



The impact of interpersonal relationships on mental health of Polish medical students

Wpływ relacji międzyludzkich na zdrowie psychiczne studentów medycyny w Polsce

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ABSTRACT

INTRODUCTION: Interpersonal relations significantly impact our well-being and mental health. They are also crucial among students, especially when they start living independently in a new social environment. The study aimed to determine the impact of relations on the occurrence of depression, anxiety, and drowsiness among medical students in Poland.

MATERIAL AND METHODS: An online questionnaire was created, consisting of four parts: the authors' questionnaire on interpersonal relations, the Beck Depression Inventory (BDI), the Generalized Anxiety Disorder 7-item Scale (GAD-7), and the Epworth Sleepiness Scale (ESS). The results were analyzed using STATISTICA software.

RESULTS: 2339 completed questionnaires were obtained. 69.75% of the subjects had good/rather good relations with their co-tenants, and 5.04% – had bad/definitely bad. 85% of the participants had good relations with their parents. 65.63% of the respondents were satisfied with their social relationships; in addition, 71.91% of respondents were satisfied with their relationships with their friends. Poor relations with family and co-tenants, and poor social and friend relationships were linked to higher levels of depression, anxiety, and sleepiness. This phenomenon was particularly evident among introverts.

CONCLUSIONS: Identifying the risk factors could significantly improve the prevention, diagnosis, and treatment of mental disorders in this group. Supporting students and paying greater attention to social competencies equally with medical knowledge acquired by them would be highly recommended.

KEYWORDS

depression, anxiety, mental health, sleepiness, medical students, interpersonal relations

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STRESZCZENIE

WSTĘP: Relacje międzyludzkie znacząco wpływają na nasze samopoczucie i zdrowie psychiczne. Są one również kluczowe wśród studentów, zwłaszcza gdy zaczynają żyć niezależnie w nowym środowisku społecznym. Badanie miało na celu określenie wpływu relacji na występowanie depresji, lęku i senności wśród studentów medycyny w Polsce.

MATERIAŁ I METODY: Utworzono kwestionariusz online, składający się z czterech części: autorskiego kwestionariusza na temat relacji międzyludzkich, *Skali depresji Becka* (Beck Depression Inventory – BDI), *Kwestionariusza lęku uogólnionego* (Generalized Anxiety Disorder 7-item Scale – GAD-7) oraz *Skali senności Epwortha* (Epworth Sleepiness Scale – ESS). Wyniki zostały przeanalizowane z użyciem oprogramowania STATISTICA.

WYNIKI: Uzyskano 2339 wypełnionych kwestionariuszy. 69,75% badanych miało dobre/raczej dobre relacje ze współlokatorami, a 5,04% – złe/zdecydowanie złe. 85% uczestników miało dobre relacje z rodzicami. 65,63% respondentów było zadowolonych ze swoich relacji społecznych, dodatkowo 71,91% badanych było usatysfakcjonowanych z relacji ze swoimi przyjaciółmi. Złe relacje z rodziną i współlokatorami oraz słabe relacje społeczne i przyjacielskie były powiązane z wyższym poziomem depresji, lęku i senności. Zjawisko to było szczególnie widoczne wśród osób introwertycznych.

WNIOSEK: Identyfikacja czynników ryzyka może znacznie poprawić zapobieganie, diagnozowanie i leczenie zaburzeń psychicznych w tej grupie. Zaleca się wspieranie studentów i zwracanie większej uwagi na zdobywanie przez nich kompetencji społecznych na równi z wiedzą medyczną.

SŁOWA KLUCZOWE

depresja, lęk, zdrowie psychiczne, senność, studenci medycyny, relacje międzyludzkie

INTRODUCTION

Mental health undoubtedly constitutes one of the most significant concerns of contemporary public health and medicine. Disorders such as depression, anxiety, and excessive daytime sleepiness are among the most common mental conditions worldwide as its incidence is estimated to be around 3.8% of the population and 5.0% among adults [1]. It was shown that in 2020 younger people were affected to a greater extent than older people [2]. Additionally, the prevalence of depression is much higher among medical students and accounts for approximately 27.2% [3]. The same applies to anxiety disorders, which affect up to 33.8% of those students [4]. Another condition affecting health in this group is the poor quality of sleep, which occurs in 34.6% of subjects [5].

The growing body of knowledge confirms that female gender, part-time studies, excessive duties, family issues and changes from a previous lifestyle increase the risk of the abovementioned conditions [6,7,8]. In contrast, gender and age seem to have no impact on excessive daytime sleepiness in this group. The results of studies investigating that matter are, however, inconsistent [9,10,11,12,13,14]. Undoubtedly, access to mental health care plays a crucial role in the prevention, development and treatment of those disorders. Unfortunately, in 2021 Walkiewicz and Guziak [15] reported that access to mental health care professionals in Poland was limited.

Numerous studies have reported that subjects with more advanced social contacts have better preserved cognitive skills and memory [16]. It was also estimated that people with good interpersonal relations have a 50% lower risk of death [17]. Cancer patients

who described their social relations as gratifying achieved better treatment outcomes; their health conditions improved [18]. Moreover, it was discovered that the longevity of cancer patients might depend on the level of social support they receive: higher levels of social support, greater social networks, and being married translated into better survival outcomes. This phenomenon was mainly due to an increased feeling of social support [19]. Also, it has been demonstrated that a sense of social support resulted in a decreased incidence of suicidal thoughts in this group [20].

Poor social relationships, in turn, can lead to an increased risk of coronary heart disease and stroke by as much as 29% and 32%, respectively [21]. Moreover, it was found that the level of emotional support and frequency of meeting with friends can also affect one's body mass [22].

Furthermore, social relations have a significant impact on people's mental health. Loneliness raises the possibility of depression and anxiety disorder [23]. In contrast, positive interpersonal relations can reduce the risk of depressive episodes or their recurrence [24]. In addition, depression treatment is more effective among patients who feel satisfied with their social life [25,26]. Poor interpersonal interactions may also contribute to anxiety disorder [27]. The exact impact of relations with other people on excessive daytime sleepiness has not yet been identified.

This study aims to assess the correlation between selected variables (among others, gender, type of personality) and the prevalence of depression, generalized anxiety, and excessive daytime sleepiness among medical students. Furthermore, our study aimed to investigate the impact of interpersonal relations on mental health in this group.



MATERIAL AND METHODS

Study population and data collection

Our study was addressed to medical students from all medical universities in Poland, irrespective of the year and form of studies (full-time vs. part-time).

The online survey was created using the LimeSurvey tool and sent to potential respondents via social media [28]. The responses were collected from February 13, 2022, to February 23, 2022. Only completed questionnaires were included in the analysis.

Questionnaire design

The questionnaire consisted of four parts: the first was the authors' form containing demographic questions (about, among others, gender, year and form of studies) and six questions or statements related to the students' interpersonal relations. They were: 1) How would you describe your type of personality? 2) How would you rate your relations with your roommate(s)? 3) How would you rate your relations with your family? 4) I feel my parents' pressure regarding my education. 5) I am satisfied with my social relationships, and 6) I am satisfied with my friendships. All the answers were presented in the form of a Likert scale.

The second part constituted the Beck Depression Inventory (BDI), a screening tool for assessing the risk of depression [29]. This standardized questionnaire includes 21 questions, rated on a 0–3 scale; the final result constitutes the total score. According to the guidelines, the following division was adopted: 0–10 points – no depression, 11–27 points – moderate depression, > 28 points – severe depression. The sensitivity and specificity of BDI, with a cut-off point of 12/13, are estimated to be 100% and 99%, respectively [30].

The third section included the Generalized Anxiety Disorder 7-item Scale (GAD-7), used as a screening tool to detect potential anxiety disorders [31]. It contains seven questions related to the subjectively perceived level of general anxiety. The answers are rated on a scale of 0–3, then the points are summed. Based on the GAD-7 methodology, our results were divided into four groups, where: 0–4 points was considered as no anxiety, 5–9 points – mild anxiety, 10–14 points – moderate anxiety, and > 15 points – severe anxiety [31]. With a threshold of 10 points, this questionnaire showed a sensitivity of 89% and specificity of 82% for generalized anxiety disorder [32].

The last part of our questionnaire was the Epworth Sleepiness Scale (ESS), utilized to assess the intensity of excessive daytime sleepiness [33]. It consists of 8 questions about the likelihood of falling asleep in different situations. The answers are scored from 0–3

points. A total score of 0–10 points is considered to be the norm, 11–12 points – mild excessive daytime sleepiness, 13–15 points – moderate excessive daytime sleepiness, and > 16 points – severe excessive daytime sleepiness. ESS with a cut-off value of 10 points showed a sensitivity of 93.5% with 100% specificity [34].

Both the ESS and GAD-7 took into consideration the last two weeks of surveyed students' lives, while in terms of BDI, it was one month.

Prior to the study, the first part of the survey – the authors' questionnaire – was validated. Five randomly selected questions were completed twice within two weeks by 38 medical students of the Medical University of Silesia in Katowice. Then, Cohen's kappa was calculated: moderate to very good repeatability was obtained [35].

Statistical analysis

All the analyses were conducted using STATISTICA software v. 13.3 (StatSoft, Poland). The chi-square test was applied to determine the significance of the differences between the groups. In the study, the value $p < 0.005$ was considered significant.

RESULTS

Baseline characteristics

Initially, data from 3649 students were included. For the final analysis, 2339 correctly filled in questionnaires completed by students from 20 medical universities in Poland were selected. 70.1% of the subjects were females. The mean age in this group was 21.5 years (range: 17–35 years, $SD \pm 2.1$). The majority of respondents (85.59%) studied in the full-time form. Detailed demographic characteristics of the study group are presented in Table I.

Table I. Baseline characteristics of study group (n = 2339)

Variable	Category	N (%)
1	2	3
Gender	female	1639 (70.1%)
	male	690 (29.5%)
	non-binary	10 (0.4%)
Age	–	21.48 (SD \pm 2.05) years
Form of studies	full-time	2002 (85.6%)
	extramural	337 (14.4%)
Year of studies	I	616 (26.3%)
	II	712 (30.4%)
	III	674 (28.8%)
	IV	153 (6.6%)
	V	65 (2.8%)
	VI	119 (5.1%)



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1	2	3
	countryside	595 (25.5%)
	city < 50.000 inhabitants	480 (20.5%)
Hometown	city 50.000–150.000 inhabitants	340 (14.5%)
	city 150.000–500.000 inhabitants	445 (19.0%)
	city > 500.000 inhabitants	479 (20.5%)

Results of BDI, GAD-7, and ESS assessment

Among the study subjects, as many as 1465 (62.6%) reported some signs of depression and 1786 (76.4%) had symptoms of generalized anxiety. In addition, 632 (27.0%) students declared that they experienced excessive daytime sleepiness. Then, a comparison analysis between the individual's anxiety and depression scores and excessive daytime

sleepiness outcome was performed. The results are presented in Table II.

The prevalence of severe depression symptoms significantly correlated with high generalized anxiety symptoms, i.e. high GAD-7 scores ($p < 0.005$). Among 320 subjects reporting symptoms of severe depression, nearly 69.4% obtained results corresponding to severe anxiety disorders (Table II).

Correlation between the gender of respondents and results of BDI, GAD-7, and ESS

Analysis of the collected data revealed a significant difference between the genders in each of the three reviewed disorders. Females reported higher levels of depression, generalized anxiety and excessive daytime sleepiness than their male counterparts (Table II). Non-binary individuals, due to the low sample size ($n = 10$), were not included in this analysis.

Table II. Correlation between gender of respondents, symptoms of depression, generalized anxiety and excessive daytime sleepiness

Variable	Level	Male	Female	p value
BDI	no depression	333 (48.3%)	540 (32.9%)	p < 0.005
	moderate depression	299 (43.3%)	840 (51.3%)	
	severe depression	58 (8.4%)	259 (15.8%)	
GAD-7	no anxiety	251 (36.4%)	301 (18.3%)	p < 0.005
	mild anxiety	205 (29.7%)	501 (30.6%)	
	moderate anxiety	135 (19.6%)	406 (24.8%)	
	severe anxiety	99 (14.3%)	431 (26.3%)	
ESS	normal sleepiness	565 (81.9%)	1135 (69.2%)	p < 0.005
	mild excessive daytime sleepiness	51 (7.4%)	206 (12.6%)	
	moderate excessive daytime sleepiness	52 (7.5%)	214 (13.1%)	
	severe excessive daytime sleepiness	22 (3.2%)	84 (5.1%)	
Correlation between symptoms of depression and generalized anxiety (p < 0.005)				
	No anxiety	Mild anxiety	Moderate anxiety	Severe anxiety
No depression	450 (81.4%)	302 (42.5%)	97 (17.9%)	25 (4.7%)
Moderate depression	102 (18.4%)	387 (54.5%)	370 (68.1%)	286 (53.7%)
Severe depression	1 (0.2%)	21 (3.0%)	76 (14.0%)	222 (41.6%)
Correlation between prevalence of depressive symptoms and excessive daytime sleepiness (p < 0.005)				
	Normal sleepiness	Mild excessive daytime sleepiness	Moderate excessive daytime sleepiness	Severe excessive daytime sleepiness
No depression	751 (44.0%)	61 (23.7%)	51 (19.0%)	11 (10.3%)
Moderate depression	797 (46.7%)	147 (57.2%)	147 (54.9%)	54 (50.5%)
Severe depression	159 (9.3%)	49 (19.1%)	70 (26.1%)	42 (39.2%)
Correlation between symptoms of generalized anxiety and excessive daytime sleepiness (p < 0.005)				
	Normal sleepiness	Mild excessive daytime sleepiness	Moderate excessive daytime sleepiness	Severe excessive daytime sleepiness
No anxiety	484 (28.3%)	33 (12.8%)	28 (10.4%)	8 (7.5%)
Mild anxiety	546 (32.0%)	77 (30.0%)	68 (25.4%)	19 (17.7%)
Moderate anxiety	367 (21.5%)	78 (30.4%)	69 (25.7%)	29 (27.1%)
Severe anxiety	310 (18.2%)	69 (26.8%)	103 (38.4%)	51 (47.7%)

BDI – Beck Depression Inventory; GAD-7 – Generalized Anxiety Disorder 7-item Scale; ESS – Epworth Sleepiness Scale.



In addition, the correlation between depressive symptoms and excessive daytime sleepiness proved to be statistically significant ($p < 0.005$). Among 320 students who obtained a BDI score corresponding to severe depression, only 49.7% reported normal daytime sleepiness. On the contrary, the respondents without depressive symptoms and excessive daytime sleepiness represented 85.9% of the study population (Table II).

Finally, a significant correlation between the symptoms of generalized anxiety and excessive daytime sleepiness was also observed ($p < 0.005$). Subjects experiencing severe excessive daytime sleepiness but no anxiety symptoms represented only 1.5%, whereas the percentage of individuals reporting severe excessive daytime sleepiness and severe anxiety was much higher and accounted for 9.6% of the study population (Table II).

Correlation between interpersonal relations and results of BDI, GAD-7, and ESS

The results of our study revealed that the type of personality was strictly associated with the BDI and GAD-7 scores ($p < 0.005$). Students declaring themselves as extroverts less frequently reported anxiety and depressive disorders than introverts. Moreover, we found that unsatisfactory relations with co-tenants were significantly linked with increased depressive symptoms ($p < 0.005$). Similarly, unpleasant family relationships were associated with worse depression and anxiety tests scores, and increased excessive daytime sleepiness ($p < 0.005$). On the contrary, positive relationships, both social and with friends, translated into lower levels of depressive and anxiety symptoms ($p < 0.005$). Lastly, high pressure put on students by their parents regarding education was associated with increased symptoms of depression and anxiety ($p < 0.005$).

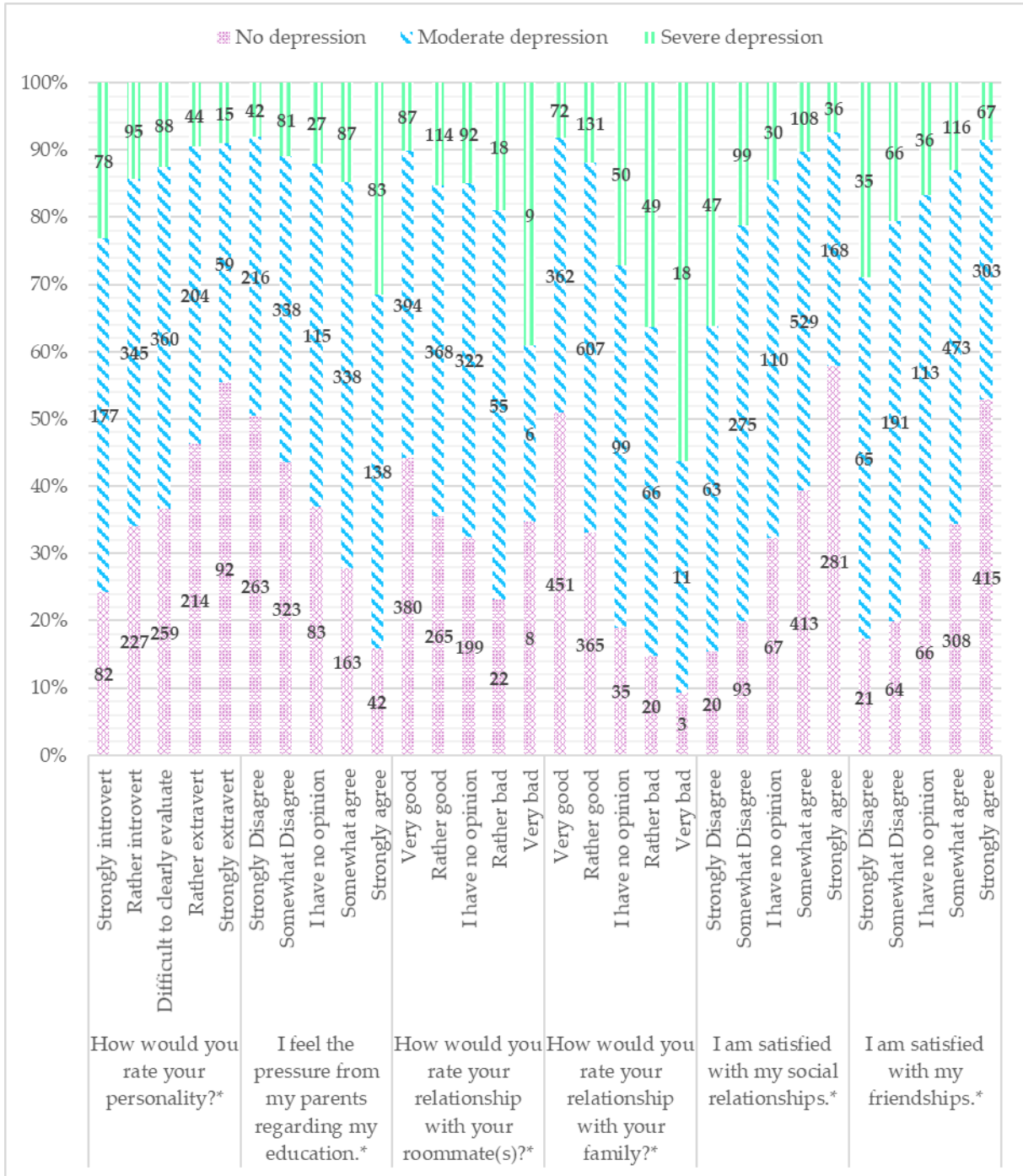


Fig. 1. Correlation between depressive symptoms and interpersonal relations in study group. *Results statistically significant ($p < 0.005$) ($n = 2339$).

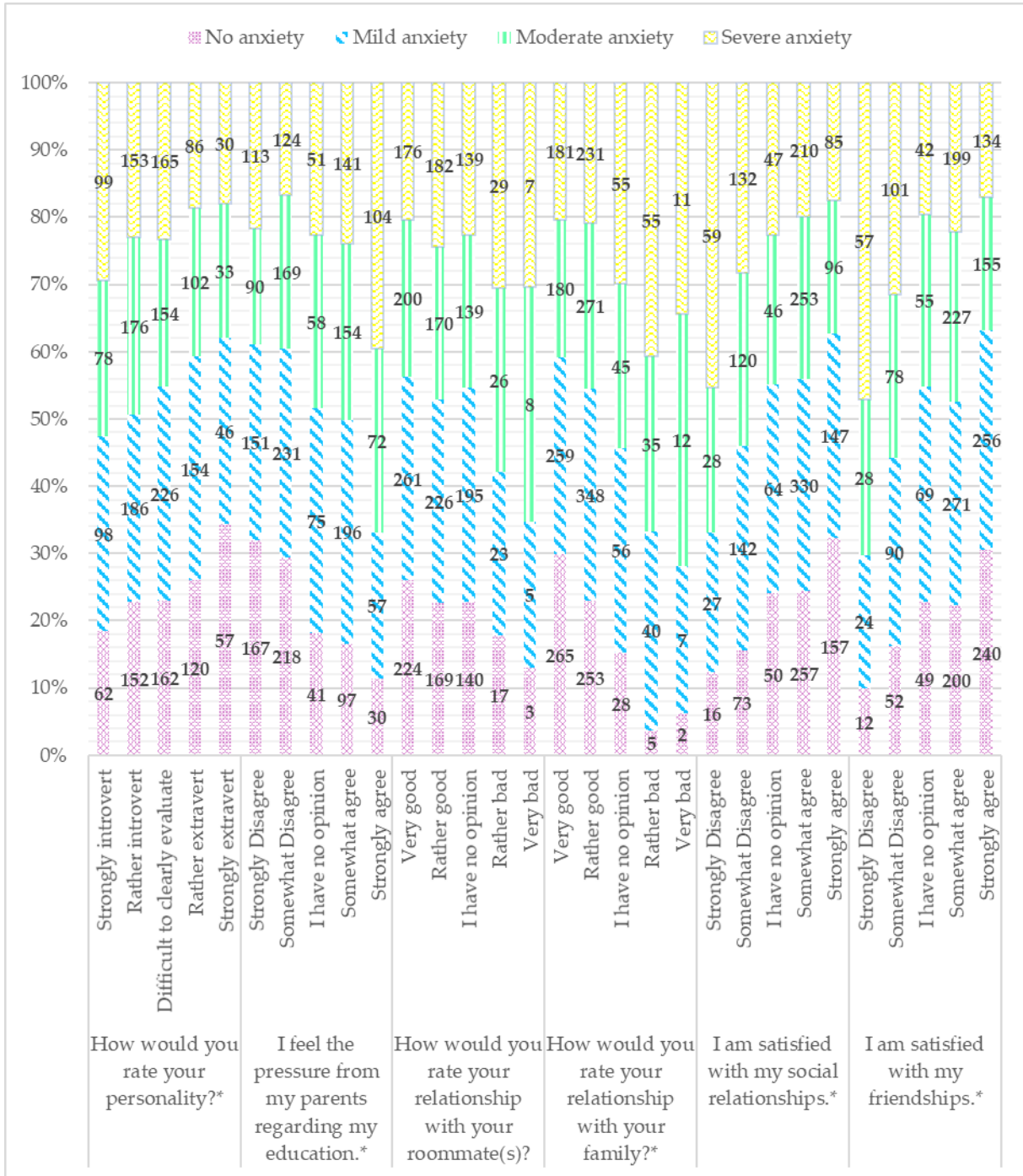


Fig. 2. Correlation between generalized anxiety and interpersonal relations in study group. *Results statistically significant ($p < 0.005$) ($n = 2339$).

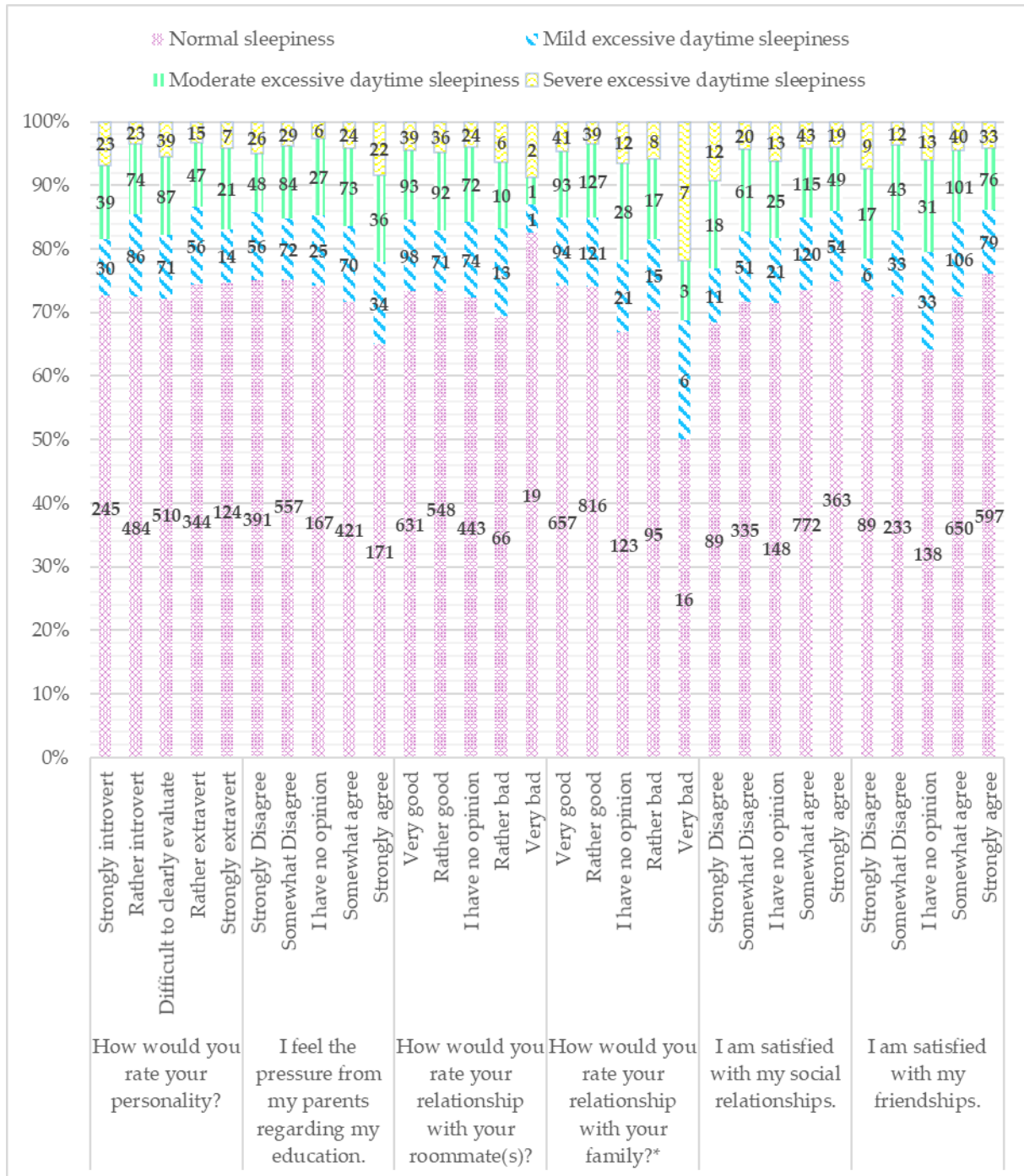


Fig. 3. Correlation between excessive daytime sleepiness and interpersonal relations in study group. *Results statistically significant ($p < 0.005$) ($n = 2339$).

DISCUSSION

Mental disorders constitute one of the greatest challenges of the contemporary world [36]. In 2016 they accounted for almost 13% of the global burden of disease [37]. Depression and anxiety are among the most common mental health conditions [38].

Medical students are particularly vulnerable to the development of mental disorders [39]. The global prevalence of depression in this group was reported at 27.2% [3], 27.0% [40], 28.0% [41]. In Europe, 20.1% of medical students showed symptoms of depression. Still, it is significantly less than among our students (62.63%). Furthermore, other Polish researchers report a very high percentage of medical students experien-



cing mental disorders. For example, Drożak et al. [42] in their study identified depressive symptoms in 81.82% of subjects. Seweryn et al. [43], in turn, comparing the BDI results among medical students from different countries found that 56.32% of Polish students experienced moderate to severe depression, and only 34.92% of German students, and 26.03% of Portuguese.

The above cited Drożak et al. found a high correlation between depression and conducting an unhealthy lifestyle (among others, a lack of physical activity, an insufficient amount of sleep), and not being able to cope well with stress in this group [42]. In turn, our study discovered that it was the quality of interpersonal relations that significantly translated into the occurrence and severity of depressive symptoms.

Excessive daytime sleepiness in our study group was lower (27.0%) compared to the medical students around the world (34.6%) [5]. It was not much higher, however, than among non-medical Polish students (26.1%) [44]. Nevertheless, the similarity of the results may suggest that there is no difference between subjects studying in different programs in Poland.

It is estimated that approximately 33.8% of medical students worldwide are afflicted by generalized anxiety disorder; again, considerably less compared to our study group (76.4%) [4]. This phenomenon may result from students' poor mental preparation for the intensity of their studies and work overload [45]. Pawlaczyk et al. [46] compared the ability to cope with difficult situations between Polish and English medical students attending the same university. They found that the Polish students had lower scores on the Defense Style Questionnaire (mean 4.90; SD = 1.23) than the English students (mean 5.66; SD = 1.28). Such a mechanism correlated with the intensity of stress, anxiety, and depressive symptoms where students with high scores in mature defense mechanisms presented a lower intensity of the mentioned disorders. Surprisingly, although the program of studies and load of duties were the same in both groups, the Polish students experienced more stress and anxiety than their English counterparts, who left their homes and families and decided to study in a foreign country and, objectively, could have more reasons to feel anxious or depressed. The reasons for this condition probably lie in the worse adaptability of Polish students to the intensity of medical studies, less systematic work and poorer ability to cope with stress. Numerous studies investigating mental disorders among medical students adopted the global perspective, concentrating more on the scale of the problem in this group and not the potential nation-related sociocultural differences in this regard [3,4,41]. Our research was conducted only among Polish students, while many other studies were carried out based on the findings from dozens of countries

from all over the world or more heterogeneous groups of students in terms of nationality [47,48,49,50].

A Brazilian study on medical students reported a significant link between anxiety and depression [6]. It was reported that 12.2% of individuals had simultaneously moderate to severe depressive symptoms and medium to high state anxiety symptoms. Additionally, 12.7% had moderate to severe depressive symptoms and medium to high trait anxiety symptoms. Similar results were obtained in our study: the prevalence of severe depression significantly correlated with severe generalized anxiety. Those independent observations indicated a frequent occurrence of both disorders at the same time [51]. In addition, in our study, the relationship between anxiety and excessive daytime sleepiness, depression, and excessive daytime sleepiness was observed. This phenomenon had not previously been well investigated among medical students; however, it was detected among students representing other university courses [52,53].

Undoubtedly, the COVID-19 pandemic led to a significant deterioration of mental health worldwide and an increased prevalence of mental disorders, also among medical students. It was reported that the greatest increase in the prevalence of anxiety and depression was among people aged 20–24 years old with a rise of 1,331 additional cases of anxiety disorders per 100,000 and 1,118 additional cases of major depressive disorder per 100,000, respectively [2]. The percentage of medical students affected by anxiety and depression was relatively higher during the pandemic in comparison to before COVID-19 [54].

Furthermore, our study demonstrated a significant association between gender and the occurrence of depression, anxiety, and excessive daytime sleepiness. Females scored significantly higher on the BDI, GAD-7, and ESS scales. This dependency was also confirmed in other studies on anxiety and depression among medical students [6,55,56,57]. The results of the multicenter study conducted by Brenneisen Mayer et al. [6] on 1350 medical students indicated an essentially increased level of both anxiety and depression among females compared to males. Similarly, in the case of excessive daytime sleepiness, a study conducted in Morocco showed a significantly higher prevalence of excessive daytime sleepiness among females (43%) in comparison to males (20.1%) [58]. Gender related differences observed in this study were also confirmed by other authors. In their opinion, the more frequent excessive daytime sleepiness among females can be explained, among others, by the higher levels of stress in this group, which translate into sleeping disorders and a poor quality of sleep [53,59]. It must be stressed, nonetheless, that medical students constitute mainly females in most countries, which



may bias the results of studies [55,56,60]. Parker and Brotchie [61] suggested that the differences between genders might be associated with factors such as mood amplification, or the more common help-seeking in the female population.

There is a mounting body of evidence that a poor quality of interpersonal relations may lead to depression and anxiety disorders [23,27]. To the best of the authors' knowledge, no difference between medical and non-medical students has been observed in this regard. Data on that topic, however, remain limited.

The results obtained in our survey suggest the importance of personality concerning mental health. Individuals who described their personality as "strongly introverted" or "rather introverted" had higher scores in both BDI and GAD-7. The difference in terms of the ESS results were not statistically significant. Peng et al. [62] revealed a correlation between extraversion and a better quality of mental health. Another study showed similar results in terms of anxiety, where four dimensions of the big five personality traits were significantly correlated with anxiety, except for extraversion [63]. These observations are consistent with our findings. Rathi et al. [64] reported a negative correlation between the Pittsburgh Sleep Quality Index scores and extraversion. These results, along with the findings in our study, suggest that the personality of medical students can have an impact on the quality of sleep but not on sleepiness itself.

In our study, interpersonal relations had an impact on the mental health of medical students, mainly on depression and anxiety. Individuals who reported poor relationships with family and friends had higher scores on the tests used in the survey. Similarly, Darling et al. [65] demonstrated how the quality of friendships, love relationships and relationships with parents had an impact on the perceived stress of 427 female college students. Another factor which could influence the mental health of undergraduate students was popularity among other peers [66]. Another study worth mentioning was conducted in Korea where it was shown that students who attended an interpersonal relationship program had improved self-esteem, interpersonal relationships and a reduced level of depression [67].

It is worth noting that no significant differences were found regarding anxiety levels and the quality of students' relationships with co-tenants. The reasons for such a state of affairs, nevertheless, are not fully understood. Further studies are required to explore that phenomenon in detail.

Due to the complexity of mental disorders, it would be highly recommended to conduct more in-depth research to determine what additional factors influence their development and such a frequent occurrence among medical students in Poland.

CONCLUSIONS

A significant percentage of medical students in Poland experience symptoms of depression and generalized anxiety. What is more, many of them report excessive daytime sleepiness. The female gender is associated with a higher prevalence of the abovementioned disorders. Unsatisfying interpersonal relations translate into a change in students' mental conditions, resulting in significantly altered anxiety, depression, and excessive daytime sleepiness. Those conditions, in turn, may adversely impact their academic performance, daily functioning at the university, and above all, their contacts with patients. They may also weaken their ability to cope with stress. Therefore, it would be highly recommended to implement support programs for Polish medical students in the form of professional assistance for those in need and coaching programs for others, enabling them to strengthen their mental health, cope with stress and build satisfying interpersonal relations.

Declarations and statements

Competing interests: The authors have no competing interests to declare that are relevant to the content of this article.

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Institutional Review Board Statement: Ethical review and approval were waived for this study due to the nature of the research and applied study method (anonymous survey).

Informed Consent Statement: All the individuals who received the authors' invitation to take part in the study were informed about the purpose and scope of this research. They were also informed about the fact that the survey was anonymous and participation in the study was voluntary. A completed questionnaire was therefore considered as respondent's informed consent.

Conflict of interest: The authors declare that they have no conflict of interest.

**Author's contribution**

Study design – J. Kuca, J. Kasperczyk
Data collection – J. Kuca, J. Laska, J. Łacwik, A. Szczuraszyk
Data interpretation – P. Limanówka, J. Kasperczyk
Statistical analysis – P. Limanówka
Manuscript preparation – P. Limanówka, J. Kuca
Literature research – P. Limanówka, J. Kuca

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