



Original article

Impact of Chronic Stress on Human Health among Medical Students: A Cross-Sectional Study

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Abstract

Medical education is associated with considerable academic and psychosocial demands that may contribute to perceived stress among students. Persistent stress may negatively affect students' psychological well-being, cognitive functioning, sleep, and academic performance. Assessing perceived stress and its associated factors is therefore important for identifying students who may benefit from appropriate support. This study assessed perceived stress among medical students and examined its association with selected demographic and lifestyle factors, as well as stress-related psychological, cognitive, and physical symptoms. A cross-sectional study was conducted among undergraduate medical students at the Faculty of Medicine, International Maaref University, Tripoli, Libya. A total of 150 students were included. Perceived stress was assessed using the 10-item Perceived Stress Scale (PSS-10), and data on demographic characteristics, lifestyle factors, and psychological and physical symptoms were collected. Data were analysed using appropriate statistical tests, with a p-value < 0.05 considered statistically significant. The mean PSS-10 score was 17.69 ± 4.73 . Most participants had moderate perceived stress (82.0%), while 17.3% had low stress and none had high stress. Higher perceived stress was significantly associated with all assessed psychological and cognitive symptoms, including anxiety or worry, low mood or sadness, difficulty concentrating, sleep disturbances, and irritability (all $p < 0.001$). Among physical symptoms, fatigue or low energy showed the strongest positive correlation with PSS-10 scores ($p = 0.549$, $p < 0.001$), followed by muscle tension or pain, headaches, gastrointestinal problems, feeling of low immunity, and frequent infections or colds ($p < 0.05$). Palpitations ($p = 0.056$) and slow wound healing ($p = 0.817$) were not significantly correlated with PSS-10 scores. Regular exercise and sleep duration were significantly associated with perceived stress ($p = 0.025$ and $p = 0.036$, respectively), while no significant associations were found with sex ($p = 0.243$), academic year ($p = 0.063$), or smoking status ($p = 0.063$). Moderate perceived stress was common among the medical students studied, while high perceived stress was not observed. Perceived stress was significantly associated with physical activity and sleep duration and was accompanied by a range of psychological, cognitive, sleep-related, and physical symptoms.

Keywords: Perceived Stress, PSS-10, Undergraduate Medical Students, Psychological Symptoms, Physical Symptoms.

Introduction

Stress is a normal physiological response that helps the body adapt to challenges and difficult situations. Acute stress may have beneficial effects on human performance and survival; however, chronic stress can negatively affect both physical and mental health due to long-term activation of the hypothalamic–pituitary–adrenal (HPA) axis and increased cortisol secretion (1,2). Chronic stress has been associated with several health problems, including cardiovascular disease, metabolic disorders, gastrointestinal disturbances, immune dysfunction, anxiety, depression, and sleep disorders (1, 3). It may also reduce concentration, emotional stability, and overall quality of life. Medical students are considered one of the most vulnerable groups to chronic stress due to heavy academic workload, frequent examinations, long study hours, and clinical responsibilities. Studies have shown that academic stress is significantly associated with poor mental well-being among university students (4). In addition, lifestyle factors such as inadequate sleep, low physical activity, and poor coping strategies may further increase stress levels and negatively affect health (5).

The World Health Organization has highlighted the

growing burden of mental health problems among young people and emphasized the importance of early identification and preventive strategies to improve mental well-being (6). Therefore, assessing the impact of chronic stress among medical students is important to understand its effects and support interventions that improve both health and academic performance. This study provides valuable insight into the burden of chronic stress among medical students and its impact on health. The findings may contribute to the development of targeted stress management programs, mental health interventions, and academic support strategies. This study aims to assess the impact of chronic stress on physical and mental health among medical students.

Methodology

Study design and setting

An analytical cross-sectional study was conducted among undergraduate medical students at the Faculty of Medicine, International Maaref University, Tripoli, Libya, during July 2026.

Study population and sampling

The study included undergraduate medical students



from the first to fifth academic years. A stratified sampling approach was used to ensure representation across academic years. The required sample size was estimated using the Raosoft Sample Size Calculator, assuming a population of 300 students, 95% confidence level, 5% margin of error, and 50% response distribution. The calculated minimum sample size was 169; however, 150 students provided complete questionnaires and were included in the final analysis (7).

Data collection

Data were collected using an anonymous, self-administered structured questionnaire comprising demographic characteristics, perceived stress, physical and mental health symptoms, immune-related symptoms, and lifestyle factors. Perceived stress was measured using the 10-item Perceived Stress Scale (PSS-10). Items 4, 5, 7, and 8 were reverse-scored, and total scores ranged from 0 to 40, with higher scores indicating greater perceived stress. Stress was categorized as low (0–13), moderate (14–26), or high (27–40) (8).

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 27.0. Continuous variables were summarized as mean $\pm$ standard deviation, and categorical variables as frequencies and percentages. Independent-samples *t*-tests and one-way ANOVA were used to compare PSS-10 scores between groups, while the Mann–Whitney U test was used when appropriate. Spearman's rank correlation was used to assess associations between PSS-10 scores and physical, mental, and immune-related symptoms. A two-sided *p*-value <0.05 was considered statistically significant.

Ethical considerations

The study was conducted in accordance with ethical principles for research involving human participants. Participation was voluntary, informed consent was obtained before data collection, and questionnaires

were completed anonymously. Confidentiality was maintained, and data were used solely for research purposes.

Results

A total of 150 medical students participated in the study. The mean age of the participants was 22 ± 2 years, with an age range of 17–25 years. The majority were female (122, 81.3%), while 28 (18.7%) were male. Regarding academic year, the largest proportion of participants were in the fourth year (46, 30.7%), followed by the second year (35, 23.3%). Twenty-seven students (18.0%) were in the first year and 27 (18.0%) were in the third year. Fourteen participants (1.0%) were in the fifth year. (Table 1)

Table 1: Demographic characteristics of the study participants

Characteristic	Category	Frequency (n)	Percentage (%)
Sex	Male	28	18.7
	Female	122	81.3
Academic year	1st year	27	18.0
	2nd year	35	23.3
	3rd year	27	18.0
	4th year	46	30.7
	5th year	14	1.0

As shown in Table 2, 79 (52.7%) participants reported being upset because of unexpected events sometimes, while 29 (19.3%) reported experiencing this fairly often. Similarly, 75 (50.0%) participants sometimes felt unable to control important things in their lives, whereas 23 (15.3%) experienced this fairly often.

Feeling nervous or stressed was reported sometimes by 66 (44.0%) participants and fairly often by 58 (38.7%). Regarding the positively worded items, 68 (45.3%) participants reported that they were sometimes confident in handling personal problems, while 26 (17.3%) reported feeling confident fairly often and 16 (10.7%) very often.

Table 2: Responses to individual PSS-10 items among medical students

PSS-10 item	Never	Rarely	Sometimes	Fairly often	Very often
	n (%)	n (%)	n (%)	n (%)	n (%)
Upset because of unexpected events	19 (12.7)	23 (15.3)	79 (52.7)	29 (19.3)	0 (0.0)
Unable to control important things	19 (12.7)	33 (22.0)	75 (50.0)	23 (15.3)	0 (0.0)
Felt nervous or stressed	12 (8.0)	14 (9.3)	66 (44.0)	58 (38.7)	0 (0.0)
Confident handling personal problems*	0 (0.0)	40 (26.7)	68 (45.3)	26 (17.3)	16 (10.7)
Felt things were going your way*	0 (0.0)	16 (10.7)	89 (59.3)	30 (20.0)	15 (10.0)
Unable to cope with responsibilities	32 (21.3)	41 (27.3)	63 (42.0)	14 (9.3)	0 (0.0)
Able to control irritations*	0 (0.0)	18 (12.0)	78 (52.0)	46 (30.7)	8 (5.3)
Felt on top of things*	0 (0.0)	21 (14.0)	80 (53.3)	31 (20.7)	18 (12.0)
Angered by things outside your control	11 (7.3)	29 (19.3)	77 (51.3)	33 (22.0)	0 (0.0)
Difficulties piling up too high	17 (11.3)	31 (20.7)	62 (41.3)	40 (26.7)	0 (0.0)

*Note: Reverse-scored items. PSS-10 = 10-item Perceived Stress Scale.

Perceived stress was assessed using the 10-item Perceived Stress Scale (PSS-10). The mean total PSS-10 score was 17.69 ± 4.73 , with scores ranging from 0 to 30. Based on the accepted PSS-10 classification, 124 (82.7%) participants had moderate stress, while 26 (17.3%) had low stress. No participant was classified as having high stress (Figure 1).

As shown in Table 3, fatigue or low energy was reported often by 56 (37.3%) participants, while headaches, muscle tension or pain, and gastrointestinal problems

were reported often by 59 (39.3%), 53 (35.3%), and 55 (36.7%) participants, respectively. Among mental health symptoms, anxiety or worry was reported often by 54 (36.0%) participants, low mood or sadness by 58 (38.7%), difficulty concentrating by 59 (39.3%), and sleep disturbances by 47 (31.3%). Frequent infections or colds, slow wound healing, and a feeling of low immunity were reported often by 35 (23.3%), 24 (16.0%), and 33 (22.0%) participants, respectively.

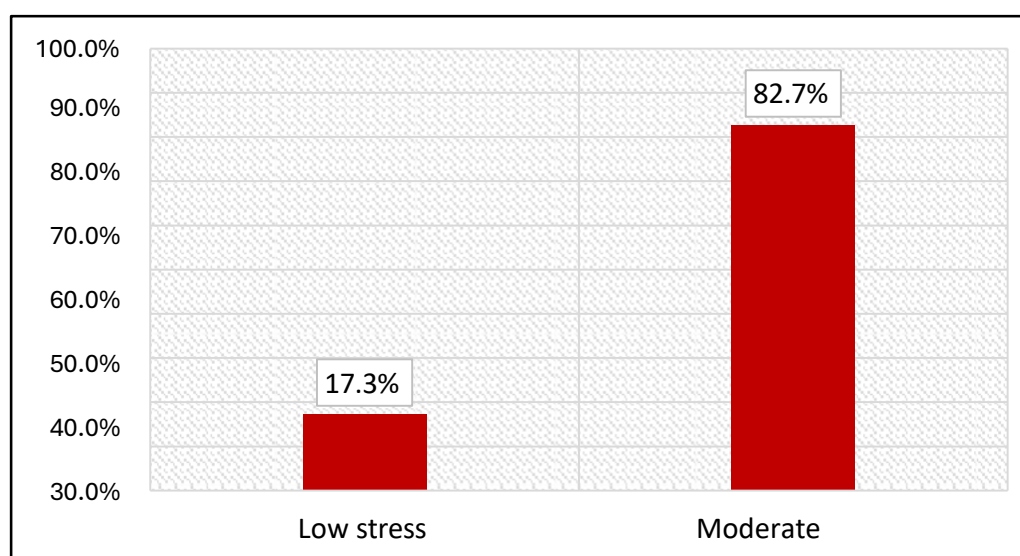


Figure 1: Distribution of participants according to perceived stress level

Table 3: Frequency of physical and mental health symptoms among medical students

Symptom	Never n (%)	Rarely n (%)	Sometimes n (%)	Often n (%)
Headaches	0 (0.0)	15 (10.0)	30 (20.0)	105 (70.0)
Palpitations	0 (0.0)	35 (23.3)	41 (27.3)	74 (49.3)
Fatigue or low energy	0 (0.0)	13 (8.7)	16 (10.7)	121 (80.7)
Muscle tension/pain	0 (0.0)	30 (20.0)	26 (17.3)	94 (62.7)
Gastrointestinal problems	0 (0.0)	37 (24.7)	27 (18.0)	86 (57.3)
Anxiety or worry	0 (0.0)	16 (10.7)	21 (14.0)	113 (75.3)
Low mood or sadness	0 (0.0)	22 (14.7)	24 (16.0)	104 (69.3)
Difficulty concentrating	0 (0.0)	17 (11.3)	34 (22.7)	99 (66.0)
Sleep disturbances	0 (0.0)	19 (12.7)	28 (18.7)	103 (68.7)
Irritability	0 (0.0)	28 (18.7)	46 (30.7)	76 (50.7)
Frequent infections/colds	0 (0.0)	50 (33.3)	49 (32.7)	51 (34.0)
Slow wound healing	0 (0.0)	67 (44.7)	49 (32.7)	34 (22.7)
Feeling of low immunity	0 (0.0)	69 (46.0)	36 (24.0)	45 (30.0)

Regarding lifestyle factors, 42 (28.0%) participants reported exercising regularly, whereas 108 (72.0%) did not. Concerning sleep duration, 50 (33.3%) participants reported sleeping for less than 5 hours per night, 70 (46.7%) reported sleeping 5–7 hours, and 30 (20.0%) reported sleeping more than 7 hours per night. The majority of participants were non-smokers (141, 94.0%),

while 9 (6.0%) reported smoking (Figure 2).

As shown in Table 4, higher PSS-10 scores were significantly positively correlated with fatigue or low energy ($p = 0.549$, $p < 0.001$), muscle tension or pain ($p = 0.343$, $p < 0.001$), headaches ($p = 0.341$, $p < 0.001$), gastrointestinal problems ($p = 0.271$, $p = 0.001$), feeling of low immunity ($p = 0.255$, $p = 0.002$), and frequent

infections or colds ($p = 0.172$, $p = 0.036$). No significant correlations were observed with palpitations ($p = 0.157$, $p = 0.056$) or slow wound healing ($p = 0.019$, $p = 0.817$). As shown in Table 5, higher PSS-10 scores were significantly positively correlated with all assessed mental health symptoms. The strongest correlation was

observed with anxiety or worry ($r = 0.478$, $p < 0.001$), followed by difficulty concentrating ($r = 0.449$, $p < 0.001$), low mood or sadness ($r = 0.404$, $p < 0.001$), irritability ($r = 0.371$, $p < 0.001$), and sleep disturbances ($r = 0.366$, $p < 0.001$).

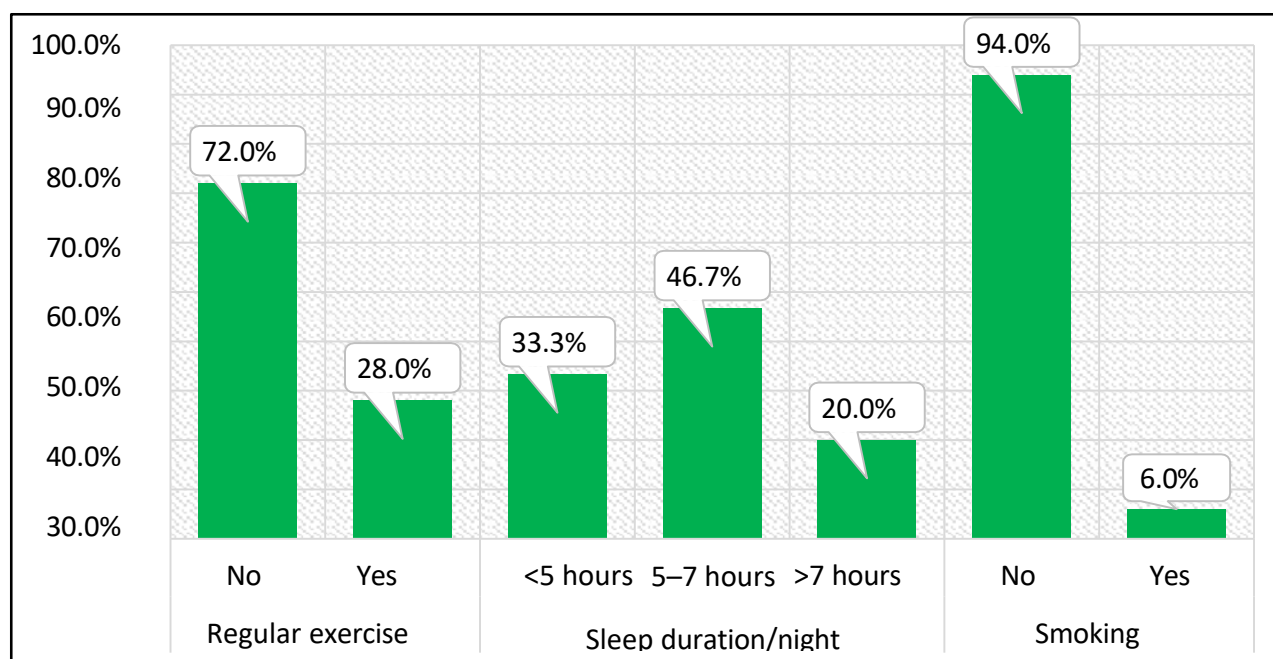


Figure 2: Lifestyle characteristics of the study participants

Table 4: Correlation between PSS-10 total score and physical health symptoms

Physical health symptom	Correlation coefficient	p-value
Headaches	0.341	<0.001
Palpitations	0.157	0.056
Fatigue or low energy	0.549	<0.001
Muscle tension/pain	0.343	<0.001
Gastrointestinal problems	0.271	0.001
Frequent infections/colds	0.172	0.036
Slow wound healing	0.019	0.817
Feeling of low immunity	0.255	0.002

Spearman's rank correlation was used. A p-value <0.05 was considered statistically significant.

Table 5: Correlation between PSS-10 total score and mental health symptoms

Mental health symptom	Correlation coefficient	p-value
Anxiety or worry	0.478	<0.001
Low mood or sadness	0.404	<0.001
Difficulty concentrating	0.449	<0.001
Sleep disturbances	0.366	<0.001
Irritability	0.371	<0.001

Spearman's rank correlation was used. A p-value <0.05 was considered statistically significant

As shown in Table 6, the association between demographic and lifestyle factors and total PSS-10 scores was assessed. Perceived stress did not differ significantly by sex ($p = 0.243$) or academic year ($p = 0.063$). In contrast, students who did not exercise

regularly had significantly higher mean PSS-10 scores than those who exercised regularly (18.23 ± 4.56 vs. 16.31 ± 4.93 , $p = 0.025$). Mean PSS-10 scores also differed significantly according to sleep duration ($p = 0.036$), with the highest score among students sleeping



5–7 hours per night (18.74 ± 4.28). No significant difference was observed according to smoking status ($U = 400.50$, $Z = -1.857$, $p = 0.063$).

Table 6: Association between demographic and lifestyle factors and total PSS-10 score

Variable	Category	Mean $\pm$ SD	p-value
Sex	Male	16.75 ± 5.41	0.243 ¹
	Female	17.91 ± 4.56	
Academic year	1st year	18.19 ± 5.15	0.063 ²
	2nd year	18.66 ± 4.34	
	3rd year	19.00 ± 4.12	
	4th year	16.42 ± 4.57	
	5th year	16.08 ± 5.65	
Regular exercise	No	18.23 ± 4.56	0.025 ¹
	Yes	16.31 ± 4.93	
Sleep duration/night	<5 hours	16.62 ± 4.99	0.036 ²
	5–7 hours	18.74 ± 4.28	
	>7 hours	17.03 ± 4.92	
Smoking	No	17.89 ± 4.64	0.063 ³
	Yes	14.56 ± 5.25	

¹ Independent-Samples t-Test; ² One-Way Analysis of Variance (ANOVA); ³ Mann–Whitney U Test. Values are presented as mean $\pm$ standard deviation (SD). PSS-10 = 10-item Perceived Stress Scale. A p-value < 0.05 was considered statistically significant.

Discussion

The present study assessed perceived stress among 150 medical students using the 10-item Perceived Stress Scale (PSS-10). Most students were classified as having moderate perceived stress, while a smaller proportion had low perceived stress, and none had high perceived stress. These findings are consistent with those of Abumaeza et al., who studied medical students at the University of Tripoli and reported that most students experienced moderate levels of stress, although some experienced severe stress (9). Similar findings have also been reported in Egypt. El-Gilany et al. reported that stress was common among male medical students at Mansoura University (10). Wassif et al., in a study among medical students at Ain Shams University, also reported a high prevalence of stress, with approximately two-thirds of students experiencing high levels of stress (11). These findings indicate that stress is a common concern among medical students across different educational settings, although the severity and distribution of stress may vary.

In contrast, Zagzoog et al. reported a relatively higher prevalence of perceived stress among medical students in Jeddah, with more than half of the participants classified as having high stress. Similarly, Al Sunni and Latif reported a mean PSS score of 17.31 ± 5.31 among preclinical medical students in Saudi Arabia, which is comparable to the mean score observed in the present

study (12). The differences in stress severity between studies may be explained by variations in academic year, sample characteristics, study timing, educational environment, and the criteria used to classify perceived stress.

The present study demonstrated that strong association between stress and fatigue is particularly relevant among medical students, who are frequently exposed to demanding academic schedules and psychological pressure. Persistent stress may be accompanied by physical exhaustion, reduced energy, and impaired daily functioning. Similarly, the associations observed with headaches and muscle tension or pain suggest that psychological stress may have important physical manifestations.

The present findings are consistent with study conducted by El Ansari et al. explored health complaints and perceived stressors among university students from nine Libyan institutions and found significant associations between stressors and several health complaints. In particular, perceived stressors were associated with a higher likelihood of headaches (OR = 1.52, 95% CI: 1.15–2.02), while sleep disturbances and depressive symptoms were also significantly associated with stressors (13).

Similar findings were reported in Egypt by El Ansari et al. in a study of university students from eleven faculties. Fatigue and headaches were among the most frequently reported symptoms, affecting 85.3% and 77.9% of students, respectively. The authors also reported a clear association between increasing perceived stress and a higher frequency of psychological symptoms (14). These findings are generally consistent with the present study, particularly regarding the prominent association between perceived stress and fatigue and headaches. However, unlike the present study, the Egyptian study did not find significant associations between perceived stress and gastrointestinal symptoms or pain and aches. These differences may be explained by variations in the study population, methods of symptom classification, stress assessment, and statistical analysis.

The association between perceived stress and muscle tension or pain in the present study is also supported by findings from Saudi Arabia. Alsulaihebi et al. conducted a cross-sectional study among 416 medical students at Umm Al-Qura University and reported a high prevalence of musculoskeletal disorders, with 70.7% of participants reporting pain during the previous 12 months. The study also demonstrated a positive relationship between musculoskeletal disorders and psychological stress (15). Additionally, the significant association between perceived stress and gastrointestinal problems observed in the present study is supported by broader evidence concerning somatic symptoms among medical students. A scoping review by Sperling et al., including studies from



multiple countries, found that somatic symptoms such as headaches, musculoskeletal pain, sleep disturbances, chronic fatigue, and functional gastrointestinal disorders were commonly associated with mental health problems among medical students (16). This evidence supports the interpretation that stress among medical students may affect not only psychological well-being but may also be expressed through a variety of physical symptoms. The present study also demonstrated weaker, but statistically significant, positive correlations between perceived stress and frequent infections or colds and a feeling of low immunity.

In contrast, palpitations and slow wound healing were not significantly correlated with PSS-10 scores. This may suggest that these symptoms are influenced by factors other than perceived stress.

Students with higher perceived stress scores were more likely to report psychological and cognitive symptoms, particularly anxiety, difficulty concentrating, low mood, irritability, and sleep disturbances. This finding is consistent with previous studies showing that perceived stress is closely associated with psychological distress among university and medical students. A systematic review and meta-analysis reported a high prevalence of anxiety and other psychological problems among medical students, highlighting academic and psychosocial stress as important contributing factors (17). Similarly, Quek et al. reported a high prevalence of anxiety among medical students worldwide, indicating that the demanding academic environment may contribute substantially to psychological distress (18). The present finding of increased anxiety among students with higher stress scores is also supported by studies demonstrating a significant relationship between perceived stress and anxiety symptoms. In particular, a study among university students found that higher perceived stress was associated with greater anxiety and that sleep disturbance may additionally contribute to this relationship (19). These findings are consistent with the present study, where anxiety was one of the prominent psychological symptoms reported by students with higher perceived stress.

The association between perceived stress and low mood is also in agreement with previous research. Studies among medical students have consistently reported an overlap between perceived stress, depressive symptoms, and psychological distress (17,20). The present finding of difficulty concentrating and irritability is supported by a mixed-method study of final-year medical students, in which stress was associated with poor concentration, excessive worry, irritability, and other emotional difficulties (21). These findings suggest that stress may affect not only students' emotional well-being but also their cognitive functioning and ability to

maintain concentration during academic activities.

The association between higher perceived stress and sleep disturbances is particularly consistent with previous evidence. Rezaei et al. reported substantial levels of sleep disturbances among medical students and resident physicians and demonstrated the close relationship between sleep problems and psychological symptoms (22). Similarly, previous research among university students found that perceived stress was significantly associated with insomnia and anxiety (19). Poor sleep may therefore reinforce psychological distress by reducing emotional regulation, concentration, and coping ability.

The present study found no statistically significant association between perceived stress and sex, academic year, or smoking status. The finding regarding sex is consistent with a study conducted among medical students in Mansoura, Egypt, which reported no significant difference in perceived stress between male and female students, although females had higher levels of depression and neuroticism (23). The lack of a significant association with academic year suggests that perceived stress may be experienced across different stages of medical education rather than being restricted to a particular year. However, the relatively small number of students in some academic-year categories may have reduced the ability to detect a statistically significant difference. Similarly, the absence of a significant association between smoking and perceived stress should be interpreted cautiously because smokers represented only 6.0% of the sample, which may have limited the statistical power of the analysis. Overall, the findings suggest that perceived stress was relatively widespread among students irrespective of sex, academic year, or smoking status. This study has several limitations. First, its cross-sectional design prevents the establishment of causal relationships between perceived stress and the associated factors. Second, the study was conducted at a single university, which may limit the generalizability of the findings to medical students at other universities or in other regions of Libya. Finally, the study relied on self-reported data, which may be subject to recall and reporting bias.

Conclusion

This study demonstrated that perceived stress was common among medical students, with most participants (82.7%) reporting moderate stress and a mean PSS-10 score of 17.69 ± 4.73 . Higher perceived stress was significantly associated with several physical health symptoms, particularly fatigue or low energy, muscle tension or pain, headaches, gastrointestinal problems, frequent infections or colds, and a feeling of low immunity. Perceived stress was also significantly positively correlated with all assessed mental health



symptoms, with the strongest association observed for anxiety or worry. Among the demographic and lifestyle factors assessed, perceived stress was significantly associated with regular exercise and sleep duration, while no significant differences were observed according to sex, academic year, or smoking status.

Recommendations

Medical faculties should strengthen student support through accessible stress-management and counseling services and promote regular physical activity and adequate sleep. Periodic screening for stress and related mental health symptoms may facilitate early identification and support. Further multicenter and longitudinal studies with larger samples are recommended to confirm these findings and better assess the relationship between perceived stress and health outcomes.

Conflict of interest. Nil

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