

## Brief Report

# SYMPTOMS OF ANXIETY AND DEPRESSION IN ESTONIAN MEDICAL STUDENTS WITH SLEEP PROBLEMS

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*High emotional stress in medical students has been observed in many studies. Our aim in this article was to assess the prevalence of symptoms of anxiety and depression among Estonian medical students and to find relationships between sleep complaints and emotional symptoms. The study group consisted of 413 medical students, ages 19–33 years, at the University of Tartu. Each was asked to complete two questionnaires: the Emotional State Questionnaire (EST-Q), containing 28 questions, and the Questionnaire on Sleep and Daytime Habits, with 25 questions. The anxiety and depression subscales from the EST-Q were applied. From the study group, 21.9% students had symptoms of anxiety, and 30.6% had symptoms of depression. The frequency of anxiety and depressive symptoms was higher in females. In regression and multiple regression analysis, we determined which sleep problems were related to emotional symptoms. The associations were different for men and women. In women, anxiety remained significantly related to waking up because of nightmares and feeling tired in the morning; depressive symptoms were related to difficulties in getting to sleep at night, waking up because of nightmares and nocturnal eating habits, daytime sleepiness, and sleepiness during school lessons. In men, significant relations were clear only for depression: difficulties in falling asleep at night before an exam and subjective sleep quality. The study demonstrated that a high percentage of medical students had emotional symptoms. We found that some sleep problems indicated underlying symptoms of anxiety and depression. Depression and Anxiety 23:250–256, 2006. © 2006 Wiley-Liss, Inc.*

## INTRODUCTION

Anxiety, mood, and sleep disorders are very common in the general population. The prevalence of anxiety disorders is 7.8–9.3% [Ohayon et al., 2000; Regier et al., 1988] and that for generalized anxiety is 0.69–1.6% [Stein and Heimberg, 2004; Wittchen et al., 1994].

The prevalence of depression varies across studies and different countries [Aluoja et al., 2004; Pakriev et al., 1998; Regier et al., 1988]. The point prevalence of depression is found to be 2.2–20.7% [Angst and Merikangas, 1997; Angst et al., 2002; Ialongo et al., 2004; Kessler et al., 1993; Regier, 1993; Regier et al., 1988], and even up to 27.3% [Pakriev et al., 1998]. The high variation is due to different study instruments and classification systems.

The point prevalence of subclinical depression and/or depressive symptoms is about two times higher than

the prevalence of depressive disorders [Angst and Merikangas, 1997; Angst et al., 2002; Cox et al., 2001].

A high level of symptoms of anxiety and depression has been found in medical students. Kirsling et al. [1989] used the Beck Depression Inventory and found depression among 23.5% of undergraduate medical

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students and 15.5% of first-year residents. Clark and Zeldow [1988] found depressive symptoms in 12% of first-year medical students and 25% of second-year students. The depression rate of medical students at the beginning of their medical studies resembled that of the general population, but reached as high as 40% in subsequent years [Rosal et al., 1997]. Liu et al. [1997], using a self-rating scale, found the prevalence of anxiety symptoms in students at a medical school to be 12.5%.

Previous studies have estimated that prevalence of sleep disorders ranges between 3.2% and 44% [Foley et al., 1995; Haldemann et al., 1996; Janson et al., 1995; Kim et al., 2000; Léger, 2000; Liu et al., 2000a; Roth and Ancoli-Israel, 1999; Steptole and Wardle, 2001; Walsh and Bedirhan Ustun, 1999]. Loayza et al. [2001] found insomnia symptoms in 28.15% of medical students.

In studies of the Estonian population, anxiety symptoms were observed in 8.5% of people, and depressive symptoms in 11.1% [Aluoja et al., 2001b, 2004]. Sleep disturbances (respondents rated their sleep quality as bad or unsatisfactory) occurred in 7% of medical students [Veldi et al., 2004]. There are no previous data concerning the student population in Estonia.

Research has shown that there is high comorbidity between sleep disturbances and psychiatric disorders, especially depression and anxiety [Alapin et al., 2000; Coelho et al., 2002; Léger, 2000; Roth and Ancoli-Israel, 1999; Specchio et al., 2004; Walsh and Bedirhan Ustun, 1999; Wolfson and Carskadon, 1998; Zammit et al., 1999]. Sleep problems are also a part of the DSM-IV criteria for depression.

Our aim in this article was to investigate the prevalence of mood and anxiety symptoms in Estonian medical students. Because a high percentage of medical students suffer from sleep problems [Veldi et al., 2004, 2005], we analyzed how sleep problems are related to emotional symptoms.

## MATERIALS AND METHODS

*Study area and study subjects:* This study covers all the medical students at the University of Tartu, from the first to the sixth year, who attended lectures October 15 to November 15, 2003. During that period, we delivered questionnaires to 515 students. The response rate was 80.2%, and the final study sample comprised 413 students: 318 (77%) females and 95 (23%) males, ages 19–33 years (mean age  $21.3 \pm 2.5$ ). The students as a group were asked to complete two questionnaires in class: the Emotional State Questionnaire (EST-Q) and the Questionnaire on Sleep and Daytime Habits (QS&DH). To avoid social desirability bias, questionnaires were administered by a researcher who was unknown to the students. Participants were unaware of the specific objectives of the study, and the answers were anonymous. The research protocol was approved

by the Ethics Review Committee on Human Research of the University of Tartu. All participants signed the informed consent.

EST-Q is a self-rating scale developed in Estonia for the screening of depression, general anxiety, agoraphobia-panic, fatigue, and insomnia during the previous 4 weeks. It has been found to be a reliable and valid instrument for assessing these psychiatric dimensions and discriminating between patients with mood or anxiety disorders and the population group [Aluoja et al., 1999; 2001a]. EST-Q has 28 questions, rated on a 0- to 4-point scale. For this study, we used two subscales: Anxiety (6 items) and Depression (8 items), reflecting symptoms of depressive disorder and generalized anxiety disorder according to ICD-10 and DSM-IV criteria. The cutoff point for clinically important symptomatology was 12 points for both subscales.

The QS&DH, the Veldi et al. [2005] modification of the Janson et al. [1995] Questionnaire on Sleep and Daytime symptoms (QSD), adds seven questions about parasomnias, and sleep and daytime habits. The QSD has been used in three European countries, together with the Health Survey program [Janson et al., 1995]. The QS&DH has 25 questions, which subjects answer using a 1- to 5-point ordinal scale. Eighteen questions assess the frequency of the respective problems during the week (1 = *never*; 5 = *almost every day or night*). Four questions require numerical answers and assess what time the subject goes to bed, time needed for falling asleep, length of daytime naps, and number of nocturnal awakenings. Sleep quality was rated from *excellent* (1) to *very poor* (5). This questionnaire was found to be useful for studying sleep problems in young adult students [Veldi et al., 2004, 2005].

*Data analysis:* The statistical analysis was performed with the help of the Statistica 6.0 software package (StatSoft Inc., Tulsa, OK). We used frequency tables to calculate the prevalence rates of symptoms, Spearman's rank-order correlation to find relationships between emotional symptoms and study years, and regression analysis to determine which sleep problems were related to symptoms of anxiety and depression. Significant associations were tested in a multiple regression analysis with standard method to control simultaneously for other sleep problems.

## RESULTS

Results indicate that 21.9% of medical students had symptoms of anxiety and 30.6% had depressive symptoms; 24.7% of females and 12.4% of males had anxiety symptoms; 34.9% of females and 16.5% of males had depressive symptoms; and 18.2% of females and 6.3% of males complained about symptoms of both anxiety and depression. According to Spearman's rank-order correlation, the anxiety score decreased with study years ( $R = -.113$ ;  $P = .025$ ) and age

**TABLE 1. Regression analysis: relationships between sleep problems and depressive and anxiety symptoms scores in male and female medical students**

Question about sleep problems/habits	Males		Females	
	Depression	Anxiety	Depression	Anxiety
	$\beta$	$\beta$	$\beta$	$\beta$
1. When do you go to bed?	.013	.069	<b>.128</b>	.045
2. Do you go to bed at an uncommon time?	.110	-.060	<b>.132</b>	.084
3. How long does it take you to fall asleep?	.161	<b>.265</b>	<b>.262</b>	.201
4. Do you have difficulty in getting to sleep at night?	.168	<b>.397</b>	<b>.387</b>	.328
5. Do you wake up because of noise?	.201	<b>.360</b>	<b>.207</b>	.188
6. How long does it take you to fall asleep at night before an exam?	<b>.378</b>	<b>.393</b>	<b>.182</b>	.189
7. Do you drink coffee late in the evening?	-.020	-.070	.038	.022
8. Do you use sleeping pills?	.182	<b>.351</b>	<b>.223</b>	<b>.219</b>
9. How many times do you wake up during the night?	<b>.222</b>	<b>.226</b>	<b>.167</b>	<b>.141</b>
10. Do you wake up because of nightmares?	.080	.204	<b>.284</b>	<b>.283</b>
11. Do you wake up because you talk during your sleep?	.006	.099	.101	.094
12. Do you wake up because you walk during your sleep?	-.100	.028	.085	<b>.124</b>
13. Do you wake up because of nocturnal eating habits?	.011	.124	<b>.210</b>	.101
14. Do you wake up because you kick with your legs?	.189	<b>.253</b>	<b>.180</b>	<b>.223</b>
15. Do you snore?	.026	-.090	.063	.009
16. Do you have nocturnal tooth-grinding?	.123	.102	-.050	.014
17. Do you feel tired when waking up?	.025	.164	<b>.234</b>	<b>.288</b>
18. Do you wake up too early and have difficulty in getting to sleep again?	<b>.203</b>	<b>.246</b>	<b>.199</b>	<b>.169</b>
19. What time of the day do you prefer for studying?	-.170	-.090	.053	.033
20. Do you feel daytime sleepiness?	.092	.102	<b>.141</b>	<b>.210</b>
21. Do you feel excessive sleepiness during school lessons?	-.060	-.050	<b>.218</b>	<b>.224</b>
22. Do you feel excessive sleepiness during your free time?	.188	.098	<b>.196</b>	<b>.216</b>
23. Do you take daytime naps?	.019	.041	.111	.077
24. If you take daytime naps, for how long?	.013	.063	.008	.000
25. How do you evaluate your sleep quality?	.434	<b>.394</b>	<b>.333</b>	<b>.285</b>

$\beta$  is highlighted if  $P < .05$ .

( $R = -.107$ ;  $P = .032$ ). However, when cutoff points for clinically important symptomatology were used, the differences were not statistically significant. Depressive symptoms were not in correlation with study years and age.

We used questions about sleep as independent variables for predicting symptoms of anxiety and depression on the EST-Q scale (dependent variables). Separate analyses were conducted for men and women, and some gender differences emerged in relationships between sleep problems and depressive and anxiety symptoms. Table 1 describes the results of regression analysis.

For further interpretation, we conducted a multiple regression analysis. Only those sleep problems that were significantly related to anxiety or depression were included in the second analysis. Table 2 presents these results for anxiety symptoms and Table 3, for depressive symptoms.

In men, only difficulties in falling asleep at night before an exam and subjective sleep quality remained significantly correlated with depressive symptoms. No sleep symptoms were correlated with anxiety.

In women, depression remained significantly related to difficulties in getting to sleep at night, waking up because of nightmares, waking up because of nocturnal

eating habits, daytime sleepiness, and sleepiness during school lessons. For anxiety, waking up because of nightmares and feeling tired in the morning remained significant predictors.

## DISCUSSION

It is usually observed that medical students undergo high emotional stress [Clark and Zeldow, 1988; Inam et al., 2003; Kirsling et al., 1989; Rosal et al., 1997; Schneider and Phillips, 1993; Stecker, 2004; Supe, 1998; Wallin and Runeson, 2003; Zoccolillo et al., 1986]. There were no previous data on Estonian students. According to our study, 21.3% of medical students reported anxiety symptoms and 29.3% reported depressive symptoms. This is much higher than rates found in the Estonian general population [Aluoja et al., 2001b, 2004]. However, Aluoja et al. reported higher depression scores in the lower income group, and among unemployed and economically inactive respondents. Students who took part in that study belonged to this group. Our findings in medical students were in accord with other studies.

The results concerning symptoms of anxiety and depression in medical students are also somewhat higher than prevalence rates found in other countries.

**TABLE 2. Multiple regression analysis: Relationships between sleep problems and anxiety symptoms**

Question about sleep problem/habit	Males			Females		
	$\beta$	$t$	$P$	$\beta$	$t$	$P$
3. How long does it take you to fall asleep?	.026	.226	> .05	.045	.715	> .05
4. Do you have difficulty in getting to sleep at night?	.083	.625	> .05	.132	1.877	> .05
5. Do you wake up because of noise?	.122	1.046	> .05	.042	.744	> .05
6. How long does it take you to fall asleep at night before an exam?	.165	1.485	> .05	.050	.888	> .05
8. Do you use sleeping pills?	.163	1.525	> .05	.097	1.741	> .05
9. How many times do you wake up during the night?	.069	.672	> .05	-.030	-.620	< .05
10. Do you wake up because of nightmares?				.188	3.434	< .001
12. Do you wake up because you walk during sleep?				.037	.695	> .05
14. Do you wake up because you kick your legs?	.027	.249	> .05	.072	1.281	> .05
17. Do you feel tired when waking up?				.154	2.503	< .05
18. Do you wake up too early and have difficulty in getting to sleep again?	.094	.911	> .05	.033	.574	> .05
20. Do you feel daytime sleepiness?				-.070	-.900	> .05
21. Do you feel excessive sleepiness during school lessons?				.111	1.676	> .05
22. Do you feel excessive sleepiness during your free time?				.071	1.088	> .05
25. How do you evaluate your sleep quality?	.130	1.080	> .05	.037	.559	> .05

For males, adjusted  $R^2 = 0.225$ ;  $F(9.81) = 3.901$ ;  $P < 0.00038$ ; Standard of Error of estimate: 3.318.  
 For females, adjusted  $R^2 = 0.206$ ;  $F(15.291) = 6.291$ ;  $P < 0.00000$ ; Standard of Error of estimate: 4.009.  
 Significant  $P$ s are highlighted.

**TABLE 3. Multiple regression analysis: Relationships between sleep problems and depressive symptoms**

Question about sleep problem/habit	Males			Females		
	$\beta$	$t$	$P$	$\beta$	$t$	$P$
1. When do you go to bed?				.060	1.128	> .05
2. Do you go to bed at an uncommon time?				.074	1.395	> .05
3. How long does it take you to fall asleep?				.085	1.395	> .05
4. Do you have difficulty in getting to sleep at night?				.164	2.37	< .05
5. Do you wake up because of noise?				.047	.872	> .05
6. How long does it take you to fall asleep at night before an exam?	.230	2.268	< .05	.036	.678	> .05
8. Do you use sleeping pills?				.099	1.867	> .05
9. How many times do you wake up during the night?	.117	1.209	> .05	-.050	-.81	> .05
10. Do you wake up because of nightmares?				.168	3.123	< .005
13. Do you wake up because of nocturnal eating habits?				.151	2.88	< .005
14. Do you wake up because you kick your legs?				.031	.557	> .05
17. Do you feel tired when waking up?				.093	1.549	> .05
18. Do you wake up too early and have difficulty in getting to sleep again?	.049	.501	> .05	.073	1.315	> .05
2. Do you feel daytime sleepiness?				-.180	-2.39	< .05
21. Do you feel excessive sleepiness during the school lessons?				.164	2.496	< .05
22. Do you feel excessive sleepiness during your free time?				.085	1.359	> .05
25. How do you evaluate your sleep quality?	.303	2.948	< .005	.061	.955	> .05

For males, adjusted  $R^2 = .221$ ;  $F(4.89) = 7.590$ ;  $P < .00003$ ; standard of Error of estimate: 3.9100.  
 For females, adjusted  $R^2 = .260$ ;  $F(17.29) = 7.291$ ;  $P < .00000$ ; standard of Error of estimate: 4.7773.  
 Significant  $P$ s are highlighted.

Steptole and Wardle [2001] found that students from Eastern Europe (from former communist states) reported many more depressive symptoms than did students from Western Europe. That may explain our high percentage of depression, although our findings were closer to Western rather than to Eastern European data.

Anxiety and depression were more common in women than in men, as has been found in many other studies [Aluoja et al., 2004; Angst et al., 2002; Canals et al., 1997; Fulkerson et al., 2004; Kessler, 2003;

Ohayon et al., 2000; Pakriev et al., 1998; Silverstein, 1999; Simonds and Whiffen, 2003; Wittchen et al., 2001], including studies of medical students [Rosal et al., 1997; Wallin and Runeson, 2003]. In some studies, stress levels were not found to differ on the basis of sex [Clark and Zeldow, 1988; Supe, 1998], but our results did not support this.

Our aim was to observe symptoms of anxiety and depression in the context of complaints about sleep. Veldi et al. [2004, 2005] have shown that these students (our study was a part of a larger one) had initial

insomnia at least twice a week, 33.4%; middle insomnia, 37.1%; and terminal insomnia, 9.4%. Also, 59% of students reported sleepiness in the mornings, and 67.1% reported daytime sleepiness. We found a relationship between initial insomnia and depressive symptoms, and between daytime sleepiness and depression in women. Surprisingly, we did not find correlations between middle and terminal insomnia and depression. One possible reason for this may have been our questionnaire. We asked about frequency of symptoms, but not strength. It is possible that initial insomnia symptoms were more intense and therefore correlated with emotional problems. Alternatively, young adults with insomnia more often complain of difficulty falling asleep; midlife and elderly adults have more difficulty with maintaining sleep and early morning awakening [Liu, 2000b].

The Saarenpaa-Heikkila et al. [2001] results show that subjective daytime sleepiness is in strong correlation with depressive emotions. Our research supported this finding for women but not for men. In studies of medical students, Hidalgo and Caumo [2002] found daytime sleepiness and insomnia to be associated with minor psychiatric disorders, and Loayza et al. [2001] found associations between difficulty initiating sleep, difficulty maintaining sleep, and falling asleep later and waking up earlier. As we found in our study, they found that some correlations differ on the basis of sex.

Our study found a relationship between subjective sleep quality and depressive symptoms in men. At the same time, Veldi et al. [2004, 2005] have shown that subjective sleep quality is related to sleep problems such as difficulty in inducing and maintaining sleep, and daytime sleepiness. It would seem that men complain about sleep quality as a general appraisal about their sleep, whereas females seem to concentrate more on single symptoms. This observation may be valid relative to symptoms of anxiety and depression too, with women giving much more attention to details compared to men. Difficulty in falling asleep at night before an exam, which was also related to depression in men, is not a classical insomnia symptom, but it can be considered a transient, stress-related sleep phenomenon.

There was a strong correlation between nocturnal eating habits and depressive symptoms in women. We did not ask about eating disorder symptoms, but this group may include students with sleep-related eating disorders as well. Winkelman et al. [1999] found that the sleep-related eating disorder prevalence rate in a student sample was as high as 4.6%, and among patients with depression, it was 3.4%. These two disorders have a high comorbidity. Similarly, high lifetime comorbidity is observed between bulimia and affective disorders [Geist et al., 1998; Spindler and Milos, 2004]. It also may be that our students had symptoms of atypical depression with excessive sleepiness and overeating. Sullivan et al. [2002] described atypical depression as a subtype of depression. This is

characterized by depressed mood, anhedonia, atypical symptoms of appetite and weight increase, agitation, and feelings of worthlessness/guilt.

In a simple regression analysis, we found many relationships between single symptoms of sleep problems and anxiety symptoms in men. After testing in a multiple regression analysis, the associations with anxiety were too weak to be significant.

In women, two symptoms were significant: waking up because of nightmares and feeling tired in the morning. Waking up because of nightmares correlated positively with both anxiety and depressive symptoms. Feeling tired in the morning was important only for anxiety. Blagrove et al. [2004] also found that both nightmare frequency and nightmare distress were in correlation with symptoms of anxiety and depression, which is in accord with our results.

## CONCLUSIONS

Before making a firm conclusion about these findings, it should be noted that this study had a limitation. We identified symptoms of anxiety and depression by using a self-report questionnaire, with high cutoff points for screening possible anxious and/or depressed subjects. Thus, these findings could not be directly compared to surveys based on structured diagnostic interviews, and we cannot speak about depression and anxiety disorders, but only about symptoms.

However, we can say that, similar to sleep problems, symptoms of anxiety and depression are frequent among Estonian medical students. The students' complaints about sleep may indicate underlying emotional problems. The relationships between sleep symptoms and emotional symptoms are different in men and women.

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