL-kolestroldeki anlamlı azalmalar (her biri için p<0.001) ve HDL-kolesteroldeki artış (p=0.007) ile risk grubundaki pozitif şift (%42.8) arasında anlamlı ilişki bulundu. Daha az riskli gruplara yönelik şift, diyabetik (%5.5 ve %41.1) ve metabolik sendromlu (%19.2 ve %34.2) hastalarda daha belirgindi (her biri için p<0.001). Takip sonrasında, özellikle daha az risk taşıyan gruplarda, kan basıncı hedefine ulaşılmasında anlamlı bir iyileşme olduğu saptandı (p<0.001).

Sonuç: Elde ettiğimiz bulgular, yakın takip ile ilişkili olarak, hipertansiyonlu hastalarda 10 yıllık KV risk tahmininde belirgin düşüşü içeren daha iyi bir KV risk yönetimine işaret etmekte ve özellikle diabetes mellitus ve metabolik sendromlu hastalar arasında daha düşük KV risk gruplarına yönelik bir şift olduğunu göstermektedir.

Hypertension is a major risk factor for patients with cardiovascular disease (CVD), increasing the risks of heart attack, stroke, and congestive heart failure. In addition, it is associated with end-stage renal disease and shorter life expectancy.[1,2] Hence, in hypertension management, an increased emphasis has been placed on global cardiovascular (CV) risk reduction, involving more sophisticated risk assessment and therapeutic targeting of underlying CVD mechanisms,[3] with major societies and international organizations establishing treatment guidelines aimed to improve the evaluation and control of hypertension.[4–7]

Received: February 06, 2014 *Accepted:* February 08, 2016

Correspondence: Dr. Ömer Kozan. Dokuz Eylül Üniversitesi Tıp Fakültesi, Kardiyoloji Anabilim Dalı, 35420 Balçova, İzmir, Turkey.
Tel: +90 232 - 464 63 08 e-mail: omer.kozan@deu.edu.tr

The designation of added risk in the European Society of Hypertension-European Society of Cardiology guidelines takes into account not only blood pressure (BP), but also recently identified risk factors (such as C-reactive protein) and measures of renal function, as well as CVD risk factors with established adverse effects on morbidity and mortality.[4]

In Turkey, the Total Cardiovascular Risk Management Initiative, a collaborative effort of the Ministry of Health and the Turkish Societies of Cardiology, Internal Medicine, Neurology, Endocrinology and Metabolism, and Hypertension and Renal Diseases was put into practice. While the program was modified to accommodate circumstances specific to Turkey, risk scoring is based on the model of the Joint British Societies, published in 2005.[8]

Patients with established CVD are among those at highest risk, and the larger the risk burden, the more important are the achievement and maintenance of target BP.[7] However, in spite of tremendous progress in medical treatment, and in the understanding and management of hypertension,[3] fewer than two-thirds of patients with hypertension have BP under control.[2] Although the goal should be a restoration to optimal levels of the various components of CV risk in order to improve CV health,[9] detailed data regarding management of CV risk factors in clinical or office settings are scarce. While various CV risk factor guidelines have been published,[6,10] their dissemination and implementation have been neither especially successful nor well-studied.[11]

Long-term trends in hypertension research and treatment have shifted toward earlier detection and aggressive treatment, with an emphasis on prevention, while questions regarding the precise nature of hypertension, and the optimal modes of treatment and risk assessment still challenge investigators.[3] Clinical practice of physicians working in CV risk management at internal medicine and cardiology clinics is associated with the development of risk models leading to increased awareness of risk management and the support of approaches such as the domestic initiative.

The present non-interventional, observational study was designed to assess clinical practice in CV risk management and related patient compliance within the past 12 months. Presented elsewhere, the cross-sectional phase of the study was conducted at 50 centers across Turkey, and included 1023 patients with essential hypertension.[12] The results of 9-month follow-up in the longitudinal phase subgroup are presented, and address clinical practice in CV risk management, patient compliance, and the influence of the follow-up period on CVD risk profiles of Turkish hypertensive patients.

Abbreviations:

ACE-I	*Angiotensin-converting-enzyme inhibitor*
ARB	*Angiotensin-receptor blocker*
BP	*Blood pressure*
CCB	*Calcium-channel blocker*
CHD	*Coronary heart disease*
CV	*Cardiovascular*
CVD	*Cardiovascular disease*
HDL	*High-density lipoprotein*
LDL	*Low-density lipoprotein*

METHODS

Study population

The cross-sectional phase of the present study was designed to evaluate clinical practice of CV risk management in hypertensive patients at internal medicine and cardiology clinics. Conducted at 50 centers across Turkey, 1023 essential hypertensive patients were included. Criteria were age ≥18 years, previous diagnosis of "essential hypertension," administration of single or combined antihypertensive therapy, and previous (<3 months) laboratory evaluations (including electrocardiography, urine analysis, and blood glucose, renal function, and microalbuminuria testing). Main exclusion criteria were known or suspected diagnosis of secondary hypertension, current hospitalization or appointment for hospitalization during study duration, and enrollment in external study.

In the cross-sectional phase, CV risk was determined, and patients were stratified according to risk level (low risk, medium risk, high risk, and very high risk).[12] High- and very high-risk patients, and those >75 years of age were invited to participate in the longitudinal follow-up phase. Change in CV risk status and patient compliance with CV risk management recommendations were recorded in a subgroup of patients (n=397) who had attended at least 1 follow-up visit within 9 months (mean [SD] = 7.7 [3.0] months).

The study was conducted according to the International Conference on Harmonisation Good Clinical Practice guidelines and local regulations. Approval of the ethics committee was obtained prior to commencement, and informed consent was obtained prior to enrollment. According to the real-time, observa-

tional, and non-interventional design of the study, treatment decisions were left to the discretion of the physician, including those regarding alternative or additive treatment of patients with BP not controlled by current medication.

CVD risk classification

Classification of patients with low, moderate, high, or very high risk was based on age, serum low-density lipoprotein (LDL) and high-density lipoprotein (HDL) cholesterol, BP, presence of diabetes mellitus, and smoking habits, with scoring charts prepared by the Turkish Society of Cardiology (http://www.tkd.org.tr/menu/213/) according to Framingham study results.[13]

Outcome variables

Recorded at enrollment were patient demographic data including age, gender, physical measurements (height, weight, body mass index, and waist circumference), and medical history (duration of hypertension, concomitant diseases, and risk factors).

In order to assess modifications in CV risk from baseline, data regarding systolic and diastolic blood pressure, serum LDL and HDL cholesterol, history and/or laboratory tests related to diabetes mellitus, and smoking status were collected at every visit. Practice patterns regarding CV risk management included physician recommendations related to hypertension, dyslipidemia, diabetes mellitus, smoking status, and obesity. Past practice patterns (both those of 12 months prior to enrollment and those between initial and previous follow-up visit), and current patterns (of initial and previous follow-up visits) were assessed, as was patient compliance.

Statistical analysis

It was estimated that the study population should comprise a minimum of 1050 patients in order to determine risk management of 1–50% of patients, with a 95% confidence interval and 3% rate of error. Data were collected twice, the first set included the data of 1023 patients enrolled in the cross-sectional phase of the study,[12] and the second included the data of 397 patients who attended at least 1 follow-up visit within 9 months of enrollment (longitudinal phase). Findings collected at the initial and final follow-up visit of the longitudinal phase subgroup (n=397) are presented.

Statistical analyses were performed using SPSS for Windows (version 12.0; SPSS Inc., Chicago, IL, USA). Descriptive statistical parameters for numerical variables (mean, median, SD, minimum, and maximum) and frequencies for categorical variables were calculated. Comparison of categorical variables was performed using the chi-square test, while paired Student's t-test, Mann-Whitney U test, Kruskal-Wallis test, and two-sample proportion tests were used for numerical data. A p value <0.05 was considered statistically significant. Data are expressed as mean (SD) and number (n; %) where appropriate.

RESULTS

Baseline characteristics

A total of 397 patients (mean [SD] age: 59.2 [11.5] years; 62.5% females) were included. Duration of hypertension was 8.3 (7.0) years (Table 1). Physical parameters (weight, height, body mass index, and waist circumference) are also presented in Table 1. Of the CVD risk factors, metabolic syndrome was present in 59.1%, family history in 41.7%, diabetes mellitus in 41.1%, left ventricle hypertrophy in 29.5%, coronary heart disease (CHD) in 24.1%, obesity in 22.4%, microalbuminuria in 13.5%, renal disease in 3.1%, and peripheral arterial disease in 2.6% of patients at enrollment visit (Table 1).

CV risk management history

Despite having been diagnosed with essential hypertension, the BP of 6% of patients had not been measured in 12 months. Of those whose BP had been measured, the level of 86.6% was high (Table 2). Taking histories and current management of CV risk into consideration, patients in certain subgroups were found to have been evaluated with recommendation of appropriate treatment for risk factors (including dyslipidemia, diabetes mellitus, obesity, and smoking) (Table 2).

Ongoing antihypertensive treatment consisted of diuretics (n=176, 44.3%), beta-blockers (n=113, 28.5%), angiotensin-receptor blockers (ARBs; n=167, 42.1%), angiotensin-converting-enzyme inhibitors (ACE-Is; n=91, 22.9%), calcium-channel blockers (CCBs; n=100, 25.2%), alpha blockers (n=11, 2.8%), and aldosterone antagonists (n=11, 2.8%).

CV risk management at study centers and patient compliance

At enrollment visit, new antihypertensive medications

Table 1. Demographics, physical parameters, and medical history of patients at enrollment visit (n=397)

	n	%
Gender		
Male	149	37.5
Female	248	62.5
Age, mean (SD)		
Overall	59.2	11.5
Male	60.0	11.9
Female	58.7	11.2
Physical parameters		
Height (cm)	163.6	8.9
Body weight (kg)	82.7	13.7
Body mass index (kg/m^2)	31.0	5.3
Waist circumference (cm)	101.3	12.5
Hypertension history		
Age at the initial diagnosis (years)	51.9	10.7
Duration of hypertension (years)	8.3	7.0
History of risk factors		
Metabolic syndrome	234	59.1
Family history for cardiovascular disease	164	41.7
Diabetes mellitus	163	41.1
Left ventricular hypertrophy	117	29.5
Coronary heart disease	95	24.1
Obesity	89	22.4
Microalbuminuria	44	13.5
Renal disorder	12	3.1
Peripheral artery disease	10	2.6
Any comorbidity	206	51.9

were prescribed for 68.5% of patients as follows: diuretics (n=120, 30.2%), beta-blockers (n=57, 14.4%), ARBs (n=117, 29.5%), ACE-Is (n=60, 15.1%), CCBs (n=114, 28.7%), alpha blockers (n=11, 2.8%), and aldosterone antagonists (n=4.1%).

Drug and dietary treatments, respectively, were recommended at enrollment visit for hypertension in 90.4% and 88.2% of patients, for dyslipidemia in 48.9% and 62.0% of patients, for diabetes in 29.2% and 36.5% of patients, and for obesity in 3.8% and 55.4% of patients (Table 3).

At final follow-up, patient compliance with enrollment-visit recommendations was assessed by questionnaire. The highest compliance was observed with antihypertensive medications (94.7%), the poorest with quitting smoking (21.1%) and drug treatment for obesity (9.7%) (Table 3).

At the final visit, nearly every patient (97.7%) was on antihypertensive medication, including diuretics (n=227, 57.2%), beta-blockers (n=156, 39.3%), ARBs (n=237, 60.0%), ACE-Is (n=101, 25.4%), CCBs (n=158, 40%), alpha blockers (n=18, 4.5%), and aldosterone antagonists (n=13, 3.3%).

Further drug and dietary recommendations were made (Table 3), and new antihypertensive medications were prescribed for 19.3% of patients, including diuretics (n=25, 6.3%), beta-blockers (n=21, 5.3%), ARBs (n=20, 5.0%), ACE-Is (n=17, 4.3%), CCBs (n=22, 5.5%), and alpha blockers (n=4, 1%).

Ten-year CHD risk

Mean (SD) 10-year CHD risk was calculated as 25.7% (12.9) in males and 16.4% (8.8) in females at enrollment visit (Table 4). There was a significant decrease in the mean (SD) 10-year CHD risk in both genders ($p<0.001$) within 9 months (Table 4). Factors used to calculate 10-year CHD risk at both visits for both genders are presented in Table 4. Among these, significant reductions in systolic and diastolic blood pressures and LDL cholesterol seemed to contribute to the decrease in risk.

Risk classification

Patients were classified as having very high (19.6%), high (20.7%), moderate (38.3%), and low (21.4%) added risk for CVD at enrollment visit, while only 6.6% had very high and 13.4% had high risk at follow-up evaluation ($p<0.001$ *vs* enrollment for both; Table 5). The distribution at both visits of patients according to diabetes mellitus, metabolic syndrome, renal disease or microalbuminuria, and obesity are presented in Table 5. The shift toward lower risk grouping was more prominent in patients with diabetes, metabolic syndrome, and in those who were obese (Table 5).

Of the 78 patients in the very high risk category at enrollment, 22 (28.2%) remained classified as such at follow-up, and improvement was similar among patients in other categories (Table 5).

When assessed at the individual level, no change

Table 2. History (beginning 12 months prior) of cardiovascular risk management and patient compliance, as recorded at enrollment

	n	%	N*
Management of hypertension			
Blood pressure was measured during the last 12 months	373	94.0	397
Blood pressure measurement revealed high levels	323	86.6	373
Medication(s) was (were) prescribed for hypertension	282	87.3	323
Use of medication as recommended	203	84.2	241
A diet was recommended for hypertension	296	91.6	323
Good compliance with the dietary recommendations	154	59.0	261
Management of dyslipidemia			
Lipid levels were measured during the last 12 months	313	78.8	397
Lipid measurements revealed high levels	191	61.2	312
Medication(s) was (were) prescribed for dyslipidemia	143	74.9	191
Use of medication as recommended	102	81.0	126
A diet was recommended for hypertension	188	98.4	194
Good compliance with the dietary recommendations	97	58.8	165
Management of diabetes mellitus			
Blood glucose levels were measured during the last 12 months	295	74.5	396
Blood glucose measurements revealed high levels	143	48.5	295
Medication(s) was (were) prescribed for diabetes	123	86.0	143
An oral anti-diabetic was prescribed for diabetes	111	77.6	143
Use of medication as recommended	97	89.0	109
Insulin treatment was prescribed	29	20.3	143
Use of insulin as recommended	20	69.0	29
A diet was recommended for diabetes mellitus	152	65.2	233
Good compliance with the dietary recommendations	86	65.2	132
Management of smoking			
The physician made an effort to motivate the patient to quit smoking (by recommending drug treatment, acupuncture, etc.)	25	43.1	58
Good compliance to the physician's recommendations to quit smoking	6	25.0	24
Management of physical measures and exercise			
Weight/ waist circumference were measured during the last 12 months	157	39.9	393
Measurements revealed obesity	171	58.8	291
The physician made an effort to motivate the patient to lose weight (by recommending drug treatment, acupuncture, etc.)	109	44.3	246
Good compliance with the physician's recommendation to lose weight	47	52.8	89
Regular exercising by the patient	94	23.9	394
The physician made an effort to motivate the patient to exercise	144	43.6	330
Good compliance with the physician's recommendations to exercise	46	36.2	127

*Number of patients with available information of the variable

in risk status was observed during follow-up in 207 patients (52.1%), a decrease was observed in 170 patients (42.8%), and an increase was observed in 20 patients (5.0%). In patients with a positive shift or no change, significant reductions in systolic and diastolic blood pressure ($p<0.001$ for each), and a decrease in

Table 3. Cardiovascular risk management by physicians during visits and patient compliance with recommendations between visits

	Enrollment visit			Last follow-up visit					
	Recommended			Compliance with initial visit recommendations			Recommended		
	n	%	N*	n	%	N*	n	%	N*
Dietary treatment for hypertension	350	88.2	397	298	80.5	370	167	42.9	389
Drug treatment for hypertension	359	90.4	397	336	94.7	355	222	57.1	389
Dietary treatment for dyslipidemia	246	62.0	397	227	77.0	295	195	49.2	396
Drug treatment for dyslipidemia	194	48.9	397	169	72.5	233	97	24.6	395
Dietary treatment for diabetes mellitus	145	36.5	397	124	68.5	181	90	22.7	396
Drug treatment for diabetes mellitus	116	29.2	397	101	69.7	145	53	13.4	396
Drug treatment for quitting smoking	2	0.5	397	12	16.9	71	4	1.0	397
Other measures for quitting smoking	53	13.4	397	15	21.1	71	19	4.8	397
Dietary treatment for obesity	229	55.4	397	146	58.4	250	144	36.4	396
Drug treatment for obesity	15	3.8	397	7	9.7	72	0	0.0	397
Physical exercise	306	77.1	397	178	57.2	311	214	54.2	395

*Number of patients with available information of the variable.

LDL cholesterol ($p<0.001$ and 0.003, respectively) were evident. A significant increase ($p=0.007$) in HDL cholesterol was observed in the former group, but not in the latter (Table 6).

Achievement of target BP

The percentage of patients who had achieved target BP was estimated to have increased from 18.9% at enrollment to 69.8% at follow-up ($p<0.001$). In 27.5% of patients, target BP was not reached at enrollment or follow-up, while 53.7% of patients who did not achieve target BP at enrollment had reached their targets at follow-up (Table 7).

DISCUSSION

Based on data of the TEKHARF study[14] in the 1990s and the PatenT study[15] conducted in 2003, preva-

Table 4. Alteration in 10-year coronary heart disease risk during follow-up

	Enrollment visit		Follow-up visit	
	Males (n=149)	Females (n=248)	Males (n=149)	Females (n=248)
Items used in calculation[a]				
Systolic blood pressure (mmHg)	154.9±21.2	155.9±20.5	131.9±18.3*	136.0±19.3+
Diastolic blood pressure (mmHg)	90.3±11.9	93.5±12.5	80.9±9.2*	82.4±9.7+
Low-density lipoprotein cholesterol (mg/dL)	136±51.2	139.6±43.1	112.8±31.2*	124.2±32.9+
High-density lipoprotein cholesterol (mg/dL)	41.0±10.0	46.2±10.8	42.4±9.1	46.4±10.4
Presence of diabetes mellitus, n (%)	66 (44.3)	97 (39.1)	66 (44.3)	99 (39.9)
Smoking, n (%)	47 (31.5)	28 (11.3)	47 (31.5)	28 (11.3)
10-year coronary heart disease risk (%)	25.7±12.9	16.4±8.8	16.5±10.9*	13.0±8.1+

*$p<0.001$ compared to measurement at enrollment visit for males.
+$p<0.001$ compared to measurement at enrollment visit for females.

lence of hypertension in Turkey was approximately 30%. However, given that, according to the PatenT study, 32.2% of participants had never had their BP measured, only 40.7% of hypertension patients were aware of their diagnosis, 31.1% were receiving pharmacological treatment, and only 8.1% had BP under control,[15] it seems reasonable to expect a high CV risk in relation to poor management. Identification of high and very high levels of risk at the initial visit of approximately 40% of patients in the present study emphasizes the need for insight into the clinical practice and efficacy of current treatment trends of CV risk management in Turkish hypertensive patients.

As has been consistently reported, hypertension is not a mere function of a discrete BP level, but should be considered part of a complex syndrome of pathologic changes in vasculature and target organs.[3] Accordingly, metabolic syndrome, family history, diabetes mellitus, left ventricular hypertrophy, coronary heart disease, obesity, microalbuminuria, renal

Table 5. Alteration in risk levels during follow-up

Risk level	Enrolment visit		Follow-up visit		*p*
	n	%	n	%	
Overall population (n=397)					
Very high	78	19.6	26	6.6**	<0.001
High	82	20.7	53	13.4*	<0.001
Moderate	152	38.3	170	42.8	0.151
Low	85	21.4	148	37.3**	<0.001
Diabetes mellitus (+) (n=163)					
Very high	57	35.0	6	3.7	<0.001
High	43	26.4	22	13.5	0.007
Moderate	54	33.1	68	41.7	0.093
Low	9	5.5	67	41.1	<0.001
Diabetes mellitus (–) (n=234)					
Very high	21	9.0	20	8.5	1.000
High	39	16.7	31	13.2	0.226
Moderate	98	41.9	102	43.6	0.662
Low	76	32.5	80	34.2	0.819
Metabolic syndrome (+) (n=234)					
Very high	63	26.9	15	6.4	<0.001
High	55	23.5	32	13.7	0.006
Moderate	71	30.3	106	45.3	<0.001
Low	45	19.2	80	34.2	<0.001
Metabolic syndrome (–) (n=162)					
Very high	14	8.6	11	6.8	0.507
High	27	16.7	21	13.0	0.313
Moderate	81	50.0	64	39.5	0.070
Low	40	24.7	66	40.7	0.002
Renal disease and/or MAU (+) (n=49)					
Very high	14	28.6	3	6.1	0.003
High	10	20.4	4	8.2	0.087
Moderate	19	38.8	22	44.9	0.547
Low	6	12.2	20	40.8	0.001
Renal disease and/or MAU (–) (n=348)					
Very high	64	18.4	23	6.6	<0.001
High	72	20.7	49	14.1	0.015
Moderate	133	38.2	148	42.5	0.179
Low	72	20.7	127	36.5	<0.001
Obesity (+) (n=89)					
Very high	16	18.0	3	3.4	0.001
High	18	20.2	8	9.0	0.037
Moderate	34	38.2	35	39.3	0.891
Low	21	23.6	43	48.3	0.001

Risk level at enrollment	Risk level at follow-up	n	%[1]
Very high (n=78)	Very high	22	28.2
	High	25	32.1
	Moderate	25	32.1
	Low	6	7.6
High (n=82)	Very high	0	0
	High	19	23.2
	Moderate	50	61.0
	Low	13	15.9
Moderate (n=152)	Very high	4	2.6
	High	9	5.9
	Moderate	88	58.0
	Low	51	33.6
Low (n=85)	Very high	0	0
	High	0	0
	Moderate	7	8.2
	Low	78	91.8

MAU: Microalbuminuria.

[1]As risk evaluation was not performed in every patient during follow-up, combined percentage does not equal 100% in each category.

Table 6. Alteration in blood pressure and lipid levels in patients switched to higher- or lower-risk group between first and last follow-up visit

	Enrollment visit	Follow-up visit	*p*
	Mean±SD	Mean±SD	
Patients with an increase in risk (n=20)			
Systolic blood pressure (mmHg)	152.8±23.9	156.5±26.4	0.645
Diastolic blood pressure (mmHg)	88.7±12.1	86.0±8.4	0.418
Low-density lipoprotein cholesterol (mg/dL)	107.6±32.3	125.7±31.8	0.082
High-density lipoprotein cholesterol (mg/dL)	51.6±12.1	44.4±13.8	0.088
Patients with a decrease in risk (n=170)			
Systolic blood pressure (mmHg)	156.6±20.4	127.8±13.4	<0.001
Diastolic blood pressure (mmHg)	93.2±11.5	80.5±8.9	<0.001
Low-density lipoprotein cholesterol (mg/dL)	152.4±43.0	115.5±30.4	<0.001
High-density lipoprotein cholesterol (mg/dL)	41.8±10.4	44.8±9.9	0.007
Patients without change in risk (n=207)			
Systolic blood pressure (mmHg)	154.9±20.7	138.6±23.4	<0.001
Diastolic blood pressure (mmHg)	91.9±12.9	83.0±12.1	<0.001
Low-density lipoprotein cholesterol (mg/dL)	129.6±38.8	138.6±23.4	0.003
High-density lipoprotein cholesterol (mg/dL)	45.5±10.4	45.3±10.3	0.794

SD: Standard deviation.

Table 7. Number (%) of patients who achieved target blood pressure at enrollment and follow-up

Target blood pressure	Enrollment visit	Follow-up visit	*p*
	n (%)	n (%)	
Achieved	75 (18.9)	277 (69.8)	<0.001 chi-square
Not achieved	322 (81.1)	120 (30.2)	
	Enrollment visit	Follow-up visit	*p*
	Achieved	Not achieved	
	n (%)	n (%)	
Achieved	64 (16.1)	11 (2.8)	=0.003 chi-square
Not achieved	213 (53.7)	109 (27.5)	

disease, and peripheral arterial disease were the established risk factors encountered, in decreasing order, in the present study population, which included patients who had suffered from essential hypertension for fewer than 10 years.

In spite of major advances in pharmacological treatment, hypertension is an increasingly common health problem worldwide.[16] BP control in patients on antihypertensive medication has been evaluated as unsatisfactory in the United States, Canada, and in European countries,[17] with only an approximate third of hypertensive patients reaching recommended goals.[3]

Initially diagnosed in the fifth decade of life and lasting an average of 8 years, systolic and diastolic blood pressure values recorded at enrollment indicated insufficient BP control, independent of risk stratification. Only 18.9% of patients met target BP levels according to risk groups.

In 9 months of follow-up, an average of 20–25 mmHg reduction in systolic and diastolic blood pressure levels occurred in patients of both genders, and 70.8% reached target BP set according to risk group. Accounting for this successful rate of BP control, more than 97% of patients were under hypertensive treatment at final follow-up, and more importantly, patient compliance with antihypertensive medication was quite satisfactory, reaching 95%. In addition, 10-year CV risk estimates, and significant decline in percentage of patients in high- and very high-risk groups seem to indicate the selection of effective risk management strategies during the 9-month follow-up period.

Along with the reduction in high- and very high-risk patients with concomitant diabetes or metabolic syndrome, findings of the present study demonstrate that achievement of target BP and improvement in dyslipidemia were evident in a higher number of patients at the final visit, compared to the first. Regarding effective control of systolic and diastolic blood pressure and dyslipidemia during follow-up, 10-year CVD risk was significantly lower at the final visit for patients of each gender.

Regardless of progressive increases in dosage of multiple medications, controlling elevated BP of patients who are gaining weight, performing little physical activity, smoking, and drinking alcohol in excess is difficult.[18] As defined in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7)[6] and the World Health Organization and International Society of Hypertension (WHO/ISH) [7] guidelines, major lifestyle modifications are often critical in the control of underlying hypertension. [18] The role of the physician in determining the prescribed regimen and convincing the patient to adhere to treatment is similarly critical.[19]

The findings of the present study indicate that most healthcare providers usually offer advice regarding lifestyle changes initially, but desist over time, as recommendation rates regarding all measures of risk management beyond medication, smoking, and physical exercise declined significantly during follow-up. Hence, CV risk management strategies practiced by clinicians during 9-month follow-up seemed very effective in terms of risk reduction associated with high patient compliance.

Problems with patient compliance are reportedly the leading cause of poor BP control.[20] Less than a third of patients were reported to have adhered to antihypertensive drug treatment 1 year after initial prescription, and change or discontinuation of treatment was documented in 40–50% of patients within 6 months.[21] Although frequency of antihypertensive prescription was in line with the significant increase in use demonstrated by NHANES data,[2] BP control of the present study population seemed to reflect not only high patient compliance but also the aim of the increase in prescription, to lower high levels.[2] To this end, diuretics, ARBs, CCBs, and beta-blockers were the most commonly prescribed antihypertensive medications. In the present study, patient compliance with medical treatment aimed at CV risk management for hypertension, dyslipidemia, and diabetes mellitus was higher than that corresponding to dietary recommendations.

Without exception, current guidelines acknowledge that in most patients, ≥1 antihypertensive agent is required to reach BP goals, particularly that of <130/80 mmHg, which newer guidelines encourage, as part of an effective strategy for reducing CV risk.[22]

Identification of diuretics and ARBs as the new and continuing medications most commonly prescribed during the period of the present study is in accordance with several lines of evidence, including recent updates to the guidelines of the European Society of Hypertension and the European Society of Cardiology,[5] and a recent analysis supporting the use of ACE-Is, ARBs, CCBs, or thiazide diuretics as a first-step therapy, to be supplemented with other antihypertensive drugs if necessary.[23]

Given the favorable tolerability profile of ARBs, with better adherence and persistence making them ideal candidates for combination therapy,[24] similarly increased prescription rates for ARBs and diuretics in the present population are noteworthy.

Absence of alteration in risk status during follow-up in half the present population is similarly noteworthy, as significant improvement in high BP and dyslipidemia was obtained only in patients with a decrease in risk level during follow-up. Regarding the likelihood of better management in longer-term follow-up, achievement of risk reduction with significant improvement in control of hypertension and dyslipid-

emia in almost half the study population via strategies applied within 9 months is promising.

Consideration not only of BP elevation, but also of dyslipidemia, metabolic syndrome, and metabolic disturbances (such as type 2 diabetes mellitus) by clinicians involved in day-to-day care of patients is an important step toward enhanced CV-risk reduction and treatment of hypertension in its broadest sense.[9,25]

As CVD has been the leading cause of death in essentially developed nations for more than 5 decades, anyone who successfully operates a ''better mousetrap'' to address this burden should rightfully receive admiration from the scientific community.[25]

Study limitations

The primary strength of the present study was the inclusion of a database involving a representative sample comprising 1023 hypertensive patients from 50 centers in Turkey, likely rendering the findings widely generalizable. Nonetheless, while high-risk hypertensive patients undergoing follow-up at internal disease and cardiology clinics of tertiary centers were included, a substantial number of hypertensive patients in Turkey undergo follow-up at primary care centers. In addition, due to the non-randomized, observational design, potential selection bias and confounding factors should be considered limitations. In accordance with protocol-defined criteria, of the 1023 enrolled subjects, only 397 patients >75 years of age who were at high or very high risk were included in longitudinal analysis.

Conclusion

Based on 10-year CV risk estimates and the significant decline in percentage of patients in high- or very high-risk groups, the results of the present observational, non-interventional study indicate the efficacy of selected risk management strategies and high patient compliance during the 9-month follow-up period of the present study. Additionally, the decrease in the number of patients in higher-risk groups, particularly those with diabetic and metabolic syndromes, emphasizes the benefits of lipid and BP control. Compatible with the framework of domestic approaches such as the Total Cardiovascular Risk Management Initiative, awareness of CVD risk and implementation of prevention guidelines through direct involvement of physicians seems to play an essential role in the development of more convenient models for CV risk management.

Acknowledgements

The present study was supported by a grant from Sanofi-Aventis Turkey. The authors would like to thank Prof. Şule Oktay, M.D., Ph.D. and Çağla Ayhan, M.D. from KAPPA Consultancy Training and Research Ltd. (İstanbul) for assistance with manuscript preparation, as well as Esra Koruyucu for data management, and Arzu Çalışkan for statistical analysis, both from Monitor Medical Research and Consulting Ltd. (İstanbul). These services were funded by Sanofi-Aventis Turkey.

Funding

This study was supported by a grant from Sanofi-Aventis Turkey. Dr. Kozan has received research grants from various pharmaceutical companies, including Sanofi-Aventis.

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Keywords: Cardiovascular risk management; hypertension; 10-year coronary heart disease risk.

Anahtar sözcükler: Kardiyovasküler risk yönetimi; hipertansiyon; 10 yıllık koroner kalp hastalığı riski.