Perceived Stress among Jazan Medical Students:
A Preliminary Study for Effective Intervention Program

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ABSTRACT
Background: Stress is an inevitable event in a medical student's life, especially during the clinical years. Overwhelming stress has a negative impact on student's mental health and academic performance.
Objectives: To assess the perceived stress levels among medical students, identify the primary stressors, and explore the relationship between stress, academic performance, and socio-demographic factors.
Subjects and Methods: This cross-sectional observational study included 240 medical students from the academic year 2020/2021. Data collection involved socio-demographic and academic information, the Perceived Stress Scale (PSS), the Medical Student Stress Questionnaire, and the Brief COPE scale.
Results: A substantial 89.3% of students experienced moderate to high stress levels (Mean ± SD: 27.83 ± 6.3). Female students reported significantly higher stress levels than males (p < 0.01). The primary sources of stress were academic-related (70.4%) and teaching and learning-related (48.75%). Adaptive coping was used by 66.7% of students. There was a significant negative correlation between PSS scores and both GPA and adaptive coping strategies. Predictors of higher stress levels included lower GPA (B= -2.72, p= 0.003), being female (B= -2.4, p= 0.05), academic-related stressors (B= 0.219, p= 0.001), interpersonal-related stressors (B= 0.154, p= 0.05), daily-related stressors (B= 0.478, p= 0.04), and adaptive coping (B= -0.388, p= 0.00). **Conclusion:** This study document high stress level among medical students in Jazan University. There is a strong need for establishing students counseling program (academic and psychological), curricular modification, and improving facilities for recreational activities.
Keywords: Stress, Medical students, Source, Coping.

INTRODUCTION

Stress is an unavoidable phenomenon in medical student's life [1]. Although a reasonable amount of stress is important to tunes up the brain and improves the personal performance in different tasks, too much stressors are non-productive and handicapping [2].

As per the findings of the WHO World Mental Health Surveys International College Student Initiative, a substantial majority of students (93.7%) reported encountering stress during their academic tenure [3]. Global research reveals that the stress levels reported by medical students vary from 25% to 90% [4,5]. Z

In addition to the academic stress, students also face the unpredictability of their future and the difficulties of systemic integration. Adolescents have several challenges in the areas of social, emotional, physical, and family matters, which can have an effect on their ability to learn and their academic achievements [6]. The elevated demands linked to academic achievement are naturally anxiety-inducing and can jeopardise the physical and mental well-being of students [7]. Female medical students exhibit significantly elevated levels of stress in comparison to their male counterparts [8].

Stress has a deleterious impact on both psychological and physiological well-being, as well as academic and physical achievement, frequently resulting in emotional fatigue [8].

Moreover, research indicates that implementing stress prevention interventions among college students within a 12-month period could potentially reduce the prevalence of mental disorders by up to 46.9%–80% [3]. Using of effective coping strategies have shown a positive outcome in reducing the negative effects of stress [9]. It involves behavioral and psychological responses to changing circumstances or the stressors itself and involve planning, instrumental support, venting, positive reframing, humor, and acceptability [10]. However, it is essential for medical educators to acquire a more comprehensive comprehension of the magnitude and origins of stress, as well as its influence on the academic performance of medical students [11].

Hence, the objective of this study was to evaluate the degree of felt stress among medical students, ascertain the origins of stressors, and investigate the correlation between stress, academic performance, and socio-demographic factors.

SUBJECTS and METHODS

This study was done on medical students at the Faculty of Medicine, Jazan University, Saudi Arabia using a cross-sectional design. Based on a total of 634 medical students, a margin of error of ±10%, a confidence interval of 95%, and a degree of variability of 0.5, the estimated required sample size is 218. The final sample size was determined to be 240 by accounting for a 90% anticipated response rate and adding an additional 10% to account for non-response. Students were invited to complete a self-administered questionnaire, which was emailed electroni

cally to their university email addresses from January to June 2022.

The used instrument for data collection contained two sections: the first section included **socio-demographics** (age, residence, marital status, family income) **and academic data** including academic year and grade point average (GPA). The second section included perceived stress scale (PSS), medical students' stressors questionnaire (MSSQ), and brief cope scale.

The Perceived Stress Scale (PSS) is a questionnaire including 10 items that assess perceived stress levels experienced in the previous month. Respondents rate their stress levels on a 5-point Likert scale, ranging from "never" (0) to "very often" (4) [12]. We employed the Arabic version, which has shown a reliable internal consistency with a Cronbach's α coefficient of 0.74 [13]. Stress levels can be categorized as low, moderate, or high based on scores ranging from 0 to 13, 14 to 26, and 27 to 40, respectively.

The MSSQ-40 is a questionnaire that uses a five-point Likert scale ranging from 0 to 4. It consists of 40 items that assess six different domains of stresses. The average scores of the items were computed and classified into the following categories: mild (0.01-1), moderate (1.01-2), high (2.01-3), and severe (3.01-4). Mild stress denotes the absence of stress or insignificant tension, whereas moderate stress signifies a fair level of stress. Elevated stress levels, characterized by major emotional disturbances, suggest high and severe stress. Severe stress can also lead to disruption of regular activities [14].

The validity and translation of the MSSQ into Arabic were confirmed. The inventory assesses six domains: Academic-related stressors (ACRS), Intrapersonal and interpersonal related stressors (IRS), Teaching and learning-related stressors (TLRS), Social related stressors (SRS), Drive and desire related stressors (DRS), and Group activity related stressors (GARS) [15].

The Brief COPE scale was employed to evaluate coping behaviours according to 14 stress coping techniques. The strategies can be categorized into adaptive coping strategies, which are problem-focused and include active coping, instrumental support, planning, acceptance, emotional support, humour, positive reframing, and religion. On the other hand, there are maladaptive coping strategies, which are emotion-focused and include behavioural disengagement, venting, denial, self-blame, self-distraction, and substance use [10].

Students evaluated each item using a 4-point scale, where 1 represented no engagement, 2 represented little engagement, 3 represented moderate engagement, and 4 represented high engagement. To facilitate analysis, ratings of 1 and 2 were classified as non-utilization of the coping strategy, whilst ratings of 3 and 4 were classified as utilisation of the coping method [16].

Ethical approval:

The study was approved by the Institutional Review Board (IRB) at Jazan University (Reference Number: REC-45/03/806). Informed consent was obtained from all participants, students were assured that all information they provided is confidential. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

The study data were subjected to statistical analysis using an IBM-compatible personal computer equipped with the SPSS statistical package version 20 (SPSS Inc., Armonk, NY, USA released in 2011). The descriptive statistics were reported as the count (No), percentage (%), average ($\bar{x}$), and standard deviation (SD). The Chi-square test ($\chi 2$) was used to analyse the relationship between categorical variables. The Mann–Whitney U test was employed to compare two distinct groups, however the independent-samples Kruskal-Wallis test was utilised for comparisons involving more than two separate groups. The Spearman's correlation coefficient test was employed to evaluate the association between PSS scores, GPA, and coping scores. A multiple linear regression analysis was performed to identify various risk factors associated with excessive stress among the pupils. A P-value less than 0.05 was deemed to be statistically significant.

RESULTS

This study was conducted using a cross-sectional design and included a total of 240 students. Among these students, 45% (108 students) were males and 55% (132 students) were females. The age of the students varied between 20 and 25 years, with an average age of 22.33 ± 1.11 years. Figure 1 displays the proportions of students who reported low, moderate, and high levels of stress. The average total score on the Perceived Stress Scale was 27.83 ± 6.23. There were no notable disparities seen between male and female students in terms of their background characteristics (Table 1).
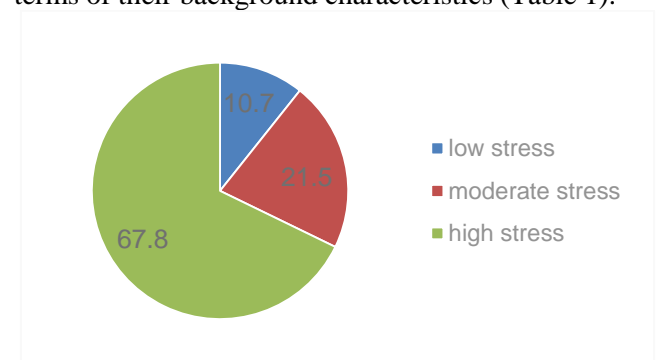

Figure (1) stress level among medical students

Table (1): The background characteristics of the study population

Demographic data		Frequency (%)		Total (%)	χ^2	p Value
		Male	**Female**			
		108 (45.0)	**132(55.0)**	**240 (100)**		
Residency	Urban	38 (15.8)	48 (20.0)	86 (35.8)	0.36	0.85
	Rural	70 (29.2)	84 (35.0)	154 (64.2)		
Marital Status	Single	106 (44.2)	126 (52.5)	232 (96.7)	1.34	0.25
	Married	2 (0.8)	6 (2.5)	8 (3.3)		
Distance between home and college	<50 Km	40 (16.6)	36 (15)	76 (31.6)	4.8	0.09
	50– 100 Km	42 (17.5)	48 (20)	90 (37.5)		
	>100 Km	26 (10.8)	48 (20)	74 (30.8)		
Method of transportation	My car	62 (25.8)	66 (27.5)	128 (53.3)	2.02	0.36
	Taxi	16 (6.7)	18 (7.5)	34 (14.2)		
	Bus	30 (12.5)	48 (20.0)	78 (32.5)		
Family Monthly Income	<10000 SR	54 (22.5)	62 (25.8)	116 (48.3)	0.33	0.85
	10000 – 20000 SR	34 (14.2)	42 (17.5)	76 (31.7)		
	> 20000 SR	20 (8.3)	28 (11.7)	48 (20.0)		
Year of study	2nd	18 (7.5)	30 (12.5)	48(20)	7.13	0.13
	3rd	18(7.5)	16 (6.7)	34 (14.2)		
	4th	23 (9.6)	37(15.4)	60 (25)		
	5th	30 (12.5)	38(15.8)	68 (28.3)		
	6th	19(7.9)	11(4.6)	30(12.5)		
GPA	>4	32(13.3)	38 (15.8)	70 (29.1)	0.79	0.85
	3.5-4	17 (7.1)	20(8.3)	37 (15.4)		
	2-3.5	45 (18.8)	58 (24.1)	103 (42.9)		
	<2	11(4.6)	19 (7.9)	30(12.5)		

On comparison of perceived stress scale scores and background characteristics, we found a significantly higher stress level among female students than male students. Students with lower GPA scores (low achievers) had a significantly higher stress level than those with high GPA scores. All other variables were insignificant. All students in different classes experienced stress however, stress level was higher among students of 2nd year and 6th year but it was insignificant (table 2).

Table (2): Relationship between perceived stress scale total scores and background characteristics of studied population.

Demographic characteristics		Total Score of Perceived Stress Scale (M ± SD)	Test	p Value
Gender	Male	25.05 ± 6.32	2.42*	<0.01
	Female	29.38 ± 5.44		
Residency	Urban	27.42± 6.39	0.84*	0.6
	Rural	27.92± 5.86		
Marital Status	Single	26.5± 9.19	0.506*	0.6
	Married	27.87± 6.32		
Distance between home and college	<50 Km	28.57± 6.9	0.89**	0.864
	50-100 Km	28.26± 5.95		
	>100 Km	27.48± 5.82		
Method of transportation	My car	24.18±5.49	5.04**	0.538
	With colleague	26.5±1.73		
	Taxi	20.51± 6.49		
	Bus	27.33±8.46		
Family Monthly Income	< 10000 SR	20.63±9.76	8.86**	0.064
	10000 – 20000 SR	24.68±8.34		
	> 20000 SR	22.56± 6.82		
Year of study	2nd	29.25±7.37	2.33**	0.66
	3rd	28.16±5.89		
	4th	27.96± 6.3		
	5th	27.75±5.29		
	6th	28.00±5.082		
GPA	> 4	20.57± 4.03	21.60**	0.001**
	3.6-4	23.76±6.01		
	2-3.5	30 ±5.13		
	<2	30.88±5.58		

*Mann–Whitney test; **Kruskal–Wallis test
A significant negative correlation was found between perceived stress scale scores and students GPA (Figure 2).
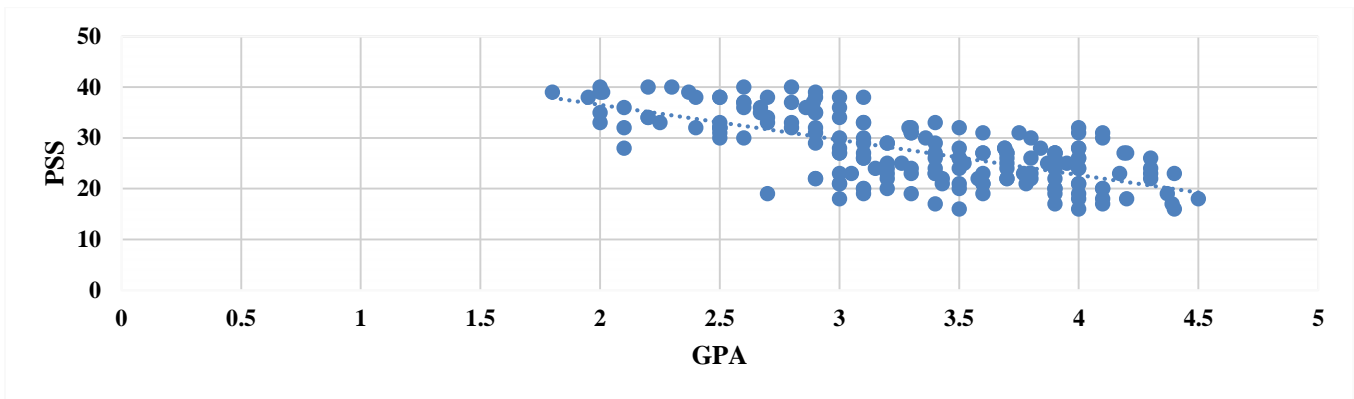

Figure (2): Spearman's correlation between PSS scores and students GPA (r= -0.6728, p<0.0001)

Source of stress identified by students:
The main stressors experienced by medical students were ACRS, TLRS, IPRS, SRS, GARS, and DRS. Approximately two third (70.4%) of students experienced ACRS as high/severe stressors. Nearly half (48.75%) of students perceived TLRS as high/severe stressors. 32.5% perceived DRS as high/severe followed by SRS, IPRS, and GARS (Table 3).

Table (3): Source of stressors according to MSSQ

MSSQ	Mean ± SD	Mild / Moderate Frequency (%)	High / Severe Frequency (%)
Academic related stressors	26.18± 6.6	70 (29.58)	169 (70.42)
Intrapersonal- and interpersonal-related stressors	14.18± 6.8	178 (74.17)	62 (25.83)
Teaching- and learning-related stressors	17.08±4.2	123 (51.25)	117 (48.75)
Social-related stressors	12.56± 4.5	170 (71.25	69 (28.75)
Drive-and desire-related stressors	4.35±2.4	162 (67.5)	78 (32.5)
Group activities-related stressors	4.56±2.3	190 (79.17)	50 (20.83)
Total score	78.93±2.8		

Coping strategies adopted by students to face stress:
The majority of students (66.7%) utilised adaptive coping techniques, including active coping, planning, and emotional support. Approximately 33.3% of the students utilised maladaptive coping techniques, including self-blame, self-distraction, and denial, as indicated in table 4. A strong inverse association was seen between PSS scores and the utilisation of adaptive coping methods. In contrast, a statistically insignificant, modest positive connection was seen between PSS scores and maladaptive coping techniques employed by students (Figures 3 and 4).

Table (4): Coping strategies adopted by the students.

| Strategy	Mean±SD	Frequency (%)
Adaptive coping strategies	37.58± 11.39	160 (66.7)
Active coping	5.5±1.4	141 (58.8)
Humor	5.3±1.6	76 (31.7)
Instrumental support	5.1±1.7	54 (22.5)
Emotional support	4.9±1.6	94 (39.2)
Planning	5.7±1.6	102 (42.5)
Acceptance	5.8±1.4	89 (37.1)
Positive reframing	5.4±1.5	114 (47.75)
Religion	6.1±1.7	135 56.3)
Maladaptive coping	27.9±9.35	80 (33.3)
Behavioural disengagement	4.3±1.5	43 (17.9)
Venting	4.8±1.7	35 (14.6)
Denial	4.9±1.8	50 (20.8)
Self -blame	5.5±1.6	67 (27.9)
Self-distraction	5.3±1.7	78 (32.5)
Substance use.	2.1±1.1	15 (6.3)
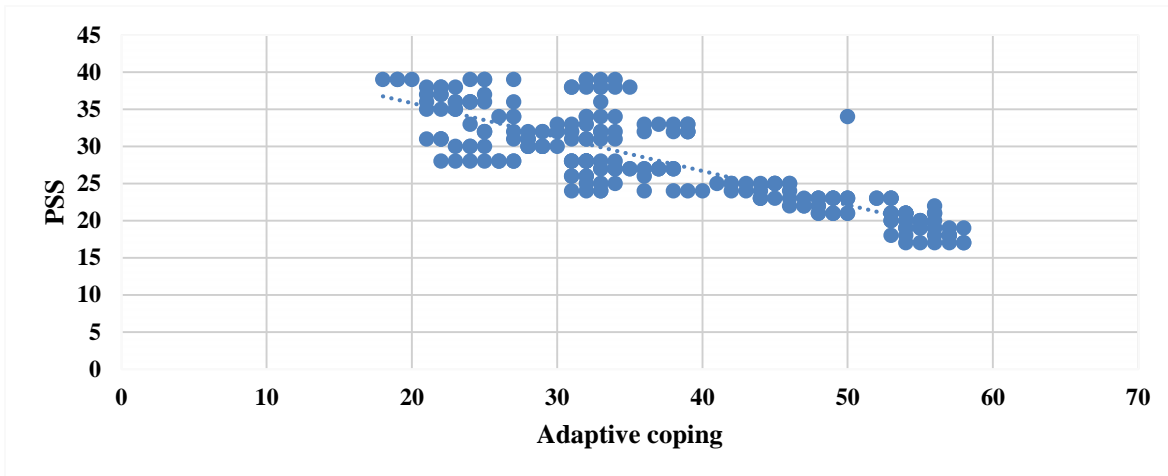
Figure (3): Spearman's correlation between PSS scores and adaptive coping scores (r= 0.85, P<0.001).
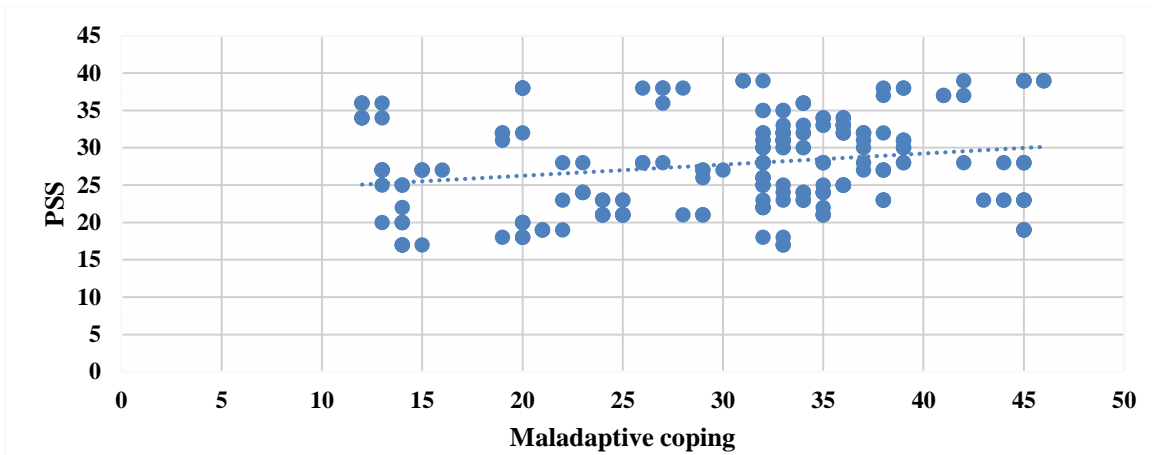

Figure (4): Spearman's correlation between PSS scores and maladaptive coping scores (r= 0.216, P >0.05).

The variables that showed a significant association with stress in the bivariate analysis were included as independent variables in the multiple linear regression model to identify the risk factors for stress. The model determined that lower GPA scores, academic-related stresses, drive and desire associated stressors, and adaptive coping were risk factors for high stress levels. Nevertheless, factors such as age, academic year, teaching and learning-related stressors, social-related stressors, and group activity-related stressors did not demonstrate a significant correlation with stress levels, as seen in Table 5.

Table (5): Multiple liner regression of demographics, academic, and sources of stressors on PSS
($F_{(3, 56)}$ = 51.12, $p < 0.001$, R^2 = 0.73, R2adj = 0.72).

	Co-eff	SE	t-stat	Lower t0.025(55)	Upper t0.975(55)	Stand Co-eff	P- value	VIF
b	14.638	8.445	1.733	-2.334	31.611	0	0.0893	
Age	0.320	0.25666	1.249	-0.194	0.836	0.093	0.217	1.233
Gender	2.401	1.22690	1.957	-0.057	4.860	0.193	0.051	1.053
Year of study	0.053	0.35851	0.14847	-0.667	0.773	0.010	0.882	1.177
GPA	-2.721	0.892	-3.049	-4.514	-0.92792	-0.277	0.003	1.806
ACRS	0.219	0.0628	3.486	0.0931	0.345404	0.360	0.001	2.432
IPRS	0.154	0.0774	1.997	0.0009	0.31014	0.168	0.051	1.552
TLRS	0.014	0.123	0.113	-0.233	0.261845	0.009	0.909	1.515
DRS	0.478	0.226	2.109	0.0227	0.933853	0.187	0.04	1.720
SRS	0.122	0.112	1.085	-0.104	0.348551	0.090	0.282	1.500
GARS	0.165	0.232	0.710	-0.301	0.631665	0.059	0.480	1.544
Adaptive coping	-0.388	0.035	-10.988	-0.459	-0.317	-0.716	<0.001	1.370

GPA: grade point average, ARS: academic-related stressors, TLRS: teaching- and learning-related stressors, GARS: group activities-related stressors, SRS: social-related stressors, IRS: intrapersonal- and interpersonal-related stressors, DRS: drive- and desire-related stressors.

DISCUSSION

Surprisingly, the study revealed that most of the students enrolled in the study experienced stress (89.3% had moderate to severe stress). The mean PSS scores in our study was 27.19 ± 6.13, which was higher than other studies conducted on medical students in different countries [17,18].

The prevalence of stress was higher than that found in previous studies conducted in Saudi Arabia; in King Khaled Medical College (85.5%) [19] and Dammam Medical College (71.7%) [20]. This difference could be explained by three factors; the first factor: timing of conduction of the survey was near the end module exams as students become anxious and more stressed near to the exam. The second factor was that most of the students enrolled in the study (65.8%) were from the clinical years (4th, 5th, 6th year). However, **Al Sunni and Latif** [20] study involved pre-clinical students only. The third factor: the study during clinical years poses more stressors than pre-clinical years as heavier workload (case presentation, seminars, logbook, and different assignments), facing illness and death of patients and difficulties in talking to patients about their health problems during clinical training, student's worries and challenges about professional life after graduation. This finding is much higher than that reported in European medical students. The marked difference could be explained by lack of students' psychological counseling program that offers stress management skills training for students in Jazan faculty of medicine.

Nevertheless, our findings were inferior to the data shown by **Ebrahim et al.** [21], who discovered that 93.2% of Helwan medical students, in Egypt, encountered moderate to high levels of stress, with an average PSS score of 31.76 ± 8.63.

The existing literature presents conflicting results about the correlation between stress and gender. According to the current investigation, female students exhibited substantially greater levels of stress (29.38 ± 5.44) compared to male students (25.05 ± 6.32). Multiple studies have demonstrated a substantial correlation between these characteristics. **Alsaleem et al.** [22] and **Saeed et al.** [23] discovered that female students in Saudi Arabia are more likely to experience perceived stress compared to their male peers. Female students exhibit a higher vulnerability to specific stressors, making them more prone to experiencing depression that is linked to stress [23].

Furthermore, female students frequently encounter a limited number of educational possibilities and leisure activities compared to their male counterparts [24], and they also shoulder greater domestic and parenting duties. Cyclic hormonal changes can also contribute to biological vulnerability to stress [25]. However, other studies have not found a significant relationship between stress and gender [8].

We found non-significant relation between age and PSS. This was in agreement with **Siddiqui et al.** [26] study on Saudi medical student.

This was in contrast to **Al-Shahrani et al.** [19] who found that students younger than 20 has higher stress level than elder students. However, **Murphy et al.** [27] fail to found such relation.

Stress levels between students from different academic year were found to be statistically significant. But our second-year students experienced the highest stress level as it represents the first exposure to the medical curriculum (first year is a preparatory year for all healthcare students conducted in a separate campus and under supervision of non-medical educators). It was consistent with **Sun and Zoriah** (2015) [28].

Academic performance is critical to academic success. Students' GPA is commonly used as an indicator of academic performance [29]. There are conflicting results in the literature regarding the relationship between stress and academic performance. We found a strong negative correlation between students GPA and stress level. This goes on with previous studies conducted in Saudi Arabia [22] and other countries [11].

Excessive stress leads to the release of cortisol, which inhibits memory recovery processes in the hippocampus and amygdala due to complete blocking of glucocorticoid receptors.in addition to increase vulnerability of depression and anxiety, which can hold students back and prevent them from meeting the demands of difficult academic subjects [11].

It is crucial for medical schools to identify potential sources of stress to address them effectively. Unsurprisingly, 70.41% of students identified academic-related stressors (such as tests/examinations, poor marks, large volumes of content to learn, and difficulty understanding the content) as their main source of stress. These were followed by TLRS, DRS, SRS, IRS, and GARS.

Moreover, the study revealed that ACRS are a significant predictor of high stress levels in medical students (B=0.218, p = 0.001). These findings align with other studies on medical student stress in Malaysia [31], Sudan [25], and Nepal [32]. **Siraj et al.** [31] reported that high stress levels in medical students might be due to course workload, lack of free time, insufficient study materials, and frequent exams. Students dissatisfied with their medical studies are less likely to be satisfied with themselves, contributing to stress, anxiety, and depression [21].

Moreover, DRS are significant predictors of high stress among medical students (B=0.478, p = 0.04). DRS can stem from various factors, including reluctance to study medicine, not prioritizing the medical field, following friends into medicine, parental pressure to study medicine, choosing the wrong

profession, and feeling demotivated after learning the realities of the medical field [33].

Although nearly half of the students (48.75%) experience TLRS, it does not significantly predict stress in our study. TLRS encompasses factors such as teachers' ability to instruct and guide students, clarity of learning objectives, and the appropriateness of assigned tasks [33]. This finding suggests that current teaching and learning practices may not be as student-friendly as needed. Therefore, a fundamental change in the curriculum may be necessary.

On studying coping strategies of medical students, about two third of our students used adaptive coping strategies to alleviate the negative effect of stress. Students frequently use problem-focused adaptive coping strategies such as: Active coping, religion, positive re-framing, and planning. One third of students adopt maladaptive coping (emotional-focused). Self-distraction and self-blame were the most frequent maladaptive coping; however, substance use was the least used coping strategy.

It was in agreement with study conduct in Saudi and Jordanian medical students where positive reframing, self-distraction, planning, and acceptance were commonly used by students [10,34]. **Shoda and Titiloye** found that self-distraction, active coping, planning, positive reframing, and acceptance were widely used by students [34].

In the UAE, students adopted various coping strategies such as praying, planning, and learning from experience [16]. Consistent with our findings, many studies have shown that substance use is the least adopted strategy [10,16,34].

Additionally, active coping strategies predicted lower students stress levels. These findings reinforce the need for comprehensive student coping skill training to protect them from stress and its negative consequences.

Limitation of the study:

We cannot generalize our findings as this study involves medical students only. Also, information bias cannot be excluded as data were collected through self-administrated questionnaire that depend up on individual's understating of the questions.

CONCLUSION AND RECOMMENDATIONS

This study document high stress level among medical students, which might have a negative impact on the students' academic performance, psychological well-being, and their professional life latter on. ACRS was the most common source of stress. This high stress level negatively correlates to students GPA, and active coping strategy. These findings raise the possibility of curricular, examination system, and campus environmental difficulties that has a negative effect on their academic performance.

Establishing of an effective student counseling program (academic and psychological) is a corner stone for better mental health of all students. This program should help students learn how to manage stress and to allow early detection of psychiatric disorders. Curriculum modification is necessary to ensure balance between the content, student's assignments and course duration to provide a favourable student friendly environment aiming to alleviate stress. Improving facilities for recreational activities to reduce the psychological distress are highly recommended.

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