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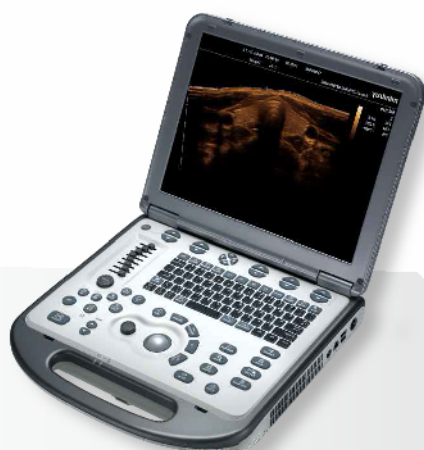
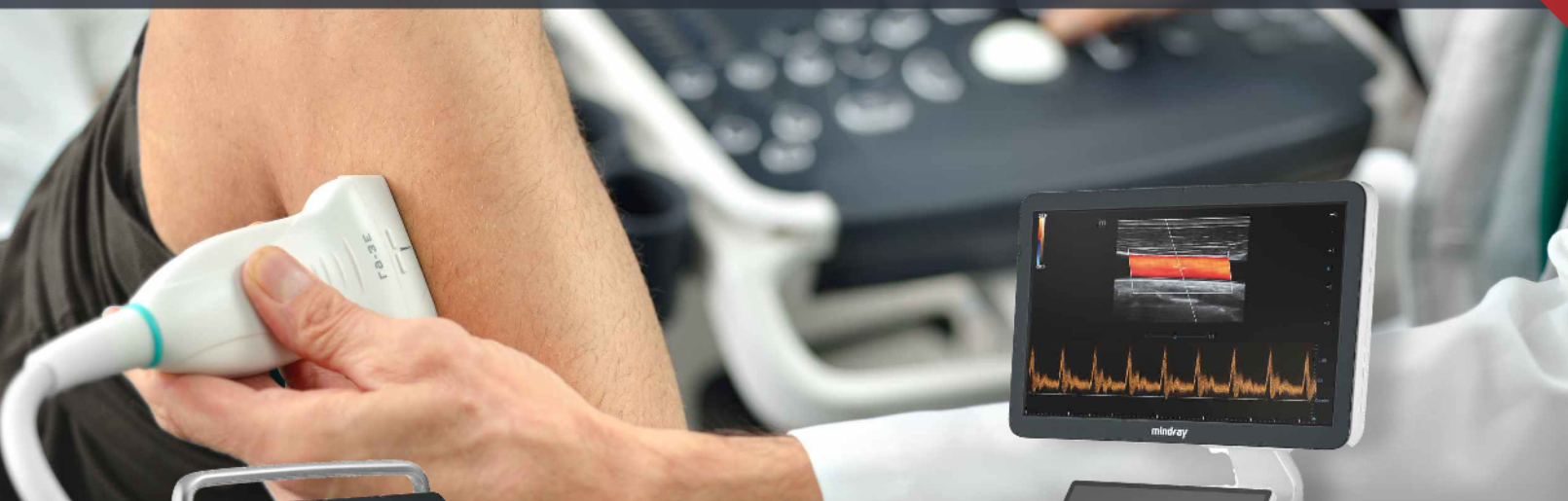
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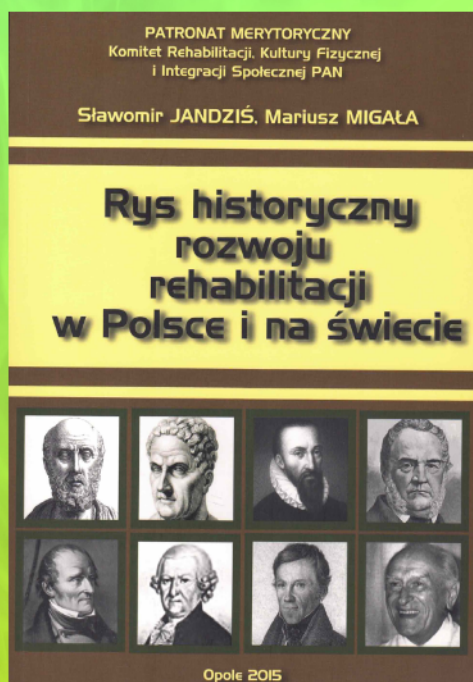
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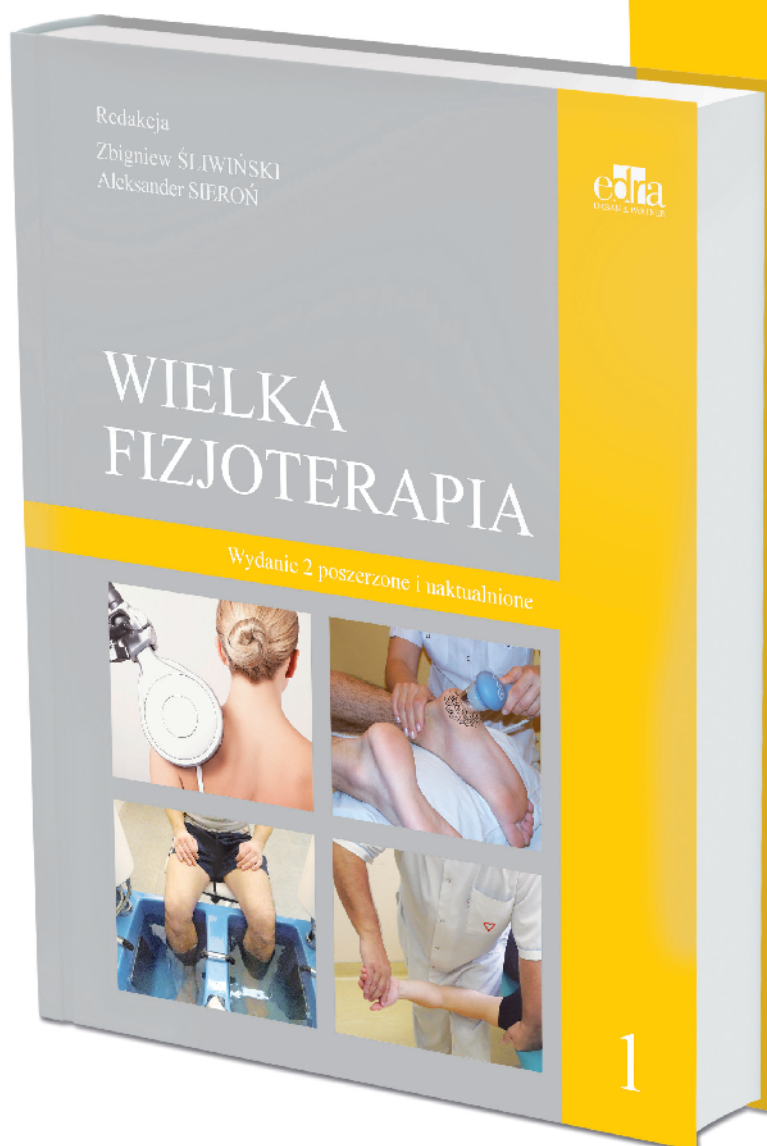
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Academic cognitive stress of undergraduate medical students during COVID-19 pandemic

Akademicki stres poznawczy wśród studentów medycyny podczas pandemii COVID-19

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Abstract

Purpose of the study. To investigate the level of academic stress among Taif University medical students during the COVID-19 pandemic and to determine its sources. Also, to declare the difference between male and female students in this concern.

Methods. The current study was conducted at Taif University, from January 15 to March 1, 2021. The target population was undergraduate medical students. The Perception of Academic Stress Scale (PAS) was the used tool to evaluate academic stress and its sources. Four-hundred thirty-three students participated in the study, 177 (39.9%) males and 256 (60.1%) females.

Results. The total score of PAS indicated mild to moderate stress. Perceptions of workload were the highest significant source of stress (moderate to severe). Pressure to perform and time restraints were the second sources of stress with a non-significant difference between them, while they resulted in significantly higher stress than the academic self-perception which demonstrated the lowest level of stress. There were non-significant differences between males and females in all four domains and the total score.

Conclusion. Taif University medical students have mild to moderate academic stress. Perception of workload represents the main source of stress. There was no significant difference between the male and female sections.

Key words:

Academic stress, medical students, COVID 19

Streszczenie

Cel. Zbadanie poziomu stresu akademickiego wśród studentów medycyny na Uniwersytecie Taif podczas pandemii COVID-19 i określenie jego źródeł. Ponadto określenie różnicy między studentami i studentkami w tej kwestii.

Metody. Badanie przeprowadzono na Uniwersytecie Taif, od 15 stycznia do 1 marca 2021 r. Populacją docelową byli studenci medycyny. Skala Percepcji Stresu Akademickiego (PAS) była narzędziem używanym do oceny stresu akademickiego i jego źródeł. W badaniu wzięło udział czterystu trzydziestu trzech studentów, 177 (39,9%) mężczyzn i 256 (60,1%) kobiet.

Wyniki. Całkowity wynik PAS wskazywał na stres o nasileniu od łagodnego do umiarkowanego. Postrzeganie obciążenia pracą było największym znaczącym źródłem stresu (od umiarkowanego do ciężkiego). Presja wykonania i ograniczenia czasowe były drugim źródłem stresu z nieistotną różnicą między nimi, przy czym powodowały one istotnie większy stres niż samoocena akademicka, która skutkowała najniższym poziomem stresu. Wystąpiły nieistotne różnice między mężczyznami i kobietami we wszystkich czterech wymiarach i wyniku całkowitym.

Wniosek. Studenci medycyny na Uniwersytecie Taif odczuwają łagodny do umiarkowanego stres akademicki. Postrzeganie obciążenia pracą stanowi główne źródło stresu. Nie zaobserwowano znaczącej różnicy między studentami i studentkami.

Słowa kluczowe

Stres akademicki, studenci medycyny, COVID 19

Introduction

Stress usually arises when demands exceed the individual's mental and physiological resources [1]. For example, when persons encounter an area they are not familiar with [2]. Furthermore, Bernstein, et al, [3] defined stress as a response to current situations, which comprises physiological deviations (increased heart rate, and/or muscle tension), emotional and behavioral changes. From a cognitive perspective, stress depends upon persons' perception of the environmental demands and finding them beyond their capabilities or resources. Trait anxiety is an important factor that makes persons vulnerable to stress. Persons may have increased selective orientation to hazard indications, negative interpretation of the unclear stimulus, and focusing on bad thoughts [4].

In the last era, there is an increased interest to study the psychopathological aspects and stress in students. According to many studies, the incidence of stress symptoms in student populations of different cultures is significant [5-9]. Stress symptoms have many harmful consequences which vary in intensity and duration. These symptoms negatively affect academic performance [10]. They also associated with psychosomatic disorders [11], reduced mental quality of life [12], and affection of the cognitive processes (executive functions) [13], mainly inhibition abilities [14].

Frequent stressors have a weighty impact on learning and cognitive functioning in young adults [15]. Some of the noticeable problems that face college students are the time factor, fear of failure, their desire to establish identity, their desire for excellence, and this may lead to emotional problems as feeling that life is not worth living or suffering worried without any apparent reason [16]. Another important aspect is that teachers frequently emphasize the academic acquisition, and neglect the psychological aspect of the students, which leads to emotional stress and consequently learning problems [17,18]. So, students have many challenges to achieve success, it isn't only a matter of studying the scientific materials [18].

The aims of the current study were to investigate the level of academic stress among Taif University medical students during the COVID-19 pandemic and to determine the sources of this stress also to declare the difference between male and female students regarding the level of stress and the sources of stress.

The current study may add new information about the academic stress that students were exposed to in the medical field in the Kingdom of Saudi Arabia, especially in Taif Governorate, during the COVID-19 pandemic, and to identify the sources of these pressures. The medical study in Taif Governorate is characterized by the presence of two separate sections, one for male students and the other for female students. Therefore, the study was in an environment that has not been addressed before (there are two separate sections for male and female students but considering the directions of the Kingdom's vision 3030 synchronizing with the COVID-19 pandemic). Previous studies dealt with the pressures that students were exposed to in the medical field with a different study environment (there are no separate sections) or before the COVID-19 pandemic. This study also focused on comparing the different sources of stress that students were exposed to and identifying the most serious ones.

Drawing attention to the problem of cognitive academic stress and investigating it, especially during the COVID-19 pandemic, could avoid the problems arising from this stress, "like maladaptive strategies" that may affect the quality of life, and the academic level of students and thus the quality of the graduate. Also, studying the difference between male and female students in this regard allows us to avoid any discrimination in the educational process between the male and female sections that could lead to these differences (if any).

Subjects and methods

Study design

This study was a cross-sectional study to investigate the level of cognitive academic stress during the COVID-19 pandemic and determine its sources. Also, to compare the level of stress between male and female students. The current study was conducted at Taif University, Saudi Arabia from January 15 to March 1, 2021. The learning strategy during this period was online learning.

Ethical considerations

All data collected was private and confidential. All participants declared their agreement to participate in the study by answering the consent section at the beginning of the questionnaire which included the study details and their rights regarding the collected data. The study has been approved by Taif university research ethics committee (project No. 42-113).

Participants

The target population was undergraduate students at the medical colleges (College of Medicine and surgery, College of Pharmacy, College of Dentistry, and college of applied medical sciences). Four hundred thirty-three students participated in the study, 177 males and 256 females their ages ranged from 19-22 years. The time of data collection was at the beginning of the second semester before receiving any exams for this semester and receiving little or no assignments. Students participated in the study if they were an undergraduate in one of the medical colleges at Taif university during the COVID-19 pandemic and excluded if the student has ended the undergraduate study before the COVID-19 pandemic.

Outcome measures

The (PAS) was the used tool to measure the level of academic stress, and its sources. Students received the questionnaire via google forms. Course coordinators announced the questionnaire through the Blackboard learning system. Bedewy and Gabriel developed the questionnaire and tested it for reliability, and validity. PAS has internal consistency reliability of 0.7 (Cronbach's alpha). There was proof for the PAS validity, and factor analysis resulted in four associated and theoretically significant factors [19]. The PAS measures the academic stress and its sources utilizing 18 items, each gets a score from one to five with a higher score indicates less stress and vice versa. Scores less than three indicate severe stress, scores three to four indicate moderate stress, and scores more than four indicate mild stress, while 5 indicates no stress. The 18 items of PAS present in four domains. The score of each domain was expressed as the average of the items' scores in this domain and the total score as the average of the 18 items.

Domain 1: pressures to perform. This domain contains five questions and refers to the increased stresses due to peer competition, parents' expectations, and educators' comments on students' performance.

Domain 2: perceptions of workload and examinations which consists of four questions. This factor concerned with stresses relating to excessive workload, long assignments, and students' fear of failing.

Domain 3: self-perceptions. It consists of five questions. It reflects academic self-confidence, confidence for success in a future career, and confidence in making the right academic decisions.

Domain 4: time restraints: it has six questions to determine stresses due to not enough time allocated to classes, homework, to catch up if late, and the restricted time to relax.

Statistical analysis

SPSS version 26 was used to conduct descriptive analysis

(mean, stander deviation, and percentage) and the mixed design. The data was examined for normality using inspection of normal Q-Q plots, boxplots histograms with normality curves, skewness, and kurtosis, all indicated that the data were close to the normal distribution. Mauchly's test indicated a violation of sphericity so, Greenhouse-Geisser test was used to adjust the degrees of freedom as a test of within-subjects effects. The between-subjects test was conducted as Levene's test showed non-significant values for all variables.

Results

Four hundred thirty-three students participated in the study, 177 (39.9%) males and 256 (60.1%) females with a mean age 22.6 ± 4.4 years and 21.1 ± 4.4 years respectively. All participants completed the 18 items of the questionnaire. Table (1) demonstrates the numbers and percentages of the participants and their specialty at each academic level.

Table 1. Numbers and percentages of participants in each academic level

Academic level	No. of students (% in relation to the total sample)	Medicine	Pharmacy	Dentistry	Applied medical sciences
		% in relation to the number of students in each academic level			
1 st year	39 (9%)	12 (30.77%)	9 (23.8%)	8 (20.51%)	10 (25.64%)
2 nd year	110 (25.3%)	23 (20.9%)	31 (28.18%)	22 (20%)	34 (30.9%)
3 rd year	29 (6.7%)	6 (20.69%)	7 (24.14%)	4 (13.79%)	12 (41.38%)
4 th year	160 (37.1%)	23 (14.38%)	40 (25%)	9 (5.63%)	60 (37.5%)
5 th year	53 (12.2%)	20 (37.74%)	26 (49.06%)	7 (13.21%)	—
6 th year	42 (9.7%)	15 (35.71%)	19 (45.24%)	8 (19.05%)	—

The level and sources of cognitive academic stress

The mean of the total score of PAS and, domains one, three and, four indicated mild to moderate stress, while domain two showed moderate to severe stress (Table 2). Figure (1) illustrates the percentage for each level of stress as indicated by the total score of PAS. Regarding within-subjects comparison (table 3,4), the results indicated a highly significant difference between the four scale domains in both sections. Domain two (perceptions of workload) was the major source of stress to students with a level of stress from moderate to severe. This

domain showed a significant increase in the level of stress compared to the other three domains. Domain one (pressure to perform) and domain four (time restraints) were the second source of stress to students with a non-significant difference between them, while they resulted in significantly higher stress when they were compared to the third domain (academic self-perception) which demonstrated the lowest level of stress. The between-subjects comparisons denoted non-significant differences between males and females in all four domains and the total score (Table 6).

Table 2. Descriptive statistics for the four domains and the total score of PAS

	Medicine	Pharmacy	Dentistry	
Domain 1	433	1.00	5.00	3.1455
Domain 2	433	1.00	5.00	2.8397
Domain 3	433	1.00	5.00	3.6818
Domain 4	433	1.50	5.00	3.0940
Total score	433	1.61	5.00	3.1839

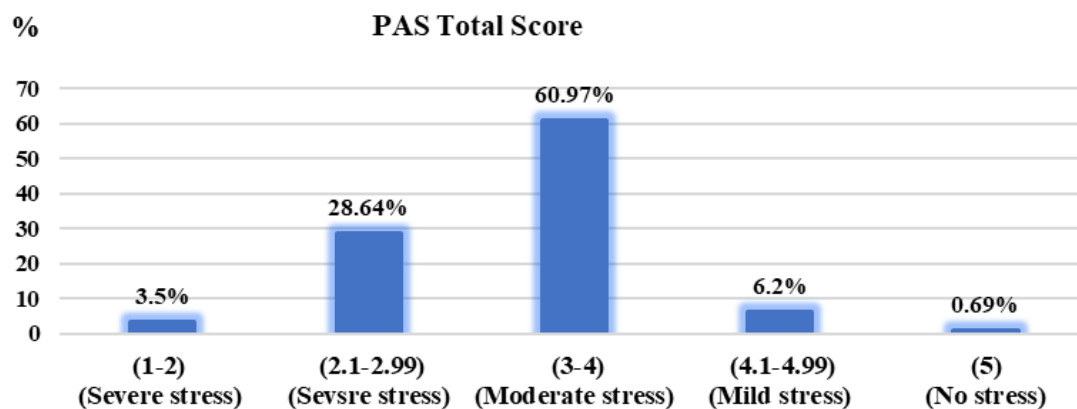


Figure 1. Percentages of the total score of PAS

Table 3. Tests of Within-Subjects Effects and descriptive statistics for PAS domains and total score for both sections

Tests of Within-Subjects Effects (Greenhouse-Geisser)		
Source	F	P
domains	96.725	0.000
gender * domains	0.799	0.468

Descriptive statistics		
Domains	Females (N = 256), M ± SD	Males (N = 177), M ± SD
1	3.11 ± 0.77	3.21 ± 0.79
2	2.84 ± 1.02	2.84 ± 1.06
3	3.67 ± 0.77	3.70 ± 0.76
4	3.11 ± 0.63	3.07 ± 0.66
Total score	3.16 ± 0.59	3.2 ± 0.58

M: Mean, SD: standard deviation

Table 4. Bonferroni pairwise comparisons for within-subjects effect

Domain (I) M ± SD	Domain (J) M ± SD	Mean Difference for female section (I-J)	Sig.	Mean Difference for male section (I-J)	Sig.
2	1	-0.24*	0.007	-0.368*	0.000
2	3	-0.765*	0.000	-0.867*	0.000
2	4	-0.217*	0.022	-0.229*	0.022
4	1	-0.028*	1.00	-0.140	0.103
4	3	-0.549*	0.000	-0.638*	0.000
1	3	-0.521*	0.000	-0.498*	0.000

*: significant difference, Sig.: significance

Table 5. Bonferroni pairwise comparisons for between-subjects effect

Test of Between-Subjects effects		
Source	F	Sig.
Gender	0.124	0.725

Domains	Bonferroni Pairwise Comparisons			
	(I) Female, M ± SD	(J) Male, M ± SD	Mean Difference (I-J)	Sig.
1	3.11 ± 0.77	3.21 ± 0.79	-0.100	0.188
2	2.84 ± 1.02	2.84 ± 1.06	0.006	0.953
3	3.67 ± 0.77	3.70 ± 0.76	-0.036	0.635
4	3.11 ± 0.63	3.07 ± 0.66	0.049	0.436
Total score	3.16 ± 0.59	3.2 ± 0.58	-0.020	0.730

M: Mean, SD: standard deviation, Sig.: significance

Discussion

COVID-19 pandemic negatively affects the psychological status and mental health of the general population [20] especially college students [21]. This study was of particular interest to students in the medical field as they suffer from high levels of depression, stress, and anxiety symptoms [22]. Puthran et al. [23] conducted a meta-analysis which concluded that depression affects about one-third of medical students around the world. They also revealed that the overall incidence of depression among medical students is higher than that informed in the general population.

The results of the study revealed that domain two which concerns stresses relating to excessive workload, long assignments, and students' fear of failing was the major source of stress. Excessive workload is one of the most important causes of students' stress [24] which can expose students to high stress and prevent them from participating in other activities [25]. The amount of this stress may depend on the field of the undergraduate. Aihie and Ohanaka [26] support these findings when they found that undergraduates in physical sciences colleges had higher stress than undergraduates in the social sciences colleges and related these findings to the higher workload. Sreeramareddy et al. [27] also come in agreement with the current results as they concluded that, medical students may encounter additional challenges including a large workload, punctuality, and the number of assessments.

Regarding domain one – which came second as a source of stress- it concerns peer competition, parents' expectations, and educators' comments. These findings may be attributed to the A-F grading system used to classify students according to Dyrbye et al. [28] who considered this grading system as a major source for this type of stress. Additionally, Patel and David [29] reported that giving the students grades from A-F always produces feelings of failure, self-criticism, increased peer competition, and poor self-esteem. They added that using this grading system forces students to avoid failure, public shame, and confirm that they are the best instead of being encouraged to try for success.

The results of the current study showed that domain four -which is related to time restraints- came second with domain one. The stress due to domain two (excessive workload) could be considered the cause of the increased stress due to domain four (time restraints). Brown et al, [30] confirmed the relation between these two domains. Students may need academic consultations in this regard for better time management. Nayak, [31] inferred that helping the undergraduate to appropriately

use their time could reduce academic stress and led to better academic performance.

Concerning domain three (self-perception), the results of the study indicated that it was the least source of stress. Adequate self-perception does not indicate good psychological status. So, domain three caused the least stress levels in association with the increased stress due to the other domains. The medical undergraduate has self-efficacy (the confidence they have in their own abilities to solve problems and complete tasks).and this self-efficacy is associated with emotions, such as course-related anxiety and boredom according to Artino et al. [32], and Guntern et al. [33].

Concerning the comparisons between males and females, the results declared that there were no significant differences between them neither in the total score nor in the four scale domains. Joseph et al, [34] came in agreement with the shown results when they assessed academic stress and found out its sources through a cross-sectional study done among medical students from the first to the fourth year. Their results showed no significant difference in the total score of academic stress when they compared males with females. Also, the results of Calaguas [35] support the obtained findings when he investigated the differences in the perception of academic stress between males and females with reference to enrolment and admission, subjects, teachers, classmates, schedule, classrooms, financial, and expectation-related stressors, and he found no significant differences between males and females. Additionally, Tasneem and Panwar [36] found non-significant differences between male and female students on academic self-confidence and mindfulness.

The current study was conducted in Taif University, Saudi Arabia where there are separate sections for males and females. The non-significant difference between males and females undergraduates can be attributed to the full congruence in the teaching strategies between male and female sections. Altemani and Merghani, [37] coincided with the expectation about the teaching strategies in male and female sections when they used Dundee Ready Education Environment Measure to examine the quality of the educational environment in the Faculty of Medicine, University of Tabuk, Saudi Arabia. They found non-significant differences between males' and females' teaching environments in three domains out of five. Additionally, the equality between males and females in terms of labor market opportunities according to Saudi Vision 2030 [38] has led to the necessity of unifying the academic climate between the male and female students.

On the other hand, other studies found significant differences between male and female students regarding academic stress. Mishra, [25] found male students had higher significant academic stress and attributed this higher stress to the increased social distractors and responsibilities of the male students. Moreover, Abdulghani et al, [39] studied the association of COVID-19 pandemic with the undergraduate medical students' stress and they concluded that the prevalence of stress was significantly higher in female medical students when in comparison to male.

Study Limitations

The limitations of the current study were that the other social stressors which may affect students' academic environment were not considered. Also, the academic achievement and the academic level of the students was not included as variables.

Conclusion

Taif University medical students have mild to moderate academic stress. Perception of workload represents the main source

of stress. There was no significant difference between the male and female sections.

Recommendations

- Reviewing programs to avoid unnecessary student workload which hinders participation in other activities
- Adding a well-being course is important for supporting medical students
- Time restraints could be reduced by supportive materials and communication with the students.
- Study the applicability of using different grading systems. The pass/fail grading system could improve students' psychological well-being and reduce stress, decline competitiveness, and encourage teamwork attitude.

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