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Sleep patterns and fatigue of nursing students who work*

PADRÃO DE SONO E SONOLÊNCIA DO TRABALHADOR ESTUDANTE DE ENFERMAGEM

PATRÓN DE SUEÑO Y SOMNOLENCIA DEL TRABAJADOR ESTUDIANTE DE ENFERMERÍA

Luciane Ruiz Carmona Ferreira¹, Milva Maria Figueiredo De Martino²

ABSTRACT

It has been observed there is currently a growing interest in developing research regarding the sleep patterns of workers who must wake up very early or who work nights. Therefore, the objective of this study was to identify the levels of fatigue and the sleep patterns of nursing students who study during the day and work at night. Participants were thirty students who completed the Epworth Sleepiness Scale and Sleep Journal for thirty days. It was found that sleep duration was longer among men compared to women on days off work, and when on vacation from school compared to the regular school period. Participants showed high levels of fatigue and sleepiness, characterized by the incidence of excessive daytime sleepiness. In conclusion, night workers who endure sleep deprivation have additional wake hours due to studying, thus causing high levels of fatigue, which may harm their performance at school and at work.

DESCRIPTORS

Sleep
Sleep stages
Students, nursing
Night work

RESUMO

Atualmente tem sido observado crescente interesse, na área da saúde, no desenvolvimento de pesquisas sobre as alterações de sono do trabalhador que acorda muito cedo ou trabalha à noite. Assim, objetivou-se identificar os níveis de sonolência e padrões de sono do estudante diurno de enfermagem que trabalha à noite. Trinta estudantes participaram, através do preenchimento da Escala de Sonolência de Epworth, e Diário de Sono, durante trinta dias. Teve-se que a duração do sono foi maior para os homens, quando comparados às mulheres, nos dias sem trabalho, e no período de férias quando comparado ao letivo. Apresentaram-se elevados níveis de sonolência, caracterizando incidência de sonolência diurna excessiva. Concluímos que o trabalhador noturno, que sofre privação do sono, tem um acréscimo das horas de vigília devido ao estudo, ocasionando níveis elevados de sonolência, o que pode prejudicar seu desempenho escolar e no trabalho.

DESCRIPTORES

Sono
Fases do sono
Estudantes de enfermagem
Trabalho noturno

RESUMEN

Actualmente, se ha observado un creciente interés en el área de salud, referente al desarrollo de investigaciones sobre alteraciones del sueño del trabajador que despierta muy temprano o trabaja de noche. Consecuentemente, se objetivó identificar los niveles de somnolencia y patrones de sueño del estudiante diurno de enfermería que también trabaja de noche. Participaron treinta estudiantes, utilizándose la Escala de Somnolencia de Epworth y Diario de Sueño durante 30 días. Se constató que la duración del sueño fue mayor para los hombres en comparación con las mujeres, en los días sin trabajo, y en el período de vacaciones en comparación al ciclo lectivo. Presentaron elevados niveles de somnolencia, caracterizando incidencia de somnolencia diurna excesiva. Concluimos en que el trabajador nocturno, que sufre de privación del sueño, incrementa sus horas de vigilia debido al estudio, ocasionándose niveles elevados de somnolencia, lo cual puede perjudicar su desempeño escolar y laboral.

DESCRIPTORES

Sueño
Fases del sueño
Estudiantes de enfermería
Trabajo nocturno

* Extracted from the thesis "Estudo da variabilidade circadiana da temperatura corporal e ciclo vigília-sono do estudante trabalhador noturno", Graduate Program in Nursing, School of Medical Sciences, Campinas University, 2011. ¹ RN. Ph.D. in Sciences by the Graduate Program in Nursing, School of Medical Sciences, Campinas University. Campinas, SP, Brazil. luruiz@fcm.unicamp.br ² Associate Professor of the Nursing Department, School of Medical Sciences, Campinas University. Campinas, SP, Brazil. milva@unicamp.br

INTRODUCTION

Due to increased industrialization in society, shift work has become increasingly common, including working during the night, with a pronounced negative effect on sleep and health which exposes workers to the risk of accidents and the development of diseases, such as cardiovascular disease and certain forms of cancer. This is because of the conflict between biological rhythms and the need to work adverse schedules⁽¹⁾.

Today a growing interest has been observed in research regarding sleep disturbances affecting workers who go to work very early or work through the night, but there has been little interest in regards to student workers. Understanding how these factors are associated with sleep quality becomes an important task in clarifying the effects that could impact the student workers' health⁽²⁾.

Studies⁽³⁾ have shown that working shifts, particularly night shifts, causes drowsiness, fatigue and mood disorders, and can also trigger or aggravate cardiovascular and intestinal problems, which are responsible for a decline in productivity and increase risk factors for the occurrence of errors and occupational accidents. For students, it may cause a decline in learning.

An insufficient duration of sleep can also negatively interfere in activities performed during the day, increasing the risk for accidents and low performance in school activities. Considering these data, we observe that the classes of undergraduate nursing students are mostly comprised of women, who may experience a higher prevalence of sleep disorders and sleepiness at work⁽⁴⁾. In public institutions, many (if not most) of the students depend economically on their parents⁽⁵⁾; however, it is believed that this is not the case in private institutions. Due to the need to finance their studies, students may have to resort to working, which may lead to poor adaptation, which favors sleep disorders.

The sleep-wake cycle, as well as other circadian rhythms, is directly influenced by night work. Humans are generally productive during the day, thus activity and wakefulness are concentrated during the day and sleep occurs at night. Thus, we can infer that the individual who works at night will have a high level of daytime sleepiness, which favors the incidence of occupational accidents, injuries and errors⁽⁶⁾.

There are indications that several factors can interfere with the adaptive capacity of the worker employed on the night shift, such as age, sex, health, fitness, flexibility and choice in sleeping habits, in addition to some personality traits and the circadian rhythm⁽⁷⁾.

Once the risks of night work on the sleep-wake cycle have been recognized, a new concern arises related to daytime study, in addition to daytime working hours, because it is believed that the night worker who is required to study in the morning experiences a shorter sleep period due to the need to attend classes, as well as tend to additional activities outside the classroom that they must comply with in order to meet the program requirements, which may culminate in chronic fatigue. However, there is a lack of studies that investigate the routine of students who are night shift workers, as most studies only address night shift work, or characteristics of sleep affecting night students who work in the daytime⁽⁸⁻¹¹⁾.

Several studies have pointed out the irregular sleep patterns of students who get less sleep due to school activities^(8,12) and the consequences of abnormal sleep patterns, but there is a gap in knowledge regarding the patterns of sleep of students who are night workers, such as nurses, who have a 12-hour shift followed by 36 hours of rest, and who are forced to attend college immediately after work, without the ability to rest or nap before their classes begin.

It is known that there is a reduction in the students' hours of sleep, as shown in one of the studies⁽¹³⁾ that evaluated the patterns of sleep-wake cycles of student workers and non-workers, which noted that individuals who work have a duration of night sleep on average of one and a half hours less during the week when compared to the weekend, and concluded that the work of these teenagers has negative repercussions on the duration and perception of sleep quality, with possible chronic sleep deprivation most likely to significantly limit the quality of life, as well as negatively impact the intellectual development and physical and mental well-being. In addition to this study, in another investigation⁽¹⁴⁾ it was also shown that work outside of school is an important factor causing an increase in excessive daytime sleepiness among students.

Considering the above, this study aimed at identifying the levels of sleepiness and sleep patterns of the daytime nursing student who works at night, who in the face of social pressures such as the need to further their education and increase their income adds to the already complicated routine of night shifts by studying on their breaks, and the implications of these habits on their health and performance.

METHOD

Sample Design

The research can be characterized as a descriptive longitudinal study with a quantitative approach. Data

collection was divided into two stages: school period and vacation period, with 15 consecutive days in each period.

Subjects

Students from the daytime nursing program of a private college in São Paulo, Brazil who worked the night shift participated in this study from September 2009 to February 2010. After being informed about the study methodology and its objectives, they were asked whether they had sleep disorders or used drugs that might interfere with the sleep-wake cycle, factors which were designated as exclusion criteria. The thirty subjects who were in favor of participating in the research signed a consent form. All survey participants stated that they had been working at night for longer than three months. The study was approved by the Research Ethics Committee of Faculdade Integradas Einstein de Limeira, under Protocol No. 09-02/050.

Materials

Initially the participants filled out the informed consent and supplied a form of identification. They also supplied personal information regarding their living habits, how they feel in class, the use of drugs to stay awake, the amount of night work and hours of work, the possibility of rest during their travel to work or at work on their breaks, and any other activities they were involved in, besides the night work and school during the daytime. Then they completed the Epworth Sleepiness Scale (ESS), developed in 1991 by John W. Murray, which quantifies the likelihood of falling asleep during eight routine situations. The responses could score a maximum of 24 points and minimum of zero points, with a score of ten considered 'average'. A score equal to or above sixteen is indicative of respiratory distress or sleep apnea⁽¹⁵⁾. They also completed a sleep log, prepared and validated by *Grupo Multidisciplinar de Desenvolvimento e Ritmos Biológicos* (Multidisciplinary Group on Biological Development and Rhythms) at the University of São Paulo Institute of Biomedical Sciences. The participants filled out the sleep log for 30 days upon awakening, divided into the school period and the vacation period. The sleep log consists of 12 questions and contains information about bedtime, sleeping, awakening and subjective quality of sleep episodes, which was obtained by indicating the perception of well-being after waking up.

Statistical Analysis

Data were tested as to adherence to normal distribution using the Kolmogorov-Smirnov test. The Mann-Whitney test was used to analyze the sleep habit variables according to selected characteristics (time the student slept, time the student awoke, half stage of sleep, hours of sleep). The Spearman correlation coefficient was used to evaluate the association among the sleep habit variables. The sleep log data were analyzed according to gender, times of collection

(school period or vacation period, working or not working). The significance level of 5% was adopted in the data analysis. The software used was SAS (version 9.1.3, SAS Institute Inc., Cary, NC, USA, 2002-2003).

RESULTS

The sample was mostly comprised of females (70%), with a mean age of 29.6 years ($dp \pm 3.38$), unmarried (60%), and childless (70%). Those with children averaged 1.6 children per person. Concerning professional training, 70% were nursing technicians and 30% were nursing assistants.

When asked about feeling tired during class, 20% said they rarely felt tired, but 70% said they felt tired two to three times a week, and 10% felt tired every day. Regarding the use of substances to stay awake, 30% reported drinking coffee and/or Coca-Cola.

Regarding health habits, 73.3% reported not being smokers and 66.6% said they consumed alcoholic beverages at least once a week. When we investigated the practice of regular physical activity, 23.3% answered yes to regular exercise; of these, 100% reported engaging in physical activity three times or more during the week. Regarding leisure activities during their free time, 86.6% said they chose sleeping over other activities.

In terms of night work, 100% reported having only one job. As to their breaks at work, which could allow them to take a nap, 63.3% reported that this practice was not allowed at their institution.

There was an average length of time on the night shift of 40 months ($sd \pm 16.27$), and 50% of the subjects reported another activity in addition to working and studying, such as working with sales and taking English classes, as well as house work reported by many of the women.

As for sleep, men reported a longer duration of sleep (6h43m) when compared to women (6h16m), but without a significant difference. It was also verified that participants slept longer during vacation, on days off, on days they did not sleep immediately after the night shift and on days they did not take a nap during the day. There was a significant difference as to the quality of sleep when it occurred immediately after working the night shift ($p = 0.0507$) by the Mann-Whitney test.

A greater perception of well-being was seen on the days when a nap was not taken ($p = 0.0013$) and an increased perception of well-being after a night's sleep during the vacation period ($p = 0.0206$), according to the Mann-Whitney test.

According to Epworth's Sleepiness Scale, the subjects presented scores for sleepiness that varied from 7.2 to 15.9, with an average of 11.4, characterizing excessive daytime sleepiness.

Table 1 - Averages of sleep time by period, days with and without work and opportunity to sleep and nap during the day - Limeira, SP, 2010

Average sleep time							
Vacation	School	Days with work	Days without work	Slept after Work	Did not sleep after Work	With nap	Without nap
6:48h	5:58h	4:34h	7:34h	4:04h	4:52h	5:51h	6:44h
p= 0.0187		p= <0.0001		p= <0.0001		p= 0.0094	

Mann-Whitney Test (p < 0.05)

A statistically significant difference and positive correlation were found for the variables duration of sleep and quality of sleep, as well as how the subjects felt after sleeping (day and night), and time before falling asleep and duration of sleep (Table 2).

Table 2 – Correlation between duration of sleep and other variables according to the Sleep Log – Limeira, SP, 2010

Variable	Value of r	Value of p
Duration of sleep and Quality of sleep (day)	0.23430	0.0078
Duration of sleep and How participant felt after sleep (day)	0.22288	0.0114
Duration of sleep and Quality of sleep (night)	0.30348	<0.0001
Duration of sleep and How participant felt after sleep (night)	0.39346	<0.0001
Duration of sleep and Time before falling asleep	0.26963	<0.0001

Spearman's Correlation Coefficient (p < 0.05)

A statistically significant difference and positive correlation were also found for the variables sleep quality (night and day) and how the participant felt after sleep, and a negative correlation in the variables time before falling asleep and how participants felt after sleep (day), sleep quality (night) and nap time (Table 3).

Table 3 – Correlation between the subjective quality of the sleep and other variables according to the Sleep Log – Limeira, SP, 2010

Variable	Value of r	Value of p
Sleep quality (day) and how participants felt after sleep day	0.85602	<0.0001
How participants felt after sleep (day) and Time spent falling asleep	-0.18512	0.0364
Sleep quality (night) and How participants felt after sleep (night)	0.76074	<0.0001
Sleep quality (night) and Opportunity to take a nap	-0.44213	0.0002

Spearman's Correlation Coefficient (p < 0.05)

DISCUSSION

Data showed that nursing students working the night shift experienced partial sleep deprivation, as demonstrated by the shorter duration of daytime sleep compared with nighttime sleep, which was also observed in

another study⁽¹⁴⁾. Furthermore, the fact that they performed other activities, in addition to work and study, predisposes them to delay bedtime even further, with an inability to change their waking time due to school activities and work. We observed increased sleep time for men compared to women. Other authors⁽¹⁶⁾ also found in their research that women slept less than men, due to their lifestyle coupled with house activities and the necessity of working double shifts.

During the vacation periods, duration of sleep tended to be higher than during the school period, as well as on days they did not sleep immediately after their night shift or nap during the day. According to research conducted with adolescents, they reported a longer period of sleep during vacations compared to weekdays⁽¹⁷⁾. It was also found that adolescents kept irregular hours in terms of when they went to bed, with increased sleep duration during vacations. This contributed to reducing their levels of sleepiness upon waking, as well as reducing by 50% the habit of taking naps. This prolongation of sleep time on vacation suggests a compensatory mechanism for the accumulated deficit of sleep incurred during the school period.

In addition to sleep deprivation, it is a fact that student workers must extend their period of wakefulness following their work shift to attend classes or undergraduate courses, which culminates in increased levels of sleepiness, as noted in this study in which excessive daytime drowsiness afflicted 70% of the subjects, with scores varying from 7.2 to 15.9. As mentioned, individuals who endure two shifts, including daytime work and nighttime school, may experience excessive daytime sleepiness due to the shorter duration of sleep episodes, caused by going to bed late after classes and waking early in the morning to go to work⁽¹⁸⁾. However, in these students, the wake-sleep cycle is in phase with the light-dark cycle; that is, although they have episodes of shorter sleep durations, the normal sleep characteristics are preserved. This does not happen with the student worker of the night shift, who, after their shift on school days are only able to sleep in the afternoon, following classes.

Thus, upon being subjected to nighttime work, the individual immediately goes to sleep during the day, but his/her circadian rhythms are preserved because, despite his/her work time reversal, the same does not occur with the schedules of his/her family and the society

in which he/she lives, therefore causing a sensation of conflict within.

Authors⁽¹⁹⁾ report that the occurrence of excessive daytime sleepiness in students can impair concentration and the ability to learn. Despite this, excessive daytime sleepiness still occurs in pre-college students, with the highest incidence among women, revealing average scores of 8.9^(15, 20). In a study of Japanese graduate students⁽²¹⁾, the incidence of excessive daytime sleepiness (SDE) and the occurrence of accidents related to sleep deprivation were identified. In the present study a prevalence of women was observed, and the average score of sleepiness obtained through Epworth's Sleepiness Scale (ESS) was 11.4, significantly higher than scores found in several studies of nursing students and other professionals.

As for the possibility of taking a nap, 50% reported having time to rest during their work shift, but even with that possibility, levels of sleepiness were high. In a study performed with nurses working the night shift⁽²²⁾, it was found that when nurses were allowed to nap during work, there was a reduction in levels of sleepiness which lasted until the end of the shift. The authors found that napping during the night shift made it possible for the workers to improve their performance, particularly in regards to household and family activities during the hours of rest, as they feel more alert and do not need a recovery sleep.

A qualitative study⁽²³⁾ evaluated the importance of napping during the night shift among nursing staff and showed that the opportunity to nap favors mental and physical rest and helps maintain alertness during night work, minimizing the risk of costly errors.

In a study conducted to verify the relationship between levels of stress and the sleep quality of nurses, we saw that in all sectors and shifts this relationship was present, with

negative repercussions for the worker who was unable to achieve sufficient sleep⁽²⁴⁾. The authors suggest that changes are required in behavior, attitude, rest and motivation to improve the quality of life of these professionals.

CONCLUSION

In general one can say that the subjects who increased their waking hours due to their studies experienced increased levels of sleepiness and a high incidence of excessive daytime sleepiness. This fact should be considered as a predictor of events during the workday, such as accidents or errors in nursing care. It is important to implement healthy habits that promote improved quality of sleep episodes and, consequently, improved perception of well-being, since partial sleep deprivation occurs during school days.

The results of this study are similar to those of other studies; however, they alert us to the fact that the night worker, who already has less time to sleep because of his/her work schedule, undergoes an increase in waking hours because of their studies. This is particularly true for women because of household responsibilities, which damage the quality of sleep and causes high levels of sleepiness during class periods, which can impair her health in addition to exposing her to the risk of accidents, particularly when traveling from school to work and back, as well as affecting school performance.

Thus, it is believed that the data provided may assist in understanding the dynamics of study/work for nursing professionals working the night shift, as well as the implications of this routine on their health, and encourage the development of health promotion programs for this professional group.

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