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Review Article

The Effect of Sleep Disorders and its Duration on the Blood Pressure of Third-Year Students of Grsmu

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Abstract

Arterial hypertension remains one of the most significant medical and social problems of our time. Despite significant advances in pharmacotherapy, the prevalence of hypertension continues to grow, which forces the search for new pathophysiological determinants. In the last two decades, sleep has become established as one of the main factors in the regulation of cardiovascular homeostasis. Sleep is a complex biological process necessary for the restoration of the autonomic nervous system, endocrine balance, and metabolic functions

Keywords: Arterial hypertension; cardiovascular homeostasis

Introduction

Relevance. Arterial hypertension remains one of the most significant medical and social problems of our time. Despite significant advances in pharmacotherapy, the prevalence of hypertension continues to grow, which forces the search for new pathophysiological determinants. In the last two decades, sleep has become established as one of the main factors in the regulation of cardiovascular homeostasis. Sleep is a complex biological process necessary for the restoration of the autonomic nervous system, endocrine balance, and metabolic functions [1, 2].

Sleep disorders, including both changes in its duration (short and prolonged sleep) and qualitative characteristics (fragmentation, insomnia, obstructive sleep apnea syndrome), are considered as independent predictors of blood pressure (BP) measurement. According to the results of the main meta-analyses, a reduction in sleep duration of less than 6 hours per day is associated with a 23% increased risk of hypertension [3, 4].

The biological mechanisms linking sleep disorders with hypertension are multifaceted. The main role is played by hyperactivation of the sympathetic nervous system. Normally, during deep sleep, there is a natural decrease in BP. However, when sleep time is reduced or fragmented, excessive sympathetic stimulation is observed at night, which persists during the waking period [5]. In addition, chronic lack of sleep alters the molecular processes that lead to activation of cellular immunity and induce inflammatory cytokines that cause the development of endothelial dysfunction, which directly contributes to vascular wall stiffness [6, 7]. An additional aspect is the effect of circadian rhythms on the renin-angiotensin-aldosterone system. Sleep disruption desynchronizes the secretion of aldosterone and cortisol, increases sodium retention and vasoconstriction [8].

Sleep problems are particularly relevant among students. The study period is characterized by high cognitive load, chronic stress and forced sleep hygiene disorders. Sleep disorders in students can become a trigger that turns transient fluctuations in blood pressure into a persistent pathology.

The aim of the work is to study the effect of sleep disorders and duration on blood pressure levels and the presence of episodes of blood pressure changes in third–year students of Grodno State Medical University in 2025/2026.

Research methods. The study involved 385 girls and 160 boys, third-year students of the Grodno State Medical University (Republic of Belarus) in the 2025-2026 academic year. The students provided voluntary informed consent to participate in the study.

An anonymous survey of students was conducted on the presence of episodes of elevated and low BP, as well as sleep disorders (insomnia, frequent waking up, restless sleep, sleep apnea syndrome). The answers were offered: "no," "yes," "I don't know." After that, the individuals who answered "I don't know" were excluded from the analysis. The students were also interviewed about their average sleep duration.

BP was measured according to WHO recommendations with a mechanical tonometer using the Korotkov method. Further, students who smoked, drank tea, coffee, and energy drinks for 1 hour or less before the study were excluded from the study. BP levels were assigned a category according to the recommendations of the European Society of Cardiology in 2024: optimal BP (<120/80 mmHg), normal BP (120-129/80-84 mmHg), high-normal BP (130-139/85-89 mmHg), elevated BP (≥140/90 mmHg), low BP (<100/60 mmHg).

Qualitative features were presented in the form of absolute values and relative frequencies (%). Categorical variables were compared using contingency tables, Pearson's chi-squared test and Fisher's exact test. A p-value of less than 0.05 was considered statistically significant. Statistical data processing was performed using StatSoft Statistica 10.0.

The results and their discussion. In girls who suffered from sleep disorders, the incidence of low BP was higher than in those who did not suffer: 15.87% and 7.84%, respectively, p=0.039 (Table 1); and there was also a higher incidence of episodes of high BP: 28.26% and 19.16%, respectively, p=0.04 (Table 2); and the incidence of episodes of low BP: 60.00% and 47.69%, respectively, p=0.027 (Table 3). Thus, the girls who indicated the presence of sleep disorders had a high frequency of episodes of both low and elevated BP.

Sleep disorders	n	Low BP	Optimal BP	Normal BP	High-normal BP	High BP
No sleep disorders	153	7.84% (12 people)	30.72% (47 people)	35.95% (55 people)	15.69% (24 people)	9.80% (15 people)
Sleep disorders present	63	15.87% (10 people)	46.03% (29 people)	17.46% (11 people)	12.70% (8 people)	7.94% (5 people)

Table 1: Sleep disorders and distribution of blood pressure categories among third-year female students of GrSMU in the 2025/2026 academic year, % (absolute value)

Sleep disorders	n	No episodes of elevated BP	Episodes of elevated BP present
No sleep disorders	214	80.84% (173 people)	19.16% (41 people)
Sleep disorders present	92	71.74% (66 people)	28.26% (26 people)

Table 2: Sleep disorders and distribution of elevated blood pressure episodes among third-year female students of GrSMU in the 2025/2026 academic year, % (absolute value)

Sleep disorders	n	No episodes of low BP	Episodes of low BP
No sleep disorders	216	52.31% (113 people)	47.69% (103 people)
Sleep disorders present	100	40.00% (40 people)	60.00% (60 people)

Table 3: Sleep disorders and distribution of low blood pressure episodes among third-year female students of GrSMU in the 2025/2026 academic year, % (absolute value)

Girls with a sleep duration of less than 5 hours had a higher frequency of episodes of elevated BP compared with those with a sleep duration of more than 5 hours: 36.11% and 21.18%, respectively, p=0.04 (Table 4).

Sleep duration	n	No episodes of elevated BP	Episodes of elevated BP
Sleep duration > 5 hours	288	78.82% (227 people)	21.18% (61 people)
Sleep duration < 5 hours	36	63.89% (23 people)	36.11% (13 people)

Table 4: Sleep duration and distribution of elevated blood pressure episodes among third-year female students of GrSMU in the 2025/2026 academic year, % (absolute value)

In young men who suffered from sleep disorders, the incidence of low BP was higher than in those who did not suffer: 6.67% and 1.67%, respectively; and there was also a higher incidence of elevated BP: 46.67% and 15.0%, respectively, p=0.049 (Table 5); and the frequency of episodes elevated BP: 48.0% and 21.7%, respectively, p=0.01 (Table 6). Thus, in young men who indicated the presence of sleep disorders, there is a high incidence of both low and elevated BP.

Sleep disorders	n	Low BP	Optimal BP	Normal BP	High-normal BP	Elevated BP
No sleep disorders	60	1.67% (1 person)	18.33% (11 people)	40.00% (24 people)	25.00% (15 people)	15.0% (9 people)
Sleep disorders present	15	6.67% (1 person)	13.33% (2 people)	13.33% (2 people)	20.00% (3 people)	46.67% (7 people)

Table 5: Sleep disorders and distribution of blood pressure categories among third-year male students of GrSMU in the 2025/2026 academic year, % (absolute value)

Sleep disorders	n	No episodes of elevated BP	Episodes of elevated BP present
No sleep disorders	106	78.30% (83 people)	21.70% (23 people)
Sleep disorders present	25	52.00% (13 people)	48.00% (12 people)

Table 4: Sleep duration and distribution of elevated blood pressure episodes among third-year male students of GrSMU in the 2025/2026 academic year, % (absolute value)

Conclusions:

1. Sleep disorders in female 3rd-year students of GrSMU (according to the survey) lead to changes in blood pressure, which is manifested in an increase in the frequency of occurrence of the category of low blood pressure, and there is also a high frequency of episodes of low and elevated blood pressure. Sleeping less than 5 hours a day leads to an increase in the incidence of episodes of elevated blood pressure.

2. Sleep disorders in male 3rd-year students of GrSMU are characterized by an increase in cases of both low and high blood pressure, as well as cases of episodes of high blood pressure.

3. Violations of the quality and duration of sleep may determine the risk of developing hypertension in the future. Early detection of sleep problems can provide effective measures to prevent hypertension in young people.

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