Research Article

Evaluation of Bolu Abant Izzet Baysal University Faculty of Medicine Students Awareness Levels About Blood Pressure Abnormalities

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Abstract

Objectives: Blood pressure (BP) abnormalities, including hypertension (HT) and hypotension, are important clinical issues. HT is defined as systolic BP ≥140 mmHg or diastolic BP ≥90 mmHg. Hypotension is defined as systolic BP <90 mmHg, mean arterial pressure <60–65 mmHg, or a >40 mmHg drop in SBP from baseline in hypertensive patients. Several global studies have examined BP abnormalities and related awareness. This study aimed to evaluate medical students' knowledge and awareness of HT and hypotension.

Methods: Medical students from Abant Izzet Baysal University voluntarily participated after providing informed consent. A supervised questionnaire was used to assess their knowledge, covering demographics (age, gender), definitions, diagnosis, treatment, and contributing factors. Awareness was evaluated across academic years, from 1st to 6th year.

Results: Awareness of BP abnormalities increased with each academic year: 72.1% in 1st year, 75.5% in 2nd, 82.8% in 3rd, 98.1% in 4th, 98.3% in 5th, and 100% in 6th year. Recognition of contributing factors such as diet, smoking, alcohol, and stress, as well as awareness that HT may damage organs, reached 100% in the 5th and 6th years.

Conclusion: The findings show a clear increase in medical students' awareness of BP abnormalities as they advance through medical education.

Keywords: Blood pressure abnormalities, awareness levels, medical students

Hypertension (HT) is a major health problem both globally and Türkiye. The 2024 Europe Guidelines state that having an office systolic blood pressure of ≥140 mmHg or a diastolic blood pressure of ≥90 mmHg is considered HT.[1] Hypotension is defined as a systolic blood pressure (SBP) <90 mmHg, a mean arterial pressure <60-65 mmHg, or an SBP decrease >40 mmHg from baseline in hypertensive patients.[2]

HT is the primary modifiable risk factor for the development of cardiovascular diseases and related deaths. The prevalence of HT varies between men and women. Heart Disease and Stroke Statistics 2021 Update reports that the age-adjusted prevalence of HT in the U.S. between 2015 and 2018 was 51.7% in men and 42.8% in women over the age of 20, highlighting HT as a continuing global concern.[3] In Türkiye, the prevalence of HT in adults is reported as 30.3% (32.3%

in women and 28.4% in men),[4] with a 4-year incidence rate of 21.4% (43.3% in individuals over 65 years of age).[5] The prevalence of HT increases with age and is associated with risk factors such as obesity, excessive salt intake, physical inactivity, diabetes mellitus, and genetic predisposition. Blood pressure follows a circadian rhythm, peaking in the early morning hours, gradually decreasing throughout the day, and reaching its lowest values at night.[6]

Like HT, hypotension is also a significant health concern. If not promptly corrected, it can lead to shock, characterized by impaired tissue perfusion, multi-organ failure, and potentially death.[7]

Our study, we aimed to evaluate the level of knowledge of Bolu Abant Izzet Baysal University Medical Faculty students on HT and hypotension and assess how their awareness evolves throughout their medical education, ultimately generating scientific data on the subject.

Methods

The study was initiated with the approval of the Abant İzzet Baysal University Ethics Committee (decision number 2023/460 dated 19.12.2023). The study was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants in the study. The required sample size was calculated using G*Power software, assuming an effect size of 0.3, 40 degrees of freedom, and a chi-square distribution with a significance level of 5% and 80% power. The analysis indicated a need for at least 307 participants to detect a significant difference. Question 9 in the survey had 6 options, and question 15 had 9 options. Therefore, the degrees of freedom were calculated as $(9-1)*(6-1)=40(9-1)*(6-1)=40(9-1)*(6-1)=40$. Question 15 was excluded from statistical evaluation.

The survey included demographic questions such as age and gender, as well as questions evaluating students' knowledge of BP abnormalities (e.g., hypotension and HT), the extent of their knowledge, and their general opinions on the diagnosis and treatment of these conditions. Responses were collected as "yes," "no," or "idea".

Statistical Analysis

In our study, the distribution characteristics of variables showing continuous variation during descriptive statistics were performed with the Kolmogrov-Smirnov test. continuous normally distributed variables expressed as mean±standard deviation and compared with one-way ANOVA. Categorical variables were expressed as absolute frequency and percentage (%) and compared with Chi-square test. Statistical significance level was accepted as $p < 0.05$.

Results

A total of 342 medical students from Bolu Abant Izzet Baysal University participated in the study: 62 from the first class, 54 from the second class, 59 from the third class, 53 from the fourth class, 60 from the fifth class, and 54 from the sixth class. Among the students who participated in the survey, 99% were single, and 57% were women. The mean age of participants was 21.69±2.17 years. Detailed demographic characteristics of the participants, including marital status, gender distribution, and mean age across class levels, are presented in Table 1.

Among the participants, 72.1% of first-class, 75.5% of second-class, 82.8% of third-class, 98.1% of fourth-class, 98.3% of fifth-class, and 100% of sixth-class students reported having knowledge about the definition, diagnosis, and treatment of blood pressure (BP) abnormalities (p<0.001). Knowledge about the prevalence of BP abnormalities in the country was lowest among first-class students (55.7%) and highest among sixth-class students (87%) (p<0.001) (Table 2).

The highest proportion of students with BP abnormalities, either in themselves or their close relatives, was observed in the sixth class (77.8%) (p<0.001). The highest proportion of students reporting medication use for BP abnormalities

Survey Questions	Class 1, %	Class 2, %	Class 3, %	Class 4, %	Class 5, %	Class 6, %	p
1. Marital Status							
Single	98.4	100	98.3	100	98.3	100	0.742
Married	1.6	0	1.7	0	1.7	0	
2. Gender							
Female	60.7	47.2	41.4	83	47.4	66.7	<0.001
Male	39.3	52.8	58.6	17	52.1	33.3	
3. Age							
Mean±SD	18.86±1.23	20.22±1.08	21.29±1.12	22.5±1.35	22.98±1.02	24.51±0.69	<0.001

Table 1. Demographic Characteristics of Survey Participants

Table 2. Knowledge and Awareness of Blood Pressure Abnormalities

Survey Questions	Class 1, %	Class 2, %	Class 3, %	Class 4, %	Class 5, %	Class 6, %	p
4. Do you have knowledge about the definition, diagnosis, and treatment of blood pressure abnormalities (low blood pressure and high blood pressure)?							
Yes	72.1	75.5	82.8	98.1	98.3	100	<0.001
6. Do you have any knowledge about the prevalence of blood pressure abnormalities in our country?							
Yes	55.7	64.2	82.8	77.4	81.4	87	<0.001

in themselves or relatives was in the second class (77.4%), (p<0.001). The proportion of students who had never had their BP measured was lowest in first-class students (77%) (p=0.001). The percentage of students who knew how to measure BP increased progressively from the first to the sixth class, reaching 100% in the fifth and sixth classes (p<0.001). The percentage of students who learned BP measurement at the hospital was 6.6% in the first class, rising to 94.8% and 92.6% in the fifth and sixth classes, respectively (p<0.001) (Table 3).

The second-class students had the highest ownership rate of BP measurement devices (69.8%), with 59.6% of these being digital devices (p<0.001). Fifth-class students were the most knowledgeable about digital BP measurement devices (89.8%) (p=0.015). Sixth-class students had the least trust in digital devices (55.5%) while fifth-class students were the most trusting in measurement digital devices (72.9%) (p=0.42). Most available BP measurement devices performed measurements from the brachial region, with the highest usage in second-class students (68.6%) (p<0.001). The belief that BP abnormalities are associated with diet, smoking, alcohol consumption, and stress, and that HT damages organs, reached 100% among fifth- and sixth-class students (p<0.001) (Table 4, Fig. 1).

As shown in Table 5, when participants were asked whether they believed there was a connection between blood pressure abnormalities (hypotension or HT) and lifestyle-related factors such as daily diet, smoking, alcohol con-

Table 3. Blood Pressure Measurement Experience, Family History, and Training Sources

Survey Questions	Class 1, %	Class 2, %	Class 3, %	Class 4, %	Class 5, %	Class 6, %	p
5. Is there anyone in your family, your spouse, or your spouse's family who has blood pressure abnormalities?							
Yes	70.5	73.6	55.2	58.5	44.1	77.8	<0.001
18. Do you or any of your relatives take medication due to blood pressure abnormalities (hypotension or hypertension)?							
Yes	75.4	77.4	63.8	52.8	49.2	40.7	<0.001
7. Have you ever had your blood pressure measured?							
Yes	77	94.3	94.8	92.5	91.5	92.6	0.001
8. Do you know how to measure blood pressure?							
Yes	60.7	81.1	89.7	96.2	100	100	<0.001
9. Where did you learn to measure blood pressure?							
At the hospital	6.6	9.6	12.1	71.7	94.8	92.6	<0.001
At the pharmacy	4.9	3.8	1.7	0	0	1.8	
From a healthcare professional	13.1	34.6	24.1	7.5	1.8	1.9	
By researching on the internet myself	6.5	5.8	1.7	0	1.7	0	<0.001
Other	36.1	30.8	51.8	17	1.7	3.7	
I don't know how to measure	32.8	15.4	8.6	3.8	0	0	

Table 4. Blood Pressure Device Ownership and Trust in Measurements

| Survey Questions	Class 1, %	Class 2, %	Class 3, %	Class 4, %	Class 5, %	Class 6, %	p
10. Do you have a blood pressure measurement device?							
Yes	52.5	69.8	46.6	49.1	27.1	38.9	<0.001
11. Do you have knowledge about digital blood pressure measurement devices?							
Yes	67.2	83	84.5	84.9	89.8	88.9	0.015
12. Is your blood pressure measurement device digital?							
Yes	49.2	59.6	34.5	41.5	20.3	31.5	<0.001
13. Do you trust the measurements of digital blood pressure devices?							
Yes	60.7	58.5	60.3	60.4	72.9	55.5	0.42
14. Where does your blood pressure measurement device take measurements from?							
Brachial area	49.2	68.6	50.9	56.6	37.3	68.5	<0.001
Wrist area	23	7.9	17.5	7.5	3.4	3.7	
I don't have a blood pressure measurement device	27.8	23.5	31.6	35.9	59.3	27.8	
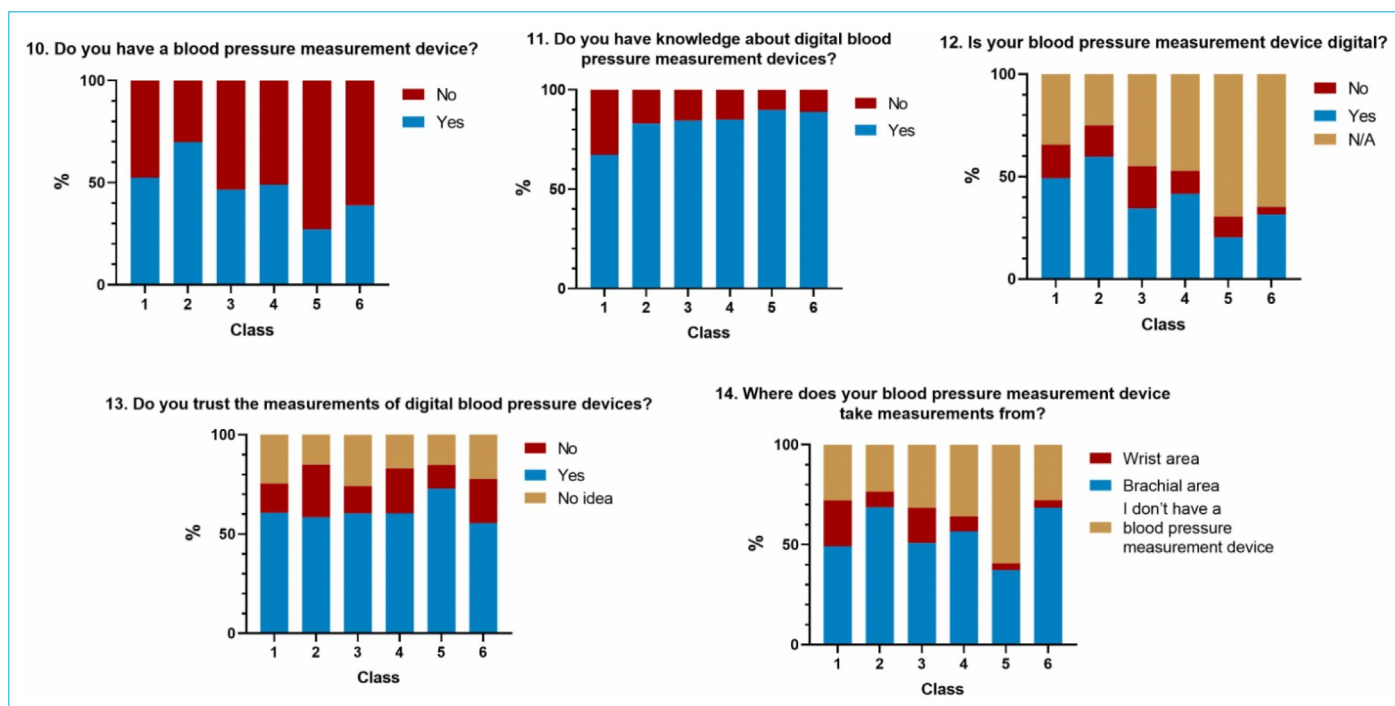
Figure 1. Distribution of Responses Regarding Blood Pressure Device Ownership, Usage, and Trust Among Medical Students by Class Year.

sumption, and stress (Question 15), a high proportion of students responded affirmatively. The percentage of "yes" responses ranged from 86.9% in Class 1 to 100% in Classes 2, 4, 5, and 6. This difference between classes was statistically significant (p<0.001). In Question 16, which evaluated students' awareness of the organ-damaging potential of HT, the proportion of affirmative responses varied between 80.3% (Class 1) and 100% (Classes 5 and 6) (p<0.001), indicating a progressive understanding of HT's systemic effects. For Question 18, addressing whether students considered medications used for blood pressure abnormalities to be harmful to the body, a wider distribution of responses was noted. Affirmative responses ranged from 24.1% (Class 6) to 49.2% (Class 5), with the difference being statistically
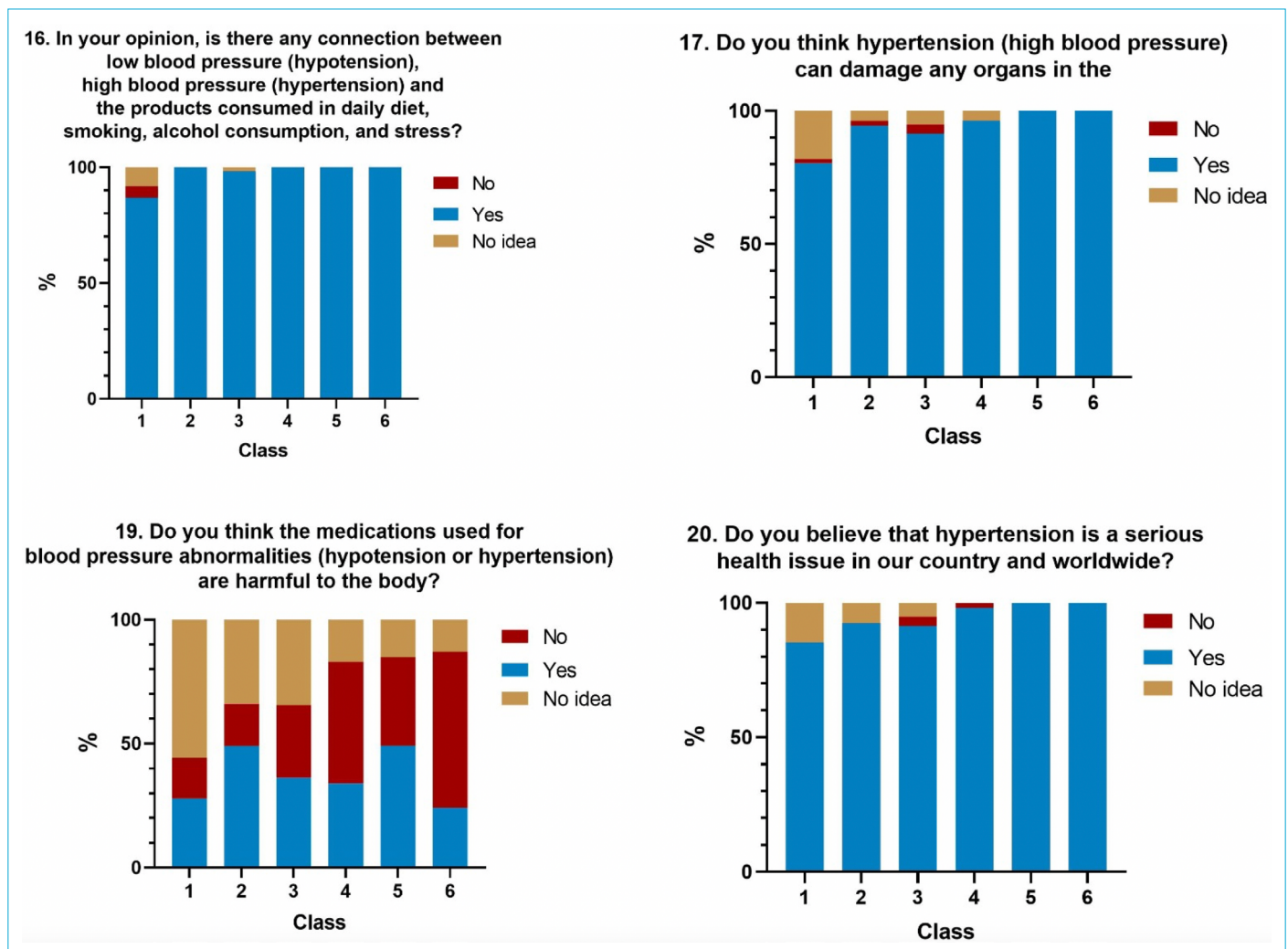
Figure 2. Medical Students' Opinions on Hypertension: Causes, Organ Damage, Medication Effects, and Public Health Importance by Class Year.

significant (p<0.001). This suggests varying perceptions or concerns about pharmacotherapy among students. Finally, the belief that HT is a serious health issue both nationally and globally (Question 20) increased to 100% from the first to the fifth and sixth classes (p<0.001) (Fig. 2).

Discussion

In our study, a total of 342 medical students participated in the survey. It was observed that the knowledge levels regarding the definition, prevalence, diagnosis, and treatment of BP abnormalities increased progressively from the first to the sixth class of medical education. Similarly, the percentage of students who knew how to measure BP and who learned this skill in a hospital setting increased with advancing class. Sixth-class students were the least trusting of digital BP measurement devices. The belief that BP abnormalities are associated with dietary habits, smoking, alcohol consumption, stress, and that HT damages organs reached 100% among fifth and sixth-classes students.

Sixth-class students were also the least likely to believe that medications for BP abnormalities are harmful to the body.

Globally and in Türkiye, the primary focus of discussions on BP abnormalities is typically HT. Among 1-1.5 billion adults worldwide suffer from HT, also known as high blood pressure, a serious global health issue, of whom over half are unaware they have it.[8] It is a major risk factor for serious illnesses such kidney disease, heart disease, and stroke.[9] The risk increases along with lifestyle factors such as poor diet, inactivity, high salt intake and alcohol use.[10] For example, in Türkiye, the prevalence of HT among adults is reported to be 30.3%, with a four-class incidence rate of 21.4%.[3,4]

HT is a serious health problem. It is not merely a risk factor but also a significant cause of various cardiac, cerebral, and vascular complications, such as stroke, coronary heart disease, heart failure, atrial fibrillation, peripheral arterial disease, cognitive impairment, and dementia, as demonstrated in numerous epidemiological studies.[11-13]

Several international studies have investigated HT awareness. For instance, similar studies conducted in France and China reported low HT awareness rates. In these studies, awareness was broadly defined as the proportion of individuals with a BP measurement of ≥140/90 mmHg who were aware of their HT status, acknowledged it, and were receiving treatment.[14,15] Another study by Kılıçkap et al.[16] highlighted that, although there have been improvements in HT awareness, treatment, and control rates, awareness levels remain below acceptable thresholds. As presented in Table 4, there is considerable variability in medical students' ownership, knowledge, and trust regarding home blood pressure monitoring (HBPM), reflecting a partial disconnect between awareness and practical engagement.

Although familiarity with digital devices was relatively high, actual ownership was limited and uneven across classes, with many students relying on wrist monitors rather than brachial devices despite known accuracy issues.[17,18] Notably, trust in digital device measurements remained moderate, aligning with previous findings that up to 72% of home sphygmomanometers are inaccurate, especially when not validated.[18] These perceptions may also reflect concerns shared by primary care physicians, such as improper measurement technique, limited integration of readings into care, and anxiety induced by HBPM.[19] Since correct usage such as proper cuff placement and arm positioning is critical for reliable readings,[20] the current findings underscore the need for structured, hands-on training in HBPM within medical education. By equipping future physicians with the skills to critically assess device quality and educate patients ef-fectively, HBPM can be leveraged as a valuable and trustworthy tool in the management of HT.

As illustrated in Table 5, medical students demonstrated a high level of awareness regarding the relationship between lifestyle factors such as diet, smoking, alcohol consumption, and stress and blood pressure regulation, aligning with previous evidence that individuals with heightened health consciousness are more likely to engage in health-promoting and environmentally responsible behaviors.[21] The belief that HT can cause organ damage increased steadily across class years, reaching full consensus among senior students, suggesting that medical education effectively enhances health literacy over time.

However, students' perceptions regarding the potential harm of antihypertensive medications showed significant variability and, in some cases, misalignment with current scientific evidence. This variation signals a critical gap in pharmacological literacy, underscoring the need for more focused and evidence-based instruction on the safety and efficacy of antihypertensive treatments. Notably, the near-unanimous agreement that HT constitutes a serious public health issue at both national and global levels reflects a commendable level of societal health awareness among future healthcare professionals. Nevertheless, the coexistence of accurate beliefs with notable misconceptions highlights the importance of integrating comprehensive, longitudinal health education that addresses both behavioral risk factors and therapeutic interventions. Such strategies are essential to strengthen scientific reasoning, correct misinformation, and promote informed decision-making in the future clinical practice of medical students.

Table 5. Perceptions of Risk Factors, Organ Damage, and Medication Use

Survey Questions	Class 1, %	Class 2, %	Class 3, %	Class 4, %	Class 5, %	Class 6, %	p
16. In your opinion, is there any connection between low blood pressure (hypotension), high blood pressure (hypertension) and the products consumed in daily diet, smoking, alcohol consumption, and stress?							
Yes	86.9	100	98.3	100	100	100	<0.001
17. Do you think hypertension (high blood pressure) can damage any organs in the body?							
Yes	80.3	94.3	91.4	96.2	100	100	<0.001
19. Do you think the medications used for blood pressure abnormalities (hypotension or hypertension) are harmful to the body?							
Yes	27.9	49.1	36.2	34	49.2	24.1	<0.001
20. Do you believe that hypertension is a serious health issue in our country and worldwide?							
Yes	85.2	92.5	91.4	98.1	100	100	<0.001

Our findings reinforce the importance of educational interventions to increase awareness and understanding of BP abnormalities, particularly HT, which remains a significant public health challenge worldwide. Strengthening these efforts could contribute to improved prevention, early diagnosis, and management of HT and its complications.

Limitations

Being a single-center study is a limitation of the study.

Conclusion

BP abnormalities, particularly HT, are widespread and serious global health issues. General awareness and consciousness levels about these conditions are often insufficient. Given that all participants in our study were medical students, it was expected that their awareness levels would be higher than those in other professions. As predicted, the findings of our survey showed that medical students' awareness of blood pressure issues increases significantly as they progress from their freshman to senior years of medical school.

Furthermore, our observation of a significant increase in awareness regarding BP abnormalities as students progressed from their first to final class highlights the substantial impact of medical education in this area. This finding underscores the importance of comprehensive training in fostering a deeper understanding of critical health issues like BP abnormalities, ultimately contributing to better prevention, diagnosis, and management practices. HT can be treated more easily when diagnosed early. Therefore, every person should adopt a healthy lifestyle and have their blood pressure checked regularly. Since HT often does not show symptoms until it reaches dangerous levels, routine blood pressure monitoring is very important. It is necessary to increase people's awareness about HT.

Disclosures

Ethics Committee Approval: The study was initiated with the approval of the Abant İzzet Baysal University Ethics Committee (decision number 2023/460 dated 19.12.2023).

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Conflict of Interest: None declared.

Authorship Contributions: Concept – T.M., M.İ.; Design – T.M., M.İ. ; Supervision – T.M., M.İ. ; Materials – T.M., M.İ.; Data collection &/or processing – T.M., M.İ., E.G., Y.Ç., Y.U.G., S.A., H.D., E.E, S.A.Ö.; Analysis, Statistics and/or interpretation – T.M., M.İ.; Literature search – T.M., M.İ.; Writing – T.M., M.İ.; Critical review – T.M., M.İ.

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