

Original Article

The Effect of Dysmenorrhea on the Severity of Insomnia among University Students in Turkey

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Abstract

Background: Dysmenorrhea is the most common gynecological condition among women of reproductive age. Although dysmenorrhea has been reported to affect the sleep, the effect of dysmenorrhea on the severity of insomnia has yet to be elucidated.

Objectives: This study aims to analyze the effect of dysmenorrhea on the severity of insomnia among university students.

Methods: Two interviews were conducted with the students; the first prior to the menstrual period, the second in the first three days after menstruation.

Results: Falling asleep took longer, sleep duration was shorter, sleep quality was poorer, and the rate of feeling rested in the morning was lower among those who suffered from dysmenorrhea during the menstrual period than among those who did not ($p<0.05$). The frequency of awakenings after falling asleep was higher, sleep quality was poorer, and the rate of feeling rested in the morning was lower among those who suffered from severe dysmenorrhea ($n=65$) ($p<0.05$).

Conclusions: It was determined that the average score of insomnia severity was higher in patients with Dysmenorrhea disease and the severity of insomnia was also increased as the severity of pain increased.

Keywords: Dysmenorrhea, insomnia, sleep, menstrual cycle

Introduction

Sleep disorders are more common in women than in men. This difference can be caused by changes in reproductive functions in women's life. Certain changes are expected to occur regularly each month and to continue from menarche to menopause, particularly in the reproductive organs,

for reproductive functions to continue in a normal way. All these changes are part of the menstrual cycle. Women in the reproductive period may also experience gynecological disorders such as premenstrual syndrome, dysfunctional uterine bleeding, amenorrhea, and dysmenorrhea. The most frequently observed complaint is dysmenorrhea, which means painful menstruation

(Fernández-Martínez et al., 2018). Mood changes, fatigue, headache, nausea, and edema during menstruation are reported with dysmenorrhea. Negative consequences of dysmenorrhoea may include impaired quality of personal and social life, mood disorders, sleep disturbance, and limitation of usual daily activities (Tahoonian-Golkhatmy et al., 2019). Dysmenorrhea may be accompanied by nausea, vomiting, headache, dizziness, and diarrhea (Fernández-Martínez et al., 2018).

The worldwide prevalence of dysmenorrhea varies considerably among countries, ranging between 50% and 90% (Habibi et al., 2015; Hailemeskel et al., 2016; Fernández-Martínez et al., 2018). The frequency of dysmenorrhea has been reported to range from 28% to 87.7 % in Turkey (Esen, et al., 2016; Midilli, Yasar and Baysal, 2015). Dysmenorrhea may negatively affect women's daily lives and interrupt daily activities, depending on its severity. A study has reported that daily activities are restricted in 15% of women who experience dysmenorrhea (Midilli, Yasar and Baysal, 2015) and that dysmenorrhea experienced during school terms leads to a reduced academic performance and absenteeism in the school (Iacovides, Avidon and Baker, 2015), negatively affects relationships with peers, and encourages avoidance of activities (Midilli, Yasar and Baysal, 2015) can cause a loss of work productivity and a reduction in the quality of life (Iacovides et al., 2014).

There is a complicated relationship between pain and sleep. Previous studies have suggested that pain is the main cause of insomnia in patients with medical problems (such as chronic diseases) and have shown evidence of a relationship between pain and insomnia (Wang, Liu and Jia, 2019; Liu, et al., 2017).

Dysmenorrhea, one of the menstrual problems, can affect girls' sleep and may increase the risk of poor sleep quality, and insomnia, because both sleep and menstruation are associated with hypothalamic-pituitary axis activities. (Wang, Liu and Jia, 2019; Liu X, et al., 2017; Gumenyuk, et al., 2015). In a study was conducted by Van Reen and Kiesner indicated that one of the factors affecting sleep was the menstrual cycle (Van Reen and Kiesner, 2016). In a study conducted by

Iacovides and colleagues, it was found that women with primary dysmenorrhea have low sleep quality (Iacovides, Avidon and Baker, 2015). Although dysmenorrhea is a commonly observed problem that affects daily life, a very limited number of studies the effect of dysmenorrhea on sleep, the lack of research in this area is surprising. The effect of dysmenorrhea on insomnia severity needs to be well known in order to ensure that young girls living with dysmenorrhea receive better quality care.

This study has more extensive sampling than previous studies. It also examines not only insomnia but also other sleep related characteristics (such as sleeping time, number of waking after sleeping, sleep duration, sleep quality). In addition, not only the dysmenorrheic and non-dysmenorrheic, but also the premenstrual and menstrual periods of the evaluation of sleep problems have been tried to examine. This study aimed to analyze the effect of dysmenorrhea on the severity of insomnia among university students.

With this study, answers to the following questions were searched. (a) Is the severity of insomnia different between premenstrual and menstrual dysmenorrhea? (b) Is there any difference between premenstrual and menstrual insomnia severity for those with dysmenorrhea?

(c) Does insomnia vary with severity of pain severity?

Materials and Method: This cross-sectional study was conducted in the Faculty of Health Sciences of a leading university in eastern Turkey between September and December 2016. The faculty is located on the central university campus and provides education for 955 female students. Power analysis yielded a sample size of 275 participants at 5% margin of error, 95% confidence interval, 0.80 power of representation, and two-way significance level. The researchers contacted 353 students considering the possible losses in the second interview. Seventy-three students did not attend the second interview and dropped out of the study. The second interview was completed with 280 students. The study sample was selected through the nonprobability random sampling method; students who agreed to participate and met the inclusion criteria were included in the sample. Of the 955 students who were asked to

participate, 353 (36.9%) responded positively. Of the 353 students who agreed to participate, 280 (79.3%) participated for the full study, providing data for two interviews. Thus, data from 280 students were analyzed in the present study.

The inclusion criteria were being nulliparous, use any type of hormonal birth control, having regular menstrual cycles for the previous six months (once every 21 to 35 days, and no menstrual bleeding in the intermediary period), absence of any systemic or chronic disease (including psychiatric or sleep disorders) and absence of diagnosis with acute or chronic pelvic diseases. The possible medical problems of the students were determined based on the verbal statement. Students who indicated no chronic or systemic disease or acute and chronic pelvic disease were included in the study.

Dysmenorrhea was defined as the experience of pain during menstrual bleeding. In addition, systemic symptoms such as nausea, vomiting, diarrhea, fatigue and insomnia frequently accompany the pain.¹⁵ In this study, the pain symptom was taken into account when the effect of dysmenorrhea on sleep quality was evaluated. The criterion for dysmenorrhea was pain in the waist, inguinal, or abdominal regions which starts in the first six to 12 hours of menstruation and lasts for eight to 72 hours (Iacovides, Avidon, and Baker, 2015). Before the study, the dysmenorrhea was defined for students. According to this definition, students who stated that they were experiencing Dysmenorrhea were given questionnaire forms.

Data Collection Tools: The data were collected using a questionnaire and the Insomnia Severity Index. The questionnaire consisted of three sections. The first section included questions on the students' individual characteristics (such as age, department, menarche age, status of having dysmenorrhea, and history of dysmenorrhea in the family); the second section included questions on sleep characteristics (the time passing before falling asleep (The time between "going to bed" and "falling asleep"), frequency of awakenings after falling asleep, sleep duration, sleep quality, and feeling rested in the morning) of the last three days; and the third section included a Visual Analog Scale (VAS) to assess the severity of dysmenorrhea. The VAS is a 10 cm scale from zero (no severe pain at all) to 10 (unbearable pain).

The scale indicates mild pain between 0 and 44 mm, moderate pain between 45 and 74 mm, and severe pain between 75 and 100 mm (Jensen, 2003).

The Insomnia Severity Index (ISI) is a short index which assesses individuals' perception of insomnia and can be self-reported. The index aims to determine the subjective symptoms and outcomes of insomnia, as well as the degree of stress and anxiety caused by insomnia. In the ISI Turkish version, questions are asked in the form of "currently" (e.g. last 2 weeks)" (Boysan, et al., 2010). However, the menstrual period varies from woman to woman and dysmenorrhea typically takes 8 to 72 hours (Iacovides, Avidon, and Baker, 2015). For this reason, while asking other questions about ISI, VAS and sleep, students were asked to evaluate the last three days.

ISI comprises seven items on the difficulties in falling asleep and continuing to sleep, satisfaction with the sleep pattern, the effects of insomnia on daily life, disorders caused by sleep problems, and the degree of stress and anxiety caused. Each item is scored between 0 and 4, and the index's total score ranges between 0 and 28. Higher scores indicate more serious sleep problems. 10 and above points are used to determine insomnia (Morin et al., 2011). The index was tested for validity and reliability in Turkish by Boysan et al. (2010), who found its Cronbach's alpha reliability coefficient to be 0.79 (Boysan, et al., 2010).

Data Collection: Two interviews were conducted with the students and only the questionnaire was applied to the students in these interviews. The questionnaires were completed by the students in presence of the first author. The first interview was conducted between two menstrual cycles (at least 1 week after menstruation and 10-14 days before next menstruation) and so that the effect of dysmenorrhea or premenstrual symptoms on sleep was tried to be minimized. During this interview, the first and second sections of the questionnaire regarding the students' individual and sleep characteristics was administered, as well as the ISI. The second interview was carried out in the first three days after menstruation. In the second interview, the second section of the questionnaire, regarding sleep characteristics, was administered to the students who reported no dysmenorrhea, along

with the ISI. The students who reported dysmenorrhea was administered the second and third sections of the questionnaire, on sleep characteristics and the VAS, and the ISI. Of the students, 79.3% (n=280) participated in a second interview.

Data Analysis: The data were analyzed using the SPSS 16.0 package for Windows. Data are reported as means and SDs to describe continuous variables. Categorical data are presented as frequencies (%). The chi-square test was used to compare categorical variables. An independent sample t test was used to evaluate differences in continuous variables between the groups (dysmenorrhea [yes], dysmenorrhea [no]), and a dependent sample t test was used evaluate differences in continuous variables within the groups (before and during menstruation of dysmenorrhea students). Mc Nemar test was used evaluate differences in categorical variables within the groups (before and during menstruation of dysmenorrhea students). Finally, one way ANOVA was used to compare differences between the mean scores for pain severity. The significance level was accepted to be 0.05.

Results

The first interview was carried out with 353 students; and 76.5% (n=270) of them were found to suffer from dysmenorrhea. Comparison of the distribution of characteristics of university students was shown in the Table 1. It was found that the frequency of dysmenorrhea was higher among the students with a family history of dysmenorrhea, yielding statistical significance between groups ($p<0.05$; Table 1).

Table 2 shows the mean ISI scores and sleep characteristics before menstruation among the students. No statistically significant difference was found between the mean ISI scores, the time passing before falling asleep, the frequency of awakenings after falling asleep, sleep duration, sleep quality, or feeling rested in the morning among the students who did and did not suffer from dysmenorrhea ($p>0.05$; Table 2). According

to ISI, 38.5% of students with dysmenorrhea and 33.7% of students without dysmenorrhea experienced insomnia ($ISI\geq 10$) before menstruation.

Two hundred eighty students were then interviewed (79.3%) during their menstrual period. Table 3 shows the mean ISI scores and sleep characteristics during menstruation among the students. The mean ISI score was 9.61 ± 5.03 among those who suffered from dysmenorrhea and 7.58 ± 5.19 among those who did not, yielding a statistically significant difference ($p<0.05$). The students who suffered from dysmenorrhea had shorter sleep duration, a higher rate of poor sleep quality, and a lower rate of feeling rested in the morning ($p<0.05$; Table 3). According to ISI, 47.9% of students with dysmenorrhea and 32.3% of students without dysmenorrhea experienced insomnia ($ISI\geq 10$) during menstruation period. Table 4 shows the mean ISI scores and sleep characteristics before and during the menstrual period among the students who experienced dysmenorrhea. The mean ISI score was 8.54 ± 4.42 before menstruation and 9.61 ± 5.03 during menstruation, yielding a statistically significant difference ($p<0.05$). The students indicated a higher frequency of awakenings after falling asleep, a shorter sleep duration, a higher rate of poor sleep quality, and a lower rate of feeling rested in the morning during the menstrual period compared to the period prior to menstruation ($p<0.05$; Table 4).

The mean score for pain severity was 5.84 ± 2.54 among students who suffered from dysmenorrhea. Of them, 25.6% had mild pain, 44.2% had moderate pain, and 30.2% had severe pain. Table 5 shows the mean ISI scores and sleep characteristics of the students who experienced dysmenorrhea in relation to the severity of dysmenorrhea during the menstrual period. The mean ISI score, the frequency of awakening after falling asleep, and the rate of poor sleep quality were higher, and the rate of feeling rested in the morning was lower for those who suffered from severe dysmenorrhea ($p<0.05$).

Table 1. Comparison of the Distribution of Characteristics of University Students (n=353)

	Dysmenorrhea			Test and p value
	Yes (n=270)	No (n=83)	Total (n=353)	
	n (%)	n (%)	n (%)	
Age (years), Mean \pm SD (min-max)	21.1 \pm 1.8 (18-31)	21.1 \pm 1.7 (18-31)	21.1 \pm 1.8 (18-31)	t= -0.081 p= 0.936
Age of menarche (years)				
\leq 12	61 (74.4)	21 (25.6)	82 (23.2)	$\chi^2= 0.261$
$>$ 12	209 (77.1)	62 (22.9)	271 (76.8)	p= 0.609
Family history of dysmenorrhea				
Yes	185 (84.9)	33 (15.1)	218 (61.8)	$\chi^2= 22.233$
No	85 (63.0)	50 (37.0)	135 (38.2)	p= 0.001

Table 2. Comparison of the mean ISI scores and sleep characteristics before menstruation among the students (n=353)

	Dysmenorrhea		Test and p value
	Yes (n=270)	No (n=83)	
	Mean \pm SD (min-max)	Mean \pm SD (min-max)	
ISI (total)	8.6 \pm 4.3 (0-22)	8.4 \pm 5.0 (0-24)	t= -0.351 p= 0.726
Time passing before falling asleep (minutes)*	27.4 \pm 30.8 (0-180)	25.73 \pm 26.5 (3-150)	t= -0.455 p= 0.650
Frequency of awakenings after falling asleep*	1.7 \pm 1.6 (0-10)	1.6 \pm 1.6 (0-10)	t= -0.291 p= 0.771
Sleep duration (hours) *	7.2 \pm 1.3 (2-12)	7.2 \pm 1.5 (2-14)	t= -0.169 p= 0.866
Sleep quality, n (%)*			
Good	212 (78.5)	69 (83.1)	$\chi^2 = 0.832$
Bad	58 (21.5)	14 (16.9)	p= 0.437

Feeling rested in the morning, <i>n</i> (%)*			
Yes	124 (45.9)	41 (49.4)	$\chi^2 = 0.307$
No	146 (54.1)	42 (50.6)	$p = 0.616$

ISI: Insomnia Severity Index *The last three days sleep characteristics have been evaluated.

Table 3. Comparison of the mean ISI scores and sleep characteristics during menstruation among the students (n=280)

	Dysmenorrhea		Test and p value
	Yes (n=215)	No (n=65)	
	Mean \pm SD (min-max)	Mean \pm SD (min-max)	
ISI (total)	9.6 \pm 5.0 (0-27)	7.5 \pm 5.1 (0-26)	t= -2.826 p= 0.005
Time passing before falling asleep (minutes) *	26.7 \pm 25.4 (0-120)	20.6 \pm 17.8 (0-120)	t= -1.810 p= 0.071
Frequency of awakenings after falling asleep*	1.9 \pm 1.6 (0-8)	1.8 \pm 2.8 (0-20)	t= 0-.492 p= 0.623
Sleep duration (hours) *	7.0 \pm 1.3 (3-10)	7.5 \pm 1.9 (1-14)	t= 2.282 p= 0.023
Sleep quality, <i>n</i> (%)*			
Good	141 (65.6)	55 (84.6)	$\chi^2 = 8.611$
Bad	74 (34.4)	10 (15.4)	$p = 0.003$
Feeling rested in the morning, <i>n</i> (%)*			
Yes	72 (33.5)	36 (55.4)	$\chi^2 = 10.099$
No	143 (66.5)	29 (44.6)	$p = 0.002$

ISI: Insomnia Severity Index *The last three days sleep characteristics have been evaluated.

Table 4. Comparison of the mean ISI scores and sleep characteristics before and during the menstrual period among the students who experienced dysmenorrhea (n=215)[^]

	Before menstrual period	During the menstrual period	Test and p value
	Mean \pm SD (min-max)	Mean \pm SD (min-max)	
ISI (total)	8.5 \pm 4.4 (0-22)	9.6 \pm 5.0 (0-27)	t= -3.571 p= 0.001
Time passing before falling asleep (minutes)*	26.6 \pm 28.9 (0-180)	26.7 \pm 25.4 (0-120)	t= -0.067 p= 0.946
Frequency of awakenings after falling asleep*	1.7 \pm 1.5 (0-8)	1.9 \pm 1.6 (0-8)	t= -2.684 p= 0.008
Sleep duration (hours)*	7.2 \pm 1.4 (2-12)	7.0 \pm 1.3 (3-10)	t= 2.259 p= 0.025
Sleep quality, n (%) [*]			
Good	171 (79.5)	141 (65.6)	$\chi^2 = 35.968$
Bad	44 (20.5)	74 (34.4)	p= 0.001 [#]
Feeling rested in the morning, n (%) [*]			
Yes	100 (46.5)	72 (33.5)	$\chi^2 = 54.629$
No	115 (53.5)	143 (66.5)	p= 0.001 [#]

ISI: Insomnia Severity Index [^] Only the students who experienced dysmenorrhea*The last three days sleep characteristics have been evaluated. [#] McNemar Test**Table 5. Comparison of the mean ISI scores and sleep characteristics of the students who experienced dysmenorrhea in relation to the severity of dysmenorrhea during the menstrual period. (n=215)[^]**

	Mild (n=55) (0-44 mm)	Moderate (n=95) (45-74 mm)	Severe (n=65) (75-100 mm)	Test and p value
	Mean \pm SD (min-max)	Mean \pm SD (min-max)	Mean \pm SD (min-max)	
ISI (total)	7.4 \pm 5.1 (0-26)	9.8 \pm 4.3 (1-24)	11.0 \pm 5.2 (1-27)	F= 8.367 p= 0.001

Time passing before falling asleep (minutes)*	20.3 ± 17.9 (0-90)	27.3 ± 23.6 (0-120)	31.2 ± 31.9 (0-120)	F= 2.785 p= 0.064
Frequency of awakenings after falling asleep*	1.3 ± 1.1 (0-6)	2.0 ± 1.7 (0-7)	2.4 ± 1.7 (0-8)	F= 6.895 p= 0.001
Sleep duration (hours)*	7.4 ± 1.0 (5-10)	6.9 ± 1.3 (3-10)	6.9 ± 1.5 (4-10)	F= 2.476 p= 0.086
Sleep quality, <i>n</i> (%)*				
Good	45 (81.8)	59 (62.1)	37 (56.9)	χ ² = 9.091
Bad	10 (18.2)	36 (37.9)	28 (43.1)	p= 0.011
Feeling rested in the morning, <i>n</i> (%)*				
Yes	33 (60.0)	26 (27.4)	13 (20.0)	χ ² =24.263
No	22 (40.0)	69 (72.6)	52 (80.0)	p= 0.001

ISI: Insomnia Severity Index [^] Only the students who experienced dysmenorrhea *The last three days sleep characteristics have been evaluated.

Discussion

Dysmenorrhea is an important health problem that negatively affects women's lives during the menstrual period. Of the students in this study, 76.5% suffered from dysmenorrhea. Various studies have reported the prevalence of dysmenorrhea to be between 50% and 90% around the world (Habibi et al., 2015; Hailemeskel et al., 2016; Fernández-Martínez et al., 2018). Its prevalence has been reported to range between 28% to 87.7 % in Turkey (Esen, et al., 2016; Midilli, Yasar and Baysal, 2015). The differences in prevalence reported may be caused by the various scales used in the studies.

No statistically significant difference was found between mean ISI scores, the time passing before falling asleep, frequency of awakenings after falling asleep, sleep duration, sleep quality, or feeling rested in the morning before menstruation among students who did and did not suffer from dysmenorrhea ($p > 0.05$). However, those who experienced dysmenorrhea indicated a shorter sleep duration, poorer sleep quality, and a lower

rate of feeling rested in the morning during the menstrual period compared to those who did not ($p < 0.05$). Sahin et al. identified a negative relationship between dysmenorrhea and sleep quality in his study conducted with university students (Sahin, et al., 2014). Liu et al. found a significant relationship between dysmenorrhea and poor sleep quality with adolescent girls (Liu et al., 2017). These findings are consistent with those of the present study. The present study also found a higher severity of insomnia during the menstrual period than in the period before menstruation among the students who suffered from dysmenorrhea ($p < 0.05$). Woosley and Lichstein reported higher scores for the severity of insomnia, higher frequency of awakenings during the sleep, and poorer sleep quality among participants who had dysmenorrhea with undergraduate students (Woosley and Lichstein., 2014).

The present study also found a higher frequency of awakenings, shorter sleep duration, poorer sleep quality, and a lower rate of feeling rested in the morning during the menstrual period among students who suffered from dysmenorrhea

($p < 0.05$). Woosley and Lichstein reported that women who had sleep problems had severer pain during menstruation than those who did not have sleep problems (Woosley and Lichstein, 2014). This is because insomnia during the menstrual period (Wang, Liu, and Jia., 2019; Liu, et al., 2017) increases sensitivity to pain. Demirci determined that 35.6% of women with dysmenorrhea suffered from insomnia during the menstrual period in women 15-49 age living Turkey (Demirci., 2017). Kazama et al. indicated that participants suffering from dysmenorrhea had shorter sleep durations with high school students (<6 hours) (Kazama et al., 2015). Wang et al. also found poorer sleep quality and shorter sleep durations among participants who experienced dysmenorrhea in female adolescents living in Chinese (Wang, Liu, and Jia, 2019). Other studies have also reported that pain reduces sleep quality and causes sleep disorders (Liu, et al., 2017).

The present study has shown a higher severity of insomnia, a higher frequency of awakenings after falling asleep, and a lower rate of feeling rested in the morning among students suffering from severe dysmenorrhea than among those with mild and moderate dysmenorrhea ($p < 0.05$). Previous studies also found better sleep quality, shorter times needed to fall asleep, and lower numbers of awakenings among participants with mild dysmenorrhea compared to participants who had moderate or severe dysmenorrhea (Woosley and Lichstein., 2014).

Study limitations: There are some limitations of the study firstly, it was performed in a single university; therefore, the sample may not be representative of all Turkish female students. Second, data collection has been performed by self-report using questionnaires that have resulted in underreporting of the conditions. Third, the VAS was not used to the students who did not suffer from dysmenorrhea. The evaluation of the pain threshold in the future studies may help to evaluate the pain objectively.

Conclusion: A majority of the students (76.5%) experienced dysmenorrhea, which caused insomnia and problems in sleep quality. Increased severity of dysmenorrhea was found to cause increased severity of insomnia. Dysmenorrhea was also found to negatively affect the sleep characteristics

of the university students (the time passing before falling asleep, frequency of awakenings after falling asleep, sleep duration, sleep quality, and feeling rested in the morning). This may also negatively affect their participation in daily activities and study success.

Implications for Nursing Practice: Health professionals should consider not only the pain experienced, but also the systemic symptoms (such as insomnia) when evaluating dysmenorrhea. It is recommended that health professionals address dysmenorrhea multi-dimensionally and make a comprehensive caregiving plan for developed conditions.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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