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HYPERTENSION PREVALENCE IN MEDICAL STUDENTS

Tıp Fakültesi Öğrencilerinde Hipertansiyon Prevalansı

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ABSTRACT	ÖZ

Objective: This research aimed to determine the blood pressure characteristics of medical students, serving as a reflection of the young adult population.

Material and Methods: This study, conducted at the Kırıkkale University Faculty of Medicine, included 20 students for each class, amounting to 120 medical students. Blood pressure (BP) was taken twice using a sphygmomanometer and averaged.

Results: The mean age of the students was 21.7±2.1years. Nineteen (15.8%) patients had hypertension. Five (4.2%) students were obese; all of them were male. There was no significant difference between the classes regarding of mean weight, height, and BMI. The mean SBP was significantly higher in grade 4 than the grades 2, 3, and 5 (126.8±5.2 mmHg vs 115.7±9.7 mmHg, 115.7±6.7 mmHg, and 113.2±13.3 mmHg, respectively). There was no significant difference with regard to the rates of smoking, alcohol use, SPS, and family history of HT and diabetes. The prevalence of HT was significantly higher in grade 4 than grades 2, 3, and 6. There was a positive correlation between SBP and body weight, height, and BMI. High BMI was found to be an independent risk factor in the multiple regression analysis.

Conclusion: We concluded that, chronic stress leads to the release of stress hormones such as steroids that play a role in the development of hypertension, especially in grade 4 students.

Keywords: Medical students, hypertension, obesity

Amaç: Bu çalışmada, tıp fakültesi öğrencilerinin kan basıncı değerlerini ve ilgili demografik özelliklerini araştırmayı amaçladık.

Gereç ve Yöntemler: Tıp Fakültesi'nde gerçekleştirilen bu çalışmaya her sınıftan 20'er olma üzere 120 tıp öğrencisi katılmıştır. Kan basınçları sfigmomanometre ile 2 kez ölçülüp ortalaması alınmıştır.

Bulgular: Öğrencilerin ortalama yaşı 21.7±2.1 yıl idi. On dokuz (15.8%) hastada hipertansiyon mevcuttu. Beş (4.2%) öğrenci obezdi; bunların tamamı erkekti. Ortalama ağırlık, boy ve BMI açısından sınıflar arasında anlamlı bir fark yoktu. Ortalama sistolik kan basıncı (SBP) 4. sınıfta 2., 3. ve 5. sınıflara göre anlamlı şekilde daha yüksekti (sırasıyla 126.8±5.2 mmHg vs 115.7±9.7 mmHg, 115.7±6.7 mmHg ve 113.2±13.3 mmHg). Sigara içme, alkol kullanımı, uyku paterni, ailede hipertansiyon ve diyabet öyküsü oranları açısından sınıflar arasında anlamlı bir fark bulunmadı. Hipertansiyon prevalansı, 4. sınıfta 2., 3. ve 6. sınıflara göre anlamlı şekilde daha yüksekti. SBP ile vücut ağırlığı, boy ve BMI arasında pozitif bir korelasyon vardı. Yüksek BMI, çoklu regresyon analizinde bağımsız bir risk faktörü olarak bulundu.

Sonuç: Özellikle de 4. sınıf tıp fakültesi öğrencilerinde kronik stresin, steroid gibi stres hormonlarının salınımına yol açarak hipertansiyona zemin hazırladığı sonucuna vardık.

Anahtar Kelimeler: Tıp öğrencileri, hipertansiyon, obezite

INTRODUCTION

Hypertension is one of the primary contributors to global mortality and represents a significant risk factor for cardiovascular disease and associated conditions (1). According to a brief report by the World Health Organization (WHO) in 2013, hypertension (HT) accounted for 9.4 million deaths worldwide, attributable to complications arising from hypertension (2). A research paper by Zhang and colleagues, using data from the National Health and Nutrition Examination Survey (NHANES) -a program that evaluates the health and dietary habits of adults and children in the United States- revealed that in the years 2013 to 2014, 7.3% of people aged 18 to 39 had HT (3). Medical students are part of the young adult group whose high blood pressure prevalence is measured using data from the NHANES database. In India, a study carried out by Patnaik and colleagues found an even greater proportion (67%) of medical students with either prehypertension or hypertension (4). Lifestyle plays a significant role in hypertension. Firstly, it's widely acknowledged that smoking and alcohol consumption are risk factors for hypertension (5,6). Likewise, dietary habits influenced by globalization have been associated with hypertension (7). Thirdly, physical inactivity is recognized as a risk factor for hypertension. Finally, obesity is strongly associated with hypertension. Obesity is regarded as an independent predictor of hypertension (5). We have not found any studies in the literature on hypertension in medical faculty students in our country. This research aimed to determine the blood pressure characteristics of medical students, serving as a reflection of the young adult population.

MATERIALS AND METHODS

This study, conducted at the Kırıkkale University Faculty of Medicine, was cross-sectional, spanning from January 2024 to March 2023. The study protocol was approved by the Faculty's Ethics Committee (decision no: 2023.12.10, date:10.01.2024). The study included 20 students for each class, amounting to 120 medical students, who consented to participate in the research (The study population was determined as 20 with G-power program by taking impact size 0.5, α=0.05, power (1-β) =0.80 at a confidence level of 95%). Participants were randomly selected from their class list. While selecting, 10 girls and 10 boys from each class were chosen. All students who expressed interest in study participation were instructed to visit the testing center at any time between 9 AM and 5 PM. There, we recorded their medical history, conducted physical examinations, and provided a consent document.

A questionnaire was employed to collect information on their identity, blood pressure measurements, smoking, alcohol and sleep pattern of sleepless (SPS), the previous years grade point average (GPA), fast food diet per month (FFDM), and first-degree relatives' history of chronic diseases (hypertension, diabetes). The physical examination included measurements of weight and height, as well as a calculation of body mass index (BMI). Blood pressure (BP) was taken twice using a sphygmomanometer and averaged.

The 2017 American College of Cardiology/American Heart Association (ACC/AHA) Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults revised the threshold for hypertension (HT) as a systolic blood pressure (SBP) of 130 mmHg or higher, or a diastolic blood pressure (DBP) of 80 mmHg or higher (8). This is different from previous guidelines, which defined hypertension as a systolic blood pressure of 140 mmHg or higher or a diastolic blood pressure of 90 mmHg or higher.

Statistical analysis

The normality of the data distribution was assessed using the Kolmogorov-Smirnov test. All the parameters under investigation were normally distributed except FFDM. Differences between the groups in terms of continuous variables in 6 groups were evaluated using the ANOVA test. Differences in proportions were evaluated using the chi-square test. Correlations between parameters were assessed using Pearson/Spearman correlation tests. Regression analysis was used to assess the relationship between blood pressure and some variables. A p-value of less than 0.05 was considered statistically significant. Statistical Package for Social Science (SPSS) version 16.0 (SPSS, Chicago, IL, USA) was used for all statistical analyses.

RESULTS

The mean age of the students was 18.9±0.8, 20.1±1.0, 21.8±1.4, 21.9±0.7, 23.4 ±0.8, 24.4 ±0.9 years, respectively in each grade; in total, the mean age was 21.7±2.1years. Nineteen (15.8%) patients had hypertension. Five (4.2%) students were obese; all of them were male. There was no significant difference between the classes in terms of mean weight, height, and BMI (p=0.304, p=0.998, p=0.558, respectively). The mean SBP was significantly higher in grade 4 than the grades 2, 3, and 5 (126.8±5.2 mmHg vs 115.7±9.7 mmHg, 115.7±6.7 mmHg, and 113.2±13.3 mmHg, respectively). Besides, the mean DBP was also higher in grade 4 than the grades 5 and 6 (83.4±3.2 mmHg vs 71.1±7.4 mmHg and 72.7±11.7 mmHg, respectively). There was no significant difference between the grades with regard to mean GPA and median FFDM (p=0.895, p=0.064, respectively). Of all students, 37.5% had insomnia, 21.7% were smoker; 17.5% were using alcohol; 27.5% had a family history of HT; and 16.7% had a family history of diabetes.

There was no significant difference with regard to the rates of smoking, alcohol use, SPS, and family history of HT and diabetes. The prevalence of HT was significantly higher in grade 4 than in grades 2, 3, and 6 (p=0.048, p=0.008, p=0.028, respectively) (Table 1).

Table 1: Distribution of parameters between classes

Variable	Total	Class 1	Class 2	Class 3	Class 4	Class5	Class 6	P	Posthoc analysis
Mean age (year)	21.7±2.1	18.9±0.8	20.1±1.0	21.8±1.4	21.9±0.7	23.4±0.8	24.4±0.9		
Mean weight (kg)	68.9±17.3	64.3±13.3	69.8±15.3	66.7±14.5	66.6±14.1	76.7±25.4	69.7±18.4	0.304	
Mean height (m)	170±14	171.4±11.1	171.4±9.4	170.5±9.3	170.1±8.5	170.7±28.1	171.0±8.8	0.998	
Mean BMI (kg/m^2)	22.8±3.4	21.6±2.4	23.6±4.0	22.7±3.4	22.7±3.0	22.7±3.2	23.5±4.3	0.558	
Mean SBP (mmHg)	117.8±11.1	120.2±13.6	115.7±9.7	115.7±6.7	126.8±5.2	115.2±11.0	113.2±13.3	<0.001	4 vs 2, p=0.002 4 vs 3, p≤<0.001 4 vs 5, p=0.004 4 vs 6, p=0.004
Mean DBP (mmHg)	78.3± 8.7	78.2±10.7	82.5±5.7	77.5±5.0	83.4±3.2	71.1±7.4	72.7±11.7	<0.001	4 vs 5, p=0.001 4 vs 6, p=<0.001
Patients with hypertension n (%)	19 (15.8)	3 (15)	2 (10)	1 (5)	8 (40)	3 (15)	2 (10)	0.041	4 vs2, p=0.48 4 vs 3, p=0.008 4 vs 6, p=0.028
Mean GPA	3.04±0.35		3.00±0.31	3.05±0.26	3.04±0.29	3.13±0.52	3.01±0.29	0.895	
Mean FFDM	5 (0-30)	7 (0-15)	7 (0-25)	5 (2-20)	5 (1-20)	3 (0-30)	10 (1-25)	0.064	
Cigarette n (%)	26 (21.7)	4 (20)	5 (25)	4 (20)	5 (25)	3 (15)	5 (25)	0.964	
Alcohol n (%)	21 (17.5)	6 (30)	5 (20)	3 (15)	3 (15)	2 (10)	2 (10)	0.457	
SPS n (%)	45 (37.5)	6 (30)	10 (20)	5 (15)	11 (55)	4 (20)	9 (45)	0.115	
Family history of hypertension n (%)	33 (27.5)	3 (15)	5 (25)	5 (25)	6 (30)	6 (30)	8(40)	0.641	
Family history of diabetes n (%)	20 (16.7)	1 (5)	2 (10)	3 (15)	3 (15)	7 (35)	4 (20)	0.175	

BMI:Body mass index, SBP:Systolic blood pressue, DBP:Diastolic blood pressure, GPA: Grade Point Average, FFDM: Fast food diet per month, SPS: sleep pattern of sleepless

There was no significant difference between patients with a family history of hypertension and patients without in comparison of gender, age, weight, height, BMI, mean SBP, mean DBP, patients with hypertension, mean GPA, mean FFDM, smoking, alcohol use, SPS, and family history of diabetes (Table 2).

Table 2: Comparison of parameters between patients with family history of hypertension and not

Variables	Family history positive	Non family history	p
Gender (male) n (%)	15 (45.5)	18 (54.5)	0.540
Mean age (year)	22.1±2.1	21.6±2.1	0.282
Mean weight (kg)	71.6±22.7	67.9±14.8	0.391
Mean height (m)	168 ±21.6	171.8±9.8	0.352
Mean BMI (kg/m^2)	23.0±3.8	22.7±3.3	0.764
Mean SBP (mmHg)	116.5±11.1	118.3±11.2	0.447
Mean DBP (mmHg)	77.2 ±8.0	78.7±9.04	0.376
Patients with hypertension n (%)	6(18.2)	13 (14.9)	0.664
Mean GPA	3.1±0.3	3.0±0.3	0.327
Mean FFDM	5 (0-30)	5 (0-25)	0.927
Cigarette n (%)	5 (15.2)	21 (24.1)	0.286
Alcohol n (%)	5 (15.2)	16 (18.4)	0.677
SPS n (%)	9 (27.3)	36 (41.4)	0.154
Family history of diabetes n (%)	9 (27.3)	11 (12.6)	0.055

BMI:Body mass index, SBP:Systolic blood pressue, DBP:Diastolic blood pressure, GPA: Grade Point Average, FFDM: Fast food diet per month

There was a positive correlation between SBP and body weight, height, and BMI (Table 3).

Table 3: Correlation coefficients between the blood pressures and the parameters

Variables*	SBP	DBP
Age	r=-0.158, p=0.085	r=0.-0.237, p=0.009*
Weight	r= 0.226, p=0.013*	r= 0.257, p=0.005*
Height	r= 0.322*, p=<0.001*	r= 0.248, p=0.006*
BMI	r=0.412, p=<0.001*	r=0.474, p=<0.001*
FFDM	r= 0.001, p=996	r= -0.006*, p=0.946
GPA	r=0.215, p=0.039*	r=0.011, p=0.918

BMI:Body mass index, SBP:Systoic blood pressue, DBP:Diastolic blood pressure, GPA: Grade Point Average, FFDM: Fast food diet per month
*p<0.05

However, there was no significant correlation between age, GPA, and FFDM (p>0.05). High BMI and male gender were found to be the risk factors for HT in univariate regression analysis. However, only high BMI was found to be an independent risk factor in the multiple regression analysis (OR=0.196, 95% CI 1.016-1.457; **p=0.033***).

DISCUSSION

Studies focusing on university students, especially those in medical programs, are rare. In our study, we showed that high BMI is influential in blood pressure like in previous studies. A study carried out in Guangxi, China, demonstrated that the prevalence of hypertension among obese adolescents was notably higher in comparison to

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those with a normal body weight 89). Additionally, the likelihood of hypertension in obese adolescents was fourfold greater than in adolescents with a normal body weight (10).

Bawazier's research from Indonesia showed a figure of 12% for the prevalence of hypertension among medical students (11). In a study conducted on 153 medical students aged between 17 and 35 at the University of Taubate Faculty of Medicine in Spain, the prevalence of hypertension was found to be 5.88% (12). A study from Uganda showed a prevalence of hypertension of 14% in medical students (13). The reason for the relatively high prevalence of hypertension in our study population is that we used the revised blood pressure limit based on the new AHA 2018 criteria (15.8%) (8). Additionally, we included all preclinical and clinical students unlike Bawazier's study which included preclinical students. According to our measurements, 4.2% of the students were obese. In a previous study in a group of medical students, this rate was found to be 15.38% (14). There was a study conducted in 2016 in which the percentage of obese students was 8.4% (15). Such variable rates in the literature may be caused by racial characteristics and dietary habits. We found that all of the 5 obese patients were male and 2 of them hypertensive. We also found that male gender was a risk factor for HT in the univariate analysis. Actually, multivariate analysis showed that the main factor here was obesity. We found that BMI had a significant positive correlation with SBP and DBP. In a study that included Chinese college students, obesity was detected in 6.69% of students with hypertension (16). A study conducted in 2018 found a prevalence of 9.8% for obesity among 1000 medical students. It also found a correlation between BMI and SBP, DBP (17). Obesity is a medical problem in male medical students, and may require rapid targeted intervention. The pathways that influence these blood pressure patterns include interactions between the renin-angiotensin-aldosterone system and sex hormones, as well as psychosocial gender-related factors like socioeconomic disadvantage (18). Moreover, elevated weight correlates with alterations in the cardiovascular system, such as fat accumulation in the vessel lumen, which ultimately results in increased blood pressure (19).

We found a higher BP and a higher prevalence of HT in class 4 students. This finding might be due to the higher stress level experienced by medical students, as has been previously reported (20). Hudzinski et al. investigated the correlation between chronic stress and hypertension (21). The study involved 127 hospitalized individuals. After three days in the hospital, 17.3% of the hospitalized patients had high blood pressure, defined as blood pressure above 140/90 mmHg. This was in contrast with the outpatient groups, where hypertension was seen in 5% of the stress group and 13% of the "normal" group. So, our results suggest that tension and chronic stress make people more susceptible to essential hypertension and new exposure of class 4 students to the hospital environment must have had a stressor effect.

A study conducted with the participation of 4th grade students from the Hacettepe University Faculty of Medicine, 22.8% of the participants scored a designated Epworth A score of 11 or above on the Sleepiness Scale (DDS) (22). Unlike that study, the rate in our study group was higher. Although the rate of students with sleeplessness was highest in the 4th class, the difference between the grades was not significant. However, we did not use a scale, and that was a limitation in our study. In another study, 17.2% of medical students smoked, with the students of the grades 1, 2, 3, 4, 5 and 6 having smoking rates of 22%, 15%, 7.1%, 31.3%, 11.7%, and 14.3% (23). Similarly, we found a smoking rate of 21.7%. In the Netherlands, 24% of students are hazardous drinkers compared to 10% in the general adult population (24). In contrast, we found a lower rate of alcohol consumption. Of course, religious factors have an important impact on alcohol consumption in our country. Additionally, none of our students was a hazardous drinker.

There was no difference in the parameters and especially in the frequency of hypertension between patients with and without a family history of hypertension. Although previous studies have shown that the presence of familial hypertension affects the development of hypertension, these studies mostly pertain to the adult period (25). Thus, our findings could indicate that familial factors lead to hypertension appearing at later stages of life.

We think that the prevalence of sleep disorders and smoking, which are among the risk factors for hypertension, increase in 4th grade students. We think that as you get used to the internship training, sleep patterns are improved over time, and the rate of smoking cessation gradually increases, hence the prevalence of hypertension decreases in grades 5 and 6. On the other hand, smoking and alcohol consumption were not risk factors for HT. We attributed this finding to the fact that these 2 harmful habits did not cause HT, the population was young, and these harmful substances need a long time to affect blood vessels. Secondly, genetic differences between individuals significantly determine the effects of alcohol and nicotine on blood pressure (26). Differences in metabolizing enzymes may cause some individuals to be more sensitive or resistant to hypertension due to alcohol and nicotine consumption (27).

A limitation of this study was that the lack of differential diagnosis of HT; biochemical laboratory values such as lipid profile and renal function tests; and

renal Doppler ultrasonography and echocardiographic study. The organic causes of hypertension have not been investigated. However, the students diagnosed with hypertension were informed and referred to the relevant internal branch for investigation.

This study carried out among medical students revealed a high rate of hypertension in this group of young participants. We concluded that, chronic stress leads to the release of stress hormones such as steroids that play a role in the development of hypertension, especially in grade 4 students. Appropriate environments and opportunities should be provided to university students including medical faculty students to avoid stress factors, (participation in exercise, consumption of quality food other than fast food, etc.). Finally, additional research, including national surveys, should be undertaken, particularly among younger age groups, to uncover the hidden burden of hypertension in Türkiye.

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