Hygienic Factors Influencing Cognitive Performance and Mental Health Among University Students: A Survey-Based Analysis in The Context of Sanitary Standards of Uzbekistan

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Abstract

This study evaluated hygienic factors affecting cognitive performance and mental functioning among university students in Uzbekistan. A cross-sectional survey involving 420 students of the Fergana Medical Institute of Public Health was conducted during the 2026 academic year. The study assessed sleep quality, psycho-emotional stress, digital exposure, physical activity, nutritional habits, and educational environmental conditions. The findings demonstrated that irregular sleep schedules, prolonged screen time, chronic academic stress, insufficient physical activity, and unhealthy nutritional behavior were associated with decreased concentration, memory difficulties, emotional instability, and mental fatigue. Students reporting poor sleep quality and excessive smartphone use demonstrated significantly higher prevalence of headaches, visual strain, and reduced learning productivity. The results indicate that educational hygiene and lifestyle factors substantially influence cognitive efficiency and mental health among university students.

Keywords: *cognitive efficiency, educational hygiene, university students, mental health, psycho-hygiene, sleep quality, academic stress*

INTRODUCTION

Mental functioning and cognitive efficiency are fundamental determinants of successful educational activity and academic productivity among university students. Cognitive processes such as memory, attention, concentration, analytical thinking, and information processing capacity directly influence educational achievement and professional development. Modern higher education systems expose students to increasing intellectual workloads, prolonged digital exposure, emotional stress, and irregular lifestyle patterns that may negatively affect mental health and neurophysiological functioning.

The rapid expansion of digital technologies and electronic learning environments has significantly transformed the educational process in recent years. University students spend prolonged periods using smartphones, laptops, and other electronic devices for both academic and recreational purposes. Although digital technologies provide substantial educational benefits, excessive screen exposure and continuous mental stimulation may contribute to chronic cognitive fatigue, sleep disturbances, emotional instability, and decreased learning productivity.

Educational hygiene represents an important branch of preventive medicine focused on preserving student health and optimizing learning efficiency. Hygienic assessment

of educational conditions includes evaluation of study schedules, classroom microclimate, ergonomic conditions, lighting quality, psycho-emotional workload, physical activity, and behavioral lifestyle factors. According to sanitary regulations of Uzbekistan, higher educational institutions are required to provide conditions supporting physiological adaptation and prevention of excessive mental overload among students.

University students represent a particularly vulnerable population because this age period is associated with intensive intellectual activity, emotional instability, adaptation to independent living conditions, and formation of long-term behavioral habits. Irregular sleep schedules, inadequate nutrition, low physical activity, excessive caffeine consumption, and prolonged academic stress may impair neurophysiological adaptation mechanisms and contribute to reduced cognitive performance.

Previous international studies have demonstrated significant associations between educational stress and development of anxiety disorders, burnout syndrome, chronic fatigue, and sleep dysfunction among students. However, relatively limited research has evaluated the combined influence of hygienic and behavioral determinants on cognitive efficiency among university students in Uzbekistan.

This study aimed to conduct a comprehensive hygienic assessment of factors affecting mental functioning and cognitive efficiency among university students in relation to sanitary standards and educational hygiene requirements of Uzbekistan.

MATERIALS AND METHODS

A cross-sectional survey-based study was conducted during the 2026 academic year at the Fergana Medical Institute of Public Health. The study included 420 undergraduate students aged between 18 and 25 years representing different academic faculties and educational levels. Participation was anonymous and voluntary. Informed consent was obtained from all respondents prior to participation.

The primary research instrument was the “Student Cognitive Hygiene Questionnaire–2026,” specifically designed for assessment of educational hygiene and psycho-physiological indicators among university students. The questionnaire consisted of 35 structured questions evaluating sleep quality, nutrition patterns, digital device exposure, psycho-emotional stress, study workload, physical activity, and environmental educational conditions.

Sleep hygiene assessment included evaluation of sleep duration, bedtime regularity, nighttime awakening, and subjective sleep quality. Nutritional assessment evaluated meal timing, breakfast frequency, caffeine intake, fast-food consumption, and dietary regularity. Students additionally reported average daily duration of smartphone and laptop use for academic and recreational purposes.

Psycho-emotional assessment included evaluation of chronic stress, emotional tension, examination anxiety, irritability, decreased motivation, and emotional exhaustion. Physical activity levels were assessed according to frequency of sports participation and daily movement activity.

Environmental hygiene assessment evaluated classroom ventilation, lighting quality, seating comfort, noise exposure, and perceived microclimate conditions during prolonged educational sessions. Students additionally reported self-perceived

cognitive symptoms including concentration difficulties, memory impairment, mental fatigue, headaches, visual strain, and decreased academic productivity.
Collected data were analyzed using descriptive statistical methods. The prevalence of hygienic risk factors and cognitive complaints was expressed as percentages. Comparative analysis was performed according to behavioral and lifestyle characteristics.

RESULTS

The results demonstrated widespread prevalence of unfavorable hygienic and lifestyle factors among university students. Sleep disturbances represented one of the most common hygienic problems identified during the study. More than half of respondents reported irregular sleep schedules during academic periods, while approximately 61% slept less than seven hours per night during examination sessions. Students with insufficient sleep more frequently reported reduced concentration, daytime fatigue, irritability, memory difficulties, and decreased educational productivity.
Psycho-emotional stress associated with academic workload was highly prevalent among respondents. Nearly 70% of students reported experiencing chronic stress during examination periods. Emotional fatigue and psychological tension were especially common among senior students and those combining educational activity with employment.
The study additionally demonstrated extremely high levels of digital exposure among students. Average daily screen time exceeded eight hours among many participants due to combined academic and recreational use of smartphones and laptops. Students reporting prolonged digital exposure more frequently experienced headaches, visual fatigue, dry eye symptoms, sleep disturbances, and reduced concentration ability.
Visual strain represented one of the most common complaints associated with excessive smartphone use. Many respondents admitted using electronic devices immediately before sleep, potentially contributing to circadian rhythm disruption and impaired melatonin secretion.
Physical inactivity was also highly prevalent among participants. More than half of respondents participated in physical exercise less than two times per week. Students with lower physical activity levels more frequently demonstrated chronic fatigue, emotional instability, and reduced stress tolerance.
Nutritional hygiene assessment revealed irregular meal timing and inadequate dietary behavior among many respondents. Skipped breakfasts, excessive caffeine intake, fast-food consumption, and prolonged intervals between meals were frequently observed. Students with irregular nutrition patterns more commonly experienced daytime weakness, reduced concentration, and decreased mental performance during educational activities.
Environmental hygiene assessment indicated that some respondents considered classroom ventilation, lighting conditions, and seating ergonomics insufficient during prolonged study sessions. Poor educational microclimate conditions were associated with increased mental discomfort and faster cognitive exhaustion during lectures and practical sessions.

DISCUSSION

The findings of this study demonstrate that hygienic and behavioral factors significantly influence mental functioning and cognitive efficiency among university students. Sleep quality emerged as one of the most important determinants of cognitive performance. Chronic sleep deprivation negatively affects attention, executive functioning, memory consolidation, emotional regulation, and neurophysiological recovery processes. The high prevalence of sleep disturbances observed among students corresponds with international studies identifying sleep deficiency as a major contributor to academic underperformance and psychological stress.

Psycho-emotional overload associated with intensive educational activity represents another important factor influencing student mental health. Chronic academic stress activates neuroendocrine stress mechanisms involving increased cortisol production and autonomic nervous system dysregulation. Long-term exposure to such conditions may contribute to development of chronic fatigue syndrome, emotional burnout, anxiety disorders, and decreased motivation.

Excessive digital exposure observed among participants reflects ongoing transformation of modern educational environments. Although electronic devices provide educational convenience, prolonged screen exposure may contribute to visual fatigue, cognitive overload, sleep disturbances, and reduced psychological recovery. Evening exposure to blue light emitted from digital screens may suppress melatonin production and negatively affect circadian rhythm stability.

Physical inactivity identified during the study also represents an important hygienic concern. Regular physical activity improves cerebral circulation, supports neurotransmitter balance, reduces emotional tension, and enhances cognitive flexibility. Sedentary educational behavior combined with prolonged sitting may impair both physical and mental well-being among students.

The nutritional habits observed in this study were frequently inconsistent with principles of rational hygiene. Irregular meal timing, excessive caffeine consumption, and skipped breakfasts negatively influence glucose metabolism and neurophysiological functioning. Balanced nutrition plays an important role in maintaining cognitive stability and optimal mental performance.

Environmental educational conditions additionally influence cognitive functioning. Poor classroom ventilation, inadequate lighting, uncomfortable seating conditions, and excessive noise exposure may accelerate development of mental fatigue and reduce learning productivity. Educational hygiene standards are specifically designed to minimize these adverse effects and preserve physiological adaptation capacity among students.

The findings indicate that cognitive efficiency should not be considered solely an intellectual characteristic but rather a complex indicator influenced by multiple hygienic, behavioral, environmental, and psycho-emotional factors.

CONCLUSION

The study demonstrated that hygienic determinants substantially influence mental functioning and cognitive efficiency among university students. Irregular sleep schedules, excessive screen exposure, chronic academic stress, physical inactivity, unhealthy nutritional behavior, and inadequate educational environmental conditions

were associated with reduced concentration, memory difficulties, emotional instability, visual fatigue, and mental exhaustion.

The results emphasize the necessity of strengthening educational hygiene measures within higher educational institutions. Optimization of academic schedules, promotion of healthy lifestyle behaviors, improvement of classroom environmental conditions, reduction of psycho-emotional overload, and development of preventive psycho-hygienic programs are necessary for preservation of student health and improvement of educational productivity.

Comprehensive hygienic interventions targeting behavioral and environmental risk factors may significantly contribute to improving cognitive efficiency, reducing mental fatigue, and strengthening psychological well-being among university students.

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