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## INFLUENCE OF PHYSICAL AND PSYCHOLOGICAL VARIABLES ON THE QUALITY OF SLEEP OF MEDICAL STUDENTS IN A CITY IN MARANHÃO

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**Abstract:** Maintaining good sleep hygiene is of paramount importance for preserving the physical and psychological integrity of human beings. However, according to Summit Saúde (2021), about 65% of Brazilians have problems sleeping or staying in a state of sleep for an adequate time, characterizing the existence of sleep disorders. Such disorders are aggravated by the presence of certain factors, such as anxiety disorder, depression, sedentary lifestyle and Burnout syndrome. Added to this, medical undergraduate students are even more likely to develop sleeping problems, given the great pressure inherent in the course.

## INTRODUCTION

Sleep is an extremely important factor for maintaining the well-being of the human body, since its function is to restore the individual mentally and physically. This process is characterized by a state of complete unconsciousness of the individual, but this characteristic can be resumed with the occurrence of external or internal stimuli, which allows to differentiate from the coma state. In addition, the sleep-wake state is regulated by the circadian cycle, a characteristic that allows recurrence at approximate times throughout the days (VASCONCELLOS et al, 2020).

The circadian sleep-wake cycle is established by the suprachiasmatic nucleus. Although there is no access to external environments, which leads to the non-differentiation between day and night, this cycle lasts about 24 hours. However, the variation in ambient light – acting on the optic chiasm – is also one of the factors that influence this cycle, as well as the practice of physical activities and daily tasks (MORAES et al., 2013).

When there is any imbalance in the efficiency of the sleep-wake cycle, disturbances begin to be noticed. Sleep disorders are problems that affect a large part of the Brazilian population,

causing a deterioration in the quality of life of those who suffer from this problem. Among Brazilians over 18 years old, about 65% have difficulties related to sleeping, which may have several reasons (SUMMIT, HEALTH 2021).

As factors that lead to sleep disorders, it is worth mentioning anxiety and depression disorders, lack of physical activity and Burnout syndrome. Approximately 8 out of 10 people who suffer from disorders related to anxiety and depression claim to have problems with both the quantity and quality of sleep, reporting difficulty falling asleep and staying asleep. Numerous nocturnal awakenings, a feeling of not being restored and the presence of bad dreams are also among the reports of individuals with this type of disorder (CHELLAPA, 2018). As for sedentary lifestyle, it is observed that people who do not exercise their body have a tendency to develop sleep disorders 84% higher than those who exercise (LIMA et al, 2022). A similar case is noted when analyzing that the Burnout syndrome, a condition related to exhaustion from overwork, also potentiates sleep disorders (AMARAL et al, 2021).

Such an analysis of the quality and quantity of sleep can be related to the daily life of medical university students, known for the extreme physical and emotional demand for their conclusion. About 70% of the studies carried out associating sleep with the academic environment of Medicine point out that academics have a poor quality of sleep, which raises an in-depth debate about how the aforementioned factors (anxiety, depression, sedentary lifestyle, Burnout), as well as other personal subjective variables impact the sleep hygiene of these students (DUTRA et al, 2021).

## **THEORETICAL FRAMEWORKS**

### **EPIDEMIOLOGY**

#### **ANXIETY**

More than 450 million individuals worldwide suffer from some form of mental health disorder. A review carried out by Baxter et al, in 87 studies and 44 countries, accounted for a percentage of about 7.3% of anxiety disorder. This psychological illness can be distinguished according to the situations or objects that generate distress or anxiety. They are diagnoses that do not have primary symptoms of anxiety, that is, they do not come from other psychiatric pathologies such as psychoses or depression, for example (COSTA et al, 2019).

#### **DEPRESSION**

Depression is one of the main conditions that contribute to the total baggage of diseases associated with mental disorders. It contributes heavily to disability, and is linked to other chronic illnesses and early death by suicide. The study carried out by the Global Burden of Disease in 2019 estimated that approximately 3.8% of the global population had a depressive disorder, equivalent to 270 million citizens (BRITO et al, 2022).

The prevalence of depression in Brazil is 4.3%. Between 2005 and 2007, a study was carried out by the Brazilian component of the World Mental Health Survey, which identified a prevalence of 16.9%, and the São Paulo Megacity Mental Health Survey, which predicted around 9.4% prevalence of depression in the last year before the interview and throughout life (BRITO et al, 2022).

#### **SEDENTARY LIFESTYLE**

Sedentarism is widely recognized for its prevalence, and is an important contributor to poor health and anticipation of death, thus being very evident in Brazil. In 2015, the

National Health Survey (PNS) was carried out, together with the Brazilian Institute of Geography and Statistics (IBGE), which reached the conclusion that more than 50% of young individuals over 18 years old are overweight as a result of physical inactivity and lack of adequate nutrition. In addition, it must be noted that obesity contributed to more than 70% of deaths in 2012 (Brazilian Institute of Geography and Statistics [IBGE], 2015). (DE MOURA CARLOS et al, 2021).

### **BURNOUT SYNDROME**

There is, nowadays, a growing increase in occupational diseases, related to the pace of intense work, constantly demanded by the worker (Silva, 2013). According to Zanelli, there are several conditions that may be related to the fragility of work, such as, for example, constant demands for productivity, overload in the work environment, conflicts between people or even goals that are difficult to achieve. (CARDOSO, 2017)

The Brazilian Ministry of Health cannot accurately monitor the number of citizens who are affected by the Burnout syndrome, given that the syndrome does not require compulsory notification. According to statistics from the Special Secretariat for Labor Pensions, there was an increase of 114.80% in sickness benefits for this syndrome between 2017 and 2018. The amount of aid increased from 196 to 421. (NEVES, 2019)

In 2018, a survey was carried out by the International Stress Management Association (Isma-BR), and it was estimated that about 33 million people have the syndrome, that is around 32% of workers. Among the professions most affected by mental and physical difficulty are police officers, doctors, nurses, journalists. In a classification distribution among eight countries, Brazil had more individuals with the disorder than China and the United States, second only to Japan, with 70% of the affected

population. (NEVES, 2019)

### **PHYSIOLOGY OF SLEEP**

The sleep-wake rhythm is regulated by a region located below the mediotopline of the brainstem, which is responsible for the processes of activation and inactivation of nervous impulses. This structure causes an active inhibitory process of nerve impulses, which limits synapses and movements of organic structures associated with these synapses (GUYTON, 2021).

The sleep-wake rhythm, as it is associated with the demands required by the body, its durability depends on the state of life in which the individual is. During the neonate phase, the duration is around 20 hours, while during old age, it is common for sleep to last between 7 and 8 hours without associated pathological changes. Such an occurrence derives from the biochemical demand for the growth and maintenance of the living organism (ARAÚJO, ET AL, 2021).

Sleep is divided into two stages, REM sleep and non-REM sleep. The first is characterized by the occurrence of rapid eye movements, high frequency and low amplitude waves when examined by electroencephalogram (EEG). Non-REM sleep (NREM) is characterized by paralysis of eye movements, low frequency and high amplitude in the EEG (GUYTON, 2021).

At the beginning of sleep, it is common for spasms to occur. This occurrence derives from the fact that there are still stimuli, perceived by the EEG with low frequency voltage, for the nucleus of the base of the globus pallidus. As this structure is responsible for inhibiting the thalamus, when there are still inhibitory stimuli from the first, small movements occur, such as eye movement and spasms during REM sleep (SILVA, 2021).

When the deep sleep stage is reached, the EEG (electroencephalogram) shows the

presence of theta waves and delta waves with large amplitudes. Such an occurrence allows the thalamus to remain inhibited, which is perceived by the absence of peripheral movements. As a result, this is the stage of sleep that allows the body to restore itself (SILVA, 2021).

Figure 1 summarizes this division of sleep stages.

Figure 2 shows the wave changes observed on the EEG during each stage of sleep.

Bearing in mind the role of melatonin and dopamine in the sleep-wake rhythm, it is clear that the reduction or absence of light is conducive to sleep. Such an occurrence is due to the release of melatonin by the pineal gland, when there is a minimization or cessation of light sources reaching the retina, which allows reasoning about the influence of screen time on sleep quality (AIRES, 2018).

In addition to these two neurotransmitters, there is serotonin, which is synthesized in the raphe nuclei, located in the lower portion of the pons and in the medulla, these are areas that act directly in the regulation of sleep, since they synthesize serotonin, which is a neurotransmitter whose function is the critical modulation of neural interaction (PEREIRA, ET AL, 2022).

Serotonin (5-HT) has its action mediated by intracellular signaling receptors, 5HT<sub>2A</sub>R, which are expressed in the central nervous system and peripheral nervous system. As a result, serotonin can act to inhibit nerve impulses that circulate in the brain, spinal cord, limbs and organs (PEREIRA, ET AL, 2022).

Sleep can also be regulated by the muramyl peptide, which is synthesized by the gut microbiota and acts on the brain-gut-microbiome axis. This substance was discovered by studies that used sleep-deprived commungoes, where it was noticed that the concentration of the muramyl peptide was

increased. Despite the discovery, there is not enough data to prove how this substance acts on the sleep-wake rhythm (MASCARENHAS, 2021, apud MATENCHUK et al, 2020).

Orexin (hypocretin) is a substance that acts to maintain the body in a state of wakefulness. This compound is endogenously synthesized by neurons in the hypothalamus, which provides the state of excitability for the thalamus and for the cerebral cortex, in the regulatory portion of movements. Although this discovery is of paramount importance for understanding the regulation of the sleep-wake rhythm, its mechanism of action is not well defined (SALATA, 2021).

The thalamus is a structure of the Central Nervous System responsible for the center of integration of nervous impulses. During the sleep state, part of the postsynaptic impulses are partially inhibited. This characteristic allows the system to remain in a state similar to the state of coma by interrupting the stimuli directed to the motor cortex of the brain (BERNE & LEVY, 2020).

As during sleep, the organism has a low metabolic activity, this state of consciousness is important for the control of homeostasis, in addition to acting on homeostasis, it also participates in memory control, in the reconstitution of physical and mental health, in mood, in behaviors of individuals associated with cognition, such as learning and practice of work activities (COSTA et al, 2021).

The quality and duration of sleep may be associated with scenarios of low academic performance, restricted concentration and reduced learning, since, when having a reduced quality of sleep, daytime sleepiness occurs due to the decrease in the activity of the system sympathetic nerve that is responsible for keeping the individual alert (VIEIRA, 2022).

To know the function of the Sympathetic Autonomous Nervous System for maintaining

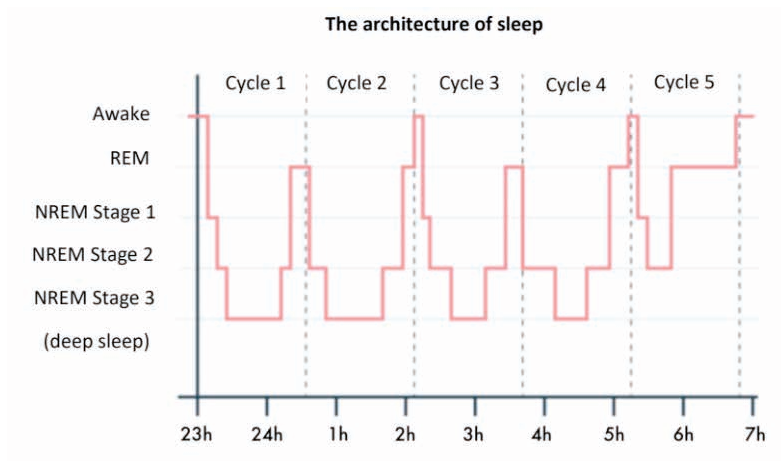


Figure 1 - Graph showing the organization of sleep architecture, relating its stages and cycles with chronological time.

Source: Sleep Watchers, 2020

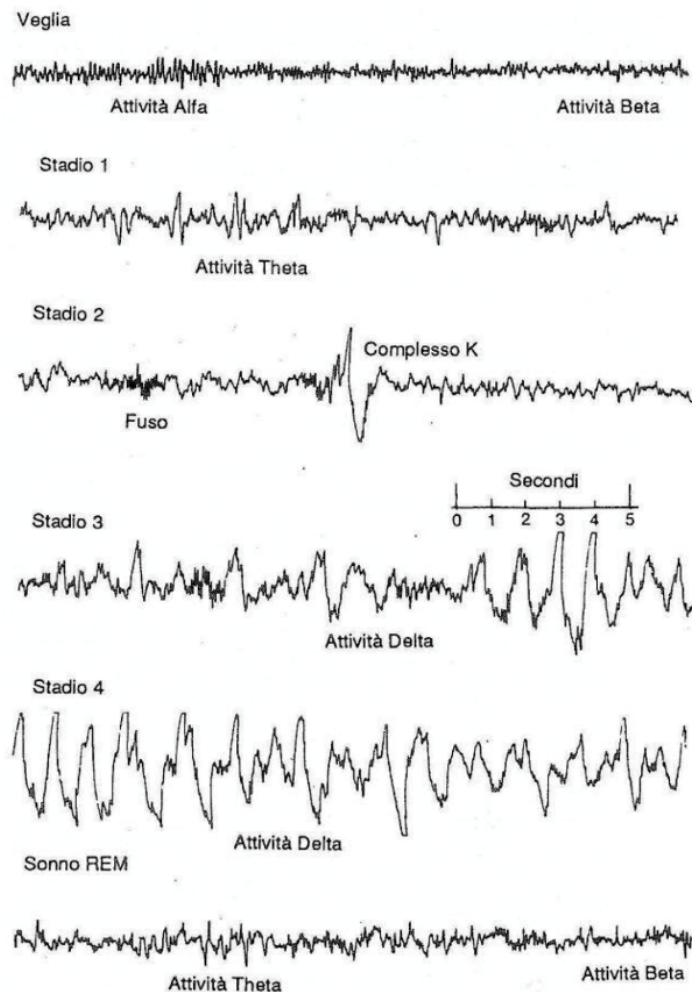


Figure 2 - Image that differentiates the appearance of the waves visualized in the electroencephalogram exam during each stage of sleep.

Source: Rationalist Universe, 2015



the state of wakefulness, it is clear that the sleep-wake rhythm is associated with the activation of this system. Therefore, the influence of noradrenergic neurons located in the *locus coeruleus* and in the *subcoeruleus nucleus*, which are located close to the rostral pons, in its dorsal portion, for sleep control is observable (BERNE & LEVY, 2018).

In addition, it is of great value to remember the Autonomic Parasympathetic Nervous System, since it acts in the reduction of synaptic activities with the neurotransmitter dopamine. The fibers that conduct this type of impulse have their origin in the brainstem, in the *pars compacta* present in the substantia nigra. This region of origin of dopaminergic fibers is also known as raphe nuclei, due to the type of cell present (BERNE & LEVY, 2020).

## CLASSIFICATION OF SLEEP QUALITY

In the physiological understanding, sleep and its definition regarding quality are measured according to several internal and external factors, whether behavioral or environmental, related to neurological reactions. The vast majority of reports related to sleep disorders are evidenced by insomnia and another smaller portion reports excessive sleepiness. Sleep deprivation is related to changes in alertness and performance, as well as in mood regulation, reasoning performance, homeostasis and immune function. Currently approximately 40% of the world's adult population is involved in problems related to sleep, aggravating their quality of life (BUCKWORTH & DISHMAN, 2002).

In this understanding, the need for the development and application of mechanisms to assess sleep disorders and deficiencies gains notoriety, even without an objective definition regarding the quality of sleep, this is classified as a subjective action, of the usual condition

of the act of sleeping, where their relationship alludes to the health and well-being conditions of the individual. The measurement of sleep quality is based on the complaints, symptoms and complaints of patients. However, the evaluation of sleep alteration is a multifactorial idealization and, because of this, for the most part, it becomes unfeasible to disassociate the causes and consequences related to the quality of sleep of patients. Thus, the challenge is to find a device that covers what is necessary to include complaints related to the duration component and sleep disturbances and correctly assess the patients' desires.

A suitable mechanism for measuring sleep disorders must include items relevant to the concept of sleep dysfunction, and be able to differentiate between good and bad sleep. Above all, it must be noted that such analysis mechanisms are limited, given that the assessment of individuals during rest, such as sleep latency and duration, favorable environment, snoring, etc., since there is a reduced awareness at rest, can generate changes in terms of sleep quality interpretations. It must be noted that there are doubts about the meaning of the duration of short or long sleep, since such information reflects the necessary amounts of physiological sleep and its beneficial or harmful aspect for the proper functioning of the body.

In this context, several literatures and researchers point out that the application and preparation of questionnaires related to sleep analysis must be complex, far beyond simple questions regarding the number of hours slept, given that the reliability of the results obtained depends on the method chosen for the application of this questionnaire, as well as the interpretation of the results.

## **QUALITY OF SLEEP IN THE FACE OF PATHOLOGIES**

### **ANXIETY**

According to Leite (2020), there is a very intimate relationship between sleep quality and the anxiety index, the results of his study showed that individuals who have good quality sleep had low levels of anxiety. It was also possible to notice, with this comparison with poor sleep, a moderate level of anxiety, this same moderate level in the degree of anxiety was revealed with those who have some type of sleep disorder. It was also observed that the majority of individuals who had a moderate level of anxiety and poor sleep quality were female.

When relating this quality of sleep related to different age groups, a small portion of the relationship between good quality of sleep and low levels of anxiety was evidenced, on the other hand, most people who have some type of occupation had poor sleep and moderate level of anxiety and with sleep disturbance and moderate level of anxiety. In relation to younger individuals, there was a small number who had good quality of sleep and low levels of anxiety, and in relation to poor sleep and moderate level of anxiety, there was a reduction in the percentage of those affected by sleep disturbance and moderate level. of anxiety. Overall, there was a greater number with good sleep quality and low levels of anxiety and also a reduction in poor sleep and moderate level of anxiety, and with sleep disturbance and moderate level of anxiety (LEITE, 2020).

### **DEPRESSION**

It is noted that a good quality of sleep is directly related to a satisfactory quality of life, while when this sleep presents disturbances, some associated problems may be present, such as depression, since regulating sleep properly means reinvigorating. the organism

physically and mentally. A person's mental health may be affected when it is difficult to sleep, either by initiating or maintaining sleep, since irritation during the day, stress and insomnia affect the quality of sleep and in the long term can trigger the depression. This way, discussing the relationship between sleep and depression is essential to seek ways to solve or reduce the manifestation of these problems, as the increasing rate of depression worldwide is evident and knowing that this disorder is related to disorders of the sleep, it is worth highlighting the importance of analyzing the presence of the association of these problems (LÓSS, 2019).

A good quality of sleep for an individual is closely related to the maintenance of the biopsychosocial balance, as this condition is a factor that directly affects the quality of life of a person, since several factors can trigger sleep disorders, whether social, psychological or even environmental. Several studies have already pointed out that there is a significant relationship between depression and sleep quality, and sleep disorders negatively affect social routine, causing irritability, difficulty concentrating, indisposition, discouragement and lack of energy - the sleep disorder is both a symptom and a risk factor for triggering depression. Another aggravating factor when associated with depression and sleep disorders is the increased consumption of alcohol and cigarettes, in an attempt to improve the depressive emotional state (SANTOS, 2021).

### **SEDENTARY LIFESTYLE**

According to Santos et al. (2021), the most common causes of sleep impairment are a restriction of sleep itself and its fragmentation, which is when the individual does not sleep for a long period, having to make up for sleeping throughout the day or waking up several times during the night. night. This type of alteration is closely linked to a lifestyle



of physical inactivity, since the practice of physical exercise considerably improves the quality of sleep. Thus, it is imperative that a new lifestyle is encouraged, aiming at more regular physical activity, and this is something that can come from health professionals, who have greater credibility and ownership to make this incentive.

There are some factors that contribute to a behavior of physical inactivity in adolescents, such as the use of electronics, which contribute to an increase in caloric intake and at the same time reduces energy expenditure, since these people do not perform any type of physical activity. In this perspective, this type of life habit, absence of physical exercise, has become an important factor associated with a short duration of sleep, since physical inactivity can lead to overweight and the relationship between this and the duration of sleep are inverse, that is, the higher the Body Mass Index (BMI) of an adolescent, the shorter the daily sleep time he will have (SANTOS et al, 2021).

### **BURNOUT SYNDROME**

Poor sleep quality is associated with an increased risk of Burnout, just as the presence of Burnout Syndrome (BS) also leads to changes in sleep quality, negatively reflecting on cognitive performance and interpersonal relationships. In addition, the correlation between sleep complaints and Burnout symptoms is notorious. Another factor that was present is a shorter time of night sleep associated with symptoms of Burnout Syndrome, it is also observed that the more hours of sleep, the smaller the symptoms of the emotional exhaustion domain, which is one of the factors that can trigger the SB. Studies have revealed that individuals with higher quality sleep experience less Burnout. Other aspects proved to be satisfactory for improving sleep quality and reducing

Burnout scores, which were using an alarm clock at dawn and removing the electronic device at bedtime, the combination of these two factors positively affected the mental state of students, reducing sleep disturbances and manifestation of Burnout to a greater degree. An important piece of information observed was the identification of the use of hypnotics by undergraduates who had poor sleep quality in association with BS (ROCHA, 2021).

According to the study by Söderström et al., 2004, it was shown that in adults with high levels of BS, the sleep pattern was very altered, with a frequency of many awakenings, since it is clear that the frequency of awakenings impairs quality, bringing about changes in the sleep pattern that may result in excessive daytime sleepiness. A similar study by Metlaine et al., 2018, showed that individuals with Burnout Syndrome also present this sleep fragmentation, in addition to having problems with insomnia and non-restorative sleep, characteristics that contribute even more to aggravating the emotional stress of these patients. Furthermore, what was exposed by Ekstedt et al., 2009, demonstrated that when patients affected by Burnout Syndrome have their stress or fatigue reduced, it leads to a decrease in the number of awakenings during sleep, causing an improvement in the quality of sleep.

### **SLEEP QUALITY OF MEDICAL STUDENTS**

#### **SLEEP AND LEARNING**

Sleep is essential for the proper functioning of the human body, maintaining the body's homeostasis, which enables the fulfillment of physiological and psychological functions. This way, a good quality of sleep is ideal for learning, as it is essential to modulate cognitive functions, consolidate memory and learning, which are important factors that participate in the cognitive development of human beings

(DO COUTO et al, 2018).

Due to having important functions, sleep-related disorders can trigger important changes in cognitive capacity, which can lead to a decrease in academic and professional performance, incidence of psychiatric disorders and decreased vigilance. From this, it is noted that in medical students the presence of sleep disorders is very present, since the great demand for time dedicated to studies and extracurricular activities corroborate the prevalence of this problem (SEGUNDO et al, 2017).

### ***SLEEP AND QUALITY OF LIFE***

Quality of life is an important factor that is influenced by sleep, since the quality of life of medical students is worse when compared to the rest of the population (PAGNIN et al, 2015). This is mainly due to the excess of activities that demand exclusive time from these academics. As a result, it is often necessary for students to exchange hours of sleep for hours of study (TEMPSKI et al, 2012). Therefore, the decrease in sleep quality can cause other unpleasant characteristics in students, such as impatience discouragement, irritability, distractions, stress, sadness, isolation, lack of energy (CAETANO et al, 2012).

### ***MENTAL HEALTH***

The medical course is considered one of the most complex and difficult courses to achieve, from entering university to entering the job market, since it requires a lot of emotional effort, dedication and sacrifice on the part of students (MEYER et al, 2012).

In addition to the great demand, constant contact with deaths and people in terminal situations transforms the health area into a very stressful environment for professionals and students in the area. (MAGALHÃES et al, 2015)

From this, it is clear that there is, among medical students, a high prevalence of psychic symptoms and mental disorders related to stress, depression, anxiety and Burnout syndrome (LIMA et al, 2006).

These particularities allow for a relationship between poor sleep quality, since sleep deprivation affects the psychological and mental state, and those with mental disorders are more likely to have sleep disorders (CAVALHEIRI et al, 2021).

### ***PHYSICAL VARIABLES***

One of the main causes that affect the quality of sleep in general are problems related to physical health, which include factors such as physical inactivity and obesity, for example. In general, medical students value excellence in intellectual training, and often end up neglecting the quality of life that involves moments of distraction, leisure and physical activity. It is also known that this profile is more frequent in female students (NETO et al, 2020). Add to this the fact that one of the main obstacles to the practice of physical activity by this population is the difficulty of reconciling the study period with personal life, and in many cases with work as well (MENDES et al, 2021).

Finally, it is important to point out that medical students will in the future come across patients who have similar difficulties, and therefore they must be examples of lifestyle changes for the population (RODRIGUES et al, 2018).

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