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The incidence rate of arterial hypertension and high normal blood pressure in students of Medical Faculty at the Kabardino-Balkarian State University

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Abstract

The aim is to assess the incidence rate of arterial hypertension (AH) and high normal arterial pressure (HNAP) in students of the Medical Faculty at the Kabardino-Balkarian State University as well as the relationship between arterial pressure (AP) and behavioral and biological risk factors (RF) of cardiovascular diseases (CVD) to substantiate the need for preventive measures.

Materials and methods

1087 students (267 males and 820 females) aged 18 years and older (average age 20.7 ± 4.6 years) have been examined with standard epidemiological methods.

Results

The incidence rate of AH among students was reported to be 5% (8.6% in males and 3.4% in females, p <0.001), HNAP was recorded to reach 4.2% (9.4% in males and 2.6% in females, p < 0.001), respectively. The interrelations between AP and anthropometric indicators, gender, smoking and physical activity were identified.

Conclusion

The study revealed the incidence rate of hypertension and HNAP in the Medical Faculty students and the interrelation between AP and the behavioral and biological RF of CVD. Our results indicate the need to develop and implement programs for the prevention of AH among students that can be used to prepare the reqiured preventive measures.

Keywords

Arterial pressure, Arterial hypertension, High normal arterial pressure, Students, Young individuals

Imprint

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Introduction

The study on arterial hypertension (AH) is a topical challenge due to high incidence rate and the predicted growth of AH morbidity and associated diseases in the Russian Federation [1-3] including particularly the Kabardino-Balkarian Republic [4]. Elevated arterial pressure (AP) is the main factor in premature death and the cause approximately of 10 million death cases and more than 200 million cases of disability in the world [5-7]. Identified is a direct relationship between the AP level and the risk of developing cardiovascular diseases (CVD), starting with the systolic AP value of 110-115 mm Hg and the diastolic AP level of 70-75 mm Hg. The latter served as the basis for the creation of the concept of prehypertension in 1939 and the subsequent definition of the high normal arterial pressure (HNAP). This issue is pressing due to the wide prevalence of HNAP and the possibility of taking early preventive measures in individuals with HNAP [6,7].

Despite a large number of studies on hypertension, the epidemiology of hypertension and HNAP among young people remains poorly understood. A special position among young people is occupied by students of medical universities, whose education and training are associated with high academic performance loading and whose actual lifestyle does not contribute to the maintenance of their health. No doubt that the formation of risk factors (RF) begins in childhood, and the negative consequences of their impact on the body accumulate throughout the life span of an individual

[8]. Some rare medical examinations in students show a wide range of data on the incidence rate of HNAP and AH in different regions [9-12]. It is found that AP levels in adolescents with hypertension demonstrate high stability during their transition to the adult category [8]. The study of the incidence of HNAP and AH is a necessary condition for planning preventive measures, and medical students are the optimal model for their implementation [13].

The aim herein is to assess the incidence rate of AH and HNAP in students of the Medical Faculty at the Kabardino-Balkarian State University and the relationship between AP and the behavioral and biological RF of CVD to substantiate the need for preventive measures.

Materials and methods

In 2011 and 2017, two parallel population studies of students of the Medical Faculty at KBSU were conducted. 1087 students (267 males and 820 females) have been examined. The average age of the examined patients was 20.7±4.6 years. The study record included a survey using a standard questionnaire to identify passport data and lifestyle indicators (education, work information, smoking adherence, alcohol consumption, the physical activity (PhA) level and dietary habits), measurement of AP, pulse rate, body length (BL) and body weight (BW), waist circumference. Tonometry was performed with a standardized sphygmomanometer, in sitting position, on the right arm, with an accuracy of 2 mmHg, in the morning, not earlier than 1 hour after physical education lessons or tests. An average value of the three measurements was used for analysis. The systolic AP and the diastolic AP values were recorded utilizing the corresponding Korotkoff sound (phase I) and the respective Korotkoff sound (phase Y). The AP categories were verified for AH and HNAP based on the systolic AP and/or diastolic AP values according to the recommendations issued by the Russian National Medical Society for Arterial Hypertension and the Russian Society of Cardiology (Fourth revision, 2010) [14]. In the present article, our analysis of the AP levels, based on the merged data file, is carried out to enhance the sampling validity. BW was measured with an accuracy of 0.1 kg, BL data were delivered with an accuracy of 0.5 cm. The Quetelet index (QI) was calculated as the ratio of BW (kg) to the square of BL (m2). Students who smoked at least one cigarette a week were classified as smokers.

Data processing was performed using the STATISTICA 6.0 software (StatSoft Inc, USA) [15]. The results of the analysis are presented as the mean and its standard deviation for continuous variables and as a percentage for categorical variables. $P<0.05$ was accepted as the critical level of significance to test statistical hypotheses. The estimation of the linear relationship (association) between the qualitative characteristics was carried out using a correlation analysis. The dependence of a quantitative normally distributed trait on the values of two or more quantitative and qualitative factors was studied using multivariate parametric analysis of variance.

Results and discussion

In the examined population of students, the average value of the systolic AP was recorded to be 113.9±10.6 mm Hg, and the average value of the diastolic AP reached 73.4±8.1 mm Hg, respectively. The values of systolic and diastolic AP in males were found higher than those in the females (see Table 1 herein).

The incidence rate of AH in the students was found to be 5%, and HNAP was recorded to be 4.2%. A comparative assessment of the incidence rate of AH and HNAP in the student population revealed some gender differences (see Figure 1 herein). The prevalence of elevated AP levels in the males was higher than that found in the females: AH was recorded in 8.6% for the males and 3.4% for the females ($p <0.001$), and HNAP was reported in 9.4% of the males and 2.6% of the females ($p <0.001$).

It should be noted that the students' awareness of the presence of AH was found to be at the low level assessed reaching 31.4%. The majority of students (58.6%) with AH reported an increase in AP during the last year. Hypotensive therapy was performed only in 6.9% of the cases.

According to studies conducted in various cities of the Russian Federation, the incidence rate of AH among students varies widely: from 9.9% in Tomsk [9] to 30-40% in Tula [12]. The highest incidence rate of HNAP was reported upon an epidemiological study covered the student cohort in Vladivostok: 5% of females and 31.4% of males [11]. As to the medical students in Perm, the incidence rate of HNAP was recorded to reach 7% [10]. The prevalence of elevated AP levels among students indicates their vulnerability to the development of cardiovascular pathology and, therefore, the need for early diagnosis-making and

Table 1
Concentration of insulin-like growth factors and their binding proteins (ng/g tissue), and ratios between the insulin-like growth factors and the binding proteins in the heart in female rats

Values	Males	Females	Total
Systolic arterial pressure, (M±δ mm Hg)	118.2±10.6*	109.6±10.6	113.9±10.6
Diastolic arterial pressure, (M±δ mm Hg)	76.7±8.0*	71.1±8.2	73.4±8.1

Note: *(p <0.0001) is a statistical significance of differences between males and females

adequate correction of elevated AP to reduce cardiovascular morbidity in the population. It is of practical importance to distinguish the category of individuals with HNAP. The implementation of preventive measures in the group of individuals with HNAP will increase the awareness of young people of the respective risk factors responsible for AH, reduce the risk of cardiovascular complications, the rate of progression of AH or avoid and prevent its development.

Associations of AP levels in the examined students with some biological (gender, age, BL, BW, QI, pulse rate) and behavioral (smoking, alcohol consumption, sleep duration, PhA, level of education) parameters were investigated using the correlation and regression analysis. Direct weak and moderate correlation coefficients were established between the levels of the systolic and diastolic AP values on the one hand and the respective anthropometric indicators (BL, BW, QI (r=0.17÷0.36, p<0.0001)), gender (r=0.38, p<0.0001), smoking (r=0.18, p<0.0001 and r=0.15, p<0.0001), smoking in the past (r=0.11, p<0.001 and r=0.09, p<0.01), regular sports (r=0.08, p<0.01 and r=0.07, p<0.05), completed hours in sports exercises (r=0.20, p<0.01 and r=0.21, p<0.01), heart rate (r=0.10, p<0.001 and r=0.07, p<0.05) on the other hand. The measured systolic AP value also correlated with the sleep duration (r=0.12, p <0.01), the number of cigarettes smoked per day by heavy smokers (r=0.26, p <0.05). Our multiple regression analysis showed that the 21% variance in the systolic blood pressure can be explained by such variables as gender (B=4.99, p <0.0001), BL (B=0.12, p <0.05), QI (B=0.90, p <0.001), pulse rate (B=0.31, p <0.0001), number of minutes per day for walking to the place of study (B=0.04, p <0.05), and the sleep duration (B=0.89, p <0.001). For the level of diastolic AP (R2=0.20), gender (B=2.09, p <0.05), pulse rate (B=0.17, p <0.01), QI (B=0.46, p <0.05), BL (B=0.10, p <0.05) and the sleep duration (B=0.45, p <0.05) were significant. It is known that the effect made by several CVD risk factors on the body can lead to the development of hypertension and its complications [8, 13]. Therefore, it is urgent to elaborate new methods for the prevention of cardiovascular complications, which may develop at the early stages of AH, when complications are formed against the seemingly full health. The results obtained by us can be used in the preparation of preventive measures aimed at keeping-up and strengthening the health of students.

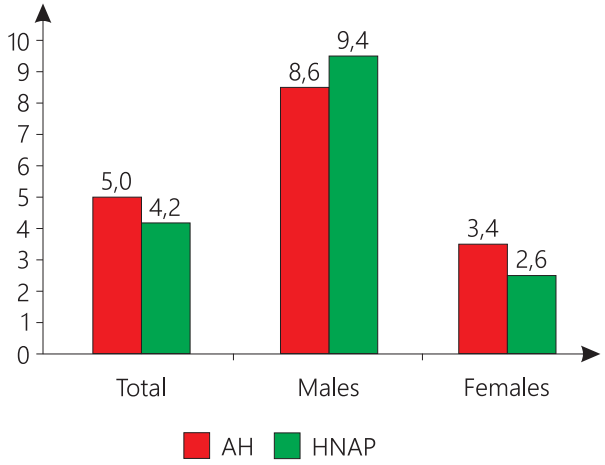

Figure 1. Incidence rate of AH and HNAP in students (%)

Statement on ethical issues

Research involving people and/or animals is in full compliance with current national and international ethical standards.

Conflict of interest

None declared.

Author contributions

The authors read the ICMJE criteria for authorship and approved the final manuscript.

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