Ann Ig 2018; 30: 470-481 doi:10.7416/ai.2018.2247

Sleep disorder, Mediterranean Diet and learning performance among nursing students: inSOMNIA, a cross-sectional study

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Key words: Mediterranean Diet, Sleep Disorder, Learning Performance, Nursing students
Parole chiave: Dieta Mediterranea, Disturbi del sonno, Progresso accademico, Studenti di Scienze Infermieristiche

Abstract

Background. *The International Classification of Sleep disorders, the International Classification of Diseases and the Diagnostic and Statistical manual of Mental Disorders defines insomnia as an experience of insufficient or poor sleep quality, characterized by at least one of the following symptoms: difficulty in initiating or maintaining sleep, early awakenings and poor restorative sleep. In Italy, the Morfeo 1 study detects a prevalence of 20% of insomnia and a 40% of cases with day-time symptoms. The chronic sleep deprivation is responsible for cognitive disorders with effects on social life. Being common knowledge, lifestyle can also influence sleep. Some of the "sleep hygiene rules" involve a control on smoking, coffee consumption and diet. The Mediterranean Diet (MD), thanks to its high level of tryptophan, has a positive influence on sleep and can protect against stress and anxiety.*

Study design. *The aim of InSOMNIA study was to determine the prevalence of sleep disorders among nursing students of the University of Perugia and, therefore, to evaluate how lifestyle, eating habits, health status and academics performance are linked to night-time and daytime symptoms of the interrupted sleep.*

Methods. *We adopted a cross sectional survey, collecting data from "Sleep and Daytime Habits Questionnaire" to evaluate the sleep disorders and from PREDIMED questionnaire to assess the adherence to MD.*

Results. *We found a statistical significant association between PREDIMED score and BMI (p-value = 0.0127)***,** *smoking habit (p-value = 0.0125), quality of life (p-value = 0.0480) and academic progress (p-value = 0.0092).*

Conclusions. *We found a high prevalence of sleep disturbances statistically associated with diet and poor academic progress.*

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Introduction

Insomnia is defined as an experience of insufficient or poor quality sleep, characterized by one or more of the following symptoms: difficult initiating or maintaining sleep, early awakenings and poor restorative sleep.

A diagnostic classification of sleep disorders has been provided by the ICSD (International Classification of Sleep Disorders), which represents a useful tool for specialist clinicians in medical practice (1). The 3rd edition of ICSD has been released in 2014 by the American Academy of Sleep Medicine. This document is sustained by other two systems of classification which deal with sleep disorders: ICD-10 (International Classification of Diseases) e DSM-V (Diagnostic and Statistical manual of Mental Disorders).

Insomnia affects 33% of adults in USA (2), whereas in Europe the prevalence of a severe insomnia is between 4% and 22% (3, 4). It affects mostly women and has a diversified course among genders. Men present the first peak between 24 and 34 years of age and a second peak after 65 years of age. On the other hand, Women have a peak in connection with menopause (5). Italian data from Morfeo 1 Study showed a 20% of prevalence of insomnia. Furthermore, 44% of the subjects affected by insomnia were also suffering from other daytime symptoms (6). The chronic sleep deprivation is responsible of cognitive disorders, memory deficit and decrease of daily performance with consequences on social and working life for those suffering from it. The daytime insomnia symptoms are mostly asthenia, memory and attention disorders, anxiety and irritability, depression and somnolence. However, at times, sleep disorder itself is determined by an intense stress condition or a strong expectation such as exams, competitions or contests (7).

As it is known, sleep is influenced by lifestyle and various environmental factors. These are known as "sleep hygiene rules" and represent the set of behaviours, scientifically recognized, which are able to facilitate sleep (8-9).

Some of these sleep hygiene rules are related to lifestyle, such as physical exercise, smoking habits, alcohol consumption and eating habits. Sleep is powerfully regulated by the circadian rhythm, whose pacemaker is identified in the pineal gland and whose effector is melatonin (10).

Melatonin derives from Tryptophan (Trp), an essential amino acid, which can only be provided with the diet. However, the capability of Trp of influencing sleep relies on quality of the proteins and on the timing of their consumption (9).

Previous studies have shown how a high-carbohydrate diet can reduce the latency of falling asleep, while a high-protein diet improves the sleep quality. Conversely, a high consumption of fat products can negatively influence the total duration of sleep (11).

Furthermore, a recent literature review (12) underlined that some foods, particularly rich in tryptophan, have positive effects on the sleep induction and maintenance, such as fruit and vegetables (e.g. lettuce, radicchio, valerian, pumpkin, black cherry and kiwi), fish (e.g. codfish, salmon and perch), grain and white meat (e.g. turkey and chicken).

Thus, Mediterranean Diet could positively influence sleep for two different reasons:

The high amount of fruit, vegetables, pulses, dried fruit and grain (whole-grain mostly), a frequent intake of fish, low consumption of saturated fat and a low amount of red meat (13).

A possible protective function towards some mental pathologies such as stress and anxiety, which were previously specified as possible causes and consequences of sleep disorders (14, 15).

Therefore, what this study meant to achieve was to verify whether the academic performance is conditioned by the quality of sleep and how the latter can be influenced by the adherence to Mediterranean Diet.

The objective is to increase the awareness that the respect of behavioural rules can improve the quality of sleep and, consequently, the academic performance and the quality of life.

Aim of the study

The project "inSOMNIA" (Sleep disOrder & MediterraneaN dIet in Advancement) aims to determine the prevalence of sleep disorders among nursing students of the University of Perugia and, therefore, to evaluate how lifestyle, eating habits, health status and the academic performance are linked to night-time and daytime symptoms of the interrupted sleep.

The critical issues are those typical of a questionnaire. For example, the subject has to choose among the only items proposed that can suggest the answer (social desirability bias), thus preventing a further analysis of the answer itself. However, the advantages are undeniable: low cost and rapidity of administration (16, 17).

Methods

Instruments

inSOMNIA is a cross-sectional study based on self-administered questionnaires among nursing students of Perugia University. The survey involved the entire population of the three-year bachelor's degree course. To evaluate the sleep disorders we collected data from "Sleep and Daytime Habits Questionnaire" (18). It is a validated questionnaire, previously used among nursing students of L'Aquila University in Italy. The aim of this questionnaire is to assess sleep and daytime habits, sleep disorder symptoms and perception of academic progress and quality of life. The original questionnaire is based on 29 items, but for more completeness we preferred to add 6 more questions regarding smoking habit, coffee consumption, physical activity, anthropometric measures (weight and height), whether they were offsite students (students from other regions) and, lastly, the academic progress. The anthropometric measures were used to estimate the Body Mass Index (BMI) obtained by dividing weight in kilograms by the square of height in meters. Based on BMI, subjects are classified in four classes: underweight (BMI <18.5 kg/m^2), normal weight (18.5 kg/m^2 $\leq$ BMI $\leq$ 24,9 kg/m^2), overweight (25.0 kg/m^2 $\leq$ BMI $\leq$ 29,9 kg/m^2) and obese (BMI $\geq$ 30.0 kg/m^2).

According to previous studies (18), the insomnia symptoms were classified in: Difficulty in Initiating Sleep (DIS), Difficulty in Maintaining Sleep (DMS), Non-Restorative Sleep (NRS), and Insomnia with Diurnal Symptoms (IDS).

DIS was defined as a sleep latency of at least 30 minutes, 3 times per week or more, with a poor or very poor sleep quality (normally or during the night before an exam).

DMS was defined as an interrupted sleep at least 3 times per week, due to disturbed sleep and difficulty to fall asleep again after early morning awake (EMA).

NRS was defined as tiredness when awoken, at least 3 times per week, associated with daytime sleepiness and naps (more than 30 minutes per day).

IDS was defined as the association of DIS or DMS (Insomnia) and NRS.

Good or excellent quality of life was defined as a good or excellent perception of academic progress, leisure activity and living conditions.

Diet habit was assessed through the PREDIMED questionnaire. It is a validated questionnaire based on 14-item score aimed to assess the Mediterranean Diet

Adherence (19). The score was grouped in three categories: low (≤5 points), moderate (6-9 points) and high (≥10 points). Due to the aims of the study and according to the literature, we further added 9 more items evaluating the consumption of other typical Mediterranean foods (water intake; pasta; whole grains, cereals, bread and rice) and of processed meat and liquor.

We also collected some demographic information such as gender (male and female), year degree course, categorized in first (I), second (II) and third (III); and age, grouped in ≤ 20 years, 21-24 years, 25-29 years and ≥30 years.

Statistical analysis

Statistical analysis was performed using STATA/SE 12 software. We examined several factors associated with sleep disturbance such as restless legs syndrome, snoring and night eating syndrome. Chi-square test (for categorical variables) and Student's *t* test (for continuous variables) were used for examining statistical significance.

Multivariable logistic regression analysis has been also conducted to analyze the associations between sleep disorders and daytime habits after adjustment for age, gender, BMI and alcohol intake. We considered age, BMI and alcohol as dichotomous variables [age = 1, if age was ≥24 years; age = 0, if age was <24 years (reference); BMI = 1, for obese and overweight students; BMI = 0, for normal weight students (reference); alcohol = 1, for alcohol consumption; alcohol = 0, no alcohol consumption (reference)].

For each dependent variable selected (Table 1) adjusted Odds Ratio (aOR) are presented.

We used the two-tailed version of all tests, and a p-value≤ 0.05 was considered statistically significant. Pearson's correlation coefficient was also used to assess linear dependences between variables.

Results

Characteristics of the population

The population consisted of 185 students, and 117 of them agreed to fill in the proposed two questionnaires. Out of 117, 82 were female (70.1%) and 35 were male (29.9%). Regarding the year of the curriculum, 43.6% (n = 51) of students were in their first year, 18.8% (n = 22) were in their second year and 37.6% (n = 44) in their third year (Figure 1). The age ranged between 20 and 43, with a mean age of 23.7 ± 4.8. Within the studied population, 42.7% (n = 50) were smokers, with 3.9 ± 5.7 cigarettes/day, and 22.2% (n = 26) were considered heavy smokers (≥ 10 cigarettes/day). In 94.9% (n = 111) of the population, the estimated adherence to the Mediterranean Diet was moderate with an average PREDIMED score of 5.9 ± 2.1. The BMI ranged between 16.3 and 39.2 kg/m^2, with a mean of 21.8 ± 4.7 kg/m^2, however 13.1% of students were obese or overweight (BMI≥ 25 kg/m^2), 11.9% drank more than 3 drinks/week of liquor, while 73.5% of the population drank less than 3 coffee/day (n = 86). In our sample, 57.3% of students (n = 67) were physically active (at least 30 minutes of moderate activity 2 to 5 days per week), 26.5% were completely inactive (n = 31), while 16.2% (n = 19) were not active enough (less than 10 minutes at least once a week). Out of 13 students (11.1%) who declared to work part-time or full time, 4 (30.8%) worked also in nighttime. 29.9% of the sample were students from other regions (n = 35), with a good or excellent quality of life for 64.1% of the cases (n = 75); whilst 29.1% had the exam mean score <26/30.

Sleep disorder prevalence

Among the nursing students, the prevalence of insomnia symptoms was 18.8% (n = 22), while the prevalence of insomnia with diurnal symptoms was 11.9% (n = 14). The distribution of insomnia symptoms increase, in a statistically significant way,

Table 1. Multivariable logistic regression analysis of the sleep disturbances and daytime habits adjusted for age, gender, BMI and alcohol intake. Adjusted Odds Ratio are presented.

	Dependent variables																	
	EMA			DIS			DMS			NRS			Nocturnal Insomnia			Insomnia with diurnal symptom		
	aOR	IC95%	p	aOR	IC95%	p	aOR	IC95%	p	aOR	IC95%	p	aOR	IC95%	p	aOR	IC95%	p
Meat at least three times/week*	17.0	2.4-120.0	0.004	1.1	0.3-3.8	n.s.	1.5	0.4-5.6	n.s.	0.6	0.3-1.6	n.s.	0.9	0.3-2.7	n.s.	1.2	0.3-4.2	n.s.
Fish at least three times/week*	-	-	n.s.	14.1	1.0-194.7	0.04	16.6	0.8-350.0	n.s.	3.7	0.3-46.2	n.s.	16.6	1.3-218.3	0.003	16.9	1.2-243.8	n.s.
Whole bread at least once/day*	0.3	0.1-1.5	n.s.	0.7	0.2-2.4	n.s.	0.1	0.0-0.9	0.04	0.5	0.2-1.2	n.s.	0.4	0.1-1.4	n.s.	0.4	0.1-1.8	n.s.
Coffee at least three times/day*	2.9	0.8-11.5	n.s.	19.2	4.2-87.2	<0.001	11.2	2.6-49.1	0.001	3.4	1.4-8.3	0.009	19.6	5.7-67.5	<0.001	30.1	5.4-167.5	<0.001
Pasta at least twice/ week*	0.6	0.2-2.3	n.s.	0.6	0.2-2.0	n.s.	1.3	0.3-4.8	n.s.	0.4	0.2-1	0.05	0.6	0.2-1.8	n.s.	0.9	0.2-3.0	n.s.
Sweets at least three times/week*	2.1	0.5-9.2	n.s.	3.1	0.8-12.3	n.s.	1.3	0.3-4.8	n.s.	3.6	1.4-9.2	0.006	4.8	1-23.4	0.05	4.8	0.9-23.4	n.s.
Smoke: yes*	1.0	0.2-4.2	n.s.	3.3	0.9-12.1	n.s.	2.0	0.5-7.8	n.s.	2.2	0.9-5.5	n.s.	3.6	1.2-10.9	0.02	3.8	1-14.5	0.05
Quality of life: good or excellent*	0.2	0.04-0.8	0.02	0.3	0.09-1.1	0.06	0.3	0.08-1.1	n.s.	0.1	.04-0.3	<0.001	0.3	0.1-0.7	0.01	0.3	0.1-1.1	n.s.
Perception of academic progress: sufficient or not satisfactory*	2.0	0.2-7.7	n.s.	1.1	0.3-3.7	n.s.	1.7	0.5-6.3	n.s.	6.4	2.5-16.6	<0.001	1.5	0.5-4.2	n.s.	1.2	0.4-3.9	n.s.

* adjusted for age, gender, BMI and alcohol intake

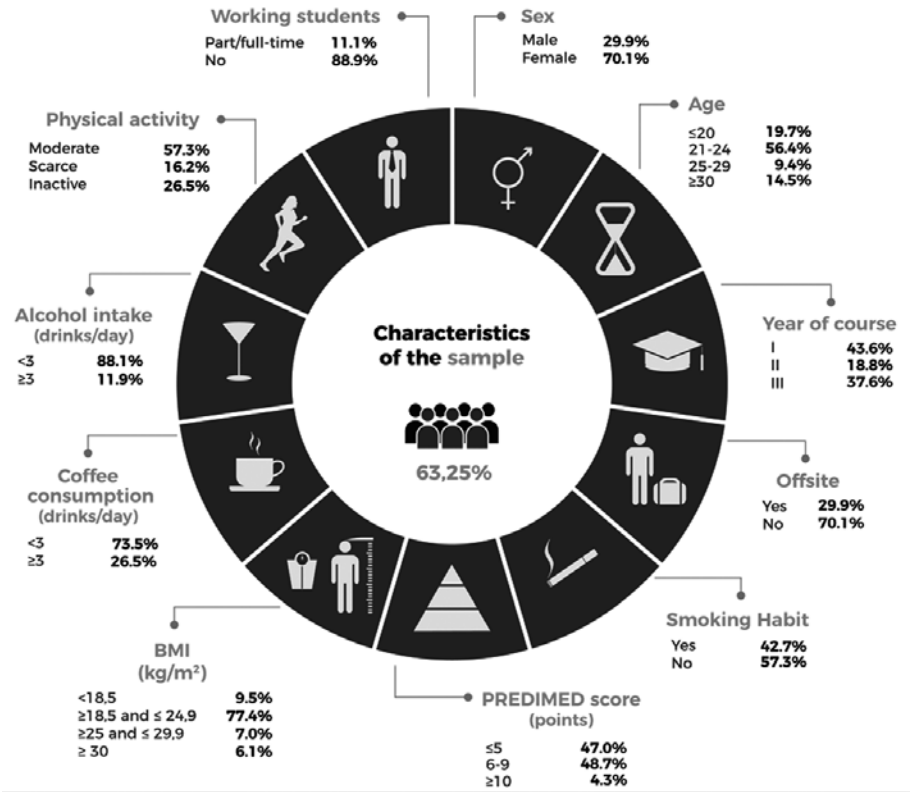


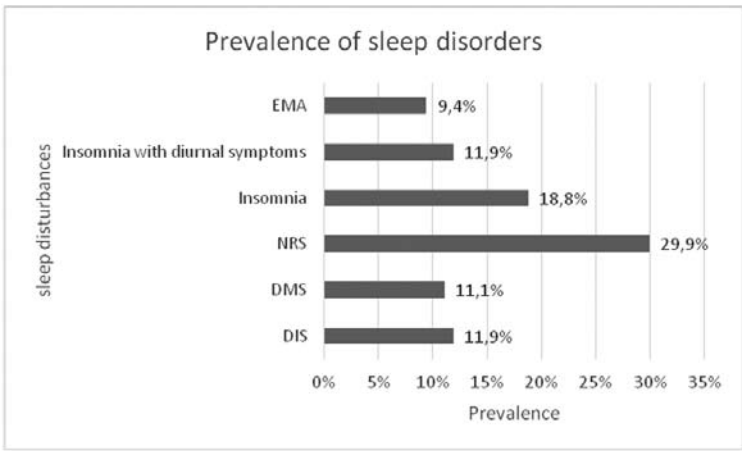
Figure 1 - Characteristics of the sample

according to the age (p = 0.019, t-test) and gender (p = 0.022, chi-square): 35.3% in the age group ≥30 vs 13.0% in subjects <20 years; and 13.4% in females vs 31.4% in males. The prevalence of DIS, DMS and NRS was 11.9% (n = 14), 11.1% (n = 13) and 29.9% (n = 35), respectively (Figure 2a). The age groups with a highest rates of DIS are those 25-29 and 21-24 years for NRS (57.1%), with no statistically significant differences. While DMS increase stepwise according to age group (29.4% at age ≥30) in a statistically significant way (p = 0.004, t-test); moreover we found a statistical association between sex and DMS: 7.3% in females vs 20.0% in males (p = 0.046, chi-square).

Sleep and daytime habits

In this section, we further analysed some important variables of sleep hygiene education such as coffee consumption in the late afternoon, sleeping pill intake, sleeping less than 7 hours per night and napping longer than 30 minutes/day (Figure 2b). Regarding daily naps, 58.9% of students (n = 69) nap at least 3 times a week, with no statistically significant differences according to age and sex; 60.7% of students sleep less than 7 hours per day during the weekdays; 77.6% of the total population drink coffee late in the afternoon. We also found a statistically significant association between late afternoon coffee consumption and sleep disturbance (DIS p-value = 0.000;

a.



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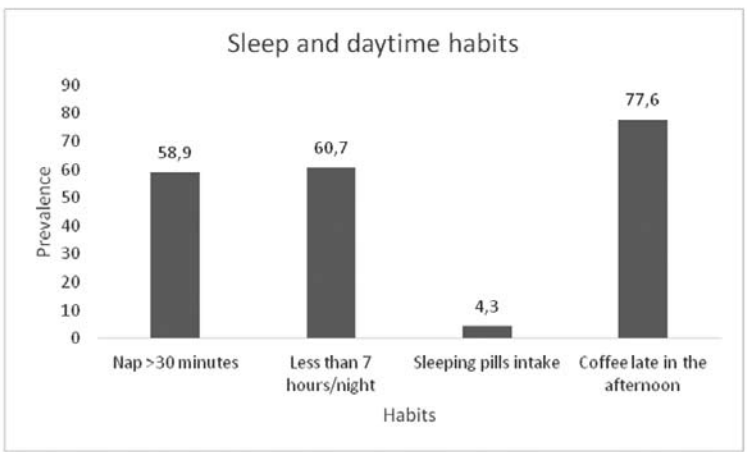

Figure 2 - Prevalence of sleep disorders (a) and sleep and daytime habits (b), among nursing students.

DMS p-value = 0.003; NRS p-value = 0.037; Insomnia p-value = 0.000; Insomnia with diurnal symptoms p-value = 0.000, chi-square).

Following correlation analysis, we found a statistical significant association between DMS and BMI (Pearson's coefficient 0.2092 p = 0.0236). Moreover, we found a statistical association between PREDIMED score and BMI (Pearson's Coefficient -0.2298 p-value = 0.0127), smoking habit (Pearson's coefficient -0.2302 p-value = 0.0125) quality of life (Pearson's coefficient 0.1832 p-value = 0.0480) and academic progress (Pearson's coefficient 0.2473 p-value = 0.0092) (data not shown).

Logistic regression analysis

Moreover, we performed a logistic regression analysis in order to predict factors associated with sleep disorders. Results highlighted the important association between coffee, smoke habits and proteins intake (meat and fish) and sleep disorders.

Data are shown in Table 1. Inversely, carbohydrates intake reduce the risk of sleep disorders, both considering the whole [aOR = 0.1, IC 95% (0.0-0.9) p = 0.04] and the refined grain pasta [aOR = 0.4, IC 95% (0.2-1) p = 0.05].

Perception of academic progress, were excellent or good in 58.6% of the total sample, whereas 41.4% were sufficient or not satisfactory. Whilst, low quality of life was reported in the 35.9% of the students. Actually, sleep disorders appear to be associated also with perception of academic progress and quality of life. A quality of life and satisfaction of academic progress are associated with sleep disorders. Actually, a good quality of life reduces significantly EMA [aOR = 0.2, IC 95% (0.04-0.8) p = 0.02], while a low satisfaction of academic progress increases NRS in a statistical significant manner [aOR = 6.4, IC 95% (2.5-16.6) p < 0.001] (Table 1). Furthermore, NRS is also directly associated with the academic progress [aOR = 3.0, IC 95% (1.1-8.8) p = 0.04] (data not shown).

Discussion

The inSOMNIA had several objectives in the study. The first was to assess the prevalence of sleep disorders among nursing students, the second was to evaluate the daytime and sleep habits, including dietary behaviour and, lastly, to assess the possible association between diet, sleep habits and learning progresses.

The prevalence of insomnia was consistent with previous studies. Actually, we found a prevalence of 18.8% of insomnia compared to 20% estimated in Morfeo 1 study among Italian population (6). Particularly, in (18) the insomnia prevalence among nursing students was around 26.7%. In our sample, 61.5% of working students are in the age group 21-24 years with a borderline statistically significant difference (p = 0.05, chi-square). Moreover, this age group (21-24 years) is the same who has the highest prevalence of NRS. The association between NRS and a working student is statistically significant (p = 0.008, chi-square). The association remain significant also after the adjustment for age (p = 0.035 for age groups 21-24 years, chi-square).

In the present study, we further found a statistically significant correlation between sleep disorders and BMI. It is consistent with previous results that showed an important role of sleep in weight control, insulin resistance, diabetes and other metabolic disorders (20-22). In 2013, Liu et al. found a higher prevalence of insulin resistance among patients with habitual shortened sleep (23). The relation between short sleep duration and insulin resistance is probably due to augmented sympathetic activity, reduced cerebral glucose utilization, elevated evening cortisol levels, increased growth hormone secretion, and dysregulation of neuroendocrine control of appetite (24). Due to this strict relation between diet, sleep and metabolic disorder, nutrition professionals play an important role in educating patients about quantity and quality of food and beverage intake, such as developing strategies to increase patients' compliance and weight control. Actually, according to sleep hygiene guidelines, coffee and alcohol intake must be reduced during the afternoon, as well as a large intake of food and drinks before bedtime (25). It is known that meal timing also play an important role (23). Recent evidences showed that plasma ghrelin levels is dependent on meal timing and caloric intake (ghrelin is a hormone with orexigenic effect) (26, 27). Contrary, leptin (anorexigenic hormone) is secreted by adipose tissue and blood levels peak during the night. Sleep deprivation can cause an increase in the ghrelin/leptin ratio with an increase of appetite (28). Stern et al. (29) found a statistically significant association

between quality diets and sleep disorders. In fact, higher dietary energy intake and lower diet quality was reported among people who slept less than 6 hours per night and was statistically significant. Moreover, women with good quality of sleep had a higher intake of carbohydrates compared to women who had a poor quality of sleep and a higher intake of fatty meals. Moreover, weight gain is associated with sleep disorders due to high BMI and consequent sleep-disorder involving breathing such as obstructive sleep apnoea (OSA) (22). In a recent trial, Papandreou et al. (30) showed that the adherence to Mediterranean Diet associated with physical activity might – with statistical significance - reduce the apnoea in obese adults with moderate/ severe OSA. The rational of this association may be found in beneficial effect of Mediterranean Diet in weight loss, such as in promoting satiation and increasing adherence to a caloric restriction diet (31). Other potential beneficial effects are that Mediterranean Diet is a nutrient-rich and low-energy-density dietary model, with high palatability and a relatively low glycaemic index (32). Furthermore, the Mediterranean Diet is based on large variety of food consumption related to the seasonality, and the intake of whole grains. Actually, in our analysis whole bread is associated with a reduction of sleep disorders. To add, Grander et al. (33) highlighted the association between short duration of sleep and low number of dietary nutrient variability. Recent studies also proved the high amount of tryptophan intake through cereal and legumes suggested by the Mediterranean Diet. Tryptophan is an essential amino acid, precursor of serotonin and melatonin (34). Increased tryptophan intake is related to a higher endocrine production of melatonin that prolongs sleep duration (35).

Recent evidence reveals that those who are well restored can learn and memorise better compared to people who are sleep deprived. Additionally, the amount of time spent sleeping is directly related to learning improvements (36). Moreover, the importance of sleep duration in problem solving is shown in a study (37). The exact physiological processes that take place during sleep to improve memory are not already known, although long term potentiation seems to be implied (38).

We also found a correlation between smoking habits and sleep disorders. Growing evidences have shown a relation between smoking tobacco and sleep interference both in quality and quantity (39-41).

Our results suggest a significant association between coffee consumption late in the afternoon and sleep disturbance. Drake et al. study (42) evaluated the effect of caffeine administration at 0, 3, and 6 hours prior to habitual bedtime. They found a significant statistical effect of moderate caffeine dosages at 3 and 6 hours prior to bedtime on sleep quality compared to a placebo. Given that smoking habits and coffee consumption are a behaviourally modifiable risk factor, clinicians, pharmacists and health educators should focus their efforts in promoting cessation especially among people with insomnia (39, 40).

The inSOMNIA study apparently enrolled a small sample of nursing students at the University of Perugia, but actually, they represent the whole population available. Another important limitation is the self-reported anthropometric measures used to estimate the BMI.

BMI has several deficiencies specially when used as a body fatness measure with self-reported data. In fact, this index is not able to distinguish fat from fat-free mass and, for this reason, the rates of misclassification might be high. Even though the BMI measure has several straights: it is very easy to obtain, not invasive, inexpensive and represents a useful continuous indicator of body mass.

Conclusion

As we already mentioned, stress is an important risk factor for insomnia and it is particularly true in our daily activities, where hectic lifestyle imposes us to sleep less and less. University years could be experienced as a period of stress in people's life. Actually, the inSOMNIA study among nursing students found a high prevalence of several sleep disturbances that are probably influenced by diet, and are simultaneously associated with poor academic progress.

In conclusion, we want to highlight the important role of nutrition professionals, pharmacists and health educators. In particular, nutrition professionals could provide diet advices, pharmacists identify and remove drugs that can interfere with sleep and health educators promote sleep hygiene rules.

Financial Support
This research received no grant from any funding agency, commercial or not-for-profit sectors.

Conflict of interest
None to declare.

Ethical approval
The inSOMNIA study received ethical approval from the local ethics committee of the University of Perugia (Comitato Universitario di Bioetica), Reference Number: 2016-12.
We applied several security safeguards in the data access, handling and storage. Written informed consent was obtained from all students and recorded information was anonymized and de-identified prior to analysis.

Acknowledgment
We would like to thank Prof Domenico Delfino, President of the School of Nursing in Foligno, for authorizing the research; all the nursing students for their participation, Dr. Santangelo Omar Enzo, Department of Sciences for Health Promotion and Mother and Child Care 'Giuseppe D'Alessandro', University of Palermo, for assistance in statistical analysis; and Mss Valeria Parisi, for figures assistance. The Authors have no conflicts of interest. All authors approved the final version of the paper. We would like to tanks the Italian Society of Hygiene, Preventive Medicine and Public Health (S.It.I), Umbria Section for the scientific support.

Riassunto

Disturbo del sonno, Dieta Mediterranea e rendimento accademico tra gli studenti di Scienze Infermieristiche: inSOMNIA, studio trasversale

Introduzione. L'insonnia è definita dall'*International Classification of Sleep disorders, International Classification of Diseases* e dal *Diagnostic and Statistical manual of Mental Disorders*, come "esperienza di sonno insufficiente o di scarsa qualità caratterizzato da almeno uno dei seguenti sintomi: difficoltà a iniziare o mantenere il sonno, risveglio precoce, sonno poco ristoratore". In Italia, lo studio Morfeo 1 rileva una prevalenza pari al 20% con il 44% dei soggetti che presenta anche sintomi diurni. La deprivazione cronica di sonno causa disturbi cognitivi che si ripercuotono sulla vita sociale. È noto come anche gli stili di vita incidano, a loro volta, sul sonno. Alcune delle "norme igieniche del sonno" riguardano il fumo, il consumo di caffè e la dieta. La Dieta Mediterranea (DM), con il suo elevato contenuto di triptofano, può influenzare positivamente il sonno e proteggere da stress e ansia.

Disegno dello Studio. Scopo dello studio è stato quello di determinare la prevalenza dei disturbi del sonno in studenti di Scienze Infermieristiche dell'Università di Perugia, e valutare come gli stili di vita, le abitudini alimentari, lo stato di salute ed il progresso accademico siano associati a sintomi notturni e diurni determinati da un sonno interrotto.

Metodi. Studio cross-sectional. I dati sono stati raccolti utilizzando il questionario "Sleep and Daytime Habits Questionnaire" per valutare i disturbi del sonno ed il questionario PREDIMED per verificare l'aderenza alla DM.

Risultati. I risultati mostrano un'associazione statisticamente significativa tra lo score PREDIMED e il BMI (p-value = 0.0127), l'abitudine tabagica (p-value = 0.0125), la qualità della vita (p-value = 0.0480) ed il profitto accademico (p-value = 0.0092).

Conclusioni. Lo studio riscontra un'alta prevalenza di disturbi del sonno statisticamente associati alla dieta e ad un basso progresso accademico.

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