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Relationship between chronotype and quality of sleep in medical students at the Federal University of Paraíba, Brazil

*Gabriela Lemos Negri Rique**, *Gilson Mauro Costa Fernandes Filho*, *Amanda Dantas Cavalcante Ferreira*, *Rilva Lopes de Sousa-Muñoz*

Department of Internal Medicine, School of Medicine, Federal University of Paraíba, João Pessoa, Brazil

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ABSTRACT

Objective: The aim of this study was to identify chronotypes of medical students at the Federal University of Paraíba (UFPB) and its relationship to quality of sleep, daytime sleepiness, age, sex and season of birth.

Methods: The final sample consisted of 221 students, assessed by four questionnaires: demographic questionnaire, Morningness–Eveningness Questionnaire (MEQ), Pittsburgh Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS).

Results: There was a statistically significant difference between groups with respect to chronotypes and PSQI score ($p<0.0005$), but not with excessive daytime sleepiness. A significant negative correlation was found between the scores of MEQ and PSQI (rho $=-0.3$, $p<0.0005$), demonstrating that the greater the eveningness, the worse the sleep quality. It was observed that 51.6% of students were classified as indifferent chronotype, 61.5% had poor quality of sleep, while 42.1% had excessive daytime sleepiness. Sex and season at birth did not differ between chronotypes.

Conclusion: These findings demonstrate that the evening chronotype was associated with poor quality of sleep in medical students, but not with increased daytime sleepiness, with potential impairment to their academic performance and quality of life.

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1. Introduction

Chronobiology organization constitutes itself as one of the parameters responsible for inter-individuality differences. Three human chronotypes are described: morning ("larks"), evening ("owls") and indifferent. They are characterized by individual preferences for activity realization during a determined period of the day, with better alertness during morning, evening or without any preference, respectively [1].

Regardless of the individual chronotype, synchronization and regularity of the sleep–wake cycle, is a must. In medical students, this process is modified by various factors, such as curricular load during the entire day, extra-curricular activities, physical and emotional stress, pressure for high academic performance and influence of hospital demands [2,3]. Learning process and humor status are also conditioned by sleep–wake cycle and influenced by the quality and duration of sleep [4]. When compared to normal population, medical students show

*Correspondence to: Rua Rita de Alencar C. Luna, no. 72, apt. 403, Brisamar, João Pessoa, PB 58033-080, Brazil. Tel.: +55 83 91886570.
E-mail address: riquegln@gmail.com (G.L.N. Rique).

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an average of 6 h of sleep per day, a result that is inferior to the 8 h per day, commonly found in the normal population [2,5].

It is supposed that individual circadian preferences for sleep–wake cycles are, till a certain degree, under genetic and hereditary control [6–10]. Possibly, such association derives from intrinsic properties of the circadian system [11], and it is also believed that diurnal preference as well as the quality of sleep, demonstrate a strong genetic component. A series of studies were conducted to verify the relationship between genes and variables of the circadian rhythm [12]. Environmental influence, on other hand, did show a low correlation with these phenotypes [11].

The main question of this research is: Does chronotype demonstrate association with the quality of sleep and excessive diurnal sleepiness among medical students? The objective of this study was to verify the association of chronotype with quality of sleep and excessive diurnal sleepiness among medical students of the Federal University of Paraiba (UFPB), as well as to evaluate its association with the demographics of the studied population.

2. Methods

2.1. Model of study and sampling

This was an observational cross-sectional study, involving students of the 1st to the 6th year of the graduation course of Medicine at the Federal University of Paraiba (UFPB), *campus* I, João Pessoa, Paraíba, Brazil. Stratified sample was used, proportionately to the number of students in each year of medical school.

For the calculation of sample size, we used the SPSS SamplePower 3.0 software, through the model of difference between means of two groups. The primary variable, the Pittsburgh Sleep Quality Index (PSQI) score, was utilized as a reference for the calculation and the data were determined from the results of Selvi et al. (2012), who also studied the quality of sleep in relationship to chronotype in a sample of university students [13]. In the referred study, the difference between the mean values for the global score obtained by the application of PQSI in morning and evening groups was of 1.5, being the highest standard deviation of 2.6. It was considered a level of significance of 0.05 for all calculations. To obtain a statistical power of 80%, it was established that the ideal sample size was of 49 students per group. As in the study by Selvi et al. (2012), the approximately proportion of morning, indifferent and evening subjects was of, respectively, 1:2:1; we estimated a similar distribution, with the need for 196 students to obtain a minimum of 49 students per group. We additionally considered 30% more individuals to compensate for possible exclusions and dropouts after the data collection (for example, by means of incomplete filling out of the research instruments) or by refusal to participate in the research, reaching then a total sample of 255 students to apply the research tools.

2.2. Instruments and procedures for data collection

The application of the research instruments was performed in the classroom, self-administered, after 4 weeks of the beginning of the ongoing semester. We handed out the study protocol to all students at the initial approach, containing the four instruments to collect the data and the Term of Informed Consent.

The following instruments were used: (1) Social-Demographic Questionnaire: gender, date of birth and course semester; (2) Standard Questionnaire for chronotype identification (MEQ); (3) Pittsburgh Sleep Quality Index (PSQI); (4) Epworth Sleepiness Scale (ESS).

The Standard Questionnaire for identifying the chronotypes (Morningness–Eveningness Questionnaire – MEQ) [14] is constituted by 19 auto-evaluating questions for identification of the chronotype and whose global score varies from 16 to 86. Individuals with values below 42 are classified as evening type; those above 58, as morning type and those between 42 and 58, as indifferent type. This questionnaire was translated and adapted for the Portuguese language by the Multidisciplinary Development and Biological Rhythms Group of the University of São Paulo [15].

The Pittsburg Sleep Quality Index (PSQI) [16] is composed of 10 questions to measure the sleep quality of the adult during the month that preceded the interview. This questionnaire is divided into seven areas: quality, latency, duration, sleep habitual efficiency, disturbances, use of medication to sleep and sleep disorders. For each area a score is attributed, varying from 0 (zero) to 3 (three). The final score is obtained from the sum of the scores from the seven areas, varying from 0 to 21, being the better the quality of sleep with the lower score obtained. Scores from 0 to 5 indicate good quality of sleep and from 6 to 21 indicate poor quality of sleep. The questionnaire was translated and adapted for the Portuguese language, whose version demonstrated a degree of confidence of 81% [17].

The Epworth Sleepiness Scale (ESS) is used to evaluate the existence of excessive diurnal sleepiness. Scores above 10 are associated with diurnal sleepiness [18]. Validated for the Portuguese language [17], this scale consists of questions about the probability of sleeping in different situations, such as, for example, watching TV, reading or sitting down, and it attributes points to each one of the evaluated items. Results inferior to 10 points indicate the absence of sleepiness; between 10 and 16 points suggest mild sleepiness; between 16 and 20 points, severe sleepiness.

The research project was approved by the Lauro Wanderley University Hospital's Ethics Committee for Research.

2.3. Variables

The main variable of the research was the chronotype. Scores of Quality of Sleep (PSQI), scores of Diurnal Sleepiness (Epworth), gender, age, season of birth (Spring, Summer, Autumn, Winter) and semester in Medical School, were all secondary variables.

To evaluate the possible correlation between chronotype and season of birth, we used the dates for the South Hemisphere: Spring between September 22nd and December 20th; Summer, between December 21st and March 20th; Autumn, between March 21st and June 20th; Winter, between June 21st and September 21st.

2.4. Statistical analysis

We utilized the normality tests of Shapiro–Wilk and Kolmogorov–Smirnov with Lilliefors corrections to verify the

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