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ARTICLE

Neck-to-height ratio in Bosnian university students according to the 2017 American College of Cardiology/ American Heart Association guidelines on hypertension classification

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Abstract

Objectives: The purpose of the present study was to assess neck-to-height ratio (NtHR) and its possible association with other anthropometric measures of obesity and blood pressure (BP) values in Bosnian university students stratified by new 2017 American College of Cardiology/American Heart Association Task Force hypertension (HT) guidelines.
Methods: The present study included 417 subjects with median age 20 (19-21) years that were divided into normal BP, elevated BP, stage 1 HT, and stage 2 HT groups based on BP measurements using auscultatory methods. Standard anthropometric indices including neck circumference (NC) were measured. NtHR (cm/m) was calculated in each participant based on the NC and height. Differences between groups were assessed by Kruskal-Wallis followed by Man-Whitney test and correlations were determined by Spearman test.
Results: The prevalence of elevated BP was 19.2%, stage 1 HT 21.6%, and stage 2 HT 11.0 %. NtHR was highest in the stage 2 HT group. NtHR correlated significantly with all anthropometric measures in all groups. No correlation between NtHR, systolic BP, and diastolic BP was found, except in the stage 1 HT group, where a significant correlation between NtHR and systolic BP was uncovered.
Conclusions: Based on the observed correlations between NtHR and standard measures of obesity, NtHR could be included in clinical practice, since it is simple and does not induce discomfort. The high prevalence of elevated BP found in the present study suggests HT prevention requires the implementation of programs aimed at promoting healthy dietary habits, physical activity, as well as effective stress management and coping mechanisms.

Key words neck-to-height ratio, anthropometry, blood pressure, hypertension, young adults, metabolic syndrome, prevention.

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Introduction

Elevated blood pressure (BP) is a risk factor for cardiometabolic, kidney, and other chronic noninfectious diseases. In 2017, novel hypertension (HT) classification guidelines were issued by the American College of Cardiology/American Heart Association (ACC/AHA) Task Force. As in previously published guidelines, the main purpose of these most recently issued guidelines is to advance prevention, treatment, and control of HT.[1] Metabolic syndrome is a state of metabolic dysregulation characterized by, among other disturbances, predisposition to HT.[2] Accordingly, many patients with metabolic syndrome have elevated BP or grade 1 HT.[3] Numerous mechanisms are involved in the development of HT in metabolic syndrome, and almost all of them are related to obesity. Major culprits implicated include increased sympathetic output, an increase in the activity of the renin-angiotensin-aldosterone system (RAAS), sodium retention, and endothelial dysfunction.[1]

Sympathetic stimulation may be a consequence of the action of leptin, a hormone secreted primarily by adipose tissue. Under normal circumstances, leptin induces vasoconstriction through the activity of the sympathetic nervous system, but also endothelium-dependent vasodilation, which ultimately does not lead to a change in vascular tone. In obese patients, however, the influence of leptin on endothelium-dependent vasodilation is decreased, while its influence on vasoconstriction through sympathetic output remains. This imbalance leads to endothelial dysfunction and consequently to HT.[4]

Insulin resistance might also play an underlying role in the development of HT. In healthy individuals, insulin leads to vasodilation via nitric oxide (NO) released by the endothelium. On the other hand, in the kidney's insulin increases sodium and consequently water retention, which may lead to an increase in the BP. Interestingly, in insulin resistance, the effects of insulin on vasodilation are lost, but the effects of insulin on the kidneys remain or may even be exaggerated.[5] Moreover, insulin may cause vasoconstriction via activation of the sympathetic nervous system, and these effects are maintained in an insulin-resistant state.[6]

One of the major mechanisms that leads to HT involves RAAS and studies have shown that insulin affects RAAS activity, pointing an interplay between RAAS and insulin. Apart from insulin, adipose tissue is also regarded as possible culprit in HT development, especially since it has been shown that adipose tissue has its own RAAS. Adipocytes secrete angiotensin converting enzyme, angiotensin 1 and 2 receptors, as well as angiotensin, which produces local but also systemic effects, and causes increased production of aldosterone, resorption of sodium and water, and vasoconstriction, all of which lead to the development of HT.[7]

Chronic low-grade inflammation, oxidative stress, and insulin resistance result in endothelial dysfunction, which contributes to an increase in BP and atherosclerosis. Local perivascular inflammation causes decreased production of adiponectin, and increased production of angiotensin II, aldosterone, and superoxide among other substances that can lead to vasoconstriction.[8,9] On the other hand, adiponectin causes vasodilation and has vasoprotective and antiatherogenic effects. Adiponectin does so by enhancing the synthesis of NO as well as by inhibiting the proliferation and migration of smooth muscle cell into vessel walls. Decreased concentrations of adiponectin are reported in patients with metabolic syndrome and HT.[10]

Upper body adiposity has been shown to be a risk factor for cardiometabolic diseases. Previous studies reported that neck circumference (NC) may be a valid anthropometric predictor of metabolic syndrome and its components.[11] Neck-to-height ratio (NtHR) is another measure of upper body obesity that has recently been introduced. It has an advantage over NC, since it adjusts for the variance in NC attributable to differences in height. Data from Selvan *et al*.[12] have shown that NtHR may be a valuable predictor of metabolic syndrome. Moreover, NtHR may serve as a predictor of breathing difficulties related to sleeping in children and adults.[13] A recent study conducted among Chinese adults demonstrated an association between NtHR and arterial stiffness.[14] Mondal *et al*.[15] reported NtHT may be a reliable predictor of nonalcoholic fatty liver disease in patients with prediabetes.

More recent findings suggest an association between NC and HT. Data from Zhang *et al.*[16] demonstrated that NC is a reliable marker of HT and that as NC increases, so does the risk for diabetes, dyslipidemia, abdominal obesity, metabolic syndrome, and HT. A cross-sectional study conducted among Thai adults has demonstrated that NC correlated with HT independently from other risk factors. The authors concluded that NC may serve as a simple anthropometric indicator in HT screening.[17]

An insufficient number of studies has so far assessed possible associations between NtHR and components of metabolic syndrome, especially HT as classified by recent 2017 ACC/AHA criteria. The majority of studies have included adults, whereas studies conducted among university students are rare. Hence, the purpose of the present study was to assess NtHR values as well as its possible association with other anthropometric measures of obesity and BP values in Bosnian university students stratified by new 2017 ACC/AHA Task Force guidelines.

Materials and methods

The present study was observational and cross-sectional by design. It included all second-year university medical, dentistry, pharmacy students and students of the faculty of health studies at the University of Sarajevo (Bosnia and Herzegovina) during the 2017-18 academic year. All data were gathered during laboratory (practical) courses in systems physiology at the Department of Human Physiology. Based on the 2017 ACC/AHA guidelines subjects were divided into four groups:[1] normal blood pressure (NBP) group, elevated blood pressure (EBP) group, stage 1 hypertension (stage 1 HT) group and stage 2 hypertension (stage 2 HT) group. The research conducted in this work was done according to the Helsinki declaration as revised in 2013. The study was approved by the local university ethics committee, and subjects provided informed consent.

Anthropometric measurements

The weight and height of each subject were measured to calculate body mass index (BMI). The height was measured in centimeters by a portable stadiometer (seca 213; Seca®; Seca GmbH & Co. KG, Hamburg, Germany). The subject stood on a horizontal surface, in footwear, with feet together. The horizontal slider of the stadiometer was placed on the top of the head. From the recorded value, 2 centimeters were deducted in order to adjust for footwear. Weight was measured in kilograms using a digital scale (BS-03; Shenzhen J & E Electronics Co., Ltd., Shenzhen, China) and subjects were measured in light, casual clothing. The BMI of each subject was calculated as weight/height^2

and is expressed in kg/m^2. NC (cm) was measured with the head positioned in the Frankfort horizontal plane by a non-elastic, calibrated, flexible tape in the middle part of neck at the level of the laryngeal prominence. The upper part of tape was placed just below the laryngeal prominence and applied perpendicular to the long axis of the neck. Based on NC and height measurements, a NtHR was calculated (cm/m). Waist circumference (WC) and hip circumference (HC) were measured in standing position by calibrated tape. During the measurement, subjects stood with feet together and breathed normally. Waist circumference was measured just above the navel and hip circumference was measured at the level of widest part of the thighs. A waist to hip ratio (WHR) was calculated using the formula: waist circumference (cm)/hip circumference (cm).

Blood pressure measurements

Arterial blood pressure was measured by a standard mercury-column sphygmomanometer (SCH 11B; Smart Care, St Paul, MN, USA) while subjects were in a seated position. Prior to measurements, subjects rested for 5 minutes. The hand was positioned at the level of the heart and the sphygmomanometer cuff was positioned around the upper arm and inflated. With the use of stethoscope, while decreasing the pressure of the sphygmomanometer, systolic blood pressure (SBP) was recorded as the pressure at which the onset of the first Korotkoff sound was heard. Diastolic blood pressure (DBP) was recorded as the pressure when Korotkoff sounds were no longer audible.

In this study, blood pressure classification was those outlined in the 2017 ACC/AHA guidelines.[1] Based on these guidelines, blood pressure values were used to classify subjects into four categories: normal blood pressure (untreated SBP <120 mmHg and DBP <80 mmHg); elevated blood pressure (untreated SBP 120-129 mmHg and DBP <80 mmHg); stage 1 hypertension (untreated SBP 130-139 mmHg or DBP 80-89 mmHg); and stage 2 hypertension (untreated SBP ≥140 mmHg or DBP ≥90 mmHg).

Statistical analysis

Variable distribution was assessed by Kolmogorov-Smirnov or Shapiro-Wilk test and found to be non-normal. Data are therefore presented as median and interquartile ranges. The differences in skewed variables were assessed by the Kruskal-Wallis test followed by Man-Whitney U test. Categorical variables are shown as percentages. Correlation coefficients were assessed by the Spearman test. Statistical significance was set to p<0.05. All statistics were performed in the Statistical Package for Social Sciences (SPSS, Chicago, Illinois, USA, version 19.0).

Results

A total of 417 subjects were included in the present study. The median age of study subjects was 20 (19-21) years.

As shown in Table 1, a significant difference was observed in the median values of NC (p=0.008) between the NBP group and the EBP group. A significant difference in the median values of BMI (p=0.015), as well as in the median values of WC, HC, and NC (p<0.001) were determined between the NBP group and the stage 1 HT group. Subjects in the stage 2 HT group had significantly higher median values of BMI, WC, HC, WHR, and NC (p<0.001) compared to the NBP group. Significant differences were observed in the median values of BMI (p=0.024), WC (p=0.020), HC (p=0.004), and NC (p=0.016) between the EBP group and the stage 1 HT group. Subjects in the stage 2 HT group had significantly higher median values of BMI, WC, and NC (p<0.001) as well as significantly higher values of median HC (p=0.001) and WHR (p=0.002) compared to the EBP group. Significant differences were determined in the median values of BMI (p=0.006), WHR (p=0.013), and NC (p=0.038) between the stage 1 and the stage 2 HT groups. As expected, significant differences were observed in the median values of SBP and DBP between all studied groups (p<0.001).

Table 1. Baseline characteristics of study subjects.

Variables	NBP (n=201; 48.2%) Male/female, % 11.4/88.6	EBP (n=80; 19.2%) Male/female, % 20.0/80.0	Stage 1 HT (n=90; 21.6%) Male/female, % 44.4/55.6	Stage 2 HT (n=46; 11.0%) Male/female, % 52.2/47.8
Body mass index, kg/m^2	21.88 (20.14-23.68)	21.60 (20.27-23.87)	22.69[cf] (20.36-25.55)	24.74[ekn] (22.57-27.18)
Waist circumference, cm	74.00 (70.00-79.00)	75.00 (71.25-81.00)	79.00[dg] (72.00-86.25)	82.50[ek] (77.00-89.00)
Hip circumference, cm	96.00 (92.00-101.00)	97.50 (93.25-102.00)	101.50[dh] (96.00-106.00)	101.00[el] (98.75-108.50)
Waist hip ratio	0.78 (0.74-0.80)	0.78 (0.75-0.82)	0.78 (0.74-0.82)	0.80[emo] (0.78-0.85)
Neck circumference, cm	32.00 (31.00-34.00)	33.00[a] (32.00-35.00)	34.00[di] (32.00-37.00)	37.00[ekp] (33.00-39.00)
Systolic blood pressure, mmHg	105.00 (100.00-110.00)	125.00[b] (120.00-125.00)	130.00[dj] (120.00-130.00)	140.00[ekq] (140.00-145.00)
Diastolic blood pressure, mmHg	65.00 (60.00-70.00)	70.00[b] (70.00-75.00)	80.00[dj] (75.00-85.00)	85.00[ekq] (80.00-90.00)

Data are presented as percentages and as median and interquartile ranges. Differences between the data were assessed by Kruskal-Wallis followed by Mann-Whitney test.
NBP, normal blood pressure group; EBP, elevated blood pressure group; 1 HT, stage 1 hypertension group; 2 HT, stage 2 hypertension group.
[a]p=0.008 compared to NBP; [b]p<0.001 compared to NBP; [c]p=0.015 compared to NBP; [d]p<0.001 compared to NBP; [e]p<0.001 compared to NBP; [f]p=0.024 compared to EBP; [g]p=0.020 compared to EBP; [h]p=0.004 compared to EBP; [i]p=0.016 compared to EBP; [j]p<0.001 compared to EBP; [k]p<0.001 compared to EBP; [l]p=0.001 compared to EBP; [m]p=0.002 compared to EBP; [n]p=0.006 compared to stage 1 HT; [o]p=0.013 compared to stage 1 HT; [p]p=0.038 compared to stage 1 HT; [q]p<0.001 compared to stage 1 HT.

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The median NtHR of 20.32 cm/m (19.30-21.22) in the stage 2 HT group was significantly higher compared to median NtHR 19.28 cm/m (18.62-20.29) observed in the NBP group (p<0.001) and compared to median NtHR 19.39 cm/m (18.66-20.36) determined in the EBP group (p=0.001). Likewise, the median NtHR in the stage 2 HT group was significantly higher compared to median NtHR 19.79 cm/m (18.85-20.55) determined in the stage 1 HT group (p=0.010). No statistically significant differences were observed between other groups stratified by BP (Figure 1).

As presented in Table 2, significant correlations were determined between NtHR and BMI (p<0.001; Rho=0.554), WC (p<0.001; Rho=0.568), HC (p<0.001; Rho=0.273), WHR (p<0.001; Rho=0.530) and NC (p<0.001; Rho=0.809) in the NBP group. In the EBP group, significant correlations were observed between NtHR and BMI (p<0.001, Rho=0.486), WC (p<0.001; Rho=0.459), and NC (p<0.001; Rho=0.780). Likewise, in the EBP group, NtHR significantly correlated with HC (p=0.004, Rho=0.322) and WHR (p=0.017; Rho=0.266). Significant correlations were determined between NtHR and BMI (p<0.001; Rho=0.632), WC (p<0.001; Rho=0.614), HC (p<0.001; Rho=0.458), WHR (p<0.001; Rho=0.603), and NC (p<0.001; Rho=0.763) in the stage 1 HT group. In the stage 2 HT group, NtHR significantly correlated with BMI (p<0.001; Rho=0.812), WC (p<0.001; Rho=0.789), HC (p<0.001; Rho=0.579), WHR (p<0.001; Rho=0.558), and NC (p<0.001; Rho=0.902). In all studied groups stratified by BP, significant correlations between NtHR, SBP, and DBP were not observed except in the stage 1 HT group, where a significant positive correlation between NtHR and SBP was determined (p=0.002; Rho=0.319).

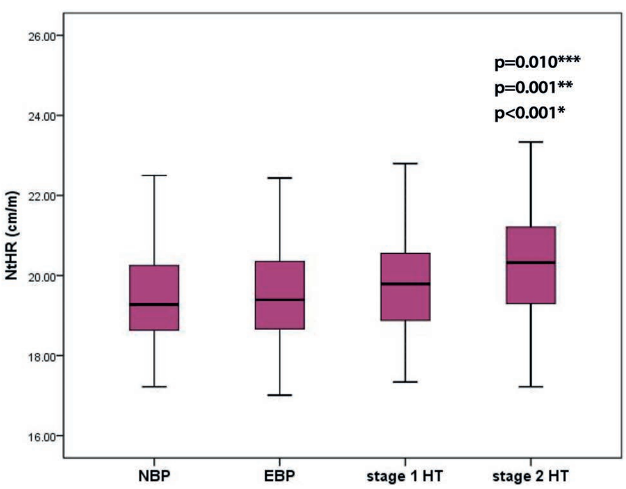

Figure 1. Box-and-whisker plots of neck-to-height ratio (NtHR, cm/m) in the four studied groups. The solid horizontal lines denote the median value, the box represents the 25% and 75% interquartile ranges, and the whiskers represent minimum and maximum values.
*Compared to normal blood pressure (NBP) group; **compared to elevated blood pressure (EBP) group; ***compared to stage 1 hypertension (HT) group.

Discussion

To the best of our knowledge, the present study is the first that has assessed NtHR is Bosnian university students stratified by 2017 ACC/AHA HT classification guidelines. We found that NtHR in subjects with stage 2 HT group was significantly higher compared to NtHR in NBP and EBP groups. Likewise, NtHR in subjects with stage 2 HT was significantly higher compared to NtHR in subjects with stage 1 HT. No statistically significant differences were observed between other studied groups stratified by BP. Since HT is one of the components of metabolic syndrome, the results obtained here are in line with the results of Patil *et al.,*[18] which demonstrated that patients with metabolic syndrome have higher values of both NtHR and NC compared to those without metabolic syndrome. Moreover, the authors reported that NtHR is a better predictor of metabolic syndrome than NC. These results are in agreement with Selvan *et al*.,[12] which demonstrated that both NtHR and NC are good predictors of metabolic syndrome and that NtHR is an even better predictor of cardiovascular risk than NC.

Although NtHR has been recently introduced, studies thus far have demonstrated that this index also serves as a reliable predictor of nonalcoholic fatty liver disease and liver stiffness in prediabetes. Namely, it has been reported that NtHR can be used as a screening tool with high sensitivity and relatively poor specificity in the diagnosis of liver stiffness. Authors have also

Table 2. Correlation between neck-to-height ratio (cm/m) and standard anthropometric measures and blood pressure values in study subjects stratified by blood pressure.

Variables	NBP (n=201)		EBP (n=80)		Stage 1 HT (n=90)		Stage 2 HT (n=46)	
	NtHR (cm/m)							
Body mass index, kg/m²	p<0.001	Rho=0.554	p<0.001	Rho=0.486	p<0.001	Rho=0.632	p<0.001	Rho=0.812
Waist circumference, cm	p<0.001	Rho= 0.568	p<0.001	Rho=0.459	p<0.001	Rho=0.614	p<0.001	Rho=0.789
Hip circumference, cm	p<0.001	Rho=0.273	p=0.004	Rho=0.322	p<0.001	Rho=0.458	p<0.001	Rho=0.579
Waist hip ratio	p<0.001	Rho=0.530	p<0.001	Rho=0.266	p<0.001	Rho=0.603	p<0.001	Rho=0.558
Neck circumference, cm	p<0.001	Rho=0.809	p<0.001	Rho=0.780	p<0.001	Rho=0.763	p<0.001	Rho=0.902
Systolic blood pressure, mmHg	p=0.729	Rho=0.025	p=0.872	Rho=-0.018	p=0.002	Rho=0.319	p=0.734	Rho=-0.051
Diastolic blood pressure, mmHg	p=0.560	Rho=0.041	p=0.257	Rho=-0.128	p=0.068	Rho=-0.193	p=0.371	Rho=-0.135

Correlation coefficients were assessed by Spearman test.
NBP, normal blood pressure group; EBP, elevated blood pressure group; 1 HT, stage 1 hypertension group; 2 HT, stage 2 hypertension group; NtHR (cm/m), neck-to-height ratio.

emphasized that NtHR has advantages over standard anthropometric measures of obesity such as WHR, since its measurement can be uncomfortable and inconvenient for certain individuals.[15] Apart from the use of NtHR and NC in the prediction of cardiometabolic diseases, these two measures are also frequently used in the detection of obstructive sleep apnea. An earlier study by Ho *et al.*[13] showed that both NtHR and NC can be used as predictors of this condition in both children and in adults.

Here, we found strong correlations between NtHR and all standard anthropometric measures in all groups stratified by BP. Similar results were reported in both male and female Asian Indians.[12] Apart from NtHR's correlations with traditional obesity indices, correlations were also shown with other cardiometabolic risk factors, such as HDL-Cholesterol and total cholesterol in males and with LDL-cholesterol, HDL-cholesterol, total cholesterol, and dysglycemia in females.[18] NtHR has also been reported to correlate with cardiometabolic risk factors and arterial stiffness in hyperlipidemic patients.[19] These results are in line with a recent study conducted among Chinese adults that demonstrated the potential of NtHR in detecting arterial stiffness and cardiovascular disease.[14]

We also assessed the correlation of NtHR with SBP and DBP. We did not uncover any significant correlation between NtHR and BP except in subjects with stage 1 HT, where a significant positive correlation was observed between NtHR and SBP. Although a positive association between obesity and BP has been demonstrated in both cross-sectional and longitudinal studies, a possible explanation for the unobserved correlation between NtHR and systolic and diastolic blood pressure in our study sample might be that subjects were within normal BMI and other anthropometric values with the exception of subjects with stage 2 HT, who were borderline overweight. Moreover, it has been shown that central adiposity is associated with greater odds for the development of HT than total adiposity.[20] Since NtHR is a marker of upper and not central adiposity, this may be another explanation for the findings attained here. Studies that evaluated correlations between NC, as another measure of upper body adiposity, with BP have produced discordant results. A recent study by Soitong *et al.*[17] reported an association between NC and HT, whereas results from an earlier study by Liang *et al.*[21] reported no association between SBP and NC as well as a diminished association between DBP and NC after adjusting for BMI and WC. These results are also in accordance with our previous report in which no correlation was observed between NC, SBP, and DBP in young adult male and female subjects.[11] Conversely, Zhang *et al*.[16] have reported that NC is strongly associated with cardiovascular risk factors in patients with HT. Since discrepancies exist between the results of studies that aim to assess the association between indices of upper body adiposity and BP, further longitudinal studies are warranted to shed light on any relevant risk associations.

Hypertension in young adults in not uncommon. This condition is diagnosed in 1 out of 8 persons aged 20-40 years.[22] The results of the present study have shown a high prevalence in elevated BP and HT in our study sample. In the present study, 19.2% of study participants had EBP, 21.6 % had stage 1 HT, and 11.0 % had stage 2 HT. The results of the Johns Hopkins Precursors study, which included 1132 white male medical students with a baseline age of 23 years, demonstrated that 0.3% of them developed HT by the age of 25 and 6.5% developed HT by the age of 45.[23] In general, estimates of HT prevalence are influenced by the population studied, the methods used to diagnose HT, as well as by the thresholds used to classify HT. In the present study, we used the 2017 ACC/AHA hypertension classification guidelines, and this might explain the observed high prevalence of EBP and HT. Accordingly, a higher prevalence of HT among US adults was determined when these new guidelines were used compared to the previous Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7).[1] The prevalence of high BP observed in our study is not in the accordance with results of Tadesse *et al.*[24] who reported that among a total of a 610 Ethiopian college students, the prevalence of HT was 7.7%. A possible reason for the observed discrepancy may be that they used JNC7 hypertension guidelines, while we used novel guidelines that have different BP classification. In this line of evidence are the results of Kamara *et al*.,[25] which compared HT prevalence in college students using novel and previous HT guidelines. The authors conclude that the change in BP classification guidelines resulted in a significant increase of those diagnosed with high BP. Our results are partially in accordance with the results of a cross-sectional observational study that aimed to assess the prevalence of HT among young adults in India. The prevalence of HT among young adults in this study was 10-30% and major risk factors associated with HT were obesity, smoking, and mental stress.[26]

The strength of the present study is that it represents the first study that explored NtHR as well as its association with standard anthropometric measures and BP values in university students stratified by the 2017 ACC/AHA HT classification guidelines. Measuring NtHR is simple and does not induce discomfort unlike some other anthropometric indices of obesity. Moreover, an advantage of NtHR is that it may be used as a surrogate marker of metabolic syndrome. Another strength of the present study is that, since the influence of ethnic background on BP and HT prevalence has been previously reported,[27] this study was the first in which BP values and prevalence of HT were assessed using the 2017 ACC/AHA HT classification guidelines in study participants of Bosnian descent. We found a high prevalence of EBP and HT in our study sample. These findings point to necessity of HT prevention among university students through programs aimed at promoting healthy dietary habits, physical activity, as well as with stress management and coping among this population.

One of the major limitations to this study is that we used a single BP measurement in estimating HT prevalence in this population. Based on current HT classification guidelines, two BP measurements during two different occasions are required for the diagnosis of HT.[1] Another limitation is that this is a cross-sectional study, which does not allow us to explore causative relationships in our findings. Finally, our study population was relatively small, and participants were university students from health-related faculties, which might influence our findings' generalizability to a wider, more diverse population.

Conclusions

The results of the present study demonstrated that the highest values of NtHR are found in subjects with stage 2 HT, and that NtHR correlates with all standard anthropometric parameters in all studied groups. BP did not correlate with NtHR, except in the stage 1 HT group, where significant positive correlation between NtHR and SBP was observed. We were limited in comparing our findings with those of other authors since an extensive literature search only yielded a few studies thus far that have evaluated NtHR, especially in university students stratified by 2017 ACC/AHA HT classification guidelines. Since we did not find a correlation between NtHR, SBP, and DBP, larger prospective studies are needed to elucidate any association between upper body adiposity indices and BP.

Contributions

The authors contributed equally.

Conflict of interest

The authors declare no conflicts of interest.

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