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Clinical Presentation of Hypertensive Crises in Emergency Medical Services

Sabina Salkic¹, Olivera Batic-Mujanovic², Farid Ljuca³, Selmira Brkic³Emergency medical services, Community Health Centre Tuzla¹Family Medicine Education Centre, Community Health Centre Tuzla²Faculty of Medicine, University of Tuzla³

Corresponding author: Sabina Salkić, Health Care Tuzla, Emergency Medical Service Department, 75000 Tuzla, Albina Herljevića 1, Phone: +387 61 729 030, email: sabinasalkic@yahoo.com

ABSTRACT

Objectives: The objective of this study is to evaluate the incidence and clinical presentation of hypertensive crises in the Emergency medical services of the Community Health Centre “Dr. Mustafa Šehović” Tuzla in relation to age, sex, duration and severity of hypertension, as well as the prevalence of accompanying symptoms and clinical manifestations. **Methods:** The study was conducted between November 2009 and April 2010 and included 180 subjects of both sexes, aged 30-80 with a diagnosis of arterial hypertension. All subjects were divided into two groups: a control group, which consisted of subjects without hypertensive crisis (95 subjects) and an experimental group that consisted of subjects with hypertensive crisis (85 subjects). **Results:** The study results indicate that female subjects were significantly over-represented compared to men (60% vs. 40%, $p=0.007$). The average age of the male subjects was 55.83 ± 11.06 years, while the female subjects' average age was 59.41 ± 11.97 years. The incidence of hypertensive crisis was 47.22%, with hypertensive urgency significantly more represented than emergency (16.47% vs. 83.53%, $p<0.0001$). The majority of subjects in the experimental group (28.23%) belonged to the age group of 60-69 years of age: 26.76% urgency and 35.71% emergency. The most common accompanying symptoms in hypertensive subjects were headache (75%), chest pain (48.33%), vertigo (44.44%), shortness of breath (38.88%) and nausea (33.89%). The most common symptoms in subjects with hypertensive crisis were headache (74.11%), chest pain and shortness of breath (62.35%), vertigo (49.41%), and nausea and vomiting (41.17%). **Conclusions:** Chest pain, shortness of breath, nausea and vomiting were significantly over-represented in subjects with hypertensive crisis ($p<0.005$). Clinical manifestations of hypertensive emergencies in almost all subjects included acute coronary syndrome, and only one subject had acute pulmonary edema.

Key words: hypertensive crisis, emergency, urgency.

1. INTRODUCTION

Arterial hypertension is the main independent risk factor for the development of cardiovascular disease and mortality in developed, as well as developing countries, such as our country. About 50% of all cases of myocardial infarction and about 60% of cerebrovascular events are the result of high blood pressure. The World Health Organization defines arterial hypertension as the level of systolic blood pressure of 140 mmHg or higher and/or diastolic blood pressure of 90 mmHg or higher in people not taking antihypertensive therapy (1).

Hypertensive crisis is a case of massive, acute increase in blood pressure which directly endangers the patient's life, represented by symptoms of hypertension which developed suddenly and which is caused by various etiological moments (2). Hypertensive crisis is defined as levels of systolic blood pressure >180 mmHg and/or levels of diastolic blood pressure >120 mmHg and is usually seen in patients with essential hypertension (3). In addition, hypertensive crisis is a severe clinical condition in which a sudden increase in arterial blood pressure can lead to acute vascular damage of vital organs, so timely detection,

evaluation and adequate treatment are crucial to preventing permanent damage to vital organs (4). Depending on whether there is damage to vital organs or not, we can distinguish between hypertensive emergency and hypertensive urgency. Hypertensive emergencies are life-threatening conditions because their outcome is complicated by acute damage to vital organs, and can be presented with neurological, renal, cardiovascular, microangiopathic and obstetric complications (5). Hypertensive emergencies include hypertensive encephalopathy, hypertensive acute left ventricular relaxation associated with acute myocardial infarction or unstable angina, aortic dissection, subarhnoic hemorrhage, ischemic stroke, and severe pre-eclampsia or eclampsia (2). Hypertensive urgency is a situation with severe increase in blood pressure without progressive dysfunction of vital organs. The most common symptoms are headache, dyspnea, nausea, vomiting, epistaxis, and pronounced anxiety (6).

Hypertension is present in approximately one billion of the world population and is responsible for an average of 7.1 million deaths annually. It is estimated that approximately 1% of patients with hypertension at some point develop a hypertensive

crisis (7). The incidence and prevalence of hypertensive crisis in the population have not been largely discussed in the medical literature. Although the incidence of hypertensive crisis is low (1%), hypertensive crisis is present in more than 500,000 Americans each year (8).

Pathophysiology of hypertensive crisis has not been entirely elucidated. In terms of pathophysiology, a disruption in the auto-regulation of systemic circulation at the level of arterioles is considered to be the cause of both forms of hypertensive crisis (9).

The fact is that in about 50% of patients with hypertensive crisis the disease progresses to that extent asymptotically and, unfortunately, hypertensive emergency and urgency are still the least understood and the worst treated acute medical problems (10).

The aim of the research is to determine the prevalence of accompanying symptoms and clinical manifestations in relation to age, sex, level of arterial blood pressure and duration of hypertension.

2. EXAMINEES AND METHODS

This paper presents and analyzes the results of a prospective study which evaluated the prevalence and clinical presentation of hypertensive crises at the level of primary health care. The study was conducted in the Emergency medical services of the Community Health Centre "Dr. Mustafa Šehović" Tuzla from November 2009 to April 2010. This study encompassed all consecutive hypertensive patients of both sexes and aged 30-80 who sought the emergency medical services of the Community Health Center Tuzla.

The study included a total of 180 hypertensive subjects divided into two groups, the control and the experimental group. The experimental group consisted of hypertensive patients with hypertensive crisis, a total of 85 subjects (47%), and the control group consisted of hypertensive patients without hypertensive crisis, a total of 95 subjects (53%).

The diagnosis of arterial hypertension was established in accordance with the definition of the World Health Organization, which defines arterial hypertension as the level of systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg in people who are not taking antihypertensive therapy (Anonymous, 1999) (1). Hypertensive crisis is defined as levels of systolic blood pressure >180 mmHg and/or diastolic blood pressure >120 mmHg in accordance with Guidelines of the U.S. National Institutes of Health (National Institutes of Health, National Heart, Lung, and Blood Institute) (3).

The criterion for inclusion in the study was the presence of hypertension. The study excluded hypertensive patients with mental illness, patients in the terminal stage of a malignant disease, patients on the chronic dialysis program, on cytotoxic therapy and long-term corticosteroid therapy, patients on oral contraceptive therapy, cocaine and amphetamine overdose. Subjects who were included in the study gave their voluntary written consent to want to participate in the study in accordance with the Code of Ethics (11).

Clinical evaluation of each subject included taking medical history data on the presence of some of the accompanying symptoms: chest pain, shortness of breath, headache, nausea and vomiting, epistaxis, anxiety, cramping, focal neurological signs and visual disturbances. The subjects provided data on the duration of hypertension, the antihypertensive therapy used

and the presence of other associated diseases (coronary heart disease, heart failure, stroke and diabetes).

Blood pressure of all patients was measured with a Welch Allyn mercury sphygmomanometer (SN 07319092504 Shock-Resistant CE0297), cuff size 34,3x11x25,3 cm. Blood pressure was measured in a sitting position after a 5 minute rest. Subjects with blood pressure $\geq 140/90$ mmHg were classified according to the guidelines of the European Society of Cardiology and the European Society of Hypertension (ECS/EHS) (12). Subjects in the control group had values of 140-179 mmHg for systolic and 90-119 mmHg for diastolic blood pressure. Subjects in the experimental group with hypertensive crisis, i.e. systolic blood pressure >180 mmHg and/or diastolic blood pressure >120 mmHg were classified into two groups: patients with hypertensive urgency (a condition with a significant increase in blood pressure without progressive damage to vital organs) and patients with hypertensive emergency (a condition with a significant increase in blood pressure with the presence of damage to vital organs, such as hypertensive encephalopathy, acute left ventricular relaxation, associated with myocardial infarction, aortic dissection, subarachnoid hemorrhage or ischemic stroke) in accordance with the guidelines of the U.S. National Institutes of Health (National Institutes of Health, National Heart, Lung, and Blood Institute) (3).

In addition to measuring blood pressure, physical examination of the subjects included the physical examination of cardiovascular and respiratory systems, as well as a neurological and ophthalmological examination.

All patients had an electrocardiogram with 12 conventional leads under optimal conditions (recording speed 25 mm/s, calibrated gauge deflection 1mV/10 mm), and the device used was Schiller AT-102 Type Serial No.070.00123 Schiller CH-6340 Baar, Switzerland. Processing of the electrocardiographic recording was performed with a traditional ruler with millimeter divisions.

For the statistical analysis of results we used methods of descriptive statistics (measures of central tendency, measures of dispersion). For comparison of proportions and mean values between the groups we used the χ^2 -test and the Student's t-test. Statistical hypotheses were tested at the significance level of $\alpha = 0.05$, i.e. the difference between the groups was considered statistically significant if $p < 0.05$.

3. RESULTS

In the prospective study, which evaluated the prevalence and clinical presentation of hypertensive crises in the Emergency medical services of the Community Health Centre "Dr. Mustafa Šehović" Tuzla, there was a total of 180 patients: 72 men (40%) and 108 women (60%), with women statistically significantly more represented than men ($p = 0.007$).

There was no statistically significant difference ($p > 0.05$) in the proportion of subjects in the control and experimental group in relation to sex.

Analyzing the representation of subjects in the experimental groups according to clinical presentation (hypertensive urgencies and emergencies), it was observed that hypertensive urgencies were significantly more common than emergencies: 71 (83.53%) vs. 14 (16.47%) ($p < 0.0001$).

There was no statistically significant difference in the proportions of subjects with hypertensive emergency and urgency in

relation to gender ($p=0.6598$). There was no statistically significant difference between subjects in the experimental and control group with respect to age, and also in the average age of both sexes between the control and experimental group ($p > 0.05$).

There was a statistically significant difference ($p < 0.05$) in the mean value of systolic pressure in subjects of both sexes between the control and the experimental group ($p < 0.0001$), and there was also a statistically significant difference ($p < 0.05$) in the mean value of diastolic blood pressure in subjects of both sexes between the control and the experimental groups ($p < 0.0001$).

Analyzing the structure of the subjects according to the accompanying symptoms in the control and experimental group (sample), and based on the calculated p -values that were less than the significance level of $\alpha = 0.05$ (5%) at which the test was performed, there is a statistically significant difference in the proportion of subjects between the control and experimental group in terms of the accompanying symptoms: nausea, vomiting, chest pain, shortness of breath, with a higher percentage recorded in the experimental group ($P < 0.0001$). The most common accompanying symptoms were headache and vertigo. Data on the distribution of accompanying symptoms in the control and experimental group are shown in Table 1.

Symptom	Control		Experimental		Total		P
	N	%	N	%	N	%	
Headache	72	75,79	63	74,11	135	75,00	0,796
Vertigo	38	40,00	42	49,41	80	44,44	0,203
Nausea	26	27,37	35*	41,17	61	33,89	0,050
Vomiting	2	2,10	35*	41,17	37	20,55	<0,0001
Chest pain	34	35,79	53*	62,35	87	48,33	<0,0001
Shortness of breath	17	17,89	53*	62,35	70	38,88	<0,0001
Epistaxis	4	4,21	3	3,53	7	3,88	0,813
Tinnitus	8	8,42	5	5,88	13	7,22	0,507

Table 1. Distribution of control and experimental group by prevalence of accompanying symptoms

Table 2 shows the distribution of subjects in the experimental group by prevalence of accompanying symptoms. Analyzing the structure of the subjects by condition (emergency or urgency) and accompanying symptoms, and based on the calculated p -values that were less than the significance level of $\alpha = 0.05$ (5%) at which the test was performed, a significantly higher proportion of patients with hypertensive emergencies had accompanying symptoms: headache, chest pain and shortness of breath ($P < 0.05$).

Accompanying symptoms	Urgency		Emergency		P
	N	%	N	%	
Headache	56	78,87	7*	50,00	0,024
Vertigo	35	49,30	7	50,00	0,962
Nausea	30	42,25	5	35,71	0,642
Vomiting	2	2,82	0	0,00	0,151
Chest pain	40	56,34	13*	92,86	<0,0001
Shortness of breath	17	23,94	10*	71,43	<0,0001
Epistaxis	3	4,23	0	0,00	0,077
Tinnitus	5	7,04	0	0,00	0,306

Table 2. Distribution of subjects in experimental group by prevalence of accompanying symptoms

There was no statistically significant difference in the proportion of male and female subjects between the urgency and emergency group. Data on the distribution of accompanying symptoms of subjects in the urgency and emergency group by sex are shown in Tables 3 and 4.

Symptom	Men		Women		P
	N	%	N	%	
Headache	18	69,23	38	84,44	0,149
Vertigo	8	30,77	27*	60,00	0,012
Nausea	11	42,31	19	42,22	0,994
Vomiting	1	3,85	1	2,22	0,710
Chest pain	14	53,85	26	57,78	0,748
Shortness of breath	7	26,92	10	22,22	0,660
Epistaxis	2	7,69	1	2,22	0,335
Tinnitus	2	7,69	3	6,67	0,873

Table 3. Distribution of patients with hypertensive urgency by prevalence of accompanying symptoms

Symptom	Men		Women		P
	N	%	N	%	
Headache	3	50,00	4	50,00	1,000
Vertigo	3	50,00	4	50,00	1,000
Nausea	2	33,33	3	37,50	0,871
Vomiting	0	0,00	0	0,00	1,000
Chest pain	6	100,00	7	87,50	0,285
Shortness of breath	4	66,67	6	75,00	0,735
Epistaxis	0	0,00	0	0,00	1,000
Tinnitus	0	0,00	0	0,00	1,000

Table 4. Distribution of patients with hypertensive emergency by prevalence of accompanying symptoms

Based on the data on the distribution of subjects by the accompanying symptoms in relation to the duration of hypertension, since the calculated (empirical) chi-square is higher than the tabular chi-square for the risk of 0.05 (5%) and 2 degrees of freedom amounting to 5.991, there was a statistically significant difference in the relative participation (percentile) of certain accompanying symptoms between the three groups of subjects grouped according to the duration of hypertension.

Table 5 illustrates the distribution of subjects in the experimental group according to the presence of left ventricular hypertrophy, based on the characteristics obtained using the ECG method. From these data we can see that left ventricular hypertrophy was present in 26 subjects (36.62%) in the urgency group and in 14 subjects (100.00%) in the emergency group.

Diagnosis	Urgency		Emergency		P
	N	%	N	%	
Left ventricular hypertrophy	26	36,62	14*	100,00	<0,0001

Table 5. Distribution of subjects in the experimental group by presence of left ventricular hypertrophy

Analysis of the data on left ventricular hypertrophy (LVH) indicated that a significantly higher proportion of subjects in the experimental group had left ventricular hypertrophy ($P=0.0001$).

A significantly higher proportion of subjects with hypertensive emergency had left ventricular hypertrophy in relation to subjects with hypertensive urgency (36.62% vs. 100.00%, $p < 0.0001$). Analyzing the clinical manifestations of hypertensive emergency, it was observed that of the 14 subjects with hypertensive emergency 13 (92.86%) (8 female and 5 male subjects) had the clinical presentation and electrocardiographic features of acute coronary syndrome, and only one male subject (7.14%) had the clinical presentation of acute pulmonary edema.

4. DISCUSSION

Hypertensive crises are urgent conditions, often life-threatening, which are characterized by a sudden onset of increased blood pressure and which are represented in more than a quarter of all medical urgencies/emergencies. As a rule, it remains unclear when and why a persistent significant increase in arterial blood pressure develops into a hypertensive crisis. The fact is that in about 50% of patients with hypertensive crisis the disease progresses to that extent asymptotically and, unfortunately, hypertensive emergency and urgency are still the least understood and the worst treated acute medical problems.

Unlike our study, the Al-Bannay and Husain cohort study, which examined the clinical presentation and comorbidities of hypertensive crises and included 154 patients with systolic and diastolic blood pressure >179 mm Hg and >119 mm Hg, concluded that 64.3% of subjects had hypertensive urgency, while hypertensive emergency was present in a higher percentage compared to our results (35.7%). In our study, hypertensive emergencies were present in 16.47% of the subjects. Given that this type of hypertensive crisis is characterized by damage to the target organs, it is assumed that the risk factors (stress, improper diet, excessive salt intake, cigarette and alcohol consumption, inadequate physical activity) that are conducive to the development of this condition were less present in the subjects of our study than in the subjects of the above-mentioned study. Their study also showed that men were over-represented compared to women (100:54) and that the majority of subjects belonged to the age group of 45-65 years of age (13). In our study, most of the subjects belonged to the age group of 60-69 years (28.23%), probably because hypertension is detected later in life, since the symptoms of this disease are particularly "covert" and, unfortunately, are most commonly detected only when they lead to the development of a potentially life-threatening symptom or complication, which is in direct correlation with the potentially lethal outcome. The one-year study by Zampaglione et al showed that out of 14,209 patients that checked into the Internal Medicine Emergency Unit, 1634 (11.5%) were classified as hypertensive crisis, 76% of whom had hypertensive urgency and 24 % hypertensive emergency. In the same study, the number of women identified with the condition was larger than that of men, as in our study. 23% of patients who checked in did not know that they were suffering from hypertension (14).

The data from these studies differ from the data obtained in our study, which suggest a much greater representation of hypertensive crisis in emergency medicine (11.5% vs. 47.23%). It is devastating that our study revealed that such a large number of patients suffer from unregulated hypertension. The probable reason for this is that the vast majority of patients do not take their disease seriously and do not adhere properly to the prescribed therapies and recommended lifestyle. On the other hand, the reason for such a large percentage of hypertensive crises may be the use of inadequate antihypertensive drugs or irregular control of blood pressure. Also, our results showed that hypertensive emergencies were less common (16.47%), while hypertensive urgencies were more common in our study compared to the data from the Zampaglione et al study (83.53% vs. 76%). Similar to the Zampaglione et al study, women were represented in greater numbers than men, namely 63.38% as hypertensive urgency and 57.14% as hypertensive emergency.

If, on the other hand, we compare the data on the percent-

age of hypertensive urgencies and emergencies with data from the Martin et al study, it is evident that, out of 452 patients, 60.4% were hypertensive urgency and 39.6% were hypertensive emergency, which is a slightly smaller percentage of urgencies, and higher percentage of emergencies, compared to the data obtained in our study. If we observe the age of subjects suffering from hypertensive urgency in this study, which was 59 ± 14.8 vs. 49.9 ± 18.6 years, it is evident that in the Martin et al study the 60-80 age group was the most represented for hypertensive emergency (15).

Of the total number of subjects in our study, hypertensive crisis was observed in 47.23% of the subjects. Although women were significantly more represented than men (60% vs. 40%, $p=0.007$) there was not a large difference in the percentage of hypertensive crisis between the two sexes. Unlike men, women have a higher prevalence of hypertension in elderly age, during the period of menopause and post-menopause, when there are changes in hormone balance which up to that period must have acted as a protective mechanism in the development of arterial hypertension. This is supported by the data from our study, where the average age of the women developing a hypertensive crisis was 61.35 ± 11.83 , while in men it was 55.56 ± 10.36 years of age. Similar data have been reported in the Zampaglione et al study, which revealed that 60% of the female subjects were classified in the group with hypertensive crisis, and that women were over-represented in the total hypertensive population.

By analyzing the accompanying symptoms, it can be seen that in the total number of subjects of all ages the most common accompanying symptom were headache (75%) and vertigo (44.44%). The Zampaglione et al study showed that the most common accompanying symptom in the hypertensive urgency group was headache (22%), then epistaxis (17%) and psychomotor agitation (10%), while in the hypertensive emergency group the most common symptom were chest pain (27%), shortness of breath (22%) and hypertensive encephalopathy (16%). Unlike our results, which indicated that acute coronary syndrome and acute left ventricular relaxation were the only two clinical manifestations of hypertensive emergency, the Martin et al study concluded that hypertensive crises constituted 0.5% of all urgency cases and 1.7% of all clinical emergencies, with cerebral ischemic stroke and acute pulmonary edema the most common hypertensive emergencies, which was correlated with neurological deficits and dyspnea (15). The 1996 Zampaglione et al study found that the most common clinical presentation of hypertensive emergency was cerebral infarction (24.5%), pulmonary edema (22.5%), followed by hypertensive encephalopathy (16.3%) and congestive heart failure (12%) (14). Based on the data of our study on the clinical manifestation of hypertensive emergency and the accompanying pathology of cardiovascular origin in the Emergency medical services, it can be assumed that the patients in this region simply have greater affinity for the development of any segment of cardiovascular incident.

5. CONCLUSION

The total sample of 180 subjects was 60% female and 40% male. The incidence of hypertensive crises in the Emergency medical services was high at 47.22%. The largest number of subjects (28.23%) with hypertensive crisis belonged to the age group of 60-69. Hypertensive urgencies were significantly more common than emergencies (88.53% vs. 16.47%, $p<0.0001$). The

average blood pressure in subjects with hypertensive crisis was 204.82/126.58 mmHg. There was no statistically significant difference in the number of patients with hypertensive urgency and emergency in relation to age, gender, duration of hypertension, except for the 40-49 age group, where urgency was statistically significantly higher ($p=0.0407$). The most common symptoms in subjects with hypertensive crisis were headache (74.11%), chest pain and shortness of breath (62.35%), vertigo (49.41%), and nausea and vomiting (41.17%). Chest pain, shortness of breath, nausea and vomiting were significantly over-represented in patients with hypertensive crisis ($p<0.005$). The most common symptoms of hypertensive urgency were headache (78.87%) and chest pain (56.34%), while the most common symptoms of hypertensive emergency were chest pain (92.86%) and shortness of breath (71.43%). Headache, chest pain and shortness of breath were significantly over-represented in patients with hypertensive emergency ($p <0.005$). Clinical manifestations of hypertensive emergency were acute coronary syndrome (92.86%) and acute pulmonary edema (7.14%).

CONFLICT OF INTEREST: NONE DECLARED.

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