Original Research

Morningness–eveningness Chronotypes, Insomnia and Sleep Quality among Medical Students of Qom

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Abstract

Background and Objective: Morningness–eveningness (ME) refers to the individual differences in diurnal inclination, sleep-wake pattern for activity, and vigilance in the morning and evening. Quantitative and qualitative components of sleep can be measured through its quality. This study aimed to evaluate the association of ME chronotype with sleep quality and insomnia in students.

Materials and Methods: This cross-sectional study was performed from September 2013 to July 2014 among students. A total of 400 students of Islamic Azad University of Qom in the 1st to 4th year of education were recruited in this study. The students filled out questionnaires including demographic characteristics, Pittsburgh Sleep Quality Index (PSQI), and Insomnia Severity Index (ISI) and a self-assessment questionnaire for ME. Data analysis was performed using SPSS version 18 and simple and multiple linear regressions were used to quantify association between ME types with ISI and PSQI scores.

Results: A mean age of participants was 24.01 ± 5.80 years. A total of 164 (41%) of participants were male. Of these, 38.5% were in eveningness, 34.3% in intermediate and 27.3% were in moriningness chronotype groups. A significant association was observed between morningness chronotype and poor sleep quality ($P < 0.001$), but the relationship with insomnia was not statistically significant ($P = 0.080$).

Conclusion: This study showed morningness chronotypes are more likely to have poor sleep quality.

Keywords: Sleep quality; Morningness-eveningness chronotypes; Insomnia

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Introduction

Sleep is considered an important physiologic process for human. A direct benefit of sleep is not fully understood, but there are many reports that indicate negative health consequence of sleep deprivation. Sleep-wake patterns and their association with different variables such as biological ones are studied in humans (1).

Morningness–eveningness (ME) refers to the individual differences in diurnal inclination, sleep-wake pattern for activity, and vigilance in the morning and evening. These two preferences are understood to have special biological, genetic, psychosocial, and background components (2). Those who are characterized by a more extreme position in the direction of morningness are typically identified as "early larks," while individuals who demonstrate a more extreme eveningness are known as "night owls." Larks are in the early hours risers, perform mentally, the peak of cognitive abilities, academic performance, personality and physically at their best in the morning hours, and go to bed early in

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the evening. The ones with owl pattern of sleep-wake stay up to a late time in the night, they wake up late in the morning and perform much better in the late afternoon. Each type of ME chronotypes affects sleep quality (3).

Quantitative and qualitative components of sleep can be measured through its quality. Duration of sleep is a quantitative component, whereas the person's report of the depth and feeling of restfulness on awakening is a qualitative component (4). Reductions in sleep duration and sleep quality and consequently insomnia are reported to have association with lifestyle, increased work and social demand across populations. Investigators have identified university students as a susceptible group regarding above-mentioned problem (5). This study aimed to assess the correlation of ME chronotypes with insomnia and sleep quality in medical students.

Materials and Methods

This cross-sectional study was performed from September 2013 to July 2014 among students. A total of 400 students of Islamic Azad University of Qom from the 1st to 4th year of education participated in the current study. An inclusion criterion was age between 18 and 30 years. Exclusion criteria consisted of shift working at hospital and any medical and/or psychological health problem or sleep disorder which we found out through interview.

The students filled out questionnaires including demographic characteristics (age, sex, weight, height, and years of education) and Self-Assessment Questionnaire of ME (MEQ) types. The questionnaire of Human Circadian Rhythm was first described by Horne and Östberg in 1976 and since then has been used for assessment of ME types in several languages (6-9). This questionnaire includes 19 questions in Likert-type. There are four possible answers to each question. The answers are organized in a comprehensive manner. According to their total points, the subjects are divided into three different categories of circadian rhythm; 58-82 points "morningness type," 42-58 points "intermediate type," and 16-42 points "eveningness type." The questionnaire was independently translated into Farsi and evaluated by 15 associate professors of Qom University. Following completion of the translation process, a pilot study was performed in a group of 20 subjects to evaluate the comprehensiveness of questionnaire. The questionnaire was given to the same subjects 15-20 days later under the same circumstances. This time interval is long enough to prevent significant level of recalling and short enough to expect measurable changes. As a result, the sixth question of the questionnaire was omitted and scores were divided into remained questions. Then, the questionnaire was applied on the study population. Internal consistency of the first and second categories of the MEQ was calculated separately and the Cronbach's alpha coefficients for this questionnaire in the first and second application were 0.76 and 0.71, respectively.

For assessment and clinical diagnosis of insomnia, the Insomnia Severity Index (ISI) questionnaire was used. It is a short subjective instrument for measuring insomnia symptoms and consequences. The ISI is composed of seven items assessing sleep onset, sleep maintenance, early morning awakening, interference with daily functioning, perceived prominence of

impairment attributed to the sleep problem, concerns about sleep problems, and satisfaction with sleep patterns (10). Perceived severity of each item is rated on a 0-4 scale. A total score ranging from 0 to 28 is obtained from summing the seven ratings. Studies show that the ISI is a useful questionnaire with acceptable validity and reliability for evaluating and screening in the context of primary insomnia. Validated Persian version of this questionnaire was used in this study (11, 12).

The Pittsburgh Sleep Quality Index (PSQI) is an effective instrument was used to measure the quality and patterns of sleep in adults. It differentiates "poor" from "good" sleep by measuring seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction over the last month. The participant self-rates each of these seven components of sleep. Scoring of answers is based on a 0-3 scale, whereby 3 reflect the negative extreme on the Likert scale. A global sum of "5" or greater indicates a "poor" sleeper. Numerous studies have used the PSQI in adult populations throughout the world and it has supported high validity and reliability in Iran (13).

Descriptive statistics were used to describe patient demographic characteristics. Differences in the means of continuous variables were assessed by Student's t-test. Any $P < 0.050$ was considered significant. Continuous data were reported as mean ± standard deviation (SD). Chi-square test was used for analysis of quantitative parameters. Simple linear regression was used to quantify unadjusted associations between ME types and ISI, PSQI, age, sex, income, body mass index (BMI) and major. Multiple linear regressions were used to assess the cross-sectional association between ME types with ISI and PSQI as the response variable. A forward selection model with P value entry criterion of 0.05 was used to create adjusted models, using the following covariates: age, sex, income, major, and BMI. Factors for which there were statistically significant associations on adjusted models were chosen on covariates in subsequent adjusted models. All data were analyzed using SPSS software for Windows (version 18; SPSS Inc., Chicago, IL, USA).

Results

Out of 400 students participated in this study, mean age was 24.10 ± 5.83 years, 164 students (41%) were male, and mean ± SD BMI was 23.13 ± 3.11 kg/m^2. A total of 103 (25.8%) were medical students, 100 (25%) nurses, 97 (24.3%) midwifery students, and 100 (25%) laboratory sciences'. Other demographic characteristics are demonstrated in table 1.

Table 1. Frequency of gender, income, BMI in medical, nurse, midwifery and laboratory sciences' students

Characteristic	Total n (%)	Medical n (%)	Nurse n (%)	Midwifery n (%)	Laboratory sciences n (%)	P value
Sex						
Male	164 (41)	95 (92.2)	11 (11)	0	58 (58)	< 0.001
Female	236 (59)	8 (8.8)	89 (89)	97 (100)	42 (42)	
Income ($)						
< 600	207 (51.8)	48 (46.6)	50 (50)	65 (67)	44 (44)	0.005
> 600	193 (48)	55 (53.4)	50 (50)	32 (33)	56 (56)	
BMI (kg/m^2)						
< 20	65 (16.3)	5 (5.1)	24 (24)	26 (26.8)	10 (10)	< 0.001
20-25	215 (53.8)	44 (42.7)	56 (56)	64 (65)	51 (51)	
> 25	120 (30)	54 (52.2)	20 (20)	7 (8.2)	39 (39)	

BMI: Body mass index

Table 2. Frequency of eveningness, intermediate, and morningness chronotypes in students

Major	Chronotype			P value
	Eveningness	Intermediate	Morningness	
Physician	47	26	30	0.006
Nurse	31	41	28	
Midwifery	26	40	31	
Laboratory science	50	30	20	
Total (%)	154 (38.3)	137 (34.3)	109 (27.3)	

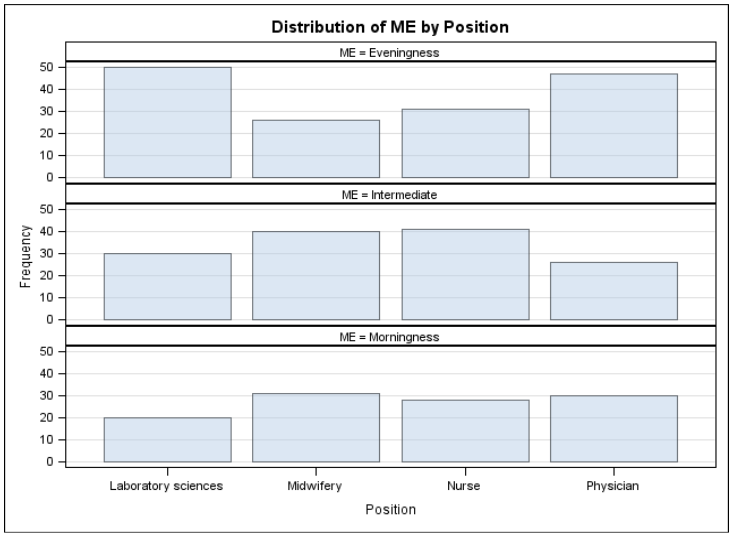

Figure 1. Frequency of eveningness, intermediate, and morningness chronotypes in students

This study showed 109 (27.3%) of students were in morningness group, 137 (34.3%) in intermediate group, and 154 (38.3%) in eveningness group (P = 0.006) (Table 2 and Figure1).

When evaluating the association between chronotype and dimensions of sleep quality, a statistically significant relationship was found between sleep disturbance, daytime dysfunction, sleep latency, and sleep quality (eveningness chronotype had less daytime dysfunction, sleep latency, and better sleep quality) (Table 3).

Table 3. Relationship between PSQI and chronotype

Parameter of PSQI	Chronotype			P value
	Eveningness n (%)	Intermediate n (%)	Morningness n (%)	
Sleep disturbance				
Better	133 (33.3)	111 (27.8)	87 (21.8)	0.350
Worse	21 (5.3)	26 (6.5)	22 (5.5)	
Daytime dysfunction				
Better	120 (30)	96 (24)	62 (15.4)	0.002
Worse	34 (8.5)	41 (10.3)	47 (11.8)	
Sleep duration				
Better	129 (32.3)	108 (26.9)	87 (21.8)	0.380
Worse	25 (6.3)	29 (7.3)	22 (5.5)	
Sleep latency*				
Better	145 (36.3)	117 (29.3)	92 (23)	0.014
Worse	9 (2.3)	20 (5.2)	17 (4.3)	
Sleep quality				
Better	121 (30.3)	99 (24.8)	64 (16.1)	0.001
Worse	33 (8.3)	38 (9.5)	45 (11.3)	

*Sleep latency (duration between onset of bedtime to sleeping), PSQI: Pittsburgh Sleep Quality Index

Table 4. Parameter estimates from simple linear regression analysis of ME types in relation to ISI, PSQI and other factors

Variables	Parameter estimates (95%CI)	P value	Partial correlation	Adjusted R^2
ISI	0.128-0.524	< 0.001	0.16	0.023
PSQI	0.368-0.949	< 0.001	0.21	0.045
Gender	−1.03-2.80	0.360	0.04	0.001
Age	−0.46-(−0.18)	< 0.001	−0.20	0.040
BMI	0.59-0.01	0.050	−0.09	0.006
Major	−1.24-0.42	0.330	−0.04	0.001
Income	−2.26-(−0.091)	0.034	−0.10	0.009

CI: Confidence interval, PSQI: Pittsburgh Sleep Quality Index, ISI: Insomnia Severity Index, BMI: Body mass index, ME: Morningness-eveningness

Simple linear regression analysis showed that age, BMI, income, ISI, and PSQI were significantly associated with ME types (P < 0.001 for age, PSQI, ISI and P < 0.050 for BMI and P < 0.034 for income). After adjustment for age, sex, BMI, income, and major, ME types were significantly associated with PSQI [P = 0.001, confidence interval (CI) 95%: 0.23-0.90] but not with ISI (P = 0.081, CI 95%: 0.02-0.42). Other parameters are described in tables 4 and 5.

Table 5. Multiple linear regression models to estimate the relationship of ME types with ISI and PSQI

Variables	Parameter estimates (95%CI)	P value	Partial correlation	Adjusted R^2
ISI	-0.02-0.42	0.081	0.08	0.099
PSQI	0.23-0.90	< 0.001	0.16	
Sex	-2.50-1.80	0.750	-0.01	
Age	-0.48-(-0.14)	< 0.001	-0.18	
BMI	-0.54-0.10	0.190	-0.06	
Major	-1.59-0.08	0.076	-0.08	
Income	-1.95-0.18	0.100	-0.08	

CI: Confidence interval, PSQI: Pittsburgh Sleep Quality Index, ISI: Insomnia Severity Index, BMI: Body mass index, ME: Morningness-eveningness

Discussion

The first aim was to test the chronotype approach in students. The authors used latent profile analysis, which can be regarded as a person-oriented framework seeking subtypes of students that exhibit similar patterns of activity and alertness in the morning and evening.

Three latent classes were identified or so-called types, namely, evening, intermediate, and morning type. The distribution of these chronotypes provides evidence that the majority of students could be classified as eveningness type. Intermediate type was the second frequent one, and the least frequent one was morningness type.

Using different methods to measure ME, one study reported (in dormitory students) higher prevalence of the intermediate type (69.2%) than moderate evening (25.6%), moderate morning (3.2%), and definite evening type (1.9%) (14). In another study, a New Zealand version of the MEQ was mailed to 5000 New Zealand adults who were randomly selected from the electoral rolls. Among the total population according to the Horne and Ostberg classification, 49.8% were classified as morning type compared to 5.6% having an evening-type preference (15).

The second aim was to test the association between ME type with sleep quality and insomnia. The current study showed stronger preferences toward morningness predicted a lower likelihood of good sleep and evening chronotype had better sleep quality. In the investigation of Bakhshandeh and colleagues (14), there was a significant negative correlation between MEQ and PSQI scores and its dimensions such as subjective sleep quality, sleep latency, sleep duration, and sleep efficiency; while there were no significant differences between sleep disturbances, daytime dysfunction, use of

sleep medication, and MEQ scores. The results showed that the quality of evening type sleep was worse than that of the morning type. There is a study that has shown excessive daytime sleepiness and eveningness chronotype are common among college students (16). However, in the study of Yazdi and colleagues (17), the results showed that more than half of the participants had poor sleep, and evening type nurses had worse sleep quality in that study. There was not any significant association between the shift type and age of the nurses with their quality of sleep.

Limitations of the current study include first; the present sample is limited to Islamic Azad University of Qom, and therefore, it cannot be generalized to other universities and other cities. Second, the direction of causal relationships is uncertain due to the cross-sectional analysis. Third, this study is based only on self-report measures, which might be prone to memory and response biases. Fourth, the reliability of the shortened Horne-Östberg MEQ is not optimal.

Conclusion

The results of this study showed ME chronotypes correlate with sleep quality and indicated morningness chronotypes has better sleep quality overall. Also with increasing age, students tend to be more of eveningness type.

Conflict of Interests

Authors have no conflict of interests.

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