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IMPACTS OF SLEEP HABITS AND DURATION ON ACADEMIC PERFORMANCE AND ADAPTATION

УЙКУ АДАТТАРЫНЫН ЖАНА УЗАКТЫГЫНЫН АКАДЕМИЯЛЫК НАТЫЙЖАЛУУЛУККА ЖАНА АДАПТАЦИЯГА ТАССИРИ

ВЛИЯНИЕ ПРИВЫЧЕК И ПРОДОЛЖИТЕЛЬНОСТИ СНА НА УСПЕВАЕМОСТЬ И АДАПТАЦИЮ

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IMPACTS OF SLEEP HABITS AND DURATION ON ACADEMIC PERFORMANCE AND ADAPTATION

Abstract

Sleep is a vital physiological process essential for cognitive function, emotional stability, and overall health. This study aimed to evaluate the prevalence of stress, fatigue, and sleep disturbances among first-year medical students at the International Medical Faculty of Osh State University and identify sleep-related behaviors linked to anxiety and mood disorders. A cross-sectional study utilizing a structured survey was conducted among 211 randomly selected first-year international medical students at Osh State University, with quantitative data analyzed using Microsoft Excel and qualitative insights obtained through literature review. The study revealed that 68.1% of students reported an average sleep duration of 6-8 hours per night, while 81.3% experienced mental health issues, 72.2% reported negative physical health impacts, and 68.9% acknowledged a decline in academic performance due to sleep deprivation. The findings highlight a significant prevalence of sleep deprivation among medical students, demonstrating its detrimental effects on mental and physical health, academic performance, and overall well-being, emphasizing the urgent need for targeted interventions to promote healthy sleep habits.

Keywords: sleep deprivation, medical students, academic performance, mental health, physical health

УЙКУ АДАТТАРЫНЫН ЖАНА УЗАКТЫГЫНЫН АКАДЕМИЯЛЫК НАТЫЙЖАЛУУЛУККА ЖАНА АДАПТАЦИЯГА ТАССИРИ

Аннотация

Уйку - бул таанып-билүү функцияларын, эмоционалдык туруктуулукту жана жалпы ден соолук абалын сактоо үчүн зарыл болгон маанилүү физиологиялык процесс. Бул изилдөө Ош мамлекеттик университетинин Эл аралык медициналык факультетинин биринчи курс студенттеринин арасындагы стресс, чарчоо жана уйку бузулуулары жайылган абалын баалоого жана тынчсызданууу жана көңүл-күй бузулуулары менен байланышкан уйку мамилесин аныктоого багытталган. 2024-жылдын ноябрында өткөрүлгөн кесилиш изилдөө 211 студенттин жооптору чогултулуп, алардын 68,1%и орточо 6-8 саат уктаганын билдиришкен. Бирок 81,3% уктабай калуудан улам психикалык ден соолук көйгөйлөрүн, анын ичинде тынчсызданууу жана депрессияны тажрыйбалашкан, ал эми 72,2% иммунитеттин начарлашы жана оорулардын жогорку ылдамдыгы сыяктуу физикалык ден соолук көйгөйлөрүн билдиришкен. Андан тышкары, 68,9% окуу жетишкендиктеринин төмөндөшүн, көңүл буруунун кыйынчылыктарын жана эстөө жөндөмүнүн начарлашын белгилешкен. Начар уктоо менен байланышкан гормондук дисбаланс 56% студенттерди камтыган, бул аппетиттин өзгөрүшүнө жана салмактын өзгөрүүсүнө алып келген. Уйку бузулуулары катышуучулардын 84%ында кеңири жайылган, бул көйгөйдү чечүүнүн актуалдуулугун белгилейт.

Ачкыч сөздөр: начар уктоо, медик студенттер, академиялык жетишкендик, психикалык ден-соолук, физикалык ден-соолук

ВЛИЯНИЕ ПРИВЫЧЕК И ПРОДОЛЖИТЕЛЬНОСТИ СНА НА УСПЕВАЕМОСТЬ И АДАПТАЦИЮ

Аннотация

Сон — это жизненно важный физиологический процесс, необходимый для поддержания когнитивных функций, эмоциональной стабильности и общего состояния здоровья. Это исследование было направлено на оценку распространенности стресса, переутомления и нарушений сна среди студентов-медиков первого курса Международного медицинского факультета Ошского государственного университета и выявление поведения, связанного со сном, связанного с тревожностью и расстройствами настроения. Перекрестное исследование, проведенное в ноябре 2024 года, собрало ответы 211 студентов и показало, что 68,1% из них сообщили, что средняя продолжительность сна составляет 6-8 часов в сутки. Однако 81,3% испытывали проблемы с психическим здоровьем, такие как тревога и депрессия, из-за недосыпания, в то время как 72,2% сообщили о негативных последствиях для физического здоровья, включая ослабление иммунитета и повышенную восприимчивость к болезням. Кроме того, 68,9% опрошенных отметили снижение успеваемости, сославшись на трудности с концентрацией внимания и сохранением памяти. Гормональный дисбаланс, связанный с плохим сном, затронул 56% студентов, что привело к изменению аппетита и колебаниям веса. Нарушения сна были распространены у 84% участников, что подчеркивает актуальность решения этой проблемы.

Ключевые слова: недосыпание, студенты-медики, академическая успеваемость, психическое здоровье, физическое здоровье

Introduction

Sleep is a fundamental biological necessity that plays a crucial role in maintaining physical and mental well-being, as well as optimizing cognitive functions essential for academic success. Medical students, due to their rigorous academic schedules and high levels of stress, often experience sleep disturbances that can significantly impact their performance and overall health. Sleep deprivation is a growing concern among medical students, as it is associated with increased stress levels, fatigue, and a decline in cognitive abilities, leading to poor academic adaptation [10].

The physiological processes of sleep are complex and involve multiple stages, including non-rapid eye movement (NREM) and rapid eye movement (REM) sleep, which are critical for memory consolidation, learning, and emotional regulation [1, 2]. Insufficient sleep disrupts these processes, resulting in diminished concentration, impaired decision-making, and heightened susceptibility to mental health disorders such as anxiety and depression. Research has shown that sleep deprivation affects not only academic performance but also physical health, increasing the risk of chronic conditions such as hypertension, obesity, and weakened immune function.

In a recent cross-sectional study conducted in November 2024 at the International Medical Faculty of Osh State University, findings revealed that 68.1% of first-year medical students reported an average sleep duration of 6-8 hours per night. However, approximately 50.2% of students experienced mental health challenges related to sleep deprivation, while 72.2% reported adverse effects on their physical health. These statistics highlight the pressing need to address sleep-related issues among medical students and implement strategies to promote healthier sleep habits.

Effective sleep hygiene practices, such as maintaining a consistent sleep schedule, creating a conducive sleep environment, and managing academic workload efficiently, are vital in improving sleep quality and academic performance. Educators and university authorities play an essential role in raising awareness and providing resources to support students in achieving optimal sleep patterns. Addressing sleep disturbances and promoting better sleep habits can contribute to enhanced academic outcomes, improved well-being, and overall adaptation to the demanding medical curriculum.

This study aims to further explore the relationship between sleep habits, academic performance, and adaptation among medical students, emphasizing the importance of sleep education and the implementation of effective interventions to mitigate the negative consequences of sleep deprivation.

Impacts on Physical and Mental Health

Adults require approximately 7-8 hours of sleep per night to maintain optimal health. The quality of sleep is crucial, especially for students, as inadequate sleep can significantly increase the risk of mental health issues. Mental health encompasses an individual's overall well-being, including their ability to realize their potential, learn effectively, and function productively. It is a fundamental component of health that influences both personal and collective capacities to make sound decisions. Furthermore, mental well-being is essential for personal and socio-economic development, playing a critical role in fostering and protecting overall mental health.

Sleep-related problems, such as insomnia, have been linked to various psychiatric disorders, including depression and anxiety. Even healthy individuals may experience symptoms of anxiety and depression when deprived of sufficient sleep. Chronic sleep disturbances can exacerbate existing

psychiatric conditions, making it essential to address sleep issues at an early stage to prevent worsening mental health outcomes. Improving both the quality and quantity of sleep is key to mitigating the severity of psychiatric disorders and promoting overall mental stability.

The heavy academic workload that students face often forces them to push themselves beyond their limits to meet deadlines for assignments and coursework. This constant pressure can adversely impact psychological, emotional, and cognitive functions. Inadequate sleep compromises physical health by weakening the immune system, making it more challenging for the body to fend off illnesses and infections. Prolonged sleep deprivation increases the risk of developing chronic conditions such as high blood pressure, diabetes, and obesity. Furthermore, sleep deficiency can affect appetite regulation, often leading to an increased sense of hunger, whereas adequate rest helps maintain balanced blood sugar levels [1, 8-9]

The consequences of insufficient sleep extend beyond physical health, affecting cognitive performance and emotional well-being. Individuals experiencing sleep deprivation may suffer from daytime drowsiness, fatigue, irritability, difficulties with concentration, memory impairment, and an increased susceptibility to headaches, colds, and fevers. When the brain is deprived of adequate rest, neurons become overworked, resulting in a diminished ability to function efficiently. An active memory state during sleep deprivation can lead to heightened subjective drowsiness, further impairing cognitive performance and overall well-being [4].

Addressing sleep-related concerns through early detection, intervention, and adopting healthy sleep practices is crucial for maintaining both mental and physical health. Prioritizing quality sleep can significantly enhance an individual's ability to perform daily tasks effectively and support long-term health outcomes [1, 2]

Hormonal Impact of Sleep Deprivation on Health

Hormonal changes due to sleep deprivation significantly impact overall health. Melatonin, a hormone that regulates the sleep-wake cycle, is reduced with insufficient sleep, leading to disruptions in circadian rhythms [5]. Cortisol, commonly known as the stress hormone, normally peaks in the morning; however, sleep deprivation can cause elevated cortisol levels throughout the day, increasing stress and anxiety. Growth hormone, which peaks during slow-wave sleep and is crucial for tissue repair and growth, is also disrupted, affecting physical development and recovery.

Leptin and ghrelin, hormones that regulate hunger, become imbalanced due to inadequate sleep, leading to increased appetite and potential weight gain. Low estrogen levels can contribute to sleep disturbances, fatigue, headaches, weight gain, and mood fluctuations. Similarly, a decrease in progesterone levels may result in anxiety, restlessness, and difficulty falling asleep.

The physical appearance of individuals suffering from sleep deprivation often reflects their internal health struggles. Common visible effects include dark circles under the eyes, puffiness, redness, swelling, droopy eyelids, and pale skin.

From a neurological perspective, delayed sleep midpoint, a consequence of inconsistent sleep schedules, is associated with an increased risk of cognitive decline compared to those with an average sleep timing. Greater sleep variability has also been linked to neurological disorders and cognitive impairments.

Sleep deprivation has notable effects on gastrointestinal health. It induces the production of pro-inflammatory markers, such as cytokines, while simultaneously reducing melatonin levels. This imbalance leads to elevated levels of pro-inflammatory cytokines and reduced anti-inflammatory cytokines, ultimately disturbing the circadian system and contributing to inflammation.

Regarding obesity, chronic sleep deprivation is associated with excessive food intake and weight gain. Increased ghrelin levels stimulate appetite, while altered metabolic regulation results in impaired energy metabolism, further exacerbating weight issues.

The long-term consequences of sleep deprivation are severe. Cardiovascular health is significantly affected, with chronic sleep restriction (5-6 hours or less per night) increasing the risk of hypertension, elevated cholesterol levels, heart attacks, and strokes [7].

Metabolic health is also compromised, as sleep deprivation leads to increased ghrelin levels, causing persistent hunger, and decreased leptin levels, which reduces satiety signals and contributes to a 50% increased risk of obesity. Additionally, insulin resistance resulting from poor sleep increases the likelihood of developing diabetes.

The digestive system suffers as well, with conditions such as irritable bowel syndrome (IBS) and Inflammatory Bowel Disease (IBD) being exacerbated by poor sleep habits. Sleep deprivation weakens the immune system by reducing the number of immune cells, making individuals three times more susceptible to colds and infections.

Lastly, the skin is notably affected by chronic sleep deprivation. The increase in stress hormones leads to damage in collagen production, a protein responsible for maintaining skin firmness and smoothness, which can result in premature aging signs such as dark circles and wrinkles.

Addressing sleep-related issues is essential for maintaining both physical and mental well-being, highlighting the importance of prioritizing quality sleep in daily life [1].

Correlation of sleep loss to learning capacity and academic performance

Sleep is an active, repetitive, and reversible biological process that serves multiple essential functions, including tissue repair and growth, memory consolidation, and restorative physiological processes. These functions take place throughout both the brain and the body. The absence of adequate sleep can impair behavioral, physiological, and neurocognitive processes, making sleep loss one of the most significant challenges in modern society.

Delayed sleep timing, often induced by lifestyle choices or academic pressures, disrupts intrinsic regulatory mechanisms, including both circadian and homeostatic processes. Such disruptions result in increased sleepiness, which negatively impacts cognitive function, emotional regulation, behavioral responses, and ultimately academic performance. Even a short period of sleep deprivation, such as less than a week, can lead to profound alterations in metabolic and endocrine functions.

While the primary function of sleep is cerebral restoration, accumulating sleep debt also affects peripheral functions, and if sleep deprivation persists chronically, it may have long-term adverse health consequences. Reduced carbohydrate tolerance and heightened sympathetic nervous system activity are well-recognized risk factors that contribute to the development of insulin resistance,

increasing the likelihood of metabolic disorders. Addressing sleep deprivation through better sleep hygiene and time management is crucial for optimizing academic performance and overall well-being [6].

Sleep Physiology, Pathophysiology, and Sleep Hygiene

Despite sleep's fundamental role in maintaining and enhancing both physical and mental health, a significant number of individuals fail to achieve the recommended amount of sleep or suffer from sleep disorders. Quality sleep contributes to improved cardiovascular function, mental well-being, cognitive performance, memory consolidation, immune function, reproductive health, and hormonal balance.

Sleep disorders, such as insomnia, sleep apnea, and circadian rhythm disorders, as well as disrupted sleep resulting from lifestyle choices, environmental factors, or underlying medical conditions, can lead to significant health risks. These conditions not only contribute to but also exacerbate various medical and psychiatric disorders.

The most effective long-term strategy for improving sleep quality is the adoption of proper sleep hygiene practices through behavioral and habitual modifications. Key recommendations for enhancing sleep include obtaining 7 to 9 hours of sleep per night, maintaining a consistent sleep-wake schedule, establishing a regular bedtime routine, engaging in regular physical activity, and incorporating mindfulness or relaxation techniques. Additionally, avoiding stimulants and other substances late in the day can further promote better sleep quality [7].

Implementing these sleep hygiene strategies can lead to substantial improvements in sleep duration and quality, thereby providing numerous health benefits across multiple physiological systems [2].

Sleep Architecture and Sleep Disorders

A good night’s sleep is defined by a rhythmic, cyclic process that alternates between three stages of non-rapid eye movement (NREM) sleep and a fourth stage of rapid eye movement (REM) sleep, collectively known as sleep architecture. When sleep is disrupted, individuals fail to experience its full restorative benefits, which are essential for maintaining, repairing, and rebuilding the body. Both sleep quantity and quality are critical in achieving these health benefits, which include enhanced mood, cognitive performance, and overall growth and development.

Although sleep influences every bodily system, its effects are particularly profound on the neurologic, immune, cardiovascular, and endocrine systems. Many individuals suffer from intrinsic sleep disorders that can lead to significant morbidity and impairments in daily functioning. Sleep disorders are commonly associated with reduced occupational performance, increased risk of motor vehicle accidents, and heightened pain perception [2]

Insomnia, one of the most prevalent sleep disorders, is characterized by difficulties in falling asleep, staying asleep, or both, leading to substantial daytime impairment. Addressing sleep disorders through appropriate interventions and lifestyle modifications is crucial for improving health and well-being.

Impact of Complete Sleep Deprivation on Stress Response and Autonomic Function

Sleep deprivation has a profound impact on the body's stress-regulating systems and is considered a potential underlying factor contributing to various health issues. It activates two important stress response systems: the autonomic nervous system (ANS) and the hypothalamic-pituitary-adrenal (HPA) axis. Sleep deprivation also disrupts the body's natural daily rhythms, which are closely connected to the stress system. These systems help the body stay balanced and respond to environmental challenges. Understanding how sleep loss and stress interact is important for learning how they can lead to diseases.

The activation of the stress response system encompasses both immediate and delayed physiological reactions. The ANS triggers rapid changes, such as an increase in heart rate (HR) and blood pressure (BP), while the HPA axis is responsible for a delayed hormonal response, notably characterized by elevated cortisol secretion. Alterations in ANS and cortisol responses to stress have significant clinical implications. Reduced cardiovascular reactivity, as well as diminished cortisol responsiveness, can have detrimental health effects and have been linked to conditions such as obesity, depression, cardiovascular diseases, and other adverse outcomes.

Various aspects of sleep can modulate cortisol responses to acute stressors. The findings suggest that insufficient sleep can either amplify, attenuate, or have no discernible effect on cortisol reactivity in response to stress. These inconsistencies highlight the complexity of sleep deprivation's impact on the body's stress adaptation mechanisms and underscore the necessity for further research to elucidate the precise pathways involved in these responses [3].

Methodology

This study employed a mixed-method approach, incorporating both quantitative and qualitative methods to comprehensively assess the impact of sleep habits and duration on academic performance and adaptation among first-year international medical students at the International Medical Faculty of Osh State University.

Study design: A cross-sectional survey was conducted in November 2024 to evaluate the prevalence of sleep disturbances and their associations with academic performance and health outcomes.

Sampling and participants: The study sample was randomly selected from a population of first-year international medical students of Indian origin at the International Medical Faculty, Osh State University. A total of 211 students voluntarily participated in the study. Random sampling was used to minimize selection bias and ensure the representativeness of the target population.

Data collection tool: Data were collected using a structured self-administered questionnaire consisting of 24 questions divided into two sections:

1. Demographic and sleep patterns:

Questions related to participants' age, gender, academic workload, and sleep habits (duration, quality, bedtime routines).

2. Impact of sleep on health and academic performance:

Items assessing mental and physical health symptoms, academic difficulties, and coping strategies related to sleep deprivation.

The questionnaire was designed based on validated sleep assessment tools and adapted to the context of medical students. It included both closed-ended questions for quantitative analysis and open-ended questions to gather qualitative insights.

Data analysis: quantitative data were analyzed using Microsoft Excel sheets, where descriptive statistics such as frequencies, percentages, and graphical representations were used to identify trends and patterns related to sleep habits and their effects on academic performance.

Qualitative analysis was conducted by reviewing findings from previous research studies on similar topics. Comparative analysis with existing literature was performed to contextualize the results and provide deeper insights into the experiences of the surveyed students.

Ethical considerations:
The study adhered to ethical principles outlined by institutional guidelines. Ethical approval was obtained from the ethics committee of the International Medical Faculty, Osh State University. Participants were informed about the study's purpose, and informed consent was obtained before data collection. Confidentiality and anonymity of responses were ensured throughout the research process.

Results

A total of 211 responses were collected from medical students. Among them, 68.1% reported having an average sleep duration of 6-8 hours per night. Notably, 68.9% of students acknowledged that sleep deprivation negatively impacted their academic performance. Moreover, 64.4% of respondents indicated that insufficient sleep contributed to immune system-related diseases, potentially increasing their susceptibility to infections. A significant proportion, 81.3%, suggested that sleep deprivation adversely affects mental health, with 72.2% emphasizing its detrimental effects on physiological well-being. In terms of physical appearance, 43% of students reported visible changes due to inadequate sleep.

Furthermore, 56% of participants recognized that sleep deprivation disrupts hormonal balance, impacting appetite and weight regulation. Cognitive performance was also a major concern, with 66% attributing forgetfulness to lack of sleep. Alarmingly, 84% of students reported experiencing sleep disorders, highlighting the widespread nature of sleep-related issues within the academic community. Additionally, 68% of respondents identified stomach-related abnormalities as a direct consequence of sleep deprivation, further underscoring its profound impact on overall health and well-being.

Diagram 1. Estimation of average sleeping hours

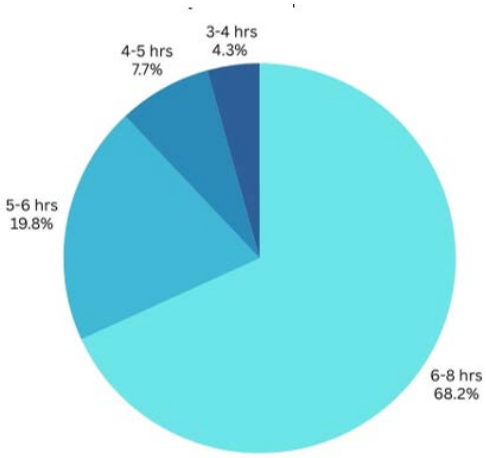
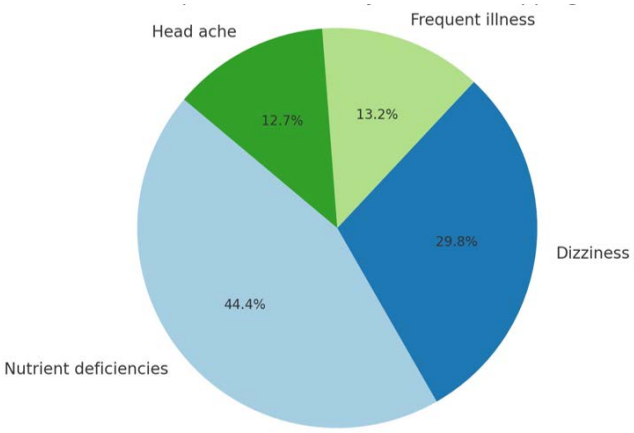


Diagram 2. Comparative analysis of side effects of skipping meals



Discussion

The findings of this study align with previous literature that underscores the critical role of sleep in maintaining cognitive and physiological functions. Kohyama (2021) highlighted that both sleep quantity and quality are crucial for overall well-being, emphasizing that sleep disturbances are associated with decreased mental resilience and heightened stress levels. Baranwal et al. (2023) further explained the physiological pathways affected by inadequate sleep, particularly its impact on cardiovascular health and metabolic processes.

Our study findings also support the conclusions of Shafiee et al. (2024), who reported a high prevalence of sleep disorders among medical students, attributing these disturbances to academic stress and lifestyle factors. This study similarly found a significant relationship between sleep deprivation and both mental and physical health deterioration.

Messa et al. (2024) explored the hormonal and autonomic consequences of sleep deprivation, revealing that sleep loss leads to disruptions in cortisol regulation and autonomic nervous system imbalances, which correspond with the elevated stress levels reported in our study population. Furthermore, Curcio et al. (2006) linked sleep deprivation to impaired learning capacity and reduced academic performance, aligning with our findings that students experiencing insufficient sleep reported difficulties in memory consolidation and focus.

These comparisons suggest that sleep deprivation is not only a widespread issue among medical students but also a multifaceted problem requiring interventions at multiple levels. Universities should consider implementing structured sleep hygiene programs, incorporating educational campaigns, and providing mental health support to mitigate the effects of sleep deprivation.

In conclusion, prioritizing sleep health is crucial for medical students, and concerted efforts from both students and academic institutions are essential to fostering a culture that values and supports healthy sleep practices.

Conclusions

Prevalence of sleep deprivation: a significant proportion of medical students experience sleep deprivation, with 68.1% reporting sleep durations of 6-8 hours per night, which may not be sufficient for optimal health and academic performance.

Impact on academic performance: Sleep deprivation is a major concern, with 68.9% of students reporting its negative impact on their academic success, highlighting the need for interventions to improve sleep habits.

Health consequences: Insufficient sleep adversely affects both mental and physical health, with 81.3% of students experiencing mental health challenges and 72.2% reporting physiological issues, such as weakened immunity and hormonal imbalances.

Physical appearance changes: Sleep deprivation visibly affects students, with 43% reporting noticeable changes such as dark circles and skin fatigue, indicating its influence on overall well-being.

Hormonal and metabolic disruptions: More than half (56%) of students acknowledged that sleep deprivation affects hormonal balance, leading to appetite dysregulation and potential weight gain.

Cognitive decline: Forgetfulness and concentration issues were reported by 66% of students, emphasizing the critical role of sleep in cognitive function and learning efficiency.

Widespread sleep disorders: Alarmingly, 84% of students reported experiencing sleep-related issues, underlining the necessity for educational institutions to address sleep hygiene among students.

Gastrointestinal effects: A considerable number of students (68%) experienced stomach-related issues due to sleep deprivation, pointing to its systemic impact on overall health.

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