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Morningness/Eveningness Chronotype, Poor Sleep Quality, and Daytime Sleepiness in Relation to Common Mental Disorders among Peruvian College Students

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Abstract

The study was designed to investigate the association between sleep disturbances and common mental disorders (CMDs) among Peruvian college students. A total of 2,538 undergraduate students completed a self-administered questionnaire to gather information about sleep characteristics, socio-demographic and lifestyle data. Evening chronotype, sleep quality, and daytime sleepiness were assessed using the Horne and Ostberg Morningness-Eveningness Questionnaire (MEQ), Pittsburgh Sleep Quality Index (PSQI), and Epworth Sleepiness Scale (ESS). Presence of CMDs was evaluated using the General Health Questionnaire (GHQ-12). Logistic regression procedures were used to examine the associations of sleep disturbances with CMDs while accounting for possible confounding factors. Overall, 33.4% of the participants had prevalent CMDs (39.2% among females and 24.4% among males). In multivariable adjusted logistic models, those with evening chronotype (OR=1.43; 95% CI 1.00–2.05), poor sleep quality (OR=4.50; 95% CI 3.69–5.49) and excessive daytime sleepiness (OR=1.68; 95% CI 1.41–2.01) were at a relative increased odds of CMDs compared to those without sleep disturbances. In conclusion, we found strong associations between sleep disturbances and CMDs among Peruvian college students. Early education and preventative interventions designed to improve sleep habits may effectively alter the possibility of developing CMDs among young adults.

Introduction

Adequate sleep is crucial for optimal physical, mental, and emotional health (IOM, 2006). The repercussions of inadequate sleep include substance abuse, reduced immunity, increased cardiometabolic risk, and mood disorders (Chaput, Despres, Bouchard, & Tremblay, 2007; Forquer, Camden, Gabriau, & Johnson, 2008; Knutson, 2010). Studies suggest that disturbances in circadian rhythm, sleep quality, and daytime functioning can lead to the development of common mental disorders (CMDs) (Park, Meltzer-Brody, & Stickgold, 2013; Schneider et al., 2011; Veldi, Aluoja, & Vasar, 2005). Researchers have noted that evening chronotypes are more prone to experience depressive symptoms, suicidal ideation

and mental distress than morning chronotypes (Giannotti, Cortesi, Sebastiani, & Ottaviano, 2002; Lemoine, Zawieja, & Ohayon, 2013; Merikanto et al., 2013; Randler, 2011). Poor sleep quality has also been associated with a wide variety of functional and psychiatric domains, including suicidal ideation, irritability, and CMDs (Park et al., 2013; Ramsawh, Stein, Belik, Jacobi, & Sareen, 2009). Similarly studies have shown that excessive daytime sleepiness may lead to CMDs (IOM, 2006). This research seeks to examine the extent to which the characteristics of morningness and eveningness chronotype, daytime sleepiness and poor sleep quality are associated with CMDs among a large sample of Peruvian college students, a population that has not been sufficiently evaluated in this area of study.

Methods and Materials

This cross-sectional study was conducted among college students in Lima, Peru at the Universidad Nacional Mayor de San Marcos and Universidad San Martin de Porres. A total of 2,538 students completed a self-administered questionnaire. Data collection methods and study procedures have been previously described in detail. (Sanchez et al., 2013) The procedures used in this study were approved by the institutional review boards of participating universities.

Morningness-Eveningness Chronotype

Chronotype preference was evaluated using the Horne and Osberg morningness/eveningness questionnaire. (Horne & Ostberg, 1976) The questionnaire has 19-items that identify morningness-eveningness preference. Scores range from 16 to 86. Higher values on MEQ indicate stronger morningness preference. For this study we used the following cut offs: (1) 16–41 for evening type; (2) 42–58 for intermediate; (3) 59–86 for morning type (Horne & Ostberg, 1976).

Sleep Quality

Sleep quality was evaluated using the 19-item Pittsburgh Sleep Quality Index (PSQI). (Buysse et al., 1989) The PSQI has seven sleep components with each component producing a score ranging from 0 to 3, where a score of 3 indicates the highest level of dysfunction. A global sleep quality score is obtained by summing the individual component scores (range 0 to 21) with higher scores indicative of poorer sleep quality during the previous month. Participants with global scores that exceed 5 are classified as having poor sleep quality. (Buysse et al., 1989)

Daytime Sleepiness

Daytime sleepiness was measured using the 8-item Epworth Sleep Scale (ESS). (Johns, 1991) The instrument has been widely validated globally including Peru. (Rosales-Mayor, Rey de Castro, Huayanay, & Zagaceta, 2012) The ESS questionnaire captures an individual's propensity to fall asleep during commonly encountered situations on a scale from 0 to 3 (range 0 to 24). In adults, ESS scores of 10 or higher are indicative of increased daytime sleepiness. (Johns, 1991)

Common Mental Disorders (CMDs)

The General Health Questionnaire-12 (GHQ-12) was used to define presence of CMDs. The GHQ has 12 items asking respondents to report how they felt during last four weeks on a range of variables including problems with sleep and appetite, subjective experiences of stress, tension, or sadness, mastering of daily problems, decision making and self-esteem. The Spanish language version of GHQ-12 has been previously validated. (Padron, Galan, Durban, Gandarillas, & Rodriguez-Artalejo, 2012) Those who scored 5 or higher are classified as having CMDs. (Fernandes, Hayes, & Patel, 2013; Patel et al., 2008)

Statistical Analysis

Continuous characteristics were summarized using means (\pm standard deviation) and categorical variables as counts and percentages. Chi-square tests and independent-sample t-tests were used to examine bivariate associations for categorical and continuous variables, respectively. Association between the general health questionnaire items and sleep disorders (as measured using total PSQI and ESS scores) were evaluated using Spearman correlation coefficients. Logistic regression models were fitted to examine the associations between CMDs and sleep disturbance characteristics. Separate models were fitted for each sleep disorder. The associations are reported as odds ratios (OR) and 95% confidence intervals (95% CI). All statistical hypothesis tests and reported p-values are two-tailed.

Results

A total of 2,538 Peruvian college students participated in this study (mean age=21.0 years \pm standard deviation=2.7) (Table 1). The prevalence of CMDs was 33.4% (95% CI 31.5%–35.2%). Figure 1 shows the prevalence of CMDs in relation to students' age and sex. Overall, female students had higher prevalence of CMDs compared to males.

Table 2 shows the strength of associations between the GHQ-12 items and total PSQI and ESS scores. All of the 12 items of GHQ were positively and significantly associated with total PSQI and ESS scores ($p < 0.001$). The item "ability to face up to problems" had highest correlation with PSQI ($r = 0.36$) while "feeling under stress" had the smallest correlations ($r = 0.20$). The item "could not overcome difficulties" had the highest correlation with total ESS score ($r = 0.18$) while "feeling reasonably happy" has the smallest correlation ($r = 0.08$).

As shown in Table 3, the multivariate adjusted logistic regression model showed that for participants classified as evening chronotypes had a 1.43-times higher relative odds of CMDs (OR=1.43; 95% CI 1.00–2.05) than participants classified as morning chronotypes. Students with poor sleep quality had a 4.5-times higher relative odds of CMDs (OR=4.50; 95% CI 3.69–5.49) compared to those without poor sleep quality. Participants with daytime sleepiness had a 1.68-times higher relative odds of CMDs (OR=1.68, 95% CI 1.41–2.01) compared to students without daytime sleepiness. All of these analyses were adjusted for age, gender, alcohol consumption, physical activity, energy drinks and smoking status.

Discussion

In this study, we found that 33.4% of students exhibited CMDs. Female students (39.2%) were more likely to report CMDs compared to male students (24.4%). Students with sleep disorders were more highly associated with having CMDs. Our study adds to the literature that has examined associations of sleep traits and disorders with CMDs and extends the literature to include evaluation of a relatively understudied population, Peruvian young adults.

The results of our study are largely consistent with prior studies that found disturbances in chronotype, poor sleep quality, and excessive daytime sleepiness are associated with CMDs. (Regestein et al.,2010; Schneider et al.,2011; Taylor, Clay, Bramoweth, Sethi, & Roane, 2011) A study conducted in Korea found that poor sleep quality was associated with an almost 8-fold higher odds of depression (OR=7.77; 95%CI 2.55–23.66). (Kang, Lee, Jang, Kim, & Sunwoo,2013) Tsuno et al. in their study among 2,259 elderly in France found that excessive daytime sleepiness was associated with severe depression.(Tsuno et al.,2007) The association of evening chronotype with CMDs has also been confirmed in other studies. Merikanto et al. in a Finnish study reported the probability of depression was higher in evening chronotypes (2.7- to 4.1-fold) than morning types.(Merikanto et al.,2013) The results of our study and those of others provide further evidence that sleep disturbances are positively associated and may lead to CMDs. (Ferrie, Kumari, Salo, Singh-Manoux, & Kivimaki,2011)

The strengths of our study include the large sample size and the use of previously validated instruments commonly utilized in large population based surveys. Our study results, however, have limitations. All participants surveyed volunteered to participate; there may therefore be volunteer bias in the findings. Additionally, due to the cross-sectional study design we cannot infer causality or directionality of the associations between sleep disturbances and CMDs.

The associations observed between sleep disorders and CMDs are biologically plausible. Adenosine, a nucleoside composed of adenine and ribose,(Dunwiddie & Masino, 2001; Porkka-Heiskanen, Alanko, Kalinchuk, & Stenberg, 2002) plays a large role in the maintenance of wakefulness, and sleep regulation and metabolism. (Dunwiddie et al.,2001; Huang, Urade, & Hayaishi, 2011; Porkka-Heiskanen et al.,2002). Another biologically plausible hypothesized explanation is through the effect of melatonin. Melatonin (Brzezinski,1997) has been found to improve sleep quality, daytime sleepiness and cognitive function(Halbach,1972). The attenuating effects of melatonin on those who suffer from depression and anxiety have been examined and reported in prior studies. (Hansen et al., 2012; Quera Salva & Hartley,2012) Melatonin and its associated equivalents are believed to have positive effects on both sleep and CMDs. Consequently, a deficiency of this hormone would lead to cognitive dysfunctions and mental decline, and possibly depression. (Hardeland, 2012)

Overall our study documented strong associations between sleep disorders and CMDs among Peruvian college-age students. This finding has important public health implications.

In addition to CMDs, the repercussions of minimal sleep include lack of motivation, reduced cognition, reduced immunity, and increased risk of other health problems. (Javaheri, Storfer-Isser, Rosen, & Redline, 2008) However, social circumstances, academic stress, and the high expectations of a fast-paced society work against the mental wellbeing of college students. Given the growing problem of sleep disorders and CMDs among college students, early education and awareness about sleep health and improved sleep hygiene may serve as one modality for effectively altering risk of CMDs among young adults. Results from our study may be used to guide sleep hygiene promotion and intervention studies among Latin American college students.

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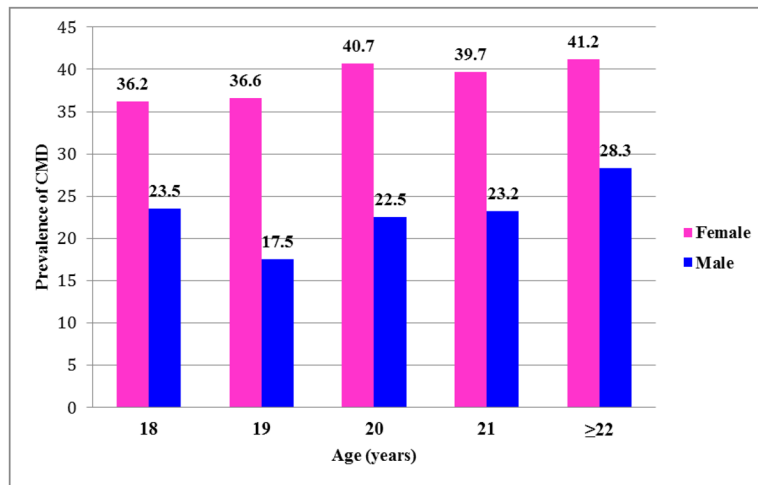


Figure 1.
Prevalence of CMDs According to Sex and Age

Table 1

Common Mental Disorders by Demographic and Lifestyle Characteristics

Characteristics*	Common Mental Disorders			p-value
	Total n	Yes (n=848)	No (1,690)	
Age (years)		%*	%*	
18	489	31.9	68.1	0.231
19	389	29.6	70.4	
20	336	34.2	65.8	
21	405	32.8	67.2	
22	919	35.8	64.2	
Sex				
Female	1,553	39.2	60.8	0.001
Male	985	24.4	75.6	
Cigarette smoking status				
Never	1,899	33.5	66.5	0.360
Former	425	36.9	63.1	
Current	214	31.3	68.7	
Alcohol consumption				
<1 drink/month	517	35.8	64.2	0.111
1–19 drinks/month	992	34.6	65.4	
20 drinks/month	1,029	31.1	68.9	
Body Mass Index (kg/m²)				
Underweight	83	10.8	89.2	0.001
Normal	1,282	34.7	65.3	
Overweight	471	32.5	67.5	
Obese	82	22.0	78.0	
Any physical activity				
No	907	35.1	64.9	0.183
Yes	1,644	32.5	67.5	

* Numbers may not add up due to missing

Table 2

Correlations of Pittsburgh Sleep Quality Index (PSQI) Score and Epworth Sleepiness Scale (ESS) Score with General Health Questionnaire (GHQ)-12 Items

GHQ-12 Items	Spearman Correlation Coefficients*	
	PSQI score	ESS score
<i>Able to concentrate</i>	0.31	0.17
<i>Lost much sleep</i>	0.25	0.09
<i>Playing useful part</i>	0.24	0.16
<i>Capable of making decisions</i>	0.27	0.17
<i>Under stress</i>	0.20	0.08
<i>Could not overcome difficulties</i>	0.25	0.18
<i>Enjoy normal activities</i>	0.32	0.10
<i>Face up to problems</i>	0.36	0.12
<i>Feeling unhappy and depressed</i>	0.28	0.17
<i>Losing confidence</i>	0.26	0.13
<i>Thinking of self as worthless</i>	0.27	0.14
<i>Feeling reasonably happy</i>	0.27	0.14

* All $p < 0.001$

Table 3

Eveningness Chronotype, Daytime Sleepiness and Poor Sleep Quality in Relation to Common Mental Disorders

Sleep Disorder	Unadjusted OR (95% CI)	Age and sex adjusted OR (95% CI)	Multivariate adjusted OR (95% CI)
Chronotype			
Morning type	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Evening type	1.51 (1.08–2.13)	1.53 (1.07–2.17)	1.43 (1.00–2.05)
Sleep quality			
Good	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Poor	4.53 (3.73–5.49)	4.40 (1.01–1.08)	4.50 (3.69–5.49)
Daytime sleepiness			
No	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Yes	1.76 (1.48–2.09)	1.75 (1.46–2.08)	1.68 (1.41–2.01)

* Adjusted for age, sex, alcohol consumption, activity, and energy drinks use;

* Presence of common mental disorder was defined as having GHQ total score of 5 and higher