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A Comparative Analysis of Mental Health, Academic Stress, and Well-Being Among Medical and Engineering Students

Objective: This study aims to compare mental health, academic stress, and overall well-being between medical and engineering students, highlighting demographic and clinical differences to inform targeted interventions.

Materials and Methods: A total of 392 students (284 medical and 108 engineering) from the university participated in this cross-sectional study. Ethical approval was obtained, and assessments included the Maslach Burnout Inventory-Student Form (MBI-SS) for burnout, the Epworth Sleepiness Scale (ESS) for sleep problems, and the Perceived Stress Scale (PSS) for stress levels. Additionally, the prevalence of Fibromyalgia Syndrome (FMS) was diagnosed based on established criteria.

Results: Statistical analysis revealed significant differences in demographic factors, with engineering students exhibiting higher levels of burnout and anxiety compared to their medical counterparts. Medical students reported lower depression and anxiety levels, potentially due to more robust support systems. The prevalence of FMS was similar across both faculties, but students with FMS experienced significantly higher stress and associated health issues.

Conclussion: The findings underscore the need for tailored mental health interventions in engineering faculties, focusing on stress management and support systems. By addressing the unique challenges faced by students in these disciplines, educational institutions can enhance student well-being and academic performance.

Key Words: *Academic stress, engineering students, medical students, mental health*

Tıp ve Mühendi̇slik Öğrenci̇leri Arasında Mental Sağlık, Akademik Stres ve İyilik Halinin Karşılaştırmalı Analizi

Amaç: Bu çalışma, tıp ve mühendislik öğrencileri arasında ruh sağlığı, akademik stres ve genel refahı karşılaştırmayı ve olası müdahale hedefleri için demografik ve klinik farklılıkları vurgulamayı amaçlamaktadır.

Gereç ve Yöntem: Bu kesitsel çalışmaya üniversitemizden toplam 392 öğrenci (284 tıp ve 108 mühendislik) katılmıştır. Etik onay alınmış ve tükenmişlik için Maslach Tükenmişlik Envanteri-Öğrenci Formu (MBI-SS), uyku sorunları için Epworth Uykululuk Ölçeği (ESS) ve stres düzeyleri için Algılanan Stres Ölçeği (PSS) değerlendirilmiştir. Ayrıca, Fibromiyalji Sendromu (FMS) prevalansı güncel kriterler temel alınarak değerlendirilmiştir.

Bulgular: İstatistiksel analiz, demografik faktörlerde önemli farklılıklar olduğunu, mühendislik öğrencilerinin tıp öğrencilerine kıyasla daha yüksek tükenmişlik ve anksiyete düzeyleri sergilediğini ortaya koymuştur. Tıp öğrencileri, muhtemelen daha sağlam destek sistemleri nedeniyle daha düşük düzeyde depresyon ve anksiyete seviyeleri bildirmiştir. FMS prevalansı her iki fakültede de benzerdi, ancak FMS'li öğrenciler önemli ölçüde daha yüksek stres ve ilişkili sağlık sorunları gösteriyordu.

Sonuç: Bulgular**,** mühendislik fakültelerinde stres yönetimi ve destek sistemlerine odaklanan özel ruh sağlığı müdahalelerine duyulan ihtiyacın altını çizmektedir. Eğitim kurumları, bu disiplinlerdeki öğrencilerin karşılaştığı özgün zorlukları ele alarak öğrencilerin refahını ve akademik performansını artırabilir.

Anahtar Kelimeler: *Akademik stres, mühendislik öğrencileri, tıp öğrencileri, mental sağlık*

Introduction

The academic environment is usually defined by prominent stress and mental health challenges, particularly among university students. This phenomenon is particularly pronounced in demanding fields such as medicine and engineering, where the rigorous curriculum and competitive atmosphere can exacerbate psychological distress. The prevailing study aims to criticize the demographic and clinical distinction between medical and engineering students, focusing on their academic performance,

mental health, and overall well-being. Understanding these differences is imperative for developing focused interference that can support students in managing their mental health effectively.

Analysis has frequently exhibited that academic stress is a substantial predictor of mental health issues among college students. For instance, a study by Octaviani highlights that students experiencing higher levels of academic stress tend to report increased levels of academic burnout, which can lead to detrimental effects on their mental health and academic performance (1). This relationship emphasises the importance of ensuring that students' mental health related concerns are addressed, particularly in high-pressure academic environments.

Moreover, the influence of mental well-being on academic performance is well-documented. A comprehensive examination by Joseph emphasizes that mental health issues can significantly hinder academic achievement, suggesting that students with mental health problems often struggle with lower grades and higher dropout rates (2). This information emphasises the importance of incorporating mental health support into academia to improve student success.

Additionally, the living conditions and social support systems available to students play a pivotal role in their mental health outcomes. In a study on academic stress, the infuluence of the positive effects of support mechanisms is mentioned, thereby promoting better mental health and academic performance (3). This finding suggests that fostering supportive environments within educational institutions is essential for mitigating the adverse effects of academic pressures.

In light of the preceding aspect, the current study investigates the specific demographic and clinical characteristics of medical and engineering students, revealing significant differences in their mental health profiles.

Materials and Methods

Research and Publication Ethics: Ethical approval for the study was obtained from the Non-Interventional Research Ethics Committee of Firat University (no. 356632; 10.19, 15/21). The study was conducted in accordance with the principles of the Declaration of Helsinki and adhered to established ethical standards for research involving human participants. Participation was voluntary, and all participants were informed about the purpose, scope, and procedures of the study prior to data collection. Written informed consent was obtained from all participants.

Research Groups: All students from the Faculty of Medicine and the Faculty of Engineering at Firat University were invited to participate in this research by providing the requested information. The total number of students from the faculties of medicine and engineering was determined by referring to the records held by the respective faculties' student affairs units. Participation in the study was voluntary, and students who consented to participate were informed about the purpose and scope of the research. Their written consent was obtained. A total of 392 students participated in the study, with 284 from the faculty of medicine and 108 from the faculty of engineering. These students completed the questionnaires in full.

The scales utilised in the study were administered to participants through face-to-face interviews conducted by the research team during designated time slots at both faculties. Prior to administration, participants were informed about the purpose and content of the scales to ensure proper understanding of the questions. The research team provided assistance as needed to avoid any difficulties during completion.

Burnout Syndrome Assessment: To define burnout syndrome, Maslach Burnout Inventory-Student Form (MBI-SS) was used (4). This Likert-type scale consists of 16 items categorized into three subscales: exhaustion (5 items), depersonalization (5 items), and personal accomplishment (6 items). A high score on the exhaustion and depersonalization subscales, along with a low score on the personal accomplishment subscale (which is reverse scored), indicates the presence of burnout. The Turkish version of the MBI-SS has been previously validated for reliability and validity (5).

Sleep Problems Assessment: The presence of sleep problems was calculated applying the Epworth Sleepiness Scale (ESS). This questionnaire comprises 8 items that assess the likelihood of dozing off in various daily situations. For the scores obtained between 0-24 in the evaluation, higher values indicated increased daytime sleepiness. The Turkish version of the ESS has undergone reliability and validity analyses (6).

Stress Assessment: The Perceived Stress Scale (PSS), a tool designed to assess perceived stress levels, has been employed in this study. The evaluation utilised a set of 10 questions, with responses ranging from 0 (never) to 4 (very often), in the Turkish version (7). This version of the PSS has been validated through rigorous studies that focused on its reliability and validity. The scale demonstrated adequate internal consistency with a Cronbach's alpha coefficient of 0.84, and a test-retest reliability coefficient of 0.87. Construct validity was confirmed through factor analysis, showing adequate correlation with other stress measurement tools. The Turkish version has been widely used in various studies involving university students and has shown consistent psychometric properties across different populations.

Fibromyalgia Syndrome Diagnosis: The diagnosis of Fibromyalgia Syndrome (FMS) was based on the modified American College of Rheumatology (ACR) classification criteria established in 2016 (8). To meet the criteria for FMS, participants must report symptoms persisting for at least three months, including widespread pain and a symptom severity index. Specifically, a widespread pain index (WPI) greater than 7 and a symptom severity index (SSI) greater than 5, or a WPI of 4-6 with an SSI greater than 9, were used to classify participants as having FMS.

Statistical Analysis: All statistical analyses were performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). The normality of the data distribution was assessed both visually (using histograms and Q-Q plots) and analytically (using the Kolmogorov-Smirnov and Shapiro-Wilk tests). Homogeneity of variances was evaluated using Levene's test. Descriptive statistics are presented as mean±standard deviation for normally distributed continuous variables, and as median (minimum-maximum) for non-normally distributed variables. Categorical variables are presented as frequencies and percentages. For comparisons between groups, the independent samples t-test was used for normally distributed data, while the Mann-Whitney U test was used for non-normally distributed data. The Chi-square test was used for comparisons of categorical variables. For multiple group comparisons, one-way analysis of variance (ANOVA) was used for normally distributed data. The Kruskal-Wallis test was applied for non-normally distributed data. A significance level of $p<0.05$ was considered statistically significant for all tests.

Results

The demographic and clinical info of participants from the study groups are introduced in Table 1. Mean age of participants within the Faculty of Medicine was 21.9 years (±1.5), while those in the Faculty of Engineering had a mean age of 22.4 years (±2.2), with a statistically notable difference ($p=0.004$). Gender distribution revealed a higher male ratio in the Faculty of Engineering (n=120, 58.6%) compared to the Faculty of Medicine (n=100, 35.1%) ($p<0.001$). A notable percentage of students reported that their current department was not their first choice, with (n=37) 18% from the Faculty of Engineering compared to just (n=17) 6% from the Faculty of Medicine ($p=0.003$).

Grade repetition was more prevalent among engineering students (n=62, 27.9%) than medical students (n=37, 13%) ($p<0.001$). Additionally, the percentage of students with no academic expectations was significantly higher in the Faculty of Engineering (n=150, 69.4%) compared to the Faculty of Medicine (n=145, 50.9%) ($p=0.001$). Health problems were reported by (n=31) 14.4% of engineering students and (n=22) 7.7% of medical students, notwithstanding the aforementioned difference did not statistical notable ($p=0.094$).

In terms of sleepiness, measured by the Epworth Sleepiness Scale, engineering students reported a lower mean score (5.95±4.3) compared to medical students (6.92±3.8), with a significant difference ($p=0.029$). The Perceived Stress Scale scores demonstrated a similarity in among the student cohorts, with no significant difference ($p=0.640$). However, the Maslach Burnout Inventory scores indicated that medical students had a lower level of desensitization (6.29±4.3) compared to engineering students (7.57±4.9), which was statistically significant ($p=0.012$).

The Hospital Anxiety and Depression Scale (HADS) scores revealed that medical students had lower depression scores (7.6±3.9) compared to engineering students (8.5±3.6) ($p=0.039$), and anxiety scores were also significantly lower in medical students (9.1±3.9) compared to engineering students (10.3±4.1) ($p=0.007$). The prevalence of fibromyalgia syndrome (FMS) was similar between the two faculties, with (n=46) 16.1% in medicine and (n=25) 11.7% in engineering ($p=0.266$).

Table 1. Demographic and clinical data of the participants

	Faculty of medicine	Faculty of engineering	*p*
Gender (Male) n (%)	100 (35.1%)	120 (58.6%)	**<0.001**
The department is not my first choice n (%,)	17 (6%)	37 (18%)	**0.003**
Grade repetition n (%)	37 (13%)	62 (27.9%)	**<0.001**
No academic expectations n (%)	145 (50.9%)	150 (69.4%)	**0.001**
Those with health problems n (%)	22 (7.7%)	31 (14.4%)	0.094
Those with FMS n (%)	46 (16.1%)	25 (11.7%)	0.266
Dry mouth/dry eyes n (%)	98 (34.4%)	92 (42.3%)	0.258
Those with GI problems n (%)	96 (33.7%)	33 (15.3%)	**0.001**
Those who recognised headache n (%)	115 (40.4%)	90 (41.4%)	0.843
Age (Year)	21.9 ± 1.5*	22.4 ± 2.2*	**0.004**
Epworth Sleepiness Scale	6.92 ± 3.8*	5.95 ± 4.3*	0.029
Perceived Stress Scale	31.1 ± 4.4*	30.7 ± 7.8*	0.640
MBI-SS (Exhaustion)	11.6 ± 5.2*	10.6 ± 5.7*	0.086
MBI-SS (Desensitisation)	6.29 ± 4.3*	7.57 ± 4.9*	**0.012**
MBI-SS (Competence)	6.57 ± 3.1*	7.26 ± 3.9*	0.068
HADS (Depression)	7.6 ± 3.9*	8.5 ± 3.6*	**0.039**
HADS (Anxiety)	9.1 ± 3.9*	10.3 ± 4.1*	0.007

*Data were presented as mean ± standard deviation

Table 2. Participants' places of residence

Places of Residence	Faculty of medicine	Faculty of engineering	*p*
With Family n (%)	159 (55.8%)	120 (55%)	
Student House n (%)	77 (27%)	39 (18%)	**0.015**
Student Dormitory n (%)	44 (15.4%)	43 (19.8%)	

Table 3. Demographic and clinical data of participants with and without FMS findings

	Faculty of medicine			Faculty of engineering		
	FMS+	FMS-	*p*	FMS+	FMS-	*p*
Gender (Male ratio, n%)	11 (23.9%)	90 (37.2%)	0.164	7 (53.8%)	113 (59.2%)	0.214
The department is not my first choice n (%)	5 (10.9%)	12 (5%)	0.212	4 (30.8%)	31 (16.3%)	0.240
Grade repetition n (%)	2 (4.3%)	35 (14.6%)	0.146	5 (38.5%)	50 (26.5%)	0.623
No academic expectations n (%)	17 (37%)	130 (53.6%)	0.079	11 (84.6%)	127 (67.3%)	0.412
Health problems n (%)	7 (15.2%)	15 (6.3%)	0.095	2 (15.4%)	27 (14.3%)	0.830
Those with headache n (%)	29 (63%)	87 (36%)	**0.001**	9 (69.2%)	71 (37.8%)	**0.030**
Those with GI problems n (%)	19 (41.3%)	78 (32.2%)	0.454	7 (53.8%)	19 (10.2%)	**<0.001**
Dry mouth/dry eyes n (%)	21 (45.7%)	78 (32.2%)	0.175	11 (84.6%)	69 (36.7%)	**0.005**
Age (Year)	22.1±1.5*	21.8±1.5*	0.428	23.8±3.9*	22.3±1.9*	0.061
Epworth Sleepiness Scale	7.7±4.1*	6.8±3.8*	0.144	10.6±6.1*	5.3±3.6*	**0.009**
Perceived Stress Scale	32.7±3.8*	30.7±4.5*	**0.004**	35.5±5.5*	30.1±7.8*	**0.016**
MBI-SS (Exhaustion)	12.7±4.5*	11.4±5.4*	0.115	11.6±6.4*	10.4±5.6*	0.475
MBI-SS (Desensitisation)	6.1±3.5*	6.4±4.4*	0.640	7.3±4.7*	7.6±5.1*	0.838
MBI-SS (Competence)	7.2±3.1*	6.5±3.1*	0.119	8.2±2.9*	7.1±3.9*	0.339
HADS (Depression)	7.8±3.6*	7.6±4.1*	0.783	11±4.2*	8.2±3.4*	**0.007**
HADS (Anxiety)	10.9±3.6*	8.7±3.9*	**0.001**	13.1±4.2*	9.9±3.9*	**0.009**

*Data were presented as mean ± standard deviation

Table 2 provides insights into the living arrangements of participants. A majority of students from both faculties lived with family (n=159, 55.8% in medicine and n=120, 55% in engineering), with a statistically notable variation in the percentage of students living in student houses (n=77, 27% in medicine vs. n=39, 18% in engineering, p=0.015). The percentage of students residing in student dormitories was higher in engineering (n=43, 19.8%) compared to medicine (n=44, 15.4%).

Table 3 examines the demographic and clinical info of participants with and without FMS findings. In the Medical Faculty, mean age of students with FMS was 22.1 years (±1.5) compared to 21.8 years (±1.5) for those without FMS (p=0.428). The male ratio was lower among those with FMS (n=11, 23.9%) compared to those without (n=90, 37.2%), even though this was not statistically notable (p=0.164). In the Faculty of Engineering, students with FMS were older (23.8±3.9) than those without (22.3±1.9), but was not statistically notable (p=0.061).

The perceived stress levels were significantly higher among students with FMS in both faculties. In Medical Faculty, Perceived Stress Scale score for FMS+ students was 32.7 (±3.8) compared to 30.7 (±4.5) for FMS- students (p=0.004). Similarly, in the Faculty of Engineering, FMS+ students had a score of 35.5 (±5.5) compared to 30.1 (±7.8) for FMS- students (p=0.016). The HADS scores indicated that students with FMS in the Faculty of Engineering had significantly higher depression (11±4.2 vs. 8.2±3.4, p=0.007) and anxiety (13.1±4.2 vs. 9.9±3.9, p=0.009) levels compared to those without FMS.

The prevalence of headaches was significantly higher among students with FMS in both faculties, with 63% (n=29) of medical students with FMS reporting headaches compared to 36% (n=87) without (p=0.001), and 69.2% (n=9) of engineering students with FMS reporting headaches compared to 37.8% (n=71) without (p=0.030). Gastrointestinal (GI) problems were reported by 41.3% (n=19) of medical students with FMS, while only 32.2% (n=78) of those without FMS reported similar

issues, even though this was not statistically notable (p=0.454). Among engineering students, GI problems were seen in 53.8% (n=7) with FMS and only 10.2% (n=19) without (p<0.001).

Discussion

The outcomes of this research reveal notable differences in demographic and clinical info between medical and engineering students, particularly in respect of depression, anxiety, and stress levels. The higher mean age of engineering students, coupled with a greater male ratio, suggests that these demographic factors may influence the psychological health of students in these faculties. Previous studies are consistent with our data, particularly with regard to perceived stress. Differences may also be due to variations in regional stressors specific to education and post-education working life (9-12).

The notable difference in the proportion of students describing that their current department was not their first choice may reflect the pressures and expectations placed on students in both faculties. The higher percentage of engineering students who repeated grades and reported no academic expectations could indicate a lack of engagement or motivation, which may contribute to their overall stress levels (13-15). This outcome is in accordance with literature suggesting that academic pressures can lead to increased psychological distress among students (16, 17).

The results from the Epworth Sleepiness Scale indicate that medical students experience greater daytime sleepiness, which can be associated to the nature of studies and the attributed stress (18-20). The significant differences in the Maslach Burnout Inventory scores between the two faculties highlight the emotional exhaustion and desensitization experienced by engineering students, which may be linked to their academic environment and expectations (21, 22).

The HADS scores reveal that medical students experience lower levels of anxiety, depression, which may be indicative of the support systems and coping mechanisms available within the medical faculty (23-25).

The phenomenon of Maslach depersonalization, alongside heightened anxiety and depression rates, is particularly pronounced among engineering students. This disparity may be attributed to several drivers inherent in academic environment and the nature of engineering education. Engineering students often face intense academic pressure, which is exacerbated by a competitive atmosphere that prioritizes high performance and technical proficiency. Studies indicate that academic stress significantly correlates with increased levels of depression and anxiety, particularly in fields demanding rigorous analytical skills and problem-solving abilities (9, 12, 26). The stressors associated with engineering curricula, including heavy workloads, tight deadlines, and the necessity for continuous self-assessment, contribute to feelings of helplessness and burnout, which are central to the concept of depersonalization as described by Maslach (27).

Furthermore, the gender dynamics within engineering programs may also have a role in the observed mental health disparities. Research suggests that male students, who constitute a significant portion of engineering cohorts, may experience different stress responses compared to their female peers, potentially leading to higher rates of depersonalization and emotional exhaustion (28). The lack of academic expectations and support systems in engineering disciplines can further exacerbate these issues, as students may feel isolated and undervalued, leading to increased anxiety and depressive symptoms (9, 26). In contrast, medical students often benefit from structured support networks and a more collaborative learning environment, which can mitigate the adverse effects of academic stress (9, 29). This contrast highlights the need for focused interventions to identify the unique challenges faced by engineering students, particularly in fostering resilience and coping strategies to combat academic stress and its psychological ramifications.

The implications of these findings are critical for educational institutions, particularly in engineering faculties, where the mental well-being of students is paramount for academic success and future professional efficacy. Addressing the high rates of academic stress, anxiety, and depression through comprehensive support systems, mentorship programs, and resilience training could significantly enhance the educational experience for engineering students. By fostering an environment that prioritizes mental health and well-being, institutions can not only improve academic outcomes but also get ready students for the challenges they will face in their professional life.

Living arrangements of students also play a decisive role in their mental health. The majority of students from both faculties living with family may provide a support system that can mitigate stress levels (30, 31). However, the differences in the percentages of students living in student houses and dormitories suggest that the living environment may also contributing to overall wellness of students, as those living in more communal settings may experience different stressors compared to those living with family (32, 33).

The prevalence of fibromyalgia among medical and engineering faculty students, as indicated by the findings of 16.1% (n=46) and 11.7% (n=25) respectively, reflects a concerning trend that aligns with broader observations in the general population. Fibromyalgia is recognized as a chronic pain syndrome that significantly impacts quality of life, affecting approximately 3% to 6% of the general population, with higher rates reported in specific subgroups, such as women and individuals with chronic stress conditions (34, 35). The rates observed in your study are notably higher than the general population prevalence, which suggests that students, particularly in high-stress academic environments, can be put into at a heightened risk of developing fibromyalgia. This is consistent with findings that indicate medical and

engineering students experiencing higher grades of depression, anxiety, and stress, which are known contributors to the onset of fibromyalgia (36, 37).

Moreover, the lack of significant difference in fibromyalgia rates between medical and engineering students suggests that the stressors associated with academic life, rather than the specific demands of medical training, may be a common factor influencing the development of fibromyalgia symptoms across disciplines. Previous studies have highlighted that university students, particularly those in demanding fields, are vulnerable to fibromyalgia due to factors such as chronic stress, sleep deprivation, and lifestyle choices (38). The prevalence of headaches and GI problems among students with FMS further emphasizes the impact of stress on physical health, as previous studies have shown a strong correlation between stress and somatic symptoms among students (39-41). The info from our study contribute to the literature shows that fibromyalgia is not only concerns the general public, but also a significant issue among students in higher education, necessitating focused interventions to address wellness and mental health in these populations (37, 42).

The findings regarding FMS highlight the need for focused interventions to identify the psychological and physical health of students in both faculties. The higher perceived stress levels among students with FMS suggest that these individuals may require additional support and resources to manage their symptoms effectively (43-45). The significant differences in anxiety and depression levels among students with FMS further emphasise the importance of identifying mental health issues in the academia (46-48).

In conclusion, the results of this article make a significant contribution to the expanding academic literature, emphasising the necessity for targeted interventions that address the specific challenges encountered by students across diverse academic disciplines. By elucidating the complex relationship between academic stress, mental health and academic performance, educational institutions can more effectively support their students in attaining both academic success and general well-being. Future research should investigate the long-term effects of stress on academic performance and the efficacy of various coping strategies employed by students across different disciplines.

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