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SLEEP QUALITY AND CHRONOTYPE IN UNIVERSITY STUDENTS' FOOD CHOICES: SUPPORT FOR ACTIONS IN A HEALTH-PROMOTING UNIVERSITY

QUALIDADE DO SONO E CRONOTIPO NAS ESCOLHAS ALIMENTARES DE UNIVERSITÁRIOS: SUBSÍDIOS PARA AÇÕES EM UMA UNIVERSIDADE PROMOTORA DA SAÚDE

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ABSTRACT: **Aim:** To assess how associations between chronotype and sleep quality may be associated with the dietary choices of nutrition students. **Methodology:** This was a cross-sectional, qualitative and analytical study carried out with nutrition students between March and July 2022. Participants were university students over the age of 18, except pregnant women and people with severe cognitive impairment. Data was collected via online questionnaires on GoogleForms, disseminated via email and social networks. Questionnaires were used to characterize sociodemographics, calculate BMI, assess food choices, sleep quality and chronotype. The data was analyzed using SPSS with chi-square and Fisher's exact tests, with a significance level of 5%. **Results:** Data was collected from 80 nutrition students, with an average age of 22 ± 23 years. The majority were female, single and had a family income of between 1 and 3 minimum wages. Among the participants, 25.0% (N=20) were overweight, 63.75% (N=51) had inadequate eating habits and 33.8% (N=27) had sleep disorders. There was an association between chronotype and sleep disturbance (p=0.049), and between chronotype and food consumption (p<0.001), with 77.7% (N=14) of afternoon students having inadequate eating habits and 40.3% (N=25) of morning students making healthy choices. **Conclusions:** The university environment affects the quality of sleep and eating habits of students, which are often inadequate. Public health interventions are needed to deal with these problems.

KEYWORDS: Chronotype. Food choices. Sleep Quality. University students.

RESUMO: **Objetivo**: avaliar como as associações entre o cronotipo e a qualidade do sono podem estar associadas às escolhas alimentares de estudantes do curso de Nutrição. **Metodologia:** Estudo do tipo transversal, qualitativo e analítico, realizado entre março e julho de 2022 com estudantes de Nutrição. Participaram universitários maiores de 18 anos, exceto gestantes e pessoas com déficits cognitivos graves. Dados foram coletados via questionários online no GoogleForms, divulgados por e-mail e redes sociais. Utilizou-se questionários para caracterizaão sociodemográfica, cálculo do IMC, avaliação de escolhas alimentares, qualidade do sono e cronotipo. A análise de dados foi feita no SPSS com testes Qui-quadrado e Exato de Fisher, adotando significância de 5%. **Resultados:** Foram coletados dados de 80 estudantes de Nutrição, com idade média de 22 ± 23 anos. A maioria era do sexo feminino, solteira e com renda familiar entre 1 e 3 salários-mínimos. Entre os participantes, 25,0% (N=20) apresentaram excesso de peso, 63,75% (N=51) hábitos alimentares inadequados e 33,8% (N=27) classificaram com distúrbios do sono. Houve associação entre cronotipo e distúrbio do sono (p=0,049), e entre cronotipo e consumo alimentar (p<0,001), com 77,7% (N=14) dos vespertinos apresentando hábitos alimentares inadequados e 40,3% (N=25) dos matutinos realizando escolhas saudáveis. **Conclusões:** O ambiente universitário afeta a qualidade do sono e os hábitos alimentares dos estudantes, que frequentemente são inadequados. Intervenções de saúde pública são necessárias para lidar com esses problemas.

PALAVRAS-CHAVE: Cronotipo. Escolhas Alimentares. Qualidade do Sono. Universitários.

INTRODUCTION

Health promotion is the process of empowering the community to take action to improve their lifestyle and health, including a greater role in these actions, with the aim of achieving a complete state of health, which includes the physical, mental and social well-being of individuals and groups. These activities enable the population to identify their aspirations, satisfy their needs and favorably modify the environment, taking into account the Sustainable Development Goals (SDGs), specifically the third one, which deals with Good Health and Well-being, a global call for actions aimed at ending poverty, protecting the environment and climate and ensuring that people everywhere can enjoy peace and prosperity [1].

University is an essential place for the development of life, since it provides the expansion of professional and personal skills and competences, as well as improving the performance of individuals' activities, generating positive impacts for them [2]. This period is marked by a transition characterized by peculiar characteristics that can occasionally be identified as a stress factor and directly affect the health of academics, promoting greater fragility to the emergence of physical and mental disorders, such as depression, anxiety and stress, which has already been confirmed by some studies with this population [3].

It should therefore be noted that, according to the Okanagan Charter [4], higher education plays a fundamental role in all aspects of the development of individuals, communities, societies and cultures, both locally and globally. The academic environment itself is an inherent part of any strategic health promotion system, working in a collaborative, transdisciplinary and intersectoral way. In this way, higher education must incorporate health promotion values and principles into its mission, vision and strategic plans, and test models and approaches for the wider community and society, transforming them into Health Promoting Universities (HPUs) [4].

The UPS has its roots in the strategy of healthy environments, which was promoted by the WHO in the 1980s, with initiatives in cities, schools, workplaces, among others, with the aim of incorporating health promotion into the university environment, bearing in mind that the university constitutes a physical, psychological and social environment for its members. The transformation of the university into a UPS involves the social responsibility of these institutions and a perception that they can positively influence the living conditions and health of the academic community by encouraging healthier eating environments [5].

It is well known how much food choices can have an impact on the physical and mental health of individuals, and how various factors can influence eating behavior and consumption, such as environmental, cognitive and biological factors. Environmental factors include social, cultural, economic, religious, climatic, educational, access to food and marketing influences. Cognitive factors focus on sensory perceptions, aversions, beliefs, preferences, parental influences and emotions. Biological factors, on the other hand, are limited to the genetic profile and homeostasis [6].

To date, the literature describes few studies carried out in the academic environment that highlight biological factors, such as chronotype and sleep quality, and how these influence the dietary choices of university students.

A study carried out with 100 university students at Mount Carmel College, Bengaluru, India, which used the same questionnaire (PSQI) as the one adopted in the present investigation, concluded that half of the university students had poor sleep quality and a higher intake of fast foods was associated with poorer sleep quality. Another study, carried out with 644 students from 8 Lebanese universities, which aimed to determine the prevalence of food addiction (PA) and assess associations

between PA, stress, sleep quality and chronotype among university students, found that 81.2% of the participants who had PA had poor sleep quality and that 70.2% of the students had an intermediate chronotype, 20.5% a nocturnal chronotype and 8.7% a morning chronotype [7][8].

However, there are few national studies investigating the association between sleep quality and chronotype and dietary choices, which highlights the relevance of this study in terms of filling national gaps. In this sense, it is pertinent to deepen our knowledge of these factors and understand how they relate to diet, in order to provide important information for the implementation of health promotion policies and actions in the university environment [9][10].

This study aimed to assess how associations between chronotype and sleep quality may be associated with the dietary choices of students on a nutrition course.

METHODOLOGY

This was a cross-sectional, qualitative, analytical study carried out with nutrition students at a public university in Vitória de Santo Antão, Pernambuco, Brazil. The study was carried out between March and July 2022.

The study included university students of both sexes, over 18 years of age and enrolled in the Nutrition course from the 1st (first) to the 8th (eighth) graduation period, who agreed to take part in the study and excluded pregnant women, people with severe cognitive impairment that prevented them from completing the questionnaires and those who were not duly enrolled.

All data collection was carried out using questionnaires prepared on the Google Forms platform and applied online. The survey was publicized by sending emails, in person on campus and via social networks (Facebook, Instagram, WhatsApp and Telegram).

For the characterization and classification of sociodemographic aspects (race, employment status, family income, marital status and schooling), a simple and practical questionnaire was used.

Self-reported anthropometric data was collected to assess the students' nutritional status by calculating their Body Mass Index (BMI=Weight/Height^2), calculated by dividing weight (kg) by height (m). Thus, BMI was classified according to the World Health Organization [7], with those with a BMI < 25 being considered not overweight and those with a BMI ≥ 25 being considered overweight.

The Ministry of Health's "How is your diet?" questionnaire [11], based on the Food Guide for the Brazilian Population [12], was used to assess food choices. The questionnaire comprises 24 questions with four scoring levels that should be answered according to the interviewee's daily life. The values are added up and classified according to the score: above 41 points indicates that the respondent has a healthy diet in many respects (adequate food choices); between 31 and 41 points there are some positive aspects of a healthy diet, but changes are still needed (intermediate food choices); up to 31 points there is a need to change their lifestyle in order to have a healthy diet (inadequate food choices). In this material, whose purpose is educational, each band is accompanied by a recommendation that highlights points to be improved in the diet of the individuals classified in it, dialoguing with the dimensions of the scale. The recommendations are "start by making good choices", "try to cook more", "eat calmly and in appropriate environments" and "take good care of your diet".

The participants' sleep quality was assessed using the validated Brazilian version of the PSQI (Pittsburgh Sleep Quality Index), which assesses sleep quality over a period of 1 month [13]. The questionnaire consists of 19 self-assessed questions and 5 questions to be answered by roommates. The last questions are used for clinical information only.

The participants' chronotype was determined using the Chronotype Questionnaire, a Portuguese version of Horne and Östberg's Morningness-Eveningness Questionnaire (MEQ) [14], translated and adapted by the Multidisciplinary Group of Development and Biological Rhythms (GMDRB) of the Institute of Biomedical Sciences at USP [12]. This questionnaire is a self-assessment instrument that contains 19 questions, with each answer assigned a value, the final value of which classifies chronotypes as: morning, afternoon, intermediate or indifferent.

To characterize the sociodemographic profile, percentage frequencies were calculated and the frequency distributions of the qualitative variables were constructed. The Chi-square test for independence was used to analyze associations between variables. In cases where the assumptions of the Chi-square test were not met, Fisher's exact test was applied. The level of significance adopted was 5% (p error $\alpha \leq 0.05$), as well as borderline significance if 10% (p error $\alpha \leq 0.1$).

The study followed the guidelines and norms of Resolution 466/2012 of the National Health Council/Ministry of Health, which deals with ethical aspects in research involving human beings. It was previously approved by the Research Ethics Committee of the Vitória Academic Center of the Federal University of Pernambuco (Certificate of Submission for Ethical Appraisal - CAAE: 53724421.3.0000.9430) and the individuals who agreed to participate made a voluntary contribution by signing the Informed Consent Form (ICF), which was also made available online before the participants answered the questionnaires.

RESULTS

A total of 80 students from all periods of the Nutrition course were collected. The average age of the participants was 22 ± 23 years. Table 1 shows that the majority of students were female, white and brown. With regard to marital status, the majority reported being single. With regard to family income, the majority reported earning between 1 and 3 minimum wages.

Still in Table 1, in relation to nutritional status, 25.0% (N=20) of the students were overweight, 63.75% (N=51) of the students had inadequate eating habits, 33.8% (N=27) had sleep disorders. With regard to the participants' chronotype, it was possible to identify that 22.5% (N=18) were classified as afternoon people, 28.7% (N=23) as morning people and 48.8% (N=39) as intermediate people.

Table 1 - Socioeconomic and demographic characteristics, nutritional status, eating habits, sleep quality and chronotype of Nutrition students at a Public University in Pernambuco, Vitória de Santo Antão Campus, 2022.

Variables	N	%
Sex		
Female	63	78,8
Male	17	2112
Material status		
Not married	72	90
Married	8	10
Course period		
1°- 4°	39	48,7
5°- 8°	41	51,3
Family income		
< 1 Minimum wage	27	33,8
1 a 3 Minimum wage	41	51,2
> 3 Minimum wage	12	15,1
Color		
White	37	46,3
Black	6	7,4
Brown	37	46,3
BMI		
Low weight	7	8,8
Eutrophic	53	63,2
Overweight	12	15,0
Obesity	8	10,0
Overweight		
<25	60	75,0
≥25	20	25,0
Eating habitis		
Suitable	29	36,25
Not suitable	51	63,75
Sleep disorders – PSQI		
Disorder	27	33,8
Bad sleep	44	55,0
Good sleep	9	11,2
Cronotype		
Afternoon	18	22,5
Intermediate	39	48,8
Morning	23	28,7

Minimum wage: R$ - 1320,00 or U$ 239,38.
Source: Authors, 2024.

Table 2 shows the data relating to the analysis of the association between sleep disorders and socio-economic data, nutritional status, dietary practices and chronotype. There was a statistical association between chronotype and sleep disturbance (p=0.049).

Table 2 - Association between sleep disturbance and sociodemographic, anthropometric, dietary practice and chronotype variables among nutrition students at a public university in Pernambuco, Vitória de Santo Antão Campus, 2022.

Variables	WITH A SLEEP DISORDER		P-value
	N	%	
Sex			0,227
Male	8	50,0	
Female	19	30,0	
Color			0,769
White	13	35,1	
Brown	13	35,1	
Black	1	16,7	
Marital status			0,548
Not married	24	37,5	
Married	3	33,3	
Age			0,110
18 a 24	25	37,3	
≥ 25	2	15,4	
Course period			0,385
1º ao 4º	15	38,5	
5º ao 8º	12	29,3	
Family Income			0,762
< 1 MW	10	37,0	
1 a 3 MW	14	34,1	
>3 MW	3	25,0	
Overweight			**0,076***
Yes	17	28,3	
No	10	50,0	
Eating habits			0,494
Suitable	8	27,6	
Intermediate	17	39,5	
Inadequate	2	25	
Chronotype			**0,049***
Evening	8	44,4	
Intermediate	21	53,8	
Morning	10	43,5	

MW = Minimum Wage - R$ 1320,00 ou U$ 239,38.
Source: Authors, 2024.

Table 3 shows an association between chronotype and food consumption (p<0.001), with 77.7% (N=14) of afternoon students being associated with inadequate eating habits, while 40.3% (N=25) of morning students had healthy food choices.

Table 3 - Association between chronotype and socioeconomic and demographic variables, food consumption and nutritional status of nutrition students at a public university in Pernambuco, Vitória de Santo Antão, 2023.

Variáveis	Afternoons		Not in the afternoon		P-value
	N	%	N	%	
Sex					0,191
Male	1	5,6	16	25,8	
Female	17	94,4	46	74,2	
Color					0,903
White	9	50,0	28	45,2	
Brown	8	44,4	29	46,8	
Black	1	5,6	5	8,1	
Marital status					0,422
Not Married	17	94,4	55	88,7	
Married	1	5,6	7	11,3	
Age					0,150
18 a 24	17	94,4	50	80,6	
≥ 25	1	5,6	12	19,4	
Course period					0,512
1º ao 4º	10	55,6	29	46,8	
5º ao 8º	8	44,4	33	53,2	
Family period					0,148
< 1 MW	4	22,2	23	37,1	
1 a 3 MW	13	72,2	28	45,2	
>3 MW	1	5,6	11	17,7	
Overweight					0,763
Yes	5	27,8	15	24,2	
No	13	72,2	47	75,8	
Eating habits					**<0,001**
Suitable	4	22,2	25	40,3	
Inadequate	14	77,8	37	59,7	

MW = Minimum Wage - R$ 1320,00 ou U$ 239,38.
Source:Authors, 2024.

DISCUSSION

The results of this study showed that there was a prevalence of female, young adult university students and that sleep-related problems were more frequent among women. Although it was not the aim of this study to assess sleep quality according to gender, it is known that women suffer more changes in their sleep patterns, which may be related to psychological conditions, since they show symptoms of anxiety and depression more often than men, and hormonal factors, present during menstrual cycles, pregnancy and menopause, are also factors that can affect sleep [15]. Corroborating these findings, a study of 6,157 undergraduate students, using the same PSQI survey questionnaire, aimed to assess the effect of COVID-19 quarantine and its lifestyle challenges on the sleep quality and mental health of university students, found that poor sleep quality was higher among women 77.8% compared to men 71.5% [16].

It is worth noting that the professional/personal demands placed on women in society influence their state of health, presenting more health problems compared to men, with increased physical and psychosocial implications, resulting in eating disorders, poor sleep quality, depression and anxiety, making them more adept at the health services available in their regions [17].

The university space is a place of various transformations, due to the management of academic tasks and social life, which directly implies the quality of sleep and the eating habits of students, in which

there is a greater consumption of industrialized foods, snacks, consumption of alcoholic beverages by this population [18].

This study found that students had inadequate eating habits and approximately 1/3 of the sample had sleep disorders. However, these variables were not associated in this study.

Sleep disturbance can also be related to obesity, as in a study carried out with medical students (n=59), which found that 82.6% (N=49) of university students were overweight and related to poor sleep quality [19], but this association was not found in this study either.

That said, it is believed that the poor quality of sleep and poor eating habits found in this study can be explained by other health determinants that can have a negative impact on these variables, such as high academic demand, a sedentary lifestyle, low income, lack of time for leisure and food deserts in the vicinity of the university, all of which may be contributing to poor sleep quality and poorer dietary choices [20].

It should also be noted that the present study was carried out during a period when the COVID-19 pandemic was recently under control and students were gradually returning to their face-to-face academic activities, which still generated insecurity, anxiety, depression and post-traumatic stress disorder in infected and uninfected people that were still very present in the memory of these university students, similar to other studies that also assessed sleep quality during this period [21] [22].

As for chronotypes, approximately a third of the students were classified as afternoon students, i.e. they had habits of going to bed and waking up later, and these variables were associated. In other words, university students in the afternoon had worse food choices. The study by Teixeira [23] also obtained similar results. In his study, which aimed to investigate the association between daytime preference, nutritional status and food consumption in undergraduate students, it was observed that afternoon students skipped breakfast more than intermediate and morning chronotypes. In addition, it was noted that when skipping breakfast there is a greater chance of having an inadequate diet, as there is a calorie compensation in the following meals compared to those who eat breakfast, however this analysis of times of greater or lesser consumption was not the subject of this study.

In the study by Najem et al. [24], an inadequate consumption of foods rich in sugar and fats was pointed out by university students who did not have adequate sleep, whether due to worries, stress, anxiety or the influence of social jetlag, i.e. their chronotype was not suited to their daily activities. Similar to the present study, which found 77.8% (N=14) of afternoon students associated with unhealthy eating habits, while 40.3% (N=25) of morning students had better food choices. The evidence on people with this chronotype points to a population with better health, physical activity and eating habits, highlighting a higher consumption of fruit and vegetables compared to afternoon people [25].

Chronutrition is a branch of chronobiology that studies the interaction between biological rhythms and nutrition, relating it to human health. These studies on circadian cycles and eating patterns are relatively recent and emerging, as are their repercussions on human health [26]. Therefore, future research that can investigate other variables associated with the chronotypes of these students, such as age, genetic and hormonal factors, such as cortisol and melatonin levels, among others, can contribute to further elucidating the findings of this study.

It is worth pointing out that chronotype can change throughout life and that these alterations can also influence the lifestyle of these students, given that the sample analyzed in this study was in early adulthood. In general, children and the elderly are more morning people and young people are more afternoon people, and in adolescence, both women and men are more afternoon people [27].

Although we are aware of the importance of this study, given the scarcity of literature on these variables among nutrition students, some of its limitations should be highlighted, such as having been

carried out in a post-pandemic period, in which there were many uncertainties and also the resumption of university students' routines; the lack of qualitative data, such as analysis of students' discourses on their difficulties in relation to access to adequate food, as well as situations that could be influencing the quality of their sleep. It should also be noted that during this period the university had not resumed all the health promotion actions carried out by the UPS commission. However, the data presented here could help to guide which actions should be prioritized for these undergraduates.

CONCLUSION

It can be concluded that the profile of the students in this study showed inadequate eating habits, sleep disorders and changes in their chronotype.

The results of this study can contribute scientific evidence to understanding the associations between sleep quality, chronotype and dietary choices of public higher education students, with a view to targeting health promotion interventions in the university environment and responding to a gap in the scientific community. These findings also have practical implications, since in order for these students to become competent professionals in the future, they must acquire a better lifestyle. This assumption takes on greater relevance in higher education in health, since during their undergraduate studies, students are already provided with the development of skills in the area of health promotion.

It is also necessary to develop food and nutrition education for these university students, as well as strategies to improve the quality of their sleep, which should be included in the Health Promoting University proposal.

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