

Use of electronic smoking devices and quality of smoking sleep in university students: Study observational

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Abstract

Background: The increase in the number of university students using electronic smoking devices (ESDs) contributes to the advancement of unfavorable impacts in this population, including on sleep quality. Recognizing these changes is essential, as they can negatively impact academic quality and performance. **Objective:** to evaluate the quality of sleep in university students from public and private institutions, users of ESDs. **Methods:** The study will be an observational cross-sectional, previously approved by the Human Research Ethics Committee of the State University of Minas Gerais - Divinópolis Unit, under protocol number 6.796.312/2024, in which the sample will be recruited through social networks and in person. Participants will answer the questionnaires through Google Forms, after being transcribed. The following questionnaires will be used: sociodemographic form, Pittsburgh Sleep Quality Index (PSQI), Fargeström test and Leicester questionnaire (LCQ), respectively assessing sleep quality and presence of sleep disorders, level of chemical dependency and nocturnal cough. **Discussion:** The use of subjective tools, such as a questionnaire to assess sleep in this population, is justified by its low cost and easy application. Recognizing these changes in the sleep of university students is important, as they can negatively impact academic quality and performance. In addition, the study may contribute to awareness campaigns and the development of public health policies, expanding data on the subject and facilitating access so that the number of preventive measures and campaigns for this population can increase.

Keywords: Sleep quality; vaping; electronic cigarette; students; smokers.

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BACKGROUND

Smoking is considered a chronic disease, related to chemical dependence on tobacco, mainly due to nicotine. It is considered one of the main risk factors for the development of serious respiratory diseases, heart disease, diabetes mellitus, hypertension and neoplasms¹ and a public health problem^{2,3}. Studies indicate that reducing or eliminating this habit can be considered an important preventive measure⁴.

Currently, there has been a decrease in its consumption, but an increase in the use of electronic smoking devices (ESDs)⁵. According to the penal code, the sale of ESDs is prohibited in Brazil, except for hookah. However, their use is excessive, with more than two million adult users in 2023⁶. The difficulty in monitoring increases the dissemination and use of electronic cigarettes, attracting university students as a technological and new product on the market⁶. Thus, even though it is prohibited, it is still sold⁷.

ESDs consist of a rechargeable battery and a cartridge containing a liquid (nicotine and/or essence). They work by heating a liquid to create an aerosol of nicotine or other substances that are inhaled by their users through a mouth-piece. They are considered more sophisticated because they are small, come in various flavors and different models, like a pen drive or pen^{1,8}. The nicotine present in these devices, combined with nanoparticle and metalized substances exposed to heating and vaporization, transform the ESDs into objects that are harmful to health, affecting the neurotransmitters of the sleep cycle, reducing the quality and quantity of rest both during the day and at night⁴.

Sleep is considered a very important factor for general health. Some factors can directly influence sleep, such as age and gender. Knowing the relationship between sleep and memory consolidation, habits that increase this drowsiness can lead to a reduction in knowledge retention, thus affecting academic life^{9,10}.

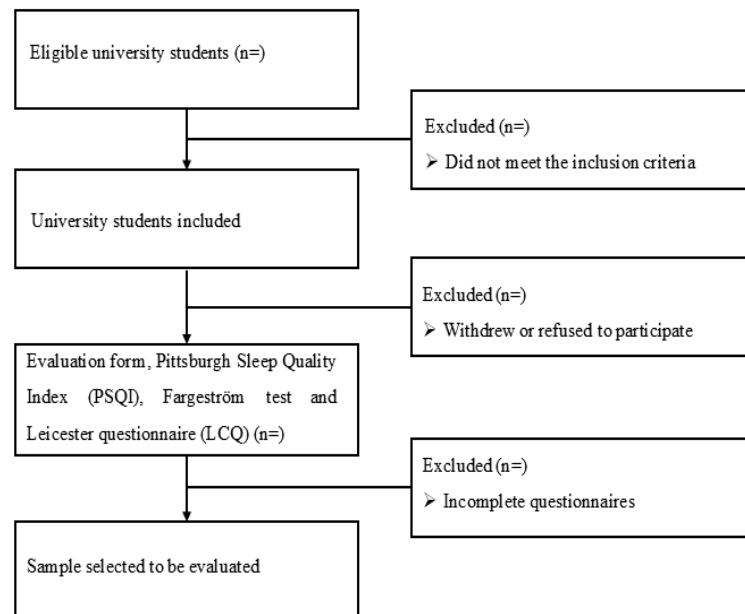
Acting as a restorative process, sleep allows the body and brain to recover from moments of activity throughout wakefulness¹¹. Thus, the ability to sleep is a basic human need and is directly related to psychological, social, metabolic, immunological, clinical or cultural issues¹². In the academic environment, students are exposed to sleep disorders that are already part of their daily lives, through sleep deprivation and the demands imposed upon entering higher education¹³.

Smoking is a habit that affects several sleep parameters, leading to poorer sleep quality and the presence of sleep disorders. Studies warn about the negative relationship between smoking and poor sleep quality in adults, but there are still few studies on these sleep disorders in adolescent and young populations¹⁴. According to recent studies, smoking may be related to difficulty initiating sleep and waking up, excessive daytime sleepiness, nightmares and nocturnal awakenings^{15,16}. According to data from the 2019 National Health Survey, a partner program of the Ministry of Health, there was an increase in the consumption of ESDs, with the highest prevalence of users in the 15 to 24 age group⁶. It was observed that most young people start using them during adolescence⁶. There is also a relationship between the use of ESDs and college students, who inhale and use these devices more frequently¹⁶. In addition, there are several factors such as male gender, socioeconomic status, alcohol use and even caffeine intake, which may be associated with the use of ESDs¹⁷. In this sense, college students believe that the use of ESDs does not lead to major health problems, imagining that the use of these devices would be less harmful than the use of regular cigarettes. The increase in college students using ESDs, combined with the low efforts to regulate, prevent and intervene in the use of these devices, may contribute to the advancement of unfavorable impacts in this population, such as poor quality of sleep¹⁸. Thus, the objective of this study will be to evaluate the quality of sleep in university students from public and private institutions, users of ESDs.

METHODS

Study design and ethical considerations

This study will be an observational cross-sectional, carried out by professors and students from the State University of Minas Gerais (UEMG) - Divinópolis Unit, with university students.

Figure 1. Flowchart representing the study design

The study design will follow the guidelines Improving the Quality of Web Surveys: The Checklist for Reporting Results of Internet E-Surveys (CHERRIES) and Consensus-Based Checklist for Reporting of Survey Studies (CROSS) for studies conducted on the web and the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement for observational studies (Figure 1)¹⁹⁻²² and will be in accordance with the ethical standards established in the Declaration of Helsinki of 1961 and in the Guidelines and Regulatory Standards for research involving human beings of the National Health Council of the Ministry of Health of Brazil, in accordance with resolutions 466/2012, 510/2016 and 580/2018.

The present study was approved by the Human Research Ethics Committee of UEMG, Divinópolis Unit, under protocol number 6.796.312/2024. The Informed Consent Form (ICF) will be obtained from all participants, and their removal at any time will be guaranteed without any charge.

Subjects

University students from public and/or private educational institutions who are users of ESDs and who consented to participate in the study by accepting the ICF will participate in the study. These university students will be invited to participate in the study by publicizing the project through e-mail and social networks. For this purpose, WhatsApp, Instagram and Facebook will be used. They will receive a link that will direct them to the Google Forms platform. On the platform, participants will have access to the ICF and the questionnaires to be answered. Participants who wish to have a physical copy of the ICF will be signed by the researchers in charge and delivered by mail. The sample will be stratified according to sociodemographic variables, smoking habits, sleep quality, and the presence or absence of chronic cough.

EVOLUTION PROTOCOL

Sociodemographic questionnaire

Personal and sociodemographic data and the prevalence of ESDs smoking habits will be collected through an online questionnaire (*Google Forms®*), which will be prepared and adapted by the authors.

Pittsburgh sleep quality index (PSQI)

To assess the participants' sleep quality and presence of sleep disorders, the Portuguese version of the pittsburgh sleep quality index (PSQI) will be applied. This questionnaire assesses sleep quality and the presence of sleep disorders over a period of one month, and the instrument is formulated with 19 self-report questions and five questions directed to the room companion. In view of the questions scored by the questionnaire, they are divided into seven components, namely, subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disorders, use of sleep medications, and daytime sleep dysfunction. When summing the values obtained from the seven components, there is the possibility of a variation from zero to twenty-one in the total score, and the higher the number, the worse the sleep quality.

The sum of these points (range: 0-21) provides an overall measure of sleep quality, and a total score greater than five indicates insufficient sleep^{23,24}.

Fargestrom test

In addition to the previous questionnaire, the Fargeström test will be used, a tool used to assess the degree of nicotine dependence in smokers, which is easy to apply and low cost^{25,26}. The test is carried out with six questions, with simple answers: the first, in relation to the first daily cigarette and the act of waking up; the second, about the difficulty of not smoking in prohibited places; the third, about which cigarette of the day satisfies the user the most; the fourth, daily quantity; five shows whether the individual has a preference in the morning and the last one shows whether the individual smokes lying down²⁶. In Brazil, the Fargeström test was validated by Carmo and Pueyo, (2002)²⁷.

The interpretation of the test is based on scores from 0 to 10 and each question has different scores, in which 0-2 would be very low, 3-4 low, 5-medium, 6-7 high and 8-10 very high, the higher the score, the worse the nicotine dependence²⁷.

Leicester quiz

After the Fargeström test, the Leicester questionnaire (LCQ) will be applied, an instrument validated in Brazil²⁸ to analyze chronic cough caused by various diseases, defined as any cough lasting more than eight weeks, without other concomitant clinical findings²⁹ and with a common risk factor, smoking. Within this context, there is the evaluation of the characteristics of the cough, how long the cough has been, and the monitoring of the response to treatment.

The LCQ is a self-administered questionnaire and requires up to five minutes of application depending on the user who answers.

It consists of 19 items subdivided into three domains: physical (questions 1, 2, 3, 9, 10, 11, 14 and 15), psychological (questions 4, 5, 6, 12, 13, 16 and 17) and social (questions 7, 8, 18 and 19). The answers are quantified by the patient on a Likert scale ranging from 1 to 7 points.

To calculate the LCQ, a sum of the scores of the questions in each domain must be performed. It is important to divide this value by the number of questions in the respective domain³⁰. The total score is the result of the addition of the scores of each domain and ranges from 3 to 21, and a score closer to 21 indicates a better health status or a lower influence of cough on the patient's quality of life³⁰.

Statistical analysis

First, a pilot study will be carried out to determine the calculation of the sample size. The *Kolmogorov-Smirnov test* will be implemented to determine the presence or absence of normality of the data. Numerical data are presented as mean and standard deviation in the case of variables with normal distribution, for data with asymmetric distribution, the median and interquartile range will be used. Categorical data are described as absolute frequency and relative frequency. In the stratification of the sample, the Student's t-test will be performed when comparison of paired samples is necessary.

For comparisons between quantitative variables, Student's t-test or the non-parametric Mann-Whitney test will be used. When the variables are qualitative, the Chi-square test or Fisher's Exact Test will be used, as appropriate. Correlations between continuous variables will be performed with Pearson's correlation test or Spearman's correlation test. For statistical treatment, statistical software (Statistical Package for Social Sciences SPSS 13.0® (Chicago, IL, USA) will be used. The level of statistical significance will be set at 5% for all tests ($p < 0.05$), for a 95% confidence interval.

DISCUSSION

The increase in the number of university users of ESDs, added to the low efforts to regulate, prevent and intervene in the use of these devices, may contribute to the advancement of unfavorable impacts in this population, such as poor sleep quality⁽¹⁸⁾. Thus, the objective of this study will be to evaluate the sleep quality of university students from public and private institutions, users of ESDs.

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