

# The Influence of Sleep Disorders, Sleep Habits, Comorbidities on the Sleep Quality of Medical Students and the Consequences of these Findings

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## Abstract

**Objectives:** Sleep impairment and sleep disorders have various repercussions on the quality of life of an individual, affecting his professional, academic performance and mental health. The objective of this study was to assess the influence of sleep characteristics and comorbidities on the quality of sleep of medical students from a University Center, as well as their consequences.

**Methods:** Subjects were evaluated for sleep habits, sleep disorders, comorbidities, quality of sleep, impact on work and social relations, and memory complaints.

**Results:** The mean of hours of sleep for the group (n=135) was 6.42, the mean Epworth Sleepiness Scale score was 10.4, the mean Pittsburgh Sleep Quality Index score was 6.98. Significant associations between poor quality of sleep and number of hours of sleep (p= 0.00), Beck Depression Inventory scores (p= 0.03) and Beck Anxiety Inventory scores (p = 0.00) were detected. Depressive disorder was a factor for the worst PSQI results (linear regression analysis, p = 0.01).

**Conclusion:** Sleep deprivation, depressive and anxiety symptoms are related to a poor quality of sleep among medical students, influencing work and social life. Thus, we alert medical schools to be aware of the workload and attributions of these students and also of the possible depressive symptoms, anxiety symptoms and suicidal ideation between medical students.

## Introduction

Sleep is a physiological state of cyclic occurrence due to the interaction of regulatory factors which involves endogenous circadian mechanisms and exogenous behavioral mechanisms. Some of the exogenous factors are environmental luminosity, bedtime and wake up time, practice of physical activity, diet, and use of alcohol, tobacco and caffeine [1-3].

During this process, several systems act jointly and therefore sleep is important for various functions of the organism, being fundamental for memory consolidation, thermoregulation, maintenance of homeostasis, restoration of energy metabolism, hormonal regulation and secretion, in addition to acting on psychological and mental health [4-6].

In general, the sleep cycles respect the circadian regulation of the human organism, as they start every 24 hours. Luminosity during the day, darkness at night, and the variations in light incidence throughout the day are transported by the optic nerve and stimulate the supra-chiasmatic nucleus in the anterior hypothalamus to produce melatonin, a neurohormone implicated in the chronobiology of the sleep-wake cycle. From this point, a somnolence situation starts which results in physiological sleep when there is no other factor disturbing this cycle [1].

Normal sleep is characterized by two main phases: NREM sleep (without rapid eye movements) and REM sleep (with rapid eye movements). NREM sleep consists of 4 stages of increasing degree of depth, i.e., stages I, II, III and IV. In NREM sleep there is muscle relaxation in comparison to wakefulness, although some basal tonic activity is always maintained [1].

It has been well established that the process of memory consolidation occurs during sleep, specifically during NREM sleep, due to thalamo-cortical oscillations. It has also been shown that sleep reduction over a period of five days affects the phonological and visuospatial components of memory storage, reducing academic performance and work activities [7,8].

It has also been suggested that inadequate sleeping time, adverse behavior at bedtime and daytime sleepiness are related to reduced attention and depressive symptoms among students. On the other hand, persons with depressive symptoms have a higher frequency of sleep disorders than persons with no depressive symptoms [9-10]. Thus, the sleep-depression dyad is a two-way street,

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a poor quality of sleep favors depressive symptoms and patients with depressive symptoms more frequently have a poor quality of sleep.

Sleep impairment and disorders have various repercussions on the quality of life of an individual, affecting his professional and academic performance with degraded attention, increased error rate, changes in psychomotor capacity and reduced ability to perform a task [5,6]. There are also psychosocial and health repercussions in view of the cognitive, immunological and metabolic impairment, with an increased risk of diabetes, overweight and hormonal changes such as those affecting cortisol due to neuroendocrine deregulation [11-16].

Regarding sleep hygiene, several external effects influence the quality of sleep. A high prevalence of sleep disorders has been detected in smokers compared to non-smokers, revealing that smoking is a factor that compromises the duration and quality of sleep [17]. Alcohol is also another external factor that influences the quality and duration of sleep, as shown in studies that have reported a positive correlation between alcohol consumption and sleep perturbation [18].

In addition, the use of electronic devices before sleeping has been associated with insufficient sleep. Studies have suggested that TV watching and the use of a computer, tablet, cell phone or other electronic devices before sleeping are associated with insomnia and daytime sleepiness. This may be probably due to the luminous stimuli of the devices which cause a delay in sleep stimulation by inhibiting the synthesis of melatonin and also to the cognitive, physiological or emotional excitement possibly caused by such devices, with consequent sleep impairment [3,19-21].

Depending on the time of day when it is practiced, physical exercise may be harmful. Exercises performed close to night-time may result in a poor quality of sleep (disturbed or fragmented sleep) when compared to exercises performed in the afternoon [22]. Finally, daily stress is also associated with quality and increased fragmentation of sleep [23].

In view of the importance of quality of sleep for medical students, the influence of several adverse behavioral factors on this quality, and the risks of academic, social and health impairment due to a poor quality of sleep, we undertook the present study.

## Objectives

The main objective of the present study was to evaluate the sleep habits and behaviors, sleep characteristics and comorbidities of medical students from a University Center, the relationship of these with the quality of sleep and the consequences for the life of these individuals, as well as memory complaints and impairment of work and social life.

## Methods

A cross-sectional descriptive study was conducted at the Faculty of Medicine of the University Center Barão de Mauá, Ribeirão Preto, São Paulo. We included first to sixth year medical students of both sexes aged at least 18 years who agreed to give written informed consent to participate. Exclusion criteria were mental impairment that would prevent the subjects from filling out the questionnaire and failure to give written informed consent to participate.

## Clinical data

An interview was applied in order to obtain data about age, sex, height, Body Mass Index (BMI), comorbidities, depressive disorder, anxiety disorder, thyroid dysfunction, diabetes, hypertension, alcohol intake, smoking, use of caffeine, use of medications and a history of head trauma. Regarding sleep aspects, we evaluated sleep behaviors (worrying and stress, physical exercises at night, use of electronic devices and social networks before sleeping, and light in the bedroom, including light from stand-by devices). We also evaluated sleep characteristics (sleep latency, duration of sleep, sleep deprivation), the presence of previously diagnosed sleep disorders such as obstructive sleep apnea syndrome, insomnia, snoring, excessive daytime sleepiness, as well as subjective aspects related to the quality of sleep (good x poor) and their impact on work and social relations, as well as the presence of subjective memory complaints. The following questionnaires were applied: Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), Prospective and Retrospective Memory Questionnaire (PRMQ), Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI), all of them validated for Brazilian Portuguese [25-29].

## Pittsburgh Sleep Quality Index (PSQI)

The PSQI was used to assess the quality of sleep of the participants. The test consists of ten questions, the first four requiring open answers and the remaining ones being objective [25]. The questions focus on: subjective sleep quality, perception of the individual regarding sleep quality, sleep latency, time needed to induce sleep, duration of sleep, habitual sleep efficiency, Sleep disorders, presence of situations that compromise sleep, use of sleep-inducing medications, daytime sleepiness and disorders. Each component can be scored from zero to three points and the maximum score is 21 points. Scores of 0-4 indicate good sleep quality, scores of 5-10 indicate poor quality, and scores above 10 indicate sleep disorders [6,24].

## Statistical analysis

Data were analyzed statistically using the SPSS software version 18.0. The X2 test or Fisher exact test was used to analyze the categorical variables according to the expected frequency in the cells. Numerical variables were analyzed by the Kolmogorov-Smirnov test in order to determine their type of distribution; those with normal distribution were analyzed by parametric tests such as the Student t-test or Analysis of Variance (ANOVA) and those without normal distribution were analyzed by the nonparametric Mann-Whitney test. Linear regression model was used to correlate two or more variables.

## Ethical aspects

The study was approved by the Ethics Committee of the University Center Barão de Mauá, Ribeirão Preto, São Paulo, Brazil (CAAE 55001816.8.0000.5378), with the applicable ethical standards.

## Limitation of the study design

We know that the use of questionnaires is a limitation of the study, once we have a closed number of questions and we could lose some important information. However, we point out the difficulty in conducting an open interview, without a questionnaire. Specifically for medicine students, we believe that symptoms are well described because they have knowledge about most of the diseases described.

These are some of the limiting factors of this type of study that deserve to be reported.

**Results**

A total of 150 students were contacted, none of them was excluded and 15 refused to participate. Thus, 135 students were included in the study. Of these, 101 (74.8%) were women and 34 (25.2%) were men. Mean age was 21.7, Sd 3.12. Mean BMI was 22.8, indicating adequate weight for height.

Regarding sleep aspects, 92 (68.1%) reported that they slept well, although the mean number of hours of sleep for the group was 6.42 Sd 1.1, and 95 (70.4%) had excessive daytime sleepiness. Mean score on the Epworth Scale was 10.4, Sd 3.71. Mean PSQI score was 6.98, Sd 3.13, indicating, on average, a poor quality of sleep. The mean time to fall asleep was 26.3, Sd 23.4 minutes.

**Table 1:** Relation between poor quality of sleep and demographic data, sleep habits, comorbidities and scores in specific tests (medical students from a University Center).

	Poor quality of sleep		P
	Yes	Yes	
Gender (male, female)*	30(male)	10	1
Electronic devices before sleeping* (no x yes)	9	31	0.32
Light from stand-by devices*	23	17	1
Watch TV in the bedroom before sleeping *	30	10	0.36
Sleep with the light on*	35	5	1
Physical exercises at night *	25	15	0.19
Alcohol intake *	25	15	0.13
Use of caffeine *	18	22	0.13
Smoking *	39	1	0.51
Depression*	31	9	0.07
Anxiety*	4	36	0.25
Memory complaints*	31	9	0.23
	Poor quality of sleep		P
	no	yes	
Body mass index**	22.4 (mean)	23.8 (mean)	0.19
BDI **	7.4	11.2	0.03
BAI **	10.1	13.6	0.00
Prospective memory complaints**	18.2	18.5	0.46
Retrospective memory complaints**	15.1	16.2	0.21
Epworth Scale Score**	10.0	11.3	0.11
Number of hours of sleep **	6.8	5.5	0.00
PSQI Score **	5.6	10.3	0.00
*Fisher's exact test **Mann-Whitney test			

\*BDI: Beck Depression Inventory Test, \*\*BAI: Beck Anxiety Inventory Test, PSQI: Pittsburgh Sleep Quality Index

Regarding previously diagnosed sleep disorders, 37 (27.4%) had insomnia, 7 (5.2%) snored, and 2 (1.5%) had obstructive sleep apnea syndrome. Regarding poor sleep habits, 112 (83%) used electronic devices and the social networks before sleeping, 56 (41.5%) kept these devices on stand-by during sleep, 16 (11.9%) slept with the light on, 44 (32.6%) watched TV in the bedroom before sleeping, 63 (46.7%) practiced physical activity at night-time, 60 (44.4%) ingested caffeine at night-time, 2 (1.5%) were smokers, and 65 (48.1%) drank alcoholic beverages at night-time.

Regarding sleep quality, 95 (70.4%) reported a good quality and 40 (29.6%) a poor quality, and regarding the impact of sleep quality on the quality of life, 79 (58.5%) stated that their sleep pattern impaired their work and 55 (40.7%) stated that their sleep pattern impaired their personal relations.

The more frequent comorbidities were psychiatric, 111 (82.2%) considered themselves to be anxious and 17 (12.6%) to be depressive, with mean BAI and BDI scores of 11.1, Sd 8.3 and 8.5 , Sd 6.4, respectively. Eight subjects (5.9%) also reported hypothyroidism, and 2 (1.5%) reported hypertension. No patient had diabetes, head trauma or a previous neurological disease. Fifty-four subjects (40%) reported memory complaints. Prospective and Retrospective Memory Questionnaire scores were 18.2, Sd 4.9 and 15.4, Sd 4.4, respectively.

Regarding the medications taken by the subjects, 27 (20%) used contraceptives, 10 (7%) used antidepressants, 6 (4.4%) used levothyroxine, 3 (2.2%) used zolpidem, and 1 (0.7%) used melatonin. None of them used benzodiazepines.

We did not detected relation between a poor quality of sleep and the use of stand-by devices, the use of electronic devices, contact with the social network before sleeping, sleeping with the light on, physical activity at night-time, smoking, use of caffeine at night-time, high BMI, presence of hypertension, anxiety, subjective memory complaints, or scores on the Prospective and Retrospective Memory Questionnaires and Epworth Scale. In addition, no relation was detected between daytime sleepiness and memory complaints (p = 0.29). There was a relation between poor quality of sleep and the score on the Beck Depression Inventory (p=0.03) and Beck Anxiety Inventory (p = 0.01) (Table 1).

A statistically significant relation was detected between number of hours of sleep and described quality of sleep (p = 0.00) (Table 1). The mean number of hours of sleep was 6.8 for the group who reported a good quality of sleep and 5.51 for the group who reported a poor quality of sleep.

There was a correlation between a subjective description of poor quality of sleep and the highest PSQI scores, as determined by the Mann-Whitney test (p= 0.00). To evaluate the PSQI scores of the interviewees and the possible factors involved in their results we used a linear regression model, where PSQI test was the dependent variable and Depressive symptoms (BDI), Anxiety symptoms (BAI), Epworth Scale score, use of electronic devices before sleeping, use of caffeine, and physical activity at night-time were independent variables (we selected the poor sleep habits most prevalent in the sample). Depressive symptoms variable was an independent factor for the worst PSQI results, (p = 0.01) with a confidence interval of 0.041 – 0.264 (Table 2).

**Table 2:** A linear regression model where PSQI test (Pittsburgh Sleep Quality Index) was dependent variable, controlled by independent variables, Depressive Disorder, Anxiety Disorder, Epworth Scale Score, use of electronic devices before sleeping, use of caffeine and physical activity at night-time.

Model	P	B	95% confidence interval for B	
Depressive symptoms*	0.01	0.15	0.041	0.264
Anxiety symptoms**	0.96	-0.00	-0.090	0.087
Epworth Scale Score	0.27	0.08	-0.650	0.227
Electronic devices before sleeping	0.33	-0.67	-0.689	2.020
Caffeine use	0.85	-0.10	-1.457	0.693
Physical activity at night-time	0.48	0.38	-0.935	1.134

\* BDI: Beck Depression Inventory Test, \*\*BAI: Beck Anxiety Inventory Test

## Discussion

The present study described and analyzed sleep habits, sleep characteristics and comorbidities of medical students from a University Center, the relationship between these and the quality of sleep, and the consequences for the external life of these individuals such as memory complaints and impaired work and social life.

The major sleep problem detected in this group of medical students was sleep deprivation. These students sleep, on average, 6.42 hours per night, which is little for their age range<sup>1</sup>, and those who sleep fewer hours describe a poor quality of sleep ( $p = 0.00$ ). These findings are thought to be the result of the excessive workload required by the medical course which, according to the definitions of the Ministry of Education, is considered to have one of the highest workloads in Brazil [31]. Furthermore, the hours of study and the extracurricular activities routinely present in the life of these students result in few hours of sleep.

This limitation of the hours of sleep is reflected both on the description of quality of sleep by the students and on daytime sleepiness. Ninety-five subjects (70.4%) in our sample reported daytime sleepiness, with a mean score of 10.4 on the Epworth Scale for the group as a whole, representing an increased value. This prevalence was higher than that detected in similar studies on students in the health area, which reported 51.5% and 50% daytime sleepiness [5,6].

It should be remembered that the daily need for sleep varies according to age range, but most adults do not feel properly restored after a sleep of less than 7 hours per night [1]. An additional factor is the sleep rebound phenomenon, that occurs on the nights following deprivation, which tends to increase REM sleep in the first night after deprivation and NREM sleep in the second night, with a return to appropriate architecture only on the third night of sleep [1]. This fact is a problem for students who do not have an adequate bedtime routine, which results in a constantly perturbed sleep structure and in associated symptoms such as excessive daytime sleepiness.

Another result of sleep deprivation detected in the present sample was an impaired quality of life. Seventy-nine of the students evaluated (58.5%) think that their sleeping pattern impairs their work and 55 (40.7%) think that it impairs their personal relations. These data agree with studies that have shown professional impairment and an

impaired ability to perform tasks [5,6,11,14,15]. In addition, some studies have shown the presence of impaired metabolism in patients with sleep disorders, which results in higher risks of developing certain diseases such as diabetes, hormonal changes and overweight. This type of finding was not detected in our sample since there was no relationship between BMI and poor sleep quality, in contrast to these previously reported aspects [12,13,16].

In contrast to other studies, [17-22] sleep hygiene factors (sleeping with the light on, use of electronic devices before sleeping, watching TV in the bedroom, use of caffeine, alcoholic drinks, smoking, or practicing physical activity during the night-time period) also had no effect on the quality of sleep or on the PSQI score. Our sample was small and we think that, in a larger study, perhaps these data may show statistical significance.

Another, expected, result observed was that the students with a poor sleep quality had higher PSQI scores. This reflects the fact that the subjective sensation of poor sleep quality is confirmed by objective findings in PSQI scores.

An interesting point of the present study was that, even though this was a population of medical students with more access to medications and with high rates of insomnia, there was no significant use of sleeping medications. No student used benzodiazepines and few used zolpidem, melatonin or antidepressants.

Regarding cognitive-behavioral impairment, there was no relationship between the quality of sleep and memory complaints or higher scores in the memory questionnaires among the subjects with a poor quality of sleep. These findings are in contrast to literature data [7,8]. We believe that possible subtle findings of memory deficit may have been unperceived in a population of high academic performance, with specific tests of memory evaluation being needed in order to detect them. This point was not well assessed in the present study and could be better approached in future studies.

Patients with higher BDI and BAI scores had a worse quality of life. In addition, after linear regression analysis, the only factor that influenced the PSQI score was depression (higher Beck Inventory score). In this case, students with more depressive symptoms have a worse quality of sleep, as also reported in some other studies [9,10]. On this basis, it can be seen that many medical students have depressive symptoms with an impact on sleep and quality of life. The demands and responsibilities of the medical career may be causes of these findings. Thus, these results deserve better attention on the part of medical schools in order to provide better health for their students and to minimize the consequences of these symptoms, especially when we have many cases of suicidal ideation between medical students [32].

We conclude that inadequate sleeping time, depressive and anxiety symptoms are related to a poor quality of sleep among medical students. On the other hand, adverse components at bedtime and sleep habits did not influence the quality of sleep in the present study. The consequences of these findings were impairment of work and social life for the subjects under study. Thus, we alert medical schools to be aware of the workload and attributions of these students and also of the possible depressive and anxiety symptoms of this population.

## References

1. Fernandes RMF. O sono normal. *Medicina Ribeirão Preto*. 2006; 39: 157-168.
2. Moraes CAT, Edelmoth DGL, Novo NF, Hübner CVK. Qualidade de sono em estudantes de medicina do método de aprendizado baseado em problemas. *Medicina Ribeirão Preto*. 2013; 46: 389-397.
3. Fossum IN, Nordnes LT, Storemark SS, Bjorvatn B, Pallesen S. The Association Between Use of Electronic Media in Bed Before Going to Sleep and Insomnia Symptoms, Daytime Sleepiness, Morningness, and Chronotype. *Behavioral. Sleep Medicine*. 2014; 12: 343-357.
4. Delattre E. Ritmos hormonais do pâncreas endócrino: dos fundamentos cronobiológicos às implicações clínicas. *Medicina Ribeirão Preto*. 2004; 37: 51-64.
5. Cardoso HC, Bueno FCC, Mata JC, Alves APR, Jochims I, Vaz Filho IHR, et al. Avaliação da qualidade do sono em estudantes de Medicina. *Revista brasileira de educação médica*. 2009; 33: 349-355.
6. Pascotto AC, Santos BRM. Avaliação da qualidade do sono em estudantes de ciências da saúde. *J Health Sci Inst*. 2013; 31: 306-310.
7. Niknazar M, Krishnan GP, Bazhenov M, Mednick SC. Coupling of Thalamocortical Sleep Oscillations Are Important for Memory Consolidation in Humans. *PLOS ONE*. 2015; 10.
8. Angel Jd, Cortez J, Juárez D, et al. Effects of sleep reduction on the phonological and visuospatial components of working memory. *Sleep Science*. 2015; 8: 68-74.
9. Lehto JE, Uusitalo-Malmivaara L. Sleep-related factors: Associations with poor attention and depressive symptoms. *Child Care Health and Development*. 2013; 40: 419-425.
10. Téllez A, Juárez-García DM, Jaime-Bernal L, García-Cadena C. Prevalencia de Trastornos de Sueño en Relación con Factores Sociodemográficos y Depresión en Adultos Mayores de Monterrey, México. *Revista colombiana de psicología*. 2016; 25: 95-106.
11. Chiang YC, Arendt SW, Zheng T, Hanisch KA. The Effects of Sleep on Academic Performance and Job Performance. *College Student Journal*. 2014; 1: 72-87.
12. Jong E, Stocks T, Visscher TLS, et al. Association between sleep duration and overweight: the importance of parenting. *International Journal of Obesity*. 2012; 36: 1278-1284.
13. Engeda J, Mezuk B, Ratliff S, Ning Y. Short Report: Epidemiology Association between duration and quality of sleep and the risk of pre-diabetes: evidence from NHANES. *Diabet Med*. 2013; 30: 676-680.
14. Juliano ML. Importância da Qualidade do Sono em Universitários e Médicos Residentes. *Rev Neurocienc*. 2013; 21: 331-332.
15. Loft M, Cameron L. The importance of sleep: Relationships between sleep quality and work demands, the prioritization of sleep and pre-sleep arousal in day-time employees. *Work & Stress*. 2014; 28: 289-304.
16. Hirotsu C, Tufik S, Andersen ML. Interactions between sleep, stress, and metabolismo: From physiological to pathological conditions. *Sleep Science*. 2015; 8: 143-152.
17. Cohrs S, Rodenbeck A, Riemann D, Szagun B, Jaehne A, Brinkmeyer J, et al. Impaired sleep quality and sleep duration in smokers-results from the German Multicenter Study on Nicotine Dependence. *Addiction Biology*. 2012; 19: 486-496.
18. Park SY, Oh MK, Lee BS, Kim HG, Lee WJ, Lee JH, et al. The Effects of Alcohol on Quality of Sleep. *Korean Journal of Family Medicine*. 2015; 36: 294-299.
19. Sugauma N, Kikuchi T, Yanagi K, Yamamura S, Morishima H, Adachi H, et al. Using electronic media before sleep can curtail sleep time and result in self-perceived insufficient sleep. *Sleep and Biological Rhythms*. 2007; 5: 204-221.
20. Kozaki T, Kubokawa A, Taketomi R, Hatae K. Effects of day-time exposure to different light intensities on light-induced melatonin suppression at night. *Kozaki et al. Journal of Physiological Anthropology*. 2015; 34: 27.
21. Zarghami M, Khalilian A, Satareh J, Salehpour G. The Impact of Using Cell Phones After Light-Out on Sleep Quality, Headache, Tiredness, and Distractibility Among Students of a University in North of Iran. *Iran J Psychiatry Behav Sci*. 2015; 9: 2010.
22. Souissi M, Chtourou H, Zranc A, Cheikh RB, Dogui M, Tabka Z, et al. Effect of time-of-day of aerobic maximal exercise on the sleep quality of trained subjects. *Biological Rhythm Research*. 2012; 43: 323-330.
23. Petersen H, Kecklund G, D'onofrio P, Nilsson J, Akerstedt T. Stress vulnerability and the effects of moderate daily stress on sleep polysomnography and subjective sleepiness. *J Sleep Res*. 2013; 22: 50-57.
24. Chellappa SL, Araujo JF. Qualidade subjetiva do sono em pacientes com transtorno depressivo. *Estudos de Psicologia*. 2007; 12: 269-274.
25. Bertolazi AN, Fagondes SC, Hoff LS, Dartora EG, Miozzo IC, de Barba ME, et al. Validation of the Brazilian Portuguese version of the Pittsburgh Sleep Quality Index. *Sleep Med*. 2011; 12: 70-75.
26. Bertolazi AN, Fagondes SC, Hoff LS, Pedro VD, Menna Barreto SS, Johns MW, et al. Portuguese-language version of the Epworth sleepiness scale: validation for use in Brazil. *J Bras Pneumol*. 2009; 35: 877-883.
27. Piauilino DC, Bueno OF, Tufik S, Bittencourt LR, Santos-Silva R, Hachul H, et al. The Prospective and Retrospective Memory Questionnaire: a population-based random sampling study. *Memory*. 2010; 18: 413-426.
28. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. *J Consult Clin Psychol*. 1988; 56: 893-897.
29. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J, et al. An inventory for measuring depression. *Arch Gen Psychiatry*. 1961; 4: 561-571.
30. SAS/ STAT User's Guide, Version 8, Cary, NC: SAS Institute Inc., 1999. R version 2.8.0 Copyright © 2008. The R Foundation for Statistical Computing.
31. Gonzaga HN, Kormann SO. A carga horária excessiva do curso de graduação em medicina e sua repercussão na saúde mental do estudante. *Braz J Ment Heal*. 2014; 6: 156.
32. Rotenstein LS, Ramos MA, Torre M, Segal JB, Peluso MJ, Guille C, et al. Prevalence of Depression, Depressive Symptoms, and Suicidal Ideation Among Medical Students. A Systematic Review and Meta-Analysis. *JAMA*. 2016; 316: 2214-2236.