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Depression and Psychological Distress in Medical Students, A Prospective Study

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ABSTRACT

Introduction: The aim of the study is to determine the changes in psychological distress and depressive symptoms of medical students in the first two years of their education process, in comparison with other faculty students.

Methods: All first-year students in the Faculties of Medicine, Economics and Sport Sciences were asked to fill out a detailed self-reported questionnaire aimed at measuring possible stressful life events and habits, General Health Questionnaire (GHQ-12), Beck Depression Inventory (BDI) during the first week of their first semester in 2017–2018. This process was repeated to the same students again in the second year, and the change was examined prospectively.

Results: The GHQ-12 score average increased from 11.19 to 13.7 in medical students (p<0.001). The prevalence of psychological distress increased from 53.8% to 61.8%. The BDI score average was 8.04 in the beginning and reached 10.1 in the second year (p<0.001). Depressive symptom prevalence increased from 8.8% to 19.5%. No significant increase was observed in the GHQ-12, BDI score average, depressive symptoms, and psychological distress prevalence of other faculty students. The incidence of depressive symptoms in medical students was 15.9%. As a result of multivariate analysis, “dissatisfaction with social activities” and “exposure to psychological pressure and violence” which were stressful life events were statistically associated with both GHQ-12 and BDI.

Conclusion: It was determined that the mental health of the students was negatively affected in the first year of medical school education. It is recommended to raise awareness for medical students at risk of mental illness and to plan interventions that will protect their mental health.

Keywords: Depression, prospective studies, psychological distress, stressful life events, medical students

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INTRODUCTION

Medical education is a long and challenging process that has various inevitable psychological effects on individuals. There are many studies reporting that medical students develop higher rates of depression and other psychological disorders at different stages of their education than students in other domains (1–3).

Recent meta-analyses and systematic reviews show that the prevalence of depression among medical students is around 30% (2–4) Aktekin et al. found that Beck Depression Inventory (BDI) score averages increased from 6.9 at the beginning of the first semester to 11.1 in the second year among medical students in Antalya (1). Additionally, in the same study, General Health Questionnaire-12 (GHQ) score averages increased from 9.3 to 14.3 during the first year (1). Moffat et al. found that mean GHQ-12 scores increased significantly between the first and third term in medical students, 9.5 to 13.3 respectively (5). The General Health Questionnaire (GHQ) has been widely used in students groups. It is used to detect psychological distress and non-psychotic psychiatric disorders (6). The dramatic deterioration in students' psychological test scores such as BDI and GHQ-12, especially in the first year, can negatively affect medical education, which is a challenging, long, and intricate process. Psychological pressure that occurs during this difficult phase may result in unfavorable experiences and even mental health problems during both the education period and post-graduate medical practice (7). It can be argued that depression is a phenomenon that develops in the medical school and is carried into the professional medicine process (8).

Highlights

- **Depressive symptom prevalence of medical students increased from 8.8% to 19.5%.**
- **The incidence of depressive symptom during one year was 15.9%.**
- **The prevalence of psychological distress increased from 53.8% to 61.8%.**
- **The mental health of medical students deteriorated in the first year of education.**
- **“Dissatisfaction with social activities” was the main risk factor for mental health.**

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Depression in medical students is a complicated issue accompanied by different factors (9). In various studies, factors related to depression in medical students were gender (2, 3), internet addiction (10, 11), age (12), school year (3, 12, 13), satisfaction with career choice (2, 12), family income or financial problems (2, 8, 12, 13), parent's education (12), academic grade level (2), residence (2), family-related problems (3), health status (3, 10), sleep deprivation (2, 8), dissatisfaction with medical education (13), dissatisfaction with social activities and worrying about the future (1).

The aim of this study is to find the changes in psychological distress and depressive symptoms of medical students after a year of education process in comparison with other faculty students and to detect the factors associated with psychological distress and depressive symptoms.

METHODS

Study Design

This is a prospective cohort study aimed at monitoring students in terms of their psychological indicators in the first two years of their education process.

Participants and Data Collection

Detailed and self-reported questionnaires were applied to all students enrolled in Akdeniz University Faculty of Medicine, Faculty of Economics (Department of Business Administration), and Faculty of Sport Sciences in 2017–2018 Academic year within the first week (wave 1). The last two faculties were used as control groups. School of Economics is a social science discipline. Students study with a flexible curriculum than medical students. Their workload allows frequenting intellectual and cultural environments. On the other hand, Faculty of Sports is a school where the students enroll through an aptitude exam and not with the university entrance examination system. The education process is based more on practice, rather than theory. For this reason, sports students are expected to have a much more stress-free education than others.

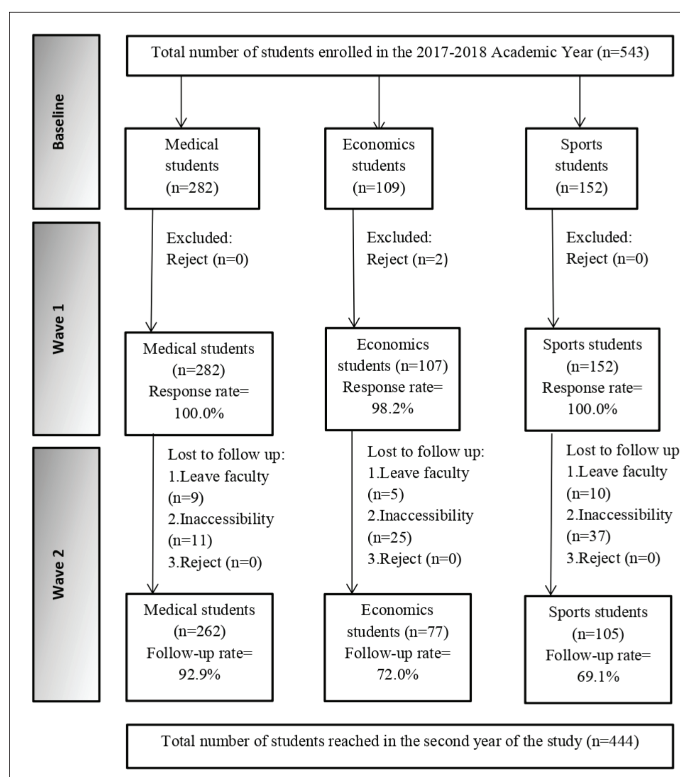

Figure 1. Flow chart of participants in the cohort study.

The ratio of students who enrolled and agreed to participate in the research in the first year was 282/282 (100%) for the Faculty of Medicine, 107/109 (98.2%) for the Faculty of Economics, 152/152 (100%) for the Faculty of Sports Sciences, respectively. The second questionnaire form, which included the same information and more, was applied to the same students in the middle of the next year (wave 2). The second-year follow-up rate was 262/282 (92.9%), 77/107 (72%), 105/152 (69.1%), respectively, and 444/541 (82.1%) in total (Figure 1).

Questionnaires were scheduled so that the students did not have any exams two weeks before and after the application. No sample was selected. All students who answered the questionnaire during registration were included in the research cohort.

Four separate sheets of printed questionnaires within a closed envelope were handled to the participating students: (i) a questionnaire developed by the investigators to gather sociodemographic characteristics of the students (age, gender, family type, parent's education level, economic status of the family, hometown, etc.), daily lifestyle and hobbies, smoking, and alcohol habits, drug use, human relations, internet usage and stressful life events of the students, (ii) GHQ-12 (6), (iii) the 21-item BDI (14), and (iv) Young's Internet Addiction Test (15).

Psychological distress was determined using the GHQ-12. The 12-item GHQ was chosen because of its well-established validity among student groups and the information it provided about general mental health problems (16). Average scores were calculated using the Likert method. Each item scored between zero and three, so the maximum score was 36. Prevalence estimates were calculated using standard scoring as 0–0–1–1 for each item (maximum score 12). Cut-off points ranging from 0/1 to 6/7 were used to determine the student ratios above the thresholds. Valid and reliable Turkish GHQ-12 was applied and the prevalence of psychological distress was calculated using 1/2 cut-off point (17).

Depressive symptoms were evaluated using a 21-item and a self-report questionnaire BDI in which each item was scored between zero and three points (14). Increasing scores indicated an increasing degree of depression. For depressive symptoms prevalence, different cut-off points were used in different sources but in this study the cut-off point (17 points and above) suggested by the authors who developed the Turkish version of BDI was used (18).

The score obtained from the Turkish version of the Young Internet Addiction scale was used only as an independent variable to be put into regression models (19).

Stressful life events (they have been written in italic throughout the text) were measured using a 23-item and self-reported check list. In the second year, three new variables were added to the list (*negative approach from lecturers, lack of adequate sleep, exposure to negative approach from accommodation staff*). Each item was scored between zero (feeling no stress) and 10 (very high, continuous stress) depending on the degree of the stress caused by the item.

The average grade for the first year was used to assess student success.

Ethical considerations

This study was in full conformance with the principles of the Declaration of Helsinki. Following a debriefing on the study aims and content, all participants gave written consent and participated in the study. This research was approved by the Clinical Research Ethics Committee of the Akdeniz University (No: 2017/280).

Statistical Analysis

Study data were evaluated using Statistical Package for Social Sciences for Windows (IBM SPSS) version 23.0. Descriptive statistics including mean, frequency, and standard deviation (SD) were used for all variables. The normality of data was evaluated using the Kolmogorov-Smirnov test. In paired groups, paired-t test was used to compare means, and McNemar's test was used to compare frequencies. When comparing more than two groups, the chi-square test was used for frequencies, and one-way ANOVA was used for means. Bonferroni correction was implemented for multiple comparisons.

In addition, stressful life events were grouped by exploratory factor analysis. Varimax was used as the rotation method in factor analysis. The scree test was used in conjunction with the eigenvalues greater than one to determine the number of factors to retain. The scores of the factors were determined by calculating the arithmetic averages of the variables in the same factor group.

Four separate models were created for multivariate analysis. The relationship of factors and other variables with GHQ-12 and BDI scores of medical students was evaluated using multiple linear regression. Logistic regression model (Backward Conditional) was used to define independent factors for psychological distress and depressive symptoms. How the models were created is explained under the related subtitle in the result section.

RESULTS

In terms of gender distribution, there was no difference among the students participating in the research in all three faculties (p=0.426). The mean age of the medical students was 18.32±0.71, lower than the economics students (19.06±1.22) and sports students (19.38±2.82) (p<0.001).

Stressful Life Events

It was observed that the scores of some stressful life events increased significantly between the two waves (Table 1). Among the stressful life events with increasing scores in medical students, *dissatisfaction with social activities, worrying about the future (individual and communal), political and moral pressure, accommodation problems, dissatisfaction with career choice, worry about examination success, risk of educational failure, mental discomfort*, and *exposure to psychological pressure and violence* were remarkable. Of these, '*worrying about the future*', '*risk of educational failure*', '*political and moral pressure*' were the stressful life events that increased during the first year in all three school students. On the other hand, a significant increase of '*dissatisfaction with social activities*' and '*dissatisfaction with physical appearance*' was seen only in medical students. Among the stressful life events, '*alienation to the city*' and '*problem of adaptation to the university environment*' decreased significantly during the first year in medical students.

General Health Questionnaire and Beck Depression Inventory

The average GHQ-12 scores increased significantly only among medical students from the first wave to the second (p<0.001). Table 2 shows the change in GHQ-12 and BDI scores of three faculty students. In the first wave, the average BDI score was lowest in medical students and highest in economics students. In contrast, a significant increase was observed only in medical students in the second wave (p<0.001). There was no significant change in other faculty students between the first and second years.

The numbers of students who received GHQ-12 scores over different cut-

Table 1. Levels of effects of stressful life events, as perceived by students

	Mean level of stressful life events (0–10)								
	Medical students			Economics students			Sports students		
Stressful life events	Wave 1 Mean	Wave 2 Mean	p*	Wave 1 Mean	Wave 2 Mean	p*	Wave 1 Mean	Wave 2 Mean	p*
Financial problems	3.17	3.43	0.113	4.66	5.27	0.045	5.13	5.21	0.780
Family-oriented problems	2.51	2.68	0.287	3.09	3.61	0.074	3.4	4.34	0.002
Alienation to the city	3.05	1.8	<0.001	2.14	1.64	0.116	2.5	2.09	0.119
Dissatisfaction with social activities	3.22	3.91	<0.001	3.4	3.82	0.296	2.92	3.3	0.297
Worrying about the future (individual)	4.05	4.47	0.044	5.66	6.64	0.012	4.43	5.73	0.001
Worrying about the future (communal)	5.05	5.95	<0.001	4.9	6.45	<0.001	4.38	5.46	0.004
Accommodation problems	2.65	3.47	<0.001	3.05	3.03	0.957	2.63	3.55	0.014
Dissatisfaction with career choice	1.32	2.49	<0.001	3.49	4.21	0.053	1.42	2.26	0.008
Problem of adaptation to the university environment	2.54	2.03	0.001	2.32	2.05	0.394	2	2	1
Risk of educational failure	1.9	2.69	<0.001	3.13	4.52	<0.001	2.45	4.07	<0.001
Worry about examination success	5.64	6.48	<0.001	5.73	6.52	0.028	4.82	4.69	0.709
Dissatisfaction with physical appearance	2.91	3.33	0.009	2.44	2.84	0.211	2.34	2.92	0.054
Political and moral pressure	1.88	2.58	<0.001	1.31	2.13	0.029	0.89	2.02	<0.001
Alcohol use	0.58	0.83	0.073	1.61	1.21	0.273	0.64	1.24	0.004
Mental discomfort	1.2	2.62	<0.001	1.88	1.7	0.665	0.74	1.73	0.001
Physical illness	1.31	1.78	0.014	1.18	1.3	0.706	1.08	1.87	0.005
Exposure to psychological pressure and violence	1.11	1.69	0.002	1.27	1.77	0.233	0.93	1.84	0.006

*Paired t-test.

Table 2. Average GHQ-12 and BDI scores in the first and second waves

Scores	Faculty	Wave 1 Mean	Wave 2 Mean	SD of the paired differences	p*
GSA-12 (0–36)	Medicine	11.19	13.7	5.98	<0.001
	Economics	13.88	14.66	8.2	0.407
	Sports	10.63	11.12	6.68	0.456
BDI (0–63)	Medicine	8.04	10.1	7.83	<0.001
	Economics	12.75	12.36	9.21	0.712
	Sport	9.23	8.9	9.08	0.708

GHQ-12: 12-Item General Health Questionnaire, BDI: Beck Depression Inventory, SD: standard deviation. *Paired t-test (Comparison of wave 1 and wave 2 for each school).

off points were examined and the prevalence of psychological distress was determined. The findings are presented in Table 3. The percentage of the medical students, who had GHQ-12 scores above 1/2 cut-off points, increased significantly from the first wave to the second wave, unlike economics and sports students. The prevalence of psychological distress increased from 53.8% to 61.8%. The level of increase using 1/2 cut-off point was statistically significant but borderline (p=0.042). The increase was more evident at the upper cut-off points.

Initially, the prevalence of depressive symptoms was significantly higher in students of other faculties than in medical students, but decreased slightly in the second year. After a year, the prevalence of depressive symptoms in medical students significantly increased (Table 4). Depressive symptom prevalence increased from 8.8% to 19.5%. While 239 medical students were not depressed in the first wave, 38 of these students were found to be depressed in the second wave. The incidence of depression was found to be 15.9%.

Table 3. Distribution of the students scoring above the different cut-off points from the GHQ-12 scale by faculty and wave

Cut-off points	Faculty	Wave 1		Wave 2		p*
		n	%	n	%	
0/1	Medicine	189	72.1	193	73.7	0.731
	Economics	62	80.5	59	76.6	0.664
	Sports	59	56.7	60	57.7	1
1/2	Medicine	141	53.8	162	61.8	0.042
	Economics	51	66.2	51	66.2	1
	Sports	47	45.2	44	42.3	0.720
2/3	Medicine	102	38.9	130	49.6	0.005
	Economics	41	53.2	43	55.8	0.845
	Sports	36	34.6	35	33.7	1
3/4	Medicine	65	24.8	103	39.3	<0.001
	Economics	36	46.8	37	48.1	1
	Sports	24	23.1	27	26	0.711
4/5	Medicine	43	16.4	91	34.7	<0.001
	Economics	22	28.6	31	40.3	0.108
	Sports	20	19.2	20	19.2	1
5/6	Medicine	30	11.5	67	25.6	<0.001
	Economics	21	27.3	23	29.9	0.839
	Sports	12	11.5	14	13.5	0.815
6/7	Medicine	21	8	46	17.6	<0.001
	Economics	15	19.5	20	26	0.383
	Sports	9	8.7	11	10.6	0.791

GHQ-12: 12-Item General Health Questionnaire, *McNemar's test.

Table 4. Depressive symptoms prevalence according to faculties

Faculty	Depressive symptom	Wave 1		Wave 2		p*
		n	%	n	%	
Medicine	Depressed (Score ≥17)	23	8.8	51	19.5	<0.001
	Non Depressed (Score<17)	239	91.2	211	80.5	
Economics	Depressed (Score ≥17)	22	28.6	20	26	0.815
	Non Depressed (Score<17)	55	71.4	57	74	
Sports	Depressed (Score ≥17)	25	23.8	21	20	0.523
	Non Depressed (Score<17)	80	76.2	84	80	

*McNemar's test.

Multivariate Analyses and Factor Analysis

Four separate multiple regression models were created:

Model 1. Multiple linear regression for BDI and GHQ-12 scores of medical students.

Stressful life events whose scores increased significantly within a year were included in the model as independent variables (Table 1). In addition, stressful life events which were added to the questionnaire in the second year, *negative approach from lecturers, lack of adequate sleep*, and other independent variables (body-mass index, Internet addiction score, average grade for the first year, gender, regular physical exercise, and chronic disease with physician diagnosis presence) were added to the model. The results are presented in Table 5.

Model 2. Multiple logistic regression analysis for psychological distress of medical students.

Students were classified as psychologically distressed/non-distressed based on their GHQ-12 scores using 1/2 cut-off point and a multiple logistic regression analysis was performed with the same independent variables used in Model 1. Regarding GHQ-12, the remaining variables in the model were *dissatisfaction with social activities, worry about examination success, exposure to psychological pressure and violence*, internet addiction score, average grade for the first year (Nagelkerke R^2=0.320). In the new model, *lack of adequate sleep* was replaced by internet addiction score (p=0.033), and other variables in Table 5 remained the same (Table 6). The Young Internet Addiction score average increased from 27.05 to 31.88 in medical students during the first year (p<0.001).

Model 3. Multiple logistic regression for depressive symptoms of medical students.

Each medical student was classified as with/without depressive symptoms using the 16/17 cut-off point, based on their BDI scores, and a multiple logistic regression analysis was performed with the same independent variables used in Model 1. *Dissatisfaction with social activities*, *exposure to psychological pressure and violence,* internet addiction score, and regular physical exercise were found as determinants in the logistic model (Nagelkerke R^2=0.293). Not doing regular physical exercise entered the model as a depression-increasing factor (p=0.013) (Table 6).

Model 4. Multiple linear regression for BDI and GHQ-12 scores of medical students using factor analysis.

All stressful life events were put into factor analysis based on the second-year scores, regardless of the changes from the first wave to the second wave. Five of the 26 variables were excluded because they were

Table 5. Results of multiple linear regression analyses for medical students

Psychological tests	Independent variables in the model (constant)	R^2	B	SE	Beta	t	p
Linear regression analysis (Model 1)							
GHQ-12	Dissatisfaction with social activities	0.337	0.405	0.066	0.354	6.154	<0.001
	Worry about examination success		0.211	0.065	0.189	3.232	0.001
	Exposure to psychological pressure and violence		0.165	0.070	0.130	2.372	0.018
	Lack of adequate sleep		0.162	0.061	0.147	2.666	0.008
	Average grade for the first year		0.027	0.011	0.131	2.499	0.013
BDI	Dissatisfaction with social activities	0.396	0.762	0.172	0.257	4.437	<0.001
	Worrying about the future		0.305	0.154	0.111	1.982	0.049
	Exposure to psychological pressure and violence		0.572	0.176	0.174	3.251	0.001
	Lack of adequate sleep		0.564	0.149	0.197	3.788	<0.001
	Young's Internet Addiction Test score		0.092	0.026	0.185	3.546	<0.001
Linear regression analysis (Model 4)							
GHQ-12	Factor 1 (social issues)	0.270	0.397	0.109	0.235	3.628	<0.001
	Factor 3 (anxiety)		0.273	0.086	0.206	3.196	0.002
	Factor 5 (family, finance)		0.230	0.103	0.140	2.228	0.027
	Factor 6 (negative approach)		0193	0.086	0.129	2.253	0.025
	Average grade for the first year		0.024	0.011	0.115	2.076	0.039
BDI	Factor 1 (social issues)	0.364	1.056	0.272	0.241	3.880	<0.001
	Factor 3 (anxiety)		0.510	0.207	0.148	2.468	0.014
	Factor 5 (family, finance)		0.712	0.248	0.167	2.875	0.004
	Factor 6 (negative approach)		0.718	0.207	0.185	3.465	0.001
	Young's Internet Addiction Test score		0.084	0.027	0.169	3.097	0.002

SE: Standard error, GHQ-12: 12-Item General Health Questionnaire, BDI: Beck Depression Inventory

Table 6. Results of logistic regression analysis for GHQ and BDI of medical students

Psychological tests	Variables	B	SE	OR	95% CI	p
Logistic regression analysis (Model 2)						
GHQ-12 (2 points and above)	Dissatisfaction with social activities	0.219	0.061	1.245	1.105-1.402	<0.001
	Worry about examination success	0.181	0.054	1.199	1.078-1.334	0.001
	Exposure to psychological pressure and violence	0.164	0.076	1.178	1.016-1.366	0.030
	Young's Internet Addiction Test score	0.020	0.009	1.020	1.002-1.038	0.033
	Average grade for the first year	0.029	0.010	1.030	1.011-1.049	0.002
	Nagelkerke R^2=0.320					
Logistic regression analysis (Model 3)						
BDI (17 points and above)	Dissatisfaction with social activities	0.240	0.070	1.271	1.109-1.457	0.001
	Exposure to psychological pressure and violence	0.178	0.062	1.194	1.057-1.350	0.004
	Young's Internet Addiction Test score	0.031	0.011	1.031	1.010-1.053	0.003
	Not doing regular physical exercise	1.041	0.420	2.833	1.245-6.447	0.013
	Nagelkerke R^2=0.293					

SE: Standard error, OR: Odds ratio, CI: Confidence interval, GHQ-12: 12-item General Health Questionnaire, BDI: Beck Depression Inventory.

incompatible during the analysis stages. As a result, a total of 21 variables were reduced to six factors. These were Factor 1- social issues (*difficulty in making friends, relations with the opposite sex, the problem of adaptation to the university environment, dissatisfaction with physical appearance, dissatisfaction with social activities*), Factor 2- physical-mental weakness-pressure (*drug use, exposure to physical violence, alcohol use, physical illness, exposure to psychological pressure and violence*), Factor 3- anxiety (*worry about examination success, worrying about the future-individual and communal*), Factor 4- estrangedness (*living away from home, alienation to the city, accommodation problems*), Factor 5- family, finance (*family-oriented problems, financial problems, high expectations of the family*) and Factor 6- negative approach (*negative approach from lecturers, negative approach from accommodation staff*). Pearson's correlation analysis was run between these six factors, and no value above 0.5 was found. Then, GHQ-12 and BDI scores (dependent variables), six factors, and six other variables as independent variables (body-mass index, internet addiction scale score, the average grade for the first year, gender, regular physical exercise, chronic disease with physician diagnosis presence) were taken and put into multiple linear regression. The results are summarized in Table 5.

DISCUSSION

According to the results of our research, it was seen that the mental health of the medical faculty students was better than the other faculty students at the beginning. The medical profession in Turkey is one of the few professions with a job guarantee, and medical faculties accept students who have high achievement according to their university exam results. For this reason, medical school students may start the faculty with high expectations and hopes, and at the same time, being successful can positively affect their mental health.

The findings showed that GHQ-12 and BDI scores increased significantly between the first and second years only in medical students, while there was no significant difference in other faculty students. While the BDI scores of other faculty students, especially at the beginning of the first year were higher than the medical students, only the scores of medical students increased after one year of education.

The medical education process may have caused deterioration in the mental health of medical students. There are similar longitudinal studies in the literature showing that emotional problems, stress, and depression increase during medical education (4, 5, 20, 21).

The GHQ-12 and BDI scores measured on wave 1 in medical students are higher than the study conducted two decades ago at the same university and the same faculties. On the other hand, the rate of increase in these scores between two waves is lower (1). This increase could be because of the social, cultural, and economic changes that took place in the last two decades in Turkey. After the first research, many physical attractions such as cinema, theater, entertainment center, student bazaar, indoor and outdoor sports facilities that met the social needs of students were built on the university campus. Since then, many social, cultural, and sports activities have been organized for students. Also, the medical education approach has changed. The classical education system in which the student was passive is now abandoned, and the mixed education method which encourages student participation and includes problem-based education sessions has been adopted instead. These improvements may explain the lower rate of increase in BDI and GHQ-12 scores between waves in the current study compared to the previous one.

Another issue is the frequency of depression or psychological distress at different degrees. GHQ-12 score of medical students increased significantly at all cut-off points after the first year (Table 3). This increase is at lower rates at all cut-off points in comparison to the study two decades ago (1). The prevalence of psychological distress increased from 53.8% to 61.8%. However, it is an undeniable finding that 25.6% and 17.6% of medical students scored above 5/6 and 6/7 cut-off points, respectively in GHQ-12. According to Üner et al., 56.8% of medical students were found to have GHQ-12 scores ≥2 points. Also, the prevalences for other cut-off points were similar to our study (22). The percentage of economics and sport students who scored above the cut-off points did not show a statistically significant increase between the two waves. It seems that university-level measures to improve the mental health of students were beneficial, but this effect was limited in medical students. The reason for this situation may be that medical students cannot benefit from the positive changes mentioned due to the obligation to attend classes, lack of free time, and academic load.

When the change of depressive symptoms prevalence was examined, a significant increase was found in the ratio of students above the threshold in medical students. In other faculties, the percentage of students who scored above the threshold did not increase between the two waves, and statistically insignificant decreases were detected. Depressive symptoms rates vary depending on the different cut-off points used in different studies. Our rates align with the literature information (2–4, 21).

In the linear regression analysis (Model 1), *dissatisfaction with social activities* was the strongest variable that remained in the model for GHQ-12. Worry *about examination success, exposure to psychological pressure and violence, lack of adequate sleep*, and the average grade for the first year accompanied it (Table 5). The high year-end mark was a factor that increased psychological distress. Successful students may feel more academic pressure. There are also studies in the literature showing that the low level of academic achievement possess a risk for depression (2). The variables determining the BDI score were *dissatisfaction with social activities, worrying about the future, exposure to psychological pressure and violence, lack of adequate sleep*, and internet addiction score. In both studies, we conducted two decades apart, *dissatisfaction with social activities* and *worrying about the future* showed continuity and stood out between the variables determining the GHQ-12 and BDI scores (1).

Dissatisfaction with social activities was remarkable again among the factors determining the frequency of both depressive symptoms and psychological distress in logistic and multiple linear regression analysis (Model 2, 3, 4).

When all findings were combined, it was once again demonstrated that GHQ-12 and BDI scores increased only in medical students during the first year of education, unlike other faculty students, and *dissatisfaction with social activities* is the most relevant factor in this increase. Similar to our study, Üner et al. examined the association between potential predictors and mental health at university students with logistic regression analysis and found an inverse relationship between leisure time activities and GHQ-12 scores (22). For this reason, the first year of medical education should be planned in a way to protect the mental health of the students. It was understood that the social attractions and activities accessible in the university campuses were effective enough for students in other faculties, but they were not for medical students. The fact that medical education has an uninterrupted intensity from the beginning and does not allow social activities may be the cause of this. Hence, social activities that would support the mental health of the students should be included in medical education curriculums and students should be encouraged to participate in such activities. There are studies indicating that intense participation in social activities prevents depression in students (23). Similarly, many studies in various countries highlight the necessity and benefit of curriculum changes towards improving the well-being of students, especially in the first years (24–26). These changes can range from reorganizations in teaching methods that increase communication amongst students and learning together, to ensuring that students exercise regularly (24, 27).

Multivariate analysis results showed that '*exposure to psychological pressure and violence*', one of the stressful life events, was a risk factor for both GHQ and BDI. Another study conducted in Turkey, it was stated that medical students exposed to emotional trauma were at higher risk for the GHQ-12 score ≥2 points (22). High expectations of themselves and their environment in the education process may increase anxiety and create psychological pressure on students. This situation can cause mental health deterioration.

In this study, sleep deprivation and internet addiction were identified as risk factors for both depression and psychological distress. Many studies have found a relationship between internet addiction, depressive symptoms, and GHQ-12 score (10, 11, 28). Measures should be taken to protect the student from internet addiction as well.

Similar to our results, studies have shown that sleep problems are associated with negative mental health (2, 8, 29). The curriculum intensity should be arranged in such a way that enables students to get enough sleep.

As it is demonstrated in our findings of factor analysis, the positive behaviors of faculty members, assistants, and staff working in faculties and accommodation units are also important in protecting the mental health of the students.

This study has some limitations. Conducting research in a single university makes it difficult to generalize results, which can be constituted as a weakness of the study. Another limitation is that the follow-up rates of other faculties are not as high as the school of medicine. Although other faculties were visited many times to collect data, some students could not be reached because they were not at school, and their follow-

up rates remained low. Therefore, the results should be interpreted with caution. The findings were based on answers that the students gave to the questions in the scales. Before the questionnaire was applied, the importance of the issue and data confidentiality were clearly explained to the participants. Yet there it is not possible to ensure the correctness and sincerity of the answers.

In conclusion, our study shows that the psychological health of medical students deteriorates in the first year of medical education. It is important to prevent, screen, diagnose and treat mental health problems of medical school students starting from the first year. It is recommended to organize trainings on mental health for students to establish and activate counseling systems that provide one-to-one communication. It should be ensured that medical faculties are environments where mental health problems can be discussed easily and there is no stigma in getting help.

In this study, it was determined that "*dissatisfaction with social activities*", "*exposure to psychological violence and pressure*", adequate sleep, and internet addiction are the most important risk factors for mental health. It is necessary to ensure the participation of students in extracurricular activities, to increase their free time as much as possible, and to prevent psychological pressure and violence on them. It is important to inform and monitor students about sleep problems and internet addiction.

Especially in our country, multicenter longitudinal studies should be conducted on medical faculty students.

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

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