The impact of sleep on the health of higher education students: Literature review

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ABSTRACT
Introduction: The study of sleep-in medicine is recent and assessing health impacts is a current necessity. Healthy sleep and sleep hygiene are fundamental for the proper functioning of the nervous system, with significant impacts on physical and mental health, including for higher education students, who have a change in their routine in the face of the new challenges experienced when entering this new stage of life. Objective: to analyze and synthesize the most recent research on the impact of sleep on the health of higher education students, in order to identify the consequences and the most effective approaches. Methodology: The searches were performed in the PUBMED and LILACS databases, using the search process through vocabulary controlled through descriptors and Boolean operators "and" and "or". Conclusion: Sleep plays a fundamental role in physical and mental health. Deprivation or an unregulated sleep routine can cause several consequences in relation to the health of the university student, the most common are: Hypertension, Metabolic Syndrome, stress, depression and other mental disorders. These are impacts that often become irreversible and decrease life expectancy. Sleep hygiene measures are simple and very effective forms of treatment, but the change in lifestyle habits is complex adaptations

Keywords: Impact of sleep on the health, higher education students.

1 INTRODUCTION

Sleep is a special physiological state that occurs in a cyclical manner in a wide variety of living beings of the animal kingdom, but defining sleep is not a simple task, either from the physiological

point of view or based on the behavioral description of the individual who sleeps. (FERNANDES, 2006)

We can say that, in sleep, individuals are immobile, or with a limited repertoire of movements, which are involuntary, automatic, without defined purposes. Reactivity to auditory, visual, tactile and painful stimuli is reduced or abolished in relation to wakefulness, particularly in deep sleep phases, requiring an increase in the intensity of the stimulus to bring the individual back to wakefulness. (FERNANDES, 2006)

However, the history of sleep medicine is relatively recent. Scientific experiments on sleep in humans only began a little over half a century ago. Until the 50s of the twentieth century, most people imagined that sleep was a passive or inactive part of our daily lives. Today, we know that our brain remains very active while we sleep. In addition, sleep affects our daily performance and our physical and mental health in many ways, but we are only beginning to understand how this actually occurs. (MAGALHÃES, 2007)

The evolution of knowledge about sleep, both in experimental and clinical practice, was possible from the domain on the recording of brain waves through the Electroencephalogram (EEG), which allowed the objective discrimination between relaxed wakefulness and sleep, as well as between their different stages. (FERNANDES, 2006)

Thus, sleep comprises a sequence of phases that can be identified through its EEG pattern, and these phases arise naturally under the influence of a regulatory mechanism of the central nervous system. Researchers Harvy and Loomis pioneered the first system of categorizing sleep phases, describing several essential EEG features that are used in the current classification system. Nowadays, these phases of sleep are called stages 1, 2, 3 and 4.

Subsequently, Aserinsky and Kleitman identified a distinct pattern of EEG sleep, characterized by low voltage and rapid activity, which was correlated with rapid eye movements. These researchers also recognized that this phenomenon was associated with dreams. This stage was called REM (rapid eye movement) sleep, which occurs alternately with the stages described by Loomis, which, by exclusion, were grouped as non-REM sleep (NREM).

After understanding the essence of sleep, the importance of it becomes the primary factor for the continuity of reasoning. The proper functioning of our nervous system depends on the need for sleep. Research involving animals has demonstrated the essential importance of sleep for survival.

Too short sleep causes drowsiness and inability to concentrate. It also leads to memory and physical performance failures and reduces the ability to perform mathematical calculations. If sleep deprivation continues, hallucinations and mood swings may develop. Without sleep, neurons can suffer energy depletion or be polluted by byproducts of normal cellular activity that cause them to function

imperfectly. Sleep also gives the brain a chance to exercise important neuronal connections that might otherwise deteriorate from lack of activity. (MAGALHÃES, 2007)

Sleep and related disorders play an important role in a large number of diseases and can affect almost all fields of medicine. As examples we have asthma attacks and strokes, which tend to occur more often during the night and early morning, perhaps because of hormonal changes, heart rate variations and other factors associated with sleep. Sleep also affects some types of epilepsy in complex ways; REM sleep seems to help prevent seizures, while deep sleep can make them easier. Sleep deprivation can also trigger seizures in people with some types of epilepsy. (SOARES, 2006)

The concern with the care of the physical and mental health of the human being has been gaining more and more attention in recent years, which is evidenced by growing publications on the subject. The need for this care extends to the various layers of the population, among them the one that includes students of Higher Education. It is brought up in the literature, for example, that the academic environment can become a source of stress for a considerable portion of the population of this level of education. (PADOVANI, 2014)

In addition, changes in life habits, after entering these spaces, can bring impacts that directly affect the quality of life of this group. This is because, Higher Education has a dynamic that will require a series of responsibilities not experienced until then in the previous school trajectory. Therefore, changes in lifestyle habits are expected to cope with the new demands. (MUNIZ, 2021)

Given this, healthy sleep is a tool capable of assisting in the issue of regularity and quality so that it is an effective instrument. Thus, the denomination of a healthy sleep can be characterized as sleep hygiene.

Sleep hygiene therefore has as its general objective to facilitate a restful and sufficient (but not exaggerated) sleep. In addition to recommendations on diet, physical exercise and the consumption of alcohol, tobacco, coffee, other measures have been added to sleep hygiene. These, more recent, arose from the premises of stress reduction methods (cognitive behavioral strategies) and, above all, from stimulus control procedures. (GOMES, 2005)

2 OBJECTIVES

The objective of this literature review is to analyze and synthesize the most recent research on the impact of sleep on the health of higher education students, in order to identify the consequences and the most effective approaches, as well as to provide a solid theoretical basis for future interventions and development of sleep hygiene measures.

3 MATERIALS AND METHODS

3.1 DATABASES

The searches were performed in two bibliographic databases — PubMed and LILACS. At the end of the searches in each database, the duplicate references were excluded.

3.2 TIME LIMIT

We selected articles published between 2015 and 2023 (including those available online in 2023 that could be published in 2024)

3.3 LANGUAGES

Articles written in English and Portuguese were selected.

3.4 DESCRIPTORS

The search process was used through vocabulary controlled through descriptors and Boolean operators "and" and "or". With this strategy, there was a recovery of specific references, ensuring the detection of most of the published works within the pre-established criteria.

The descriptors used were "*Health Impact*", "*Sleep*" and "college student*" were* combined with the associations and operator "and". As it was not the objective of this review to evaluate the impacts on students of other levels, the term was specific to "college student" in the search.

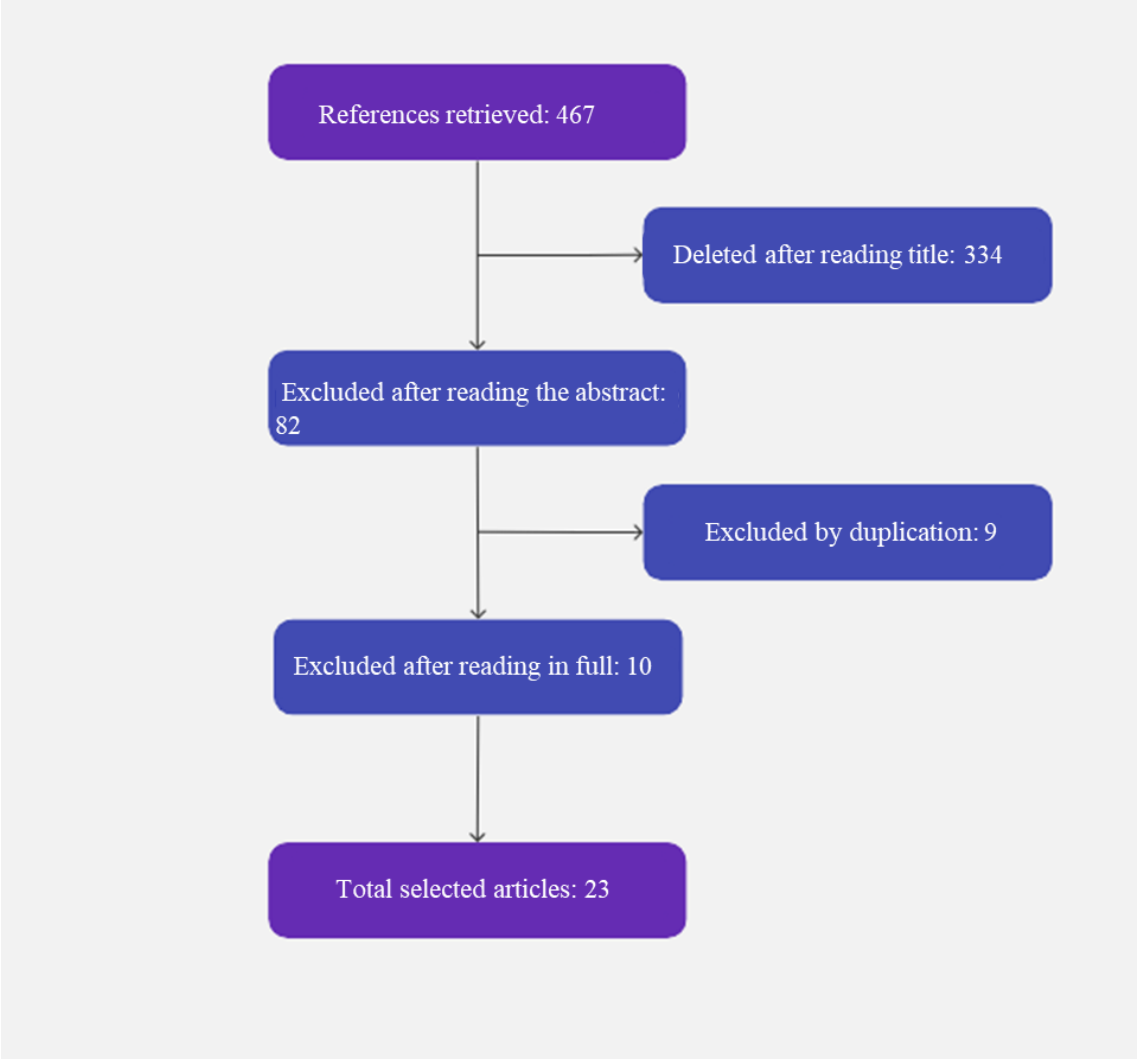
3.5 INCLUSION AND EXCLUSION CRITERIA

We included all original articles indexed in the period between the first of January 2015 and August 16, 2023, with experimental design (clinical trials, randomized or not) or observational (case-control studies, cohort studies and before and after studies). Articles that analyzed observational studies with cross-sectional analysis, phase I or II studies and studies conducted in pregnant patients were excluded.

3.6 PROCESS OF SELECTION AND ANALYSIS OF ARTICLES

Figure 1 shows the process of selecting the articles in their different stages and the respective number of articles retrieved in each one. The captured references were included in a unique library in the Zotero program. Two medical students were responsible for the selection and reading in full of the selected articles; After the selection, a library was created in which all the selected references and the respective complete articles in PDF format were contained. A total of 20 original articles were included in the present review (Figure 1).

Figure 1- Flowchart of the selection process of the researched articles. The number of articles in each step is indicated.



Source: Own Authorship

4 DISCUSSION AND RESULTS

4.1 EPIDEMIOLOGY

Sleep disorders are among the clinical disorders with the greatest health and socioeconomic impact. They are as common as asthma and diabetes; however, few are properly diagnosed and treated. As an example, it can be mentioned that only 5% of patients with insomnia consult primary health care and 69% never mentioned to doctors their sleeping difficulties. Vgontzas and Kales reported that sleep disorders are very prevalent in the general population and that insomnia is the most common, and, when chronic, usually reflects psychological and behavioral disorders (SOUZA, 2004)

The prevalence of sleep disorders in a hospital population in Milan, Italy, for one year, with a sample of 1,347 women and 1,171 men, between 6 and 92 years of age, and found 12.8% of insomnia complaints, more prevalent in the orthopedics sector (17.5%). Insomnia

initial (39.1%) and maintenance (32.1%) were the most prevalent. There was a higher prevalence among women and an increase with age in both sexes. (SOUZA, 2004)

4.2 SLEEP STAGES

The characterization of the sleep phases can be made based on 3 physiological variables that comprise the electroencephalogram (EEG), the electrooculogram (EOG) and the submental electromyogram (EMG). Through them are characterized 2 fundamental sleep patterns: without rapid eye movements (NREM) and with rapid eye movements (REM). NREM sleep is composed of 4 stages in an increasing degree of depth, stages I, II, III and IV. In NREM sleep, there is muscle relaxation compared to wakefulness, however, some basal tonicity is always maintained. EEG exhibits progressive slow-wave increases as one progresses from stage I to stage IV of NREM sleep. (FERNANDES, 2006)

During stage 1, which is shallow and fleeting, we drift off to sleep, return to wakefulness, and can be awakened with ease. In the EEG, this stage is characterized by the presence of waves of low amplitude and frequency from 3 to 7Hz (theta waves). Our eyes move very slowly and muscle activity gradually slows down. When we awaken from this stage, it is often possible to have fragmented memories of environmental events that occurred in the period. When we enter stage 2, our eye movements stop, and our brain waves become slower. The so-called K complexes arise, which are accompanied by occasional bursts of 5 to 7 waves of 12 to 15Hz, in the form of crescendo-decrescendo, the so-called 'sleep spindles'. In stage 3, extremely slow waves (0.3 to 2Hz), the so-called delta waves, begin to appear, interspersed with smaller, faster waves. In stage 4, the waves are almost exclusively delta frequency. It is very difficult to wake someone up during stages 3 and 4, which together are called the delta stage or deep sleep. At this stage, there is no eye movement or muscle activity. People awake during deep sleep do not orient themselves immediately and often feel 'groggy' and disoriented for a few seconds after they awaken. Stages 1, 2, 3, and 4 are collectively called non-REM sleep (NREM). (MAGALHÃES, 2007)

4.3 CHANGE OF ROUTINE IN UNIVERSITY STUDENTS

Admission to the University is characterized by significant and complex changes in the way students think in different areas of their lives, being able to develop intellectually and personally (PAPALIA, 2006). First, admission often represents the first important attempt to implement a sense of autonomous identity, an attempt that is translated through professional choice (or attempted choice), which is a typical developmental task in the passage from adolescence to adulthood (ERIKSON, 1976). Adjusting to the university thus implies socially integrating with the people of this new context, participating in social activities and developing satisfactory interpersonal relationships. (Diniz & Almeida, 2006)

Students often have irregularity in sleep, as well as high levels of stress, as a result, they are fit into a risk group with a high probability of presenting sleep disorders (RIOS, 2019). Due to numerous tasks performed, it is worth noting that its alteration can cause physical, occupational, social, emotional and cognitive disturbances, compromising the quality of life (CALDAS, 2009; CARLETO, 2018).

Since their academic training, the student is in circumstances that already put them in contact with the area of activity, which is characterized by changes in routine. (Smith, 2012; BRANDT, 2019). The quality of sleep is an essential element to human health and the quality of life of university students, which represent the future of the country, so it is essential that they are healthy people (SCHNEIDER, 2010; SANTANA, 2018).

4.4 IMPACTS OF SLEEP ON THE ROUTINE OF UNIVERSITY STUDENTS

Today, there are several ways of presenting both numerical and linguistic data. Given this, the use of tables refers to several benefits such as conserving and restricting data loss, greater specificity and, in addition, provides a better analysis of the data that are grouped in order allowing comparisons and conclusions.

This article presents Table 1 to demonstrate the impacts of sleep on the routine of higher education students. Thus, Table 1, below, summarizes the results and discussions that the authors of their respective articles carried out during their research.

Table 1: Analysis of the results of the articles

Quality of Sleep and Depression in College Students: A Systematic Review	Education and the application of sleep hygiene policies can prevent, in some cases, the development of depression and improve sleep quality in other cases.
Sleep and Health Among Collegiate Student Athletes	Poor sleep health and sleep disorders are a growing concern among the college athlete population and have recently been recognized by national and international sports regulatory bodies. These habits reflect on the health of the athlete and on their school and sports performance.
Poor sleep quality and insufficient sleep of a collegiate student-athlete population	College athletes often experience poor sleep quality, regularly get insufficient sleep, and commonly exhibit daytime sleepiness reflecting on the performance of their activities and causing health impacts.
The Impact of a Randomized Sleep Education Intervention for College Students	A brief, personalized online sleep education intervention improved sleep behaviors, sleep quality, and depression scores. This new approach to dealing with sleep deprivation, poor sleep habits, and mood among college students may offer an effective and inexpensive remedy while still preventing disease.
The Impact of Ashwagandha on Stress, Sleep Quality, and Food Cravings in College Students: Quantitative Analysis of a Double-Blind Randomized Control Trial	The method used can be a safe and effective intervention in young adult populations to help regulate sleep, manage stress and its detrimental impacts on health, sleep and satiety in less than 30 days.

Sleep difficulties in college students: The role of stress, affect and cognitive processes	These findings suggest that the effect of poor sleep quality is reflected in stress and further intensifies quality sleep difficulties.
Poor sleep quality and its related risk factors among university students	Through physical activity and good sleep quality can be important factors in improving quality of life and preventing disorders in university students.
Insomnia among medical and Paramedical Students in Jordan: Impact on Academic Performance	A high prevalence of insomnia was found in this group of students. There is an impact on the health of students and academic performance was significantly associated with ISI scores and self-reported sleep quality.
Internet Addiction, Sleep Quality and Depressive Symptoms Amongst Medical Students in Delhi, India	Significant correlations were found between potential internet dependence (ID), sleep quality and depression ($p < 0.001$). The study concluded a strong correlation between ID, disturbed sleep quality and depression.
Mental health and sleep habits during preclinical years of medical school	Depression, anxiety and sleep habits showed a cyclical change associated with the academic/seasonal cycle. Medical students who contemplated fewer hours of sleep presented greater severity.
Stress and sleep in college students prior to and during the COVID-19 pandemic	The results suggest that within the U.S. college student population, the impact of stress and sleep may not be entirely negative during the pandemic.
Sleep disorders as primary and secondary factors in relation with daily functioning in medical students	Insufficient sleep is a common problem in medical students and several sleep disorders have been found. The results suggest that sleep disturbances may have negative impacts on students' daily functioning.
Academic adaptation in university students: associations with stress and sleep quality	Better rates of adaptation to university were correlated with better sleep quality and lower stress levels. The importance of working on the development of positive emotional aspects in university students is evidenced to favor the processes of academic adaptation.
Factors associated with sleep quality of university students	The results highlight socioeconomic and mental health factors that interfere in sleep quality and demonstrate the need for reflection and proposal of interventions capable of minimizing this problem.
Changes in sleep quality during an academic semester in health careers students	There was a significant increase in poor sleep quality at the end of the academic semester, with the change being greater in the students of the professional cycle, causing loss in the quality of life and health of those involved.
Factors associated with poor sleep quality in nursing students from a private university in the state of Ceará	Sleep is essential for the physical, psychic and social well-being of individuals. Its poor quality/quantity may lead to functional impairment in the performance of social roles and interpersonal relationships.
Prevalence of behavioral health risk factors and their simultaneous occurrence in students of a public university in Pelotas, Rio Grande do Sul, 2017	Inadequate sleep time, lack of physical activity and smoking negatively impact routine, health and quality of life in the medium and long term.
Sleep quality and associated factors in undergraduate nursing students	Low income, high stress level, and smoking were associated with poor sleep quality. The results challenge the proposition of interventions capable of minimizing poor sleep quality in nursing students.
	There was a high prevalence of the outcome in the sample. In addition, poor sleep quality occurs differently between men and women. The

Sleep quality and associated factors in university students in the Midwest of Brazil	importance of monitoring poor sleep quality in university students and the health impacts that these habits have on the health of these habits is highlighted
Sleep quality and risk factors for hypertension among university students	Students are at high risk of developing overweight, due to physical inactivity, alcohol consumption and sleep quality, and consequently susceptible to the development of hypertension in the future.
Screen time and Sleep Quality among College and University Students of Karachi	Because negative impacts have been determined on sleep quality and increased screen viewing of various versions of the devices (screen time), influencing the recommended level of screen viewing among college students and college students (age 17-24) is a public health issue.
Sleep quality of university students and its interface with metabolic syndrome and health indicators	College students with poor sleep habits are more likely to have metabolic syndrome compared to good sleepers.
Sleep quality and daytime sleepiness in university students: prevalence and association with social determinants	The high prevalences of poor sleep quality and EDS observed in university students were due to biological factors and, for the most part, behavioral factors.

Source: Own Authorship

5 CONCLUSIONS

Several studies have proven that sleep has a fundamental role in physical and mental health, and that sleep hygiene measures are simple and very effective forms of treatment, but the change in lifestyle habits is of complex adaptations. The benefits of sleep quality is multifactorial and this explains the success of sleep clinics in Brazil and worldwide.

Sleep deprivation or an unregulated routine can cause several consequences in relation to the health of the university student, the most common are: Hypertension, Metabolic Syndrome, stress, depression and other mental disorders. These are harmful both in the short, medium and long term. These are impacts that often become irreversible and decrease life expectancy.

The most efficient way to prevent health damage is a regular sleep routine aimed at maintaining a balance between physical well-being and the fast-paced routine of medical students. Drug treatment has been part of the current therapeutic regimen. What is observed is that people are aware of the importance of sleep, however the permanence of the regularity of healthy sleep habits does not progress.

Fortunately, we have seen in recent years, healthy lifestyle habits being incorporated into society as a desired but difficult standard. The digital world and its characters are concretizing routines indicated for maintenance and prolongation of life. However, this wave of healthy living has an effect on higher social classes and their predominantly young audience. This can bring a healthier future, but it is necessary to expand the age group and income.

The income of patients is also a decisive factor at the time of sleep and routine, and this greatly restricts with the population of lower purchasing power due to the need to contemplate work, study and family with quality times.

Despite difficulties, it is possible to establish a better quality of life for higher education students, reducing medication burden with the simple act of sleep hygiene. It is known that adherence to new life habits comes in a particular way from each individual, but with the presentation of evidence and awareness of this public the engagement becomes very expressive.

Therefore, it is seen that the articles related to the methodology applied corroborate and ratify the importance of awareness and measures of focus on routine for sleep hygiene to better provide quality of life and prevention of damage to the health of university students. These facts place us before a fundamental responsibility in the correct orientation of the routine and responsibilities of academics.

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