ÖZGÜN ARAŞTIRMA ORIGINAL RESEARCH

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CLINICAL CHARACTERISTICS, OFFICE BLOOD PRESSURE, AND HOME BLOOD PRESSURE OF PATIENTS DIAGNOSED WITH HYPERTENSION IN THE EMERGENCY DEPARTMENT

ACİL SERVİSTE HİPERTANSİYON TANISI ALAN HASTALARIN KLİNİK ÖZELLİKLERİ, OFİS TANSİYONLARI VE EV TANSİYONLARI

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Öz

Amaç

Bu çalışmanın amacı, acil servise ilk kez yüksek tansiyon ile başvuran hastaların özelliklerini araştırmak, acil servis, ofis ve ev ortamlarındaki kan basınç ölçümlerini karşılaştırmak ve hipertansiyon için tanısal değerini değerlendirmektir.

Gereç ve Yöntem

Daha önce hipertansiyon öyküsü olmayan, çeşitli semptomlarla başvuran toplam 109 hasta dahil edildi. Acil serviste, ofiste ve evde temel özellikler ve kan basıncı ölçümleri analiz edildi.

Bulgular

Çalışma popülasyonunun (ortalama yaş: 48,5±12,9 yıl, %44 erkek) acil serviste ortalama sistolik kan basıncı (SKB) 166,87 (±16,24) mmHg ve ortalama diyastolik kan basıncı (DKB) 94,95 (±11,98) mmHg idi. Acil serviste ölçülen SKB ve DKB, ofis ve ev ölçümlerinden anlamlı olarak yüksekti ($p<0.001$). Hem ofis hem de ev kan basıncı ölçümlerine göre hastaların %56,9'u hipertansif (SKB ≥140 ve/veya DBP ≥90 mmHg) idi. SKB ile grade 1 ve üzeri hipertansif retinopati ($p=0,002$), hipotiroidizm ($p=0,007$), düşük hemoglobin düzeyi ($p=0,026$), yüksek potasyum düzeyi ($p=0,05$) ve göreceli duvar kalınlığı ($p=0.05$). DKB, erkek cinsiyet ($p=0,05$), grade 1 ve üstü hipertansif retinopati ($p=0,025$), obezite ($p=0,037$) ve düşük hemoglobin düzeyi ($p=0,047$) ile anlamlı korelasyon gösterdi.

Sonuç

Acil serviste başlangıçta yüksek tansiyonu olan hastalarda, ofiste ve evde daha düşük tansiyon değerleri vardı. Ancak bu hastaların yarısından fazlasına takip sırasında hipertansiyon tanısı konmuştur. Bu bulgular, yüksek tansiyon ile başvuran acil servis hastalarında hipertansiyonu doğru bir şekilde teşhis etmek için kan basıncı ölçümlerinin ayarlanmasının ve takip değerlendirmelerinin dikkate alınmasının önemini vurgulamaktadır.

Anahtar Kelimeler: Acil servis kan basıncı, Ev kan basıncı, Ofis kan basıncı

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Abstract

Objective
This study aimed to investigate the characteristics of patients presenting to the emergency department (ED) with high blood pressure for the first time, comparing their blood pressure measurements in the ED, office, and home settings, and evaluating the diagnostic value for hypertension.

Material and Method
A total of 109 patients with no previous history of hypertension, presenting with various symptoms, were included. Baseline characteristics and blood pressure measurements in the ED, office, and home were analyzed.

Results:
The study population (mean age: 48.5±12.9 years, 44% male) had a mean systolic blood pressure (SBP) of 166.87 (±16.24) mmHg and mean diastolic blood pressure (DBP) of 94.95 (±11.98) mmHg in the ED. SBP and DBP measured in the ED were significantly higher than office and home measurements (p<0.001). According to both office and home blood pressure measurements, 56.9% of the patients were hypertensive (SBP ≥140 and/or DBP ≥90 mmHg) Significant correlations were found between SBP and grade 1 or higher hypertensive retinopathy (p=0.002), hypothyroidism (p=0.007), low hemoglobin levels (p=0.026), high potassium levels (p=0.05), and relative wall thickness (p=0.05). DBP was significantly correlated with male gender (p=0.05), grade 1 or higher hypertensive retinopathy (p=0.025), obesity (p=0.037), and low hemoglobin levels (p=0.047).

Conclusion
Patients with initial high blood pressure in the ED had lower blood pressure readings in the office and at home. However, over half of these patients were diagnosed with hypertension during follow-up. These findings highlight the importance of considering the setting of blood pressure measurements and the need for follow-up evaluations to accurately diagnose hypertension in ED patients presenting with high blood pressure.

Keywords: Emergency department blood pressure, Home blood pressure, Office blood pressure

Introduction

Hypertension is defined as office systolic blood pressure (SBP) values ≥140 mmHg and/or diastolic blood pressure (DBP) values ≥90 mmHg. Globally, the prevalence of hypertension was estimated to be 1.13 billion in 2015, with a particularly high prevalence of over 150 million in central and eastern Europe (1). It is projected that the number of individuals with hypertension will increase by 15-20% by 2025, reaching close to 1.5 billion (2). Hypertension is a major modifiable risk factor for cardiovascular diseases (3-6). Elevated blood pressure is independently and continuously associated with an increased risk of stroke, myocardial infarction, sudden death, heart failure, atrial fibrillation, peripheral arterial disease, and kidney failure (7, 8). The epidemiological link between blood pressure and cardiovascular risk extends even to relatively lower blood pressure levels. Early identification and management of hypertension have been demonstrated to reduce complications associated with long-term hypertension (9-13).

The emergency department (ED) experiences a significant volume of patient admissions and thus represents a crucial setting for screening and early detection of hypertension. However, studies investigating the importance of high blood pressure in patients presenting to the ED are scarce. The evaluation and management of patients with hypertension in the ED often lack evidence-based approaches (14). Existing studies have primarily focused on the characteristics of ED patients with severely elevated blood pressure, while less is known about the characteristics of ED patients, including those with milder degrees of blood pressure elevation (15, 16).

Material and Method

Patient Selection
The research was carried out following the guidelines and regulations established by the Ethics Committee of Istanbul Yeni Yüzyıl University. The research protocol was approved by the committee on 04.07.2022, under the reference number 2022/07-890. Informed consent was obtained from all participants prior to their inclusion in the study. In the last 6 months, an average of 110 patients were referred from the hospital emergency to the cardiology clinic every month. Therefore, 110 patients were included as

a population size. The effect size was determined as 0.50, α=0.05, power (1-β)=0.80, and the study population was determined as 109 with the G-power program at 95% confidence level. This retrospective study included data collected from adult individuals without a previous diagnosis of hypertension (HT) whose blood pressure measurements were assessed in the emergency department (ED), office, and home, following appropriate protocols based on current guidelines. Eligible patients were those who presented to the ED of a single-center between November 2020 and March 2022, did not require immediate medical intervention, had no specific complaints, and exhibited systolic blood pressure (SBP) ≥140 mmHg and diastolic blood pressure (DBP) ≥90 mmHg during the ED visit. All patients underwent laboratory tests, urinalysis, electrocardiography (ECG), and echocardiographic examinations in the cardiology clinic. Additionally, assessment for hypertensive retinopathy was conducted in the ophthalmology clinic. Inclusion criteria comprised age 18 years and older, no prior HT diagnosis, and blood pressure measurements obtained in the ED, office, and home settings. Exclusion criteria encompassed severe cardiac, renal, or other systemic diseases, sustained arrhythmia, and pregnancy. The Institutional Review Board approved the study (IRB #2022/07-890), and written informed consent was obtained from all participants.

Blood Pressure Measurements

Blood pressure measurements were performed with patients seated after a minimum rest period of 3 minutes, utilizing an automated device. Measurements were obtained in three settings: the ED, office, and home. The time intervals between the ED, office, and home measurements did not exceed two weeks.

In the ED and office, a single blood pressure measurement was recorded for each patient. For the home setting, patients were monitored over a period of 3 to 5 days, during which multiple blood pressure measurements were taken to calculate the average.

To ensure accuracy and consistency, the automated device used for blood pressure measurements was regularly calibrated according to manufacturer guidelines. Cuff size selection adhered to recommended guidelines for proper fit based on the patient's upper arm circumference.

Hypertension Classification

The categorization of hypertension followed the guidelines outlined in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-7). Grade 1 hypertension was assigned to patients with SBP ranging from 140 to 159 mmHg or DBP ranging from 90 to 99 mmHg. Grade 2 hypertension was designated for patients with SBP ranging from 160 to 179 mmHg or DBP ranging from 100 to 109 mmHg. Patients with an SBP of 180 mmHg or higher or a DBP of 110 mmHg or higher were classified as having grade 3 hypertension.

Statistical Analysis

We evaluated the distribution and normality of parameters using the Kolmogorov-Smirnov test. Continuous variables were reported as mean and standard deviation or median and interquartile range, depending on their distribution. Categorical variables were presented as frequency and percentage. For two-group comparisons, we used the χ^2 test or Fisher's exact test for categorical variables, and Student's t-test or Mann-Whitney U test for continuous variables. Paired Student's t-test or Wilcoxon signed-rank test was used to compare measurements at two-time points, while repeated measures ANOVA was employed for comparisons involving three or more repeated measurements. Multivariate linear regression analysis was utilized to identify predictors of SBP and DBP measured in the ED. Logistic regression analysis was performed to identify factors influencing hypertension. Statistical analysis was conducted using SPSS software version 25.0 (SPSS, Inc, Chicago, IL). A p-value of 0.05 was considered statistically significant.

Results

The analysis included the home and office blood pressure data of 109 patients who were not previously diagnosed with hypertension (HT) but exhibited high blood pressure in the emergency department (ED). The mean age of the participants was 48.5±12.9 years, and 44% were male. Unlike the general population of individuals with essential HT, the occurrence of comorbidities such as diabetes mellitus (DM), coronary artery disease (CAD), and heart failure (HF) was infrequent among patients with elevated blood pressure measured in the ED for the first time. However, 10.1% of the patients had hypothyroidism, and 20.2% had obesity. Sinus rhythm was observed in 81.7% of the patients, and the prevalence of left ventricular hypertrophy (Sokolow-Lyon criteria) was low (13.8%). Hypertensive retinopathy (grade 1-2) was detected in almost one-third of the patients. The characteristics of the enrolled patients are presented in Table 1.

Table 1 Baseline clinical characteristics of the study population

	wn=109
Age (years) (mean±SD)	48.5±12.9
Sex (male%)	44
DM (%)	2.8
CAD (%)	6.4
HF (%)	0.9
Obesity (%)	20.2
Hypothyroidism (%)	10.1
Active smoker (%)	28.4
Hemoglobin (g/dL) (mean±SD)	14.1±1.5
GFR (ml/min/1.73 m²) (median±SD)	±20.1
Na (mmol/L)	139.2±3.1
K (mmol/L)	4.2±0.4
Urine dipstick protein (>30 mg/dL) (%)	11
ECG Ritm Normal sınus Sınus bradycardia Sınus tachycardia AF/Flutter	 81.7 0.9 13.8 3.7
Positive Sokolow-Lyon criteria (%) **(For left ventricular hypertrophy)**	13.8
Hypertensive retinopathy None Grade 1 Grade 2	 68.8 25.7 5.5
IVS (mm)	11.1±1.4
RWT	0.48±0.06
LVMI (g/m²) **Male** **Female**	 98.2±19.4 93.2±20.9

CAD: Coronary artery disease, DM: Diabetes mellitus, ECG: Electrocardiography, ED: Emergency department, GFR: Glomerular filtration rate, HF: Heart failure, IVS: Interventricular septum, K: Potassium, LWMI: Left ventricular mass index, NA: Sodium, RWT: Relative wall thickness

Approximately one-third (30.3%) of the study participants did not exhibit any symptoms associated with HT. Among those who experienced symptoms, the most common was headache, reported by more than one-third (34.9%) of the patients. Other common symptoms included chest pain (13.8%) and neck pain (9.2%). The ranking of symptoms based on frequency is illustrated in Figure 1.

All patients in the study had SBP ≥140 mmHg or DBP ≥90 mmHg measured in the ED. The mean SBP measured in the ED was 166.87±16.24 (ranging from 135 to 212) mmHg, and the mean DBP was 94.95±11.98 (ranging from 60 to 146) mmHg. The characteristics of blood pressure measurements obtained in the ED, office, and home settings are presented in Table 2.

Table 2 Central tendency and distribution of statistical data of blood pressure measurements in the emergency department, office, and home (all values are in mmHg).

Value		SBP in ED	SBP in office	SBP at home	DBP in ED	DBP in office	DBP at home
Mean		166.87	152.11	144.13	94.95	86.77	87.39
Median		165.00	150.00	145.00	93.00	90.00	89.00
Std. Deviation		16.239	19.991	15.577	11.980	14.150	8.009
Minimum		135	109	111	60	50	65
Maximum		212	240	185	146	115	110
Percentiles	25	155.00	140.00	130.00	89.00	80.00	80.00
	50	165.00	150.00	145.00	93.00	90.00	89.00
	75	178.00	160.00	155.00	100.00	95.00	90.00

DBP: Diastolic blood pressure, ED: Emergency department, SBP: Systolic blood pressure

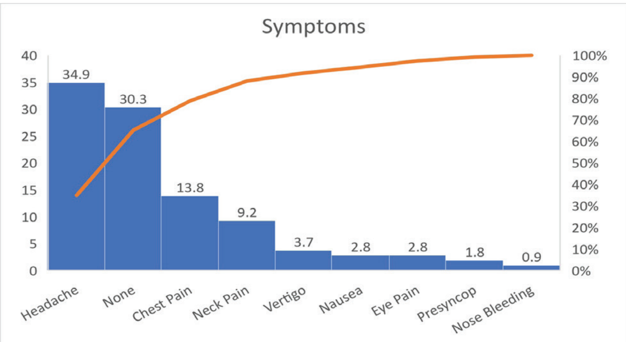

Figure 1
Hypertension-related symptoms of patients with high blood pressure in the emergency department.

The mean SBP measured in the ED was significantly higher than the mean SBP measured in the office and at home (mean difference [MD]=14.76, 95% confidence interval [CI]=9.77-19.74, $p<0.001$; MD=22.74, 95% CI=18.57-26.92, $p<0.001$, respectively). Similarly, the mean DBP measured in the ED was significantly higher than the mean DBP measured in the office and at home (MD=8.18, 95% CI=4.51-11.86, $p<0.001$; MD=7.57, 95% CI=4.62-10.52, $p<0.001$, respectively). However, the mean SBP measured in the office was significantly higher than the mean SBP measured at home (MD=7.98, 95% CI=3.05-12.92, $p<0.001$), while the mean DBP measured at the office was similar to the mean DBP measured at home (MD=-0.62, 95% CI=-3.82-2.59, $p=0.94$) (Figure 2).

Hypertension grades were determined based on the blood pressure measurements of the patients.

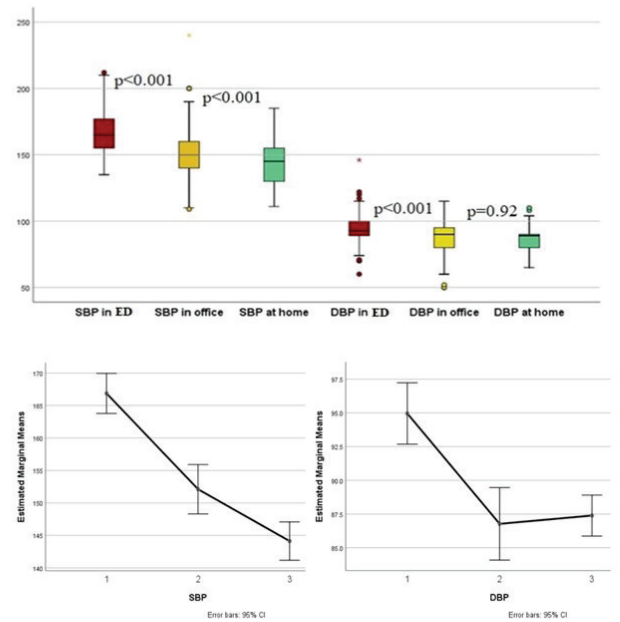

Figure 2
Comparison of blood pressure measured in the emergency department, office, and home with Box plot and estimated marginal means graph.

Except one patient, the systolic blood pressure (SBP) measured in the emergency department (ED) was ≥140 mmHg, and almost half (45%) of the patients had grade 2 hypertension (HT). When comparing the patient groups based on HT grades, the HT grades in the ED were higher than those determined by office and home SBP measurements ($p<0.001$ for both). The HT grades determined by SBP measurements at the office and home were similar (p=0.122). Nearly half (45%) of the diastolic blood pressure (DBP) measurements in the ED were within the normal range. The HT grades in the ED were higher than those obtained from office DBP measurements (p=0.001). The HT grades determined by DBP measurements in the ED and at home were similar (p=0.59). The HT grades at home were higher than those obtained from office DBP measurements (p=0.002) (Figure 3).

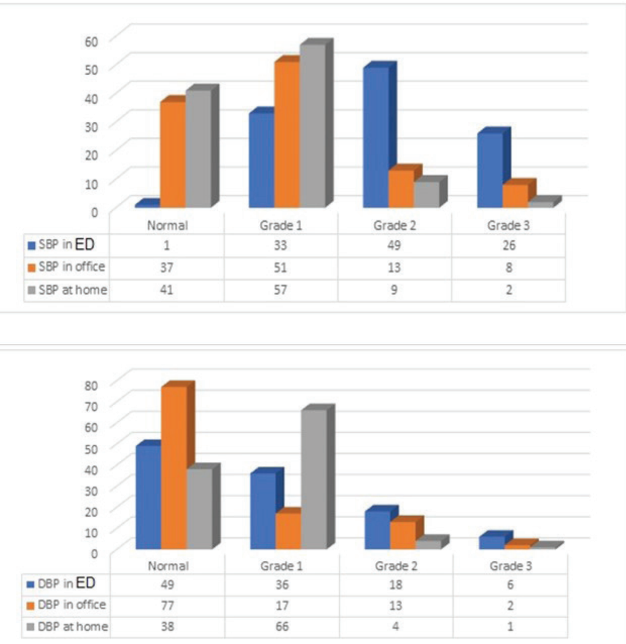

Figure 3
Comparison of systolic and diastolic blood pressure measurements in the emergency department, office, and home according to hypertension grade.

According to office blood pressure measurements, 66% of the patients were hypertensive, while home blood pressure measurements classified 62% of the patients as hypertensive. Combining both office and home blood pressure measurements, 56.9% of the patients were considered hypertensive (SBP ≥140 mmHg and/or DBP ≥90 mmHg) (Figure 3). A significant relationship was observed between hypertensive retinopathy (p=0.03), obesity (p=0.028), proteinuria (p=0.044), positive Sokolow-Lyon criteria (p=0.036), increased sodium levels (p<0.001), decreased hemoglobin levels (p=0.023), and hypertension.

The SBP and diastolic DBP of the patients were analyzed based on sex subgroups. The average SBP measured in the emergency department (ED) was significantly higher compared to the average SBP measured in the office and at home for both males (mean difference [MD]=15.48, 95% confidence interval [CI]= 8.75-22.21, p<0.001; MD= 23.88, 95% CI= 17.92-29.83, p<0.001) and females (MD=14.20, 95% CI= 6.84-21.55, p<0.001; MD=21.85, 95% CI= 15.87-27.83, p<0.001). Moreover, the average SBP measured in the office was significantly higher than the average SBP measured at home for both males (MD=8.40, 95% CI= 0.90-15.89, p=0.023) and females (MD=7.66, 95% CI= 0.86-14.45, p=0.022).

Similarly, the mean DBP measured in the ED was significantly higher than the mean DBP measured in the office and at home for both males (MD=10.17, 95% CI= 5.05-15.28, p<0.001; MD=9.20, 95% CI= 4.86-13.55, p<0.001) and females (MD=6.62, 95% CI= 1.33-11.92, p=0.009; MD=6.28, 95% CI= 2.18-10.38, p=0.001). However, there was no significant difference between the mean DBP measured at the office and at home for both males (MD=-0.96, 95% CI=-5.94-4.02, p=0.94) and females (MD=-0.34, 95% CI=-4.70-4.00, p=0.91) (Figure 4).

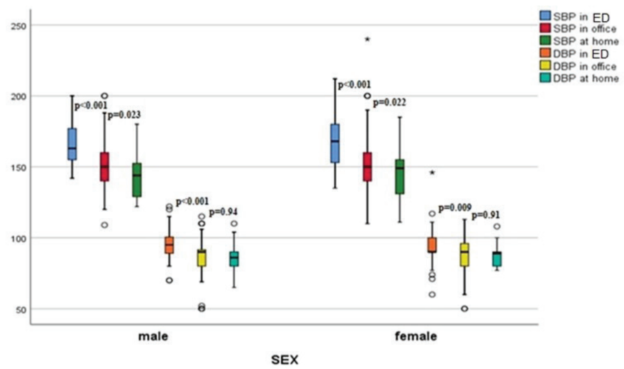

Figure 4
Comparison of systolic and diastolic blood pressure measurements in men and women in the emergency department, office, and home.

The study also investigated the impact of baseline features on SBP and DBP measured in the ED. A significant correlation was observed between SBP measured in the ED and grade 1 or higher hypertensive retinopathy (p=0.002), hypothyroidism (p=0.007), low hemoglobin levels (p=0.026), increased potassium levels (p=0.05), and relative wall thickness (RWT) (p=0.05). Furthermore, a significant correlation was found between DBP measured in the ED and male gender (p=0.05), grade 1 or higher hypertensive retinopathy (p=0.025), obesity (p=0.037), and low hemoglobin levels (p=0.047) (Table 3).

Table 3 Multivariate Linear Regression Analysis of the effect of baseline characteristics on systolic and diastolic blood pressure measured in the emergency department.

Variables	Systolic Blood Pressure				Diastolic Blood Pressure			
	UCB	SCB	T Value	P Value	UCB	SCB	T Value	P Value
Sex (female)	-2.217	-0.068	-0.612	0.542	-5.575	-0.232	-1.979	0.050*
Age	0.074	0.059	0.580	0.564	-0.061	-0.066	-0.616	0.540
ECG Rhythm (Other than sinüs rhythm)	0.316	0.017	0.159	0.874	1.393	0.100	0.898	0.372
Sokolow Lyon criteria (For left ventricular hypertrophy)	1.788	0.038	0.370	0.712	-0.563	-0.016	-0.150	0.881
Bundle branch block (RBBB or LBBB)	-0.358	-0.006	-0.061	0.951	-5.772	-0.128	-1.271	0.207
Hypertension related symptom	0.092	0.015	0.144	0.886	-0.154	-0.033	-0.310	0.758
Hypertensive retinopathy (≥Grade 1)	8.664	0.314	3.159	0.002*	4.854	0.238	2.276	0.025*
DM	-5.964	-0.060	-0.618	0.538	1.351	0.019	0.180	0.857
CAD	7.119	0.108	0.970	0.335	-2.841	-0.058	-0.498	0.620
HF	-4.169	-0.025	-0.220	0.826	15.482	0.124	1.052	0.296
Obesity	2.116	0.053	0.516	0.607	6.770	0.228	2.125	0.037*
Hypothyroidism	14.684	0.274	2.741	0.007*	4.551	0.115	1.092	0.278
Active smoker	-3.316	-0.093	-0.939	0.350	-2.856	-0.108	-1.040	0.301
Hemoglobin (g/dL)	-2.896	-0.263	-2.271	0.026*	-1.995	-0.245	-2.012	0.047*
GFR (ml/min/1.73 m2)	-0.038	-0.050	-0.430	0.668	0.038	0.066	0.545	0.587
NA (mmol/L)	-0.192	-0.037	-0.334	0.739	0.071	0.018	0.158	0.875
K (mmol/L)	8.875	0.213	1.986	0.050*	-2.805	-0.091	-0.807	0.422
Proteinuria on spot urinalysis (>30 mg/dL) (%)	6.976	0.135	1.379	0.172	4.407	0.116	1.120	0.266
IVSD (mm)	-1.360	-0.114	-0.460	0.646	3.485	0.395	1.517	0.133
RWT	83.503	0.313	1.938	0.050*	-22.625	-0.115	-0.675	0.501
LVMI (g/m2)	-0.074	-0.092	-0.430	0.669	-0.163	-0.274	-1.215	0.228

CAD: Coronary artery disease, DM: Diabetes mellitus, ECG: Electrocardiography, GFR: Glomerular filtration rate, HF: Heart failure, IVS: Interventricular septum, K: Potassium, LWMI: Left ventricular mass index, NA: Sodium, RWT: Relative wall thickness

Discussion

This study provides crucial insights into the clinical significance of hypertension (HT) screening in the emergency department (ED) among previously undiagnosed patients presenting with high blood pressure. The findings of this study have substantial implications for clinical practice and healthcare guidelines.

The importance of hypertension (HT) screening in the ED was initially highlighted in 1987 by Chernow et al. (17). Their study revealed that many ED patients with high blood pressure values did not have a previous history of HT, and these patients remained hypertensive during follow-up. Similarly, Karras et al. (14) found that high blood pressure values were common among ED patients, with half of them not having a history of hypertension. One-fourth of the patients still had high blood pressure during followups. In our study, we found that systolic blood pressure (SBP) and diastolic blood pressure (DBP) measured in the ED were significantly higher than corresponding measurements taken in the office and at home. This highlights the value of ED-based blood pressure screening as a means of early HT detection.

Symptoms associated with HT are another critical aspect of this study. Approximately one-third of the patients did not display any symptoms related to HT, highlighting the silent nature of this condition in some cases (18). Friedman et al. demonstrated that patients presenting to the ED with headaches are more likely to have high blood pressure compared to patients with other complaints (19). In our study, the most common symptom was headache, followed by chest pain and neck pain. These findings underscore the importance of considering HT as a potential underlying cause for various symptoms, especially headaches, when evaluating patients in the ED.

One of the noteworthy findings is the age and comorbidity profile of the patients in this study. Screening the entire population after a certain age may not be a cost-effective approach. Instead, in daily clinical practice, it may be more efficient to measure blood pressure within a minute or two for ED patients, considering the large patient population. Studies have shown that HT screening can facilitate early diagnosis and treatment (20, 21). Unlike the typical population of individuals with essential HT, our study participants were relatively young, with infrequent comorbidities such as diabetes mellitus (DM), coronary artery disease (CAD), and heart failure (HF). Similar to previous studies, the prevalence of obesity and, interestingly, hypothyroidism were noteworthy in our study (22). This suggests that HT can affect a broader spectrum of patients than previously assumed, emphasizing the importance of ED-based screening.

Hypertension grades were determined based on the ED blood pressure measurements, revealing that nearly half of the patients had grade 2 hypertension. Importantly, the grades assigned in the ED were higher than those determined by office and home SBP measurements, indicating the potential for underdiagnosis when relying solely on non-ED measurements. Additionally, nearly half of the DBP measurements in the ED fell within the normal range, further emphasizing the need for comprehensive assessment.

Combining office and home blood pressure measurements, 56.9% of the patients were classified as hypertensive, reinforcing the importance of incorporating both settings for accurate diagnosis and management. Importantly, this study found significant relationships between hypertensive retinopathy, obesity, proteinuria, positive Sokolow-Lyon criteria, increased sodium levels, decreased hemoglobin levels, and hypertension. These findings provide valuable clinical insights into factors associated with HT and its complications.

Gender-based analysis revealed differences in blood pressure patterns, with higher blood pressure levels observed in the ED compared to office and home settings for both males and females. However, there was no significant difference between office and home measurements. This suggests that the ED setting may elicit higher blood pressure readings, emphasizing the importance of multiple measurements in different settings for a comprehensive assessment.

The detection of early microvascular changes through fundoscopic examination may become an essential and routine screening method for early HT diagnosis and the prevention and management of ocular and systemic complications (23). Moreover, the study investigated the impact of various baseline features on SBP and DBP measured in the ED, identifying significant correlations with hypertensive retinopathy, hypothyroidism, low hemoglobin levels, increased potassium levels, relative wall thickness (RWT), male gender, and obesity. These correlations provide valuable information for risk assessment and personalized treatment approaches.

Although studies on blood pressure in males and females show differences in pathways such as ACE2, estrogens, and ET-1 signaling, current guidelines for hypertension (HT) management rarely address gender-specific differences (24-26). It has been observed that there is a positive relationship between hypertension-related end-organ damage and the number of accompanying comorbidities and the severity of HT (27). A study conducted by Paul et al. found that anemia was more prevalent in patients with uncontrolled blood pressure compared to those with well-controlled blood pressure. Hemoglobin concentration gradually decreased as blood pressure increased, starting from patients with controlled blood pressure to those with high blood pressure. High salt consumption has been linked to an increased risk of developing hypertension. Furthermore, the risk of hyperkalemia is further amplified if one or more risk factors such as chronic kidney disease, diabetes mellitus, and heart failure are present (28).

In our study, we observed similar changes in blood pressure when comparing men and women based on blood pressure measurements taken in the emergency department (ED), office, and home settings. However, the distribution of blood pressure in women was found to be broader compared to men. Additionally, we identified a positive linear correlation between blood pressure measured in the ED and hypertensive retinopathy, hypothyroidism, low hemoglobin levels, increased potassium levels, increased relative wall thickness (RWT), male gender, and obesity. Patients diagnosed with hypertension in the office and at home exhibited a higher prevalence of hypertensive retinopathy, obesity, proteinuria, positive Sokolow-Lyon criteria, elevated sodium levels, and decreased hemoglobin levels.

In conclusion, this study underscores the clinical implications of HT screening in the ED for previously undiagnosed patients with elevated blood pressure. The findings emphasize the importance of considering HT as a potential underlying condition in a broader patient population, even among those without typical risk factors or symptoms. Early detection and accurate diagnosis of HT in the ED setting can lead to timely intervention and improved patient outcomes. This study highlights the need for comprehensive blood pressure assessment, including both office and home measurements, to ensure accurate diagnosis and appropriate management. It also underscores the relevance of gender-specific considerations in HT management. While acknowledging the study's limitations, including its single-center design, these findings have the potential to inform clinical practice and guidelines, ultimately benefiting patients by enhancing the early detection and management of hypertension in the ED setting. Further research on a larger scale is warranted to confirm and expand upon these findings.

This study has several limitations that should be taken into account when interpreting its findings. Firstly, the single-center design restricts the generalizability of the results, as healthcare practices, patient demographics, and available resources can vary across different healthcare facilities. Additionally, the relatively small sample size may affect the statistical power and reliability of the outcomes, potentially limiting the study's ability to draw definitive conclusions. Furthermore, the use of a single blood pressure measurement in the emergency department (ED) for each patient, due to practical constraints, may not fully capture their true blood pressure status, and obtaining multiple measurements could have provided a more accurate assessment. The absence of baseline blood pressure data before the ED visit introduces uncertainty about how patients' awareness of their hypertension diagnosis might have influenced their subsequent blood pressure readings. Additionally, although the treatment of patients with high blood pressure in the ED was conducted after the decision of the cardiology clinic, the patients might have been more conscious of their blood pressure before this process and attempted to reduce their blood pressure using various methods. Not having access to the patients' blood pressure information prior to their ED visit could have influenced the results and introduced bias.

Conclusion

Despite these limitations, our study identified important findings regarding blood pressure measurements in the ED. We observed that office and home blood pressure measurements of patients with no previous HT diagnosis, and whose high blood pressure was measured in the ED for the first time, were significantly lower than the measurements obtained in the ED. This suggests that blood pressure readings obtained in the ED may overestimate the true blood pressure levels of these individuals.

Furthermore, we found significant correlations between blood pressure measured in the ED and several factors, including hypertensive retinopathy, hypothyroidism, low hemoglobin levels, high potassium levels, increased RWT, male gender, and obesity. These associations indicate that elevated blood pressure measured in the ED may be indicative of underlying health conditions and risk factors.

Moreover, we identified significant relationships between hypertensive retinopathy, obesity, proteinuria, positive Sokolow-Lyon criteria, increased sodium levels, decreased hemoglobin levels, and hypertension. These findings emphasize the importance of considering these factors when evaluating patients with high blood pressure in the ED.

In conclusion, despite the limitations of our study, our findings highlight the significance of measuring blood pressure accurately in the ED setting. Improved blood pressure assessment techniques and consideration of associated factors are crucial for appropriate management and identification of underlying conditions in patients presenting with high blood pressure in the ED.

Conflict of Interest Statement
The authors have no conflicts of interest to declare.

Ethical Approval

Istanbul Yeni Yüzyıl University Ethics Committee decision dated 04.07.2022 and numbered 2022/07-89. The study was conducted in line with the principles of the "Helsinki Declaration".

Consent to Participate and Publish

Informed consent was not obtained due to the retrospective design of the study.

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Availability of Data and Materials

Data available on request from the authors.

Authors Contributions

FP: Conceptualization; Data curation; Formal analysis; Project administration; Investigation; Methodology; Validation; Visualization; Writing-original draft; Formal analysis

ZK: Conceptualization; Funding acquisition; Methodology; Resources; Validation; Writing-review & editing.

MAÖ: Investigation; Validation; Writing-original draft; Resources
İA: Formal analysis; Investigation; Visualization; Writing-review & editing; Supervision

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