Burnout, Stress, and Stimulant Abuse among Medical and Dental Students in the Western Region of Saudi Arabia: An Analytical Study

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Abstract

Background: High levels of burnout, stress, and stimulant abuse have been reported among medical and dental students worldwide, with country-specific factors being contributors. The association, risk factors, and predictors of these three variables have not sufficiently been reported from Saudi Arabia, especially from the Western region.

Objective: To determine the prevalence, association, and predictors of burnout, stress, and stimulant abuse among medical and dental students in the Western region of Saudi Arabia.

Methods: This cross-sectional study included all second to sixth year medical and dental students enrolled at Taibah University, Madinah, Saudi Arabia, during the 2019–2020 academic year. A self-administered, closed online questionnaire was administered. Data regarding stress were elicited using Cohen's 10-item Self-Perceived Stress Scale and regarding burnout using the Oldenburg Burnout Inventory Student Version questionnaire. Multiple logistic regression model to identify the risk of burnout was conducted, and univariate and multiple linear regression models were carried out to identify the predictors of stress.

Results: Of 1016 eligible students, 732 responded (medical: 511; dental: 221). About half of the students experienced burnout (51.5%), with both high disengagement (49%) and exhaustion (45%). Most participants (90.3%) experienced moderate levels of stress. Eight (1.1%) respondents had experienced stimulant abuse; there was a no significant association between stimulant abuse and burnout in the multivariate analysis. Stress, age, gender, body mass index, GPA, study field, smoking, family income, and birth order were significant predictors of burnout, while burnout, age, gender, GPA, and physical exercise were significant predictors of stress.

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Conclusion: The findings in this study highlight the need for policymakers to devise strategies that target early identification as well as reduction of the high levels of burnout and stress.

INTRODUCTION

Burnout, as per the World Health Organization International Classification of Diseases 11th Revision (ICD-11), is "a syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed."[1] Medical students and interns worldwide have higher levels of burnout compared with similarly aged general population.[2,3] A recent quantitative comprehensive review indicates that the prevalence of burnout among medical students is above 30%.[4] Medical undergraduate education is clearly the key contributing factor. In longitudinal studies from the United States, at the time of enrollment at medical schools, students were found to have similar or lower levels of burnout compared with age-matched students pursuing education in other programs; thereafter, there was a downward trajectory in the mental health of medical students relative to those pursuing other programs.[5] Similarly, burnout among students studying dentistry is common worldwide.[6]

Country-specific factors contribute to burnout among medical students.[7] In Saudi Arabia, a few studies have assessed burnout among medical students, with variations in findings. For example, the prevalence of burnout among medical students in Qassim has been found to relatively be lower (8%) than that found among medical students in Dammam (55.5%).[8,9] To the best of the authors' knowledge, there is limited research assessing burnout among medical or dental students from the Western region of Saudi Arabia.

Medical and dental students also often experience high levels of stress, with academic stressors (e.g., academic workload) being the most common sources of stress.[10-12] Other sources of stress include personal issues, work–life balance conflicts, and inadequate time management.[10,12] Stress is a significant problem among students, and it has a negative impact on their academic performance.[13]

Abuse of stimulants is also commonly prevalent among medical students.[14] This practice has an important impact on their clinical practice and training. In addition, substance abuse can cause cognitive and functional impairments,

psychiatric morbidity, and behavioral changes that potentially affect the health and education of students.[15]

There is a lack of research on stimulant abuse and its relationship with burnout and stress among healthcare students in Saudi Arabia. Accordingly, this study was conducted to determine the prevalence, association, and predictors of burnout, stress, and stimulant abuse among medical and dental students in the Western region of Saudi Arabia.

METHODS

Study design, setting, and participants
This was a cross-sectional study conducted at Taibah University, Madinah, Saudi Arabia. All second to sixth year students enrolled in the University's medical ($N = 695$) and dental ($N = 321$) programs during the 2019–20 academic year were eligible; the first year is a foundation year that is not administered by the Colleges of Medicine and Dentistry, and thus they were not included. To avoid exam-related stressors influencing responses, the study was conducted between September 1 and December 8, 2019, which is a nonexam period.

The study was approved by the Research Ethics Committee at Taibah University, Madinah, Saudi Arabia.

Questionnaire and data collection
In this closed online survey, data were collected through Google Forms, using a structured self-administered questionnaire.

Prior to data collection, the authors approached the target students during their compulsory weekly academic activity in-campus to ensure the entire invitation coverage, after a permission was obtained from the administrative team. The research was introduced, and the mechanism of online data collection was explained. A representative from each cohort of students helped in distributing the web address of the questionnaire and a unique access code assigned to each student. The one-time-use code limited the potential repeatability of questionnaire completion. The respondents were informed that answering all questions was mandatory for submitting the response. The questionnaire comprised a cover page that provided the

objectives of the study, the expected time for completing the survey (as determined in the pilot study), and assurances regarding the anonymity and confidentiality of the collected data. The students were also informed of their right of withdrawal from the study at any time without any harm, that data will only be used for this study purpose, and that responding to the questionnaire will be considered as consent for participation in the study. No incentives were provided for participation. To ensure confidentiality, no identifying information were collected.

The questionnaire was in English and composed of the following four sections.

General characteristics

This section elicited data regarding socio-demographic characteristics, academia-related factors, and lifestyle factors. Data concerning socio-demographic characteristics included age, gender, family's monthly income, marital status, father's education, parents' marital status, birth order, body mass index (BMI), and smoking. The academia-related factors included year of study and self-reported Grade Point Average (GPA). The years of study were grouped into two academic levels (Junior: second and third year; Senior: fourth to sixth year). Lifestyle factors included smoking status, physical exercise, tea consumption, coffee consumption, and energy drink consumption. Smoking status was defined as follows: current smoker is any person who smoked regularly in the past month at the time of responding; ex-smoker, who quit smoking at least 1 month prior to the study; and nonsmoker as someone who has never smoked.

Stimulant abuse section

This adaptive section first elicited information regarding the perception of the impact of stimulant abuse on academic performance (scored on a 5-point Likert like scale, ranging from "Strongly disagree" to "Strongly agree") and whether the student had abused stimulants (yes/no). Stimulant abuse in this study was considered as the nonprescribed use of amphetamine, dextroamphetamine, and/or methylphenidate. For students who answered "yes," the following additional data were collected: the lifetime frequency of use, recency of use, reason behind the use, and trial of withdrawal. The trial of withdrawal was considered based on acting on and intention to withdraw.

Stress section

Cohen's 10-item Self-Perceived Stress Scale (PSS) was used to determine data regarding stress in the past 1 month (Cronbach's alpha: 0.82).[16] The PSS was scored on a five-point scale, where 0 = never and 4 = very often.[17]

Burnout section

The English Oldenburg Burnout Inventory (OLBI) was used for assessing burnout. The original OLBI is a 16-item, two-dimension (exhaustion and disengagement) scale that has been validated and found to be reliable tool for assessing work-related burnout.[18,19] This questionnaire had been adapted for students in English (OLBI-student version), and this version was used in the current study.[20] Exhaustion refers to "general feelings of emptiness, overtaxing from work, a strong need for rest, and a state of physical exhaustion," whereas disengagement is defined as "distancing oneself from the object and the content of one's work and to negative, cynical attitudes and behaviors toward one's work in general."[21] OLBI was scored on four-point Likert scale from strongly agree (1) to strongly disagree (4) with a lower final score implying a lower degree of burnout.[21]

Pilot study

A pilot study was conducted over a 2-week period, in which four medical students (two males and two females) from each academic year (i.e., second to sixth; *n* = 20) were invited for participation. Due to challenges at the beginning of the study, the pilot study could not include dental students. Following the online administration of the pilot questionnaire, we estimated the average time for completing the questionnaire, which was 5–10 minutes. The usability and technical functionality of the electronic questionnaire, which was tested at this phase of the study. No changes in the questionnaire were deemed necessary based on the pilot study. The responses obtained during the pilot study were not included in the final analysis.

Data analysis

The data were coded before data entry. The data were entered by exporting from an Excel sheet after converting from the web. Stata software version 13.1 (Stata Corp, College Station, Texas USA) was used for data analysis. The primary outcome was burnout. The burnout score was first calculated separately for the disengagement and exhaustion subscales. Students who scored higher than the average value in both disengagement and exhaustion subscales were considered to have burnout. The second outcome was stress. Scores of 0–13 on the PSS were considered as low stress; 14–26 as moderate stress, and 27–40 as high stress.

All continuous variables were tested for normality using the Shapiro–Wilks test. The mean and standard deviation were calculated for all continuous variables. The bivariate associations between the dependent variable (burnout and stress) and other independent variables were tested using Chi-square test and Fisher's exact test, where applicable.

A multiple logistic regression model was used to identify risk factors of burnout among the study participants. We used a stepwise technique with a *P* value for the entrance of independent covariates set at 0.1, and a *P* value of 0.101 was set as the exit value of the model. The same model was constructed with a locked term "stimulant abuse;" however, all stimulant users experienced burnout, and thus this variable was omitted from the model. We tested the interaction term between age and gender, but there was no significant association. A multiple linear regression model was used to identify predictors of stress among the study participants. We used a stepwise technique with a locked term "stimulant abuse" and a *P* value for the entrance of independent covariates set to 0.1, and a *P* value of 0.101 was set as the exit value of the model. There was collinearity between age and academic level, but we decided to keep age because it is a continuous variable and showed a strong association with the outcome of stress. A *P* value of less than 0.05 with two-tailed probability was considered statistically significant.

RESULTS

A total of 732 of the 1016 eligible students completed the questionnaire (response rate: 72.1%). Of these, 511 students were from the College of Medicine (235 males and 276 females) and 221 from the College of Dentistry (121 males and 100 females).

Burnout and stress levels and their associated factors
More than half (51.5%) of the students experienced burnout, with 48.9% experiencing disengagement and 45.4% experiencing exhaustion. In terms of stress, most participants (90.3%) experienced moderate levels of stress, while 6.6% experienced high stress and 3.1% experienced low stress.

Burnout was significantly associated with having a higher birth order (*P* < 0.001), being unmarried (*P* = 0.02), parents being divorced (*P* = 0.03), and a low family income (*P* < 0.001). There was a significant association between burnout and academic level and GPA: 60.5% of juniors experienced burnout compared with seniors (46.3%) and students with the two extreme GPAs (i.e., <3.0 or >4.0) were more likely to experience burnout. There was a significant association between burnout and being a current smoker (*P* < 0.001) and daily consumption of tea (*P* < 0.001), coffee (*P* < 0.001), and energy drinks (*P* = 0.02). Students who did physical exercise once or twice per week were significantly less likely to experience burnout (*P* < 0.001) [Table 1].

Stimulant abuse
Nearly two-thirds (70.0%) of the students disagreed or strongly disagreed that stimulants are helpful, without a medical prescription, in achieving better grades. Only 8 (1.1%) students had a history of stimulant abuse; seven used amphetamine and one used dextroamphetamine. Half of the stimulant-abusing students had 3–9 episodes of lifetime use. Only 37.5% reported recent use, i.e., "within the last 7 days." Half of the medical and dental students described a need to focus on their studies as the reason behind their lifetime use. Only a quarter of the students mentioned an attempt to quit stimulant use [Table 2].

Association between burnout, stress, and stimulant abuse
There was a significant association between burnout and stimulant abuse, with all the eight students who used stimulants experiencing burnout. Most students with highly positive perception of stimulant abuse reported moderate stress (95.5%) [Table 3].

The association between burnout and stress is presented in Table 4. There was a statistically significant trend in stress levels and burnout, i.e., students with higher stress levels were more likely to experience burnout. A high proportion of students with moderate or high stress were either disengaged or exhausted.

Risk factors of burnout
Stress level, age, gender, study field, GPA, BMI, smoking, family income, and birth order were found to be significantly correlated with burnout in the multiple logistic regression model [Table 5]. After adjusting for all the other variables in the model, the odds of burnout increased by 67.7 folds for students in the high stress level category; 2.7 folds for obese students compared with normal weight students; 2.2 folds for female students compared with males; and 3 folds for medical students compared with dental students. Furthermore, the odds of burnout were decreased by 17% with each additional year of age and by 75% for students with 3–4 GPAs compared with those with GPAs <3. Students with a family income of ≥20,000 Saudi Riyals had lower odds of burnout than those with family income of ≤9999 Saudi Riyals (adjusted odds ratio: 0.32, 95% CI: 0.16–0.64). Students with the birth order of 3rd or higher were 2.6 times more likely to have burnout than students with the birth order of 1st.

Predictors of stress
Burnout, age, gender, GPA, and physical exercise were significant predictors of stress according to the univariate and multiple linear regression models [Table 6]. After

Table 1: Association of burnout with sociodemographic characteristics, academic profile, and lifestyle parameters (N=732)

Theme	Parameter	Academic burnout		P†
		No (*n*=355), *n* (%)	Yes (*n*=377), *n* (%)	
Socio-demographics	Gender			
	Male	218 (61.2)	138 (38.8)	<0.001*
	Female	137 (36.4)	239 (63.6)	
	Birth order			
	First	188 (66.2)	96 (33.8)	<0.001*
	Second	83 (52.2)	76 (47.8)	
	Third or higher	84 (29.1)	205 (70.9)	
	Marital status			
	Unmarried	330 (47.5)	365 (52.5)	0.02*
	Married	25 (67.6)	12 (32.4)	
	Parents' marital status			
	Married	290 (47.8)	317 (52.2)	0.03*
	Widowed	40 (59.7)	27 (40.3)	
	Divorced	13 (33.3)	26 (66.7)	
	Separated	12 (63.2)	7 (36.8)	
	Family income (SR/month)			
	≤9999	16 (17.4)	76 (82.6)	<0.001*
	10,000-14,999	42 (37.8)	69 (62.2)	
	15,000-19,999	119 (56.4)	92 (43.6)	
	≥20,000	178 (56.0)	140 (44.0)	
Academia	Academic level			
	Junior	106 (39.6)	162 (60.5)	<0.001*
	Senior	249 (53.7)	215 (46.3)	
	GPA			
	<3	15 (26.8)	41 (73.2)	<0.001*
	3-4	197 (61.8)	122 (38.2)	
	>4	143 (40.1)	214 (59.9)	
Lifestyle	Smoking status			
	Current smoker	12 (14.6)	70 (85.4)	<0.001*
	Ex-smoker	13 (35.1)	24 (64.9)	
	Nonsmoker	330 (53.8)	283 (46.2)	
	Physical exercise (/week)			
	No	85 (40.7)	124 (59.3)	<0.001*
	Once	162 (53.8)	139 (46.2)	
	Twice	96 (59.3)	66 (40.7)	
	Three or more times	12 (20.0)	48 (80.0)	
	Tea consumption (/day)			
	No	146 (55.1)	119 (44.9)	<0.001*
	Once	95 (37.0)	162 (63.0)	
	More than once	114 (54.3)	96 (45.7)	
	Coffee consumption (/day)			
	No	32 (26.2)	90 (73.8)	<0.001*
	Once	59 (27.4)	156 (72.6)	
	More than once	264 (66.8)	131 (33.2)	
	Energy drinks consumption (/day)			
	No	313 (50.3)	309 (49.7)	0.02*
	Once	38 (41.8)	53 (58.2)	
	More than once	4 (21.1)	15 (79.0)	

*Statistically significant at *P*<0.05, †Chi-squared test. SR - Saudi Riyal; GPA - Grade point average

controlling for the other variables in the regression model, the mean stress score decreased with student's age (adjusted β = −0.29). In addition, females were less likely to experience stress than males (adjusted β = −1.09), while the stress scores among students with GPA <3 (adjusted β = 0.72) and GPA 3–4 (adjusted β = 0.11) were higher than those with GPA 4+. Regular physical activity including twice weekly (adjusted β = 1.23) and thrice or more weekly (adjusted β = 1.51) was independently associated with higher stress scores compared with no physical activity. Students who experienced burnout had higher stress level (adjusted β = 0.28).

DISCUSSION

In the current study, a high prevalence of burnout and stress among medical and dental students were identified. According to our analysis, burnout and stress affect each other, and they can be evolved by some similar factors. In a systematic review and meta-analysis conducted between 2000 and 2017, it was reported that the rates of professional burnout ranged from 7% to 75.2% depending on applied instruments, country-specific factors, and cut-off criteria for burnout symptomatology.[3] In our study, about more

than one half of the sample suffered from burnout. A previous study, from Riyadh, revealed that 13.4% of medical undergraduate students experienced burnout.[22] Another Saudi study conducted in Jazan city demonstrated that the prevalence of burnout was as high as 60.2% among 440 medical students.[23] There is no remarkable variation of burnout dimensions between medical and dental students.[24]

In the present study, few proportion of medical and dental students experienced stimulant abuse. only 1.09% of students were stimulant abusers, which is optimistically low and far behind from an earlier study in the U.S. among 7000 undergraduate general students at nine faculties where 11.2% abused stimulants.[25] The high use of stimulant among college students might be because of a snowballing effect in college students, i.e., general youth students are engaged in risky behaviors when in peer groups than alone.[26] However, our students' perception was deemed to be at great level, as 70% of our students perceived that stimulant abuse negatively impacts on the academic performance, whereas only 33% of general college students have this belief.[25] The low level of stimulant abuse among our sample could also be because of the religious and spiritual emphasis of Madinah City.

Despite the religious and legal prohibitions of illegal drugs in Saudi Arabia, 9% of secondary school students in Saudi Arabia report they have used illegal drugs; nearly half of them have used a stimulant.[27] However, locally, there is a limited information available about the severity of this issue. Concerning the beliefs and attitude towards stimulant use without prescription and its impact on the academic performance, we found that 10.8% of the students believed that stimulants used without prescription can enhance the academic performance, and 19.4% were neutral towards this statement. This common belief constitutes the most common cognitive factor for stimulant abuse among students and the strongest predictor of the student's intention to the abuse.[28,29]

Regular use of illegal substances by students may be a symptom of a specific illness (physical or psychological) that could harm their mental health and, as a result, increase their risk for burnout. The abuse of stimulants and stress among students were found to be significantly correlated in a number of previous research.[30,31] However, the use of illicit drugs did not appear to be associated with burnout in our study as well as in other studies conducted in Hong Kong and the Middle East region.[32,33] Nevertheless, all stimulant abusers in our study experienced burnout.

Burnout is influenced by many factors. Data analysis of 440 medical students showed that younger age, female gender, and having better burnout knowledge were determinants for significant higher burnout among students.[23] In our study, burnout was predicted by high levels of stress, younger age, gender, medical college, low GPA, being obese, smoking status, family income, and high birth order. Females scored significantly higher than males—they were twice as likely to experience burnout than males. These findings are consistent with similar studies.[22,34] According to our study, students with a higher birth order were more likely to experience burnout and this may be due to socio-cultural characteristics. For instance, first members of the family may have received more attention and care from parents compared with the last ones.

Table 2: Stimulant abuse among the participants (*N*=732)

Item	Category	*n* (%)
Nonprescribed use of stimulants will help in achieving better grades	Strongly disagree	88 (12.2)
	Disagree	423 (57.8)
	Neutral	142 (19.4)
	Agree	57 (7.8)
	Strongly agree	22 (3.0)
Stimulant abuse	Yes	8 (1.1)
	No	724 (98.9)
Lifetime frequency of use (*n*=8)	Once or twice	2 (25.0)
	3-9	4 (50.0)
	10+	2 (25.0)
Recency of use (*n*=8)	Within the last 7 days	3 (37.5)
	A week to 1 month ago	3 (37.5)
	More than a month ago	2 (25.0)
Reason behind the use (*n*=8)	For study	4 (50.0)
	Other than study	4 (50.0)
Trial of withdrawal (*n*=8)	No	6 (75.0)
	Yes	2 (25.0)

Table 3: Association of burnout and stress with stimulant abuse (*N*=732)

Parameter	Unit	Burnout			Stress			
		No, *n* (%)	Yes, *n* (%)	P	Low, *n* (%)	Moderate, *n* (%)	High, *n* (%)	P
Nonprescribed use of stimulants will help in achieving better grades	Strongly disagree	23 (26.1)	65 (73.9)	<0.001*,†	4 (4.6)	76 (86.4)	8 (9.1)	<0.001*,‡
	Disagree	296 (70.0)	127 (30.0)		14 (3.3)	397 (93.9)	12 (2.8)	
	Neutral	27 (19.0)	115 (81.0)		3 (2.1)	120 (84.5)	19 (13.4)	
	Agree	4 (7.0)	53 (93.0)		2 (3.5)	47 (82.5)	8 (14.0)	
	Strongly agree	5 (22.7)	17 (77.3)		0	21 (95.5)	1 (4.6)	
Stimulant abuse	Yes	0	8 (100.0)	0.006*,‡	1 (12.5)	6 (75.0)	1 (12.5)	0.11‡
	No	355 (49.0)	369 (51.0)		22 (3.0)	655 (90.5)	47 (6.5)	

*Statistically significant at *P*<0.05, †Chi-squared test, ‡Fisher's exact test

Along with stress, depression and burnout are substantially correlated.[35] The symptoms of depression and burnout may worsen during medical school.[36] A study from Makkah found that 55.8% of medical students had depressive symptoms.[37] This highlights the high prevalence of depression in this particular group, who may avoid seeking mental health treatment out of concern for exposure

and stigma, and to overcome depression, sometimes students use stimulant substances. In our study, we did not investigate the factor of depression as one of the potential correlates of burnout and stimulant abuse.

Most medical schools in Saudi Arabia are currently updating their curricula to reflect the most well-known global trends in medical education. The curriculum for medical schools should be aligned with the requirements for community health.[38] The majority of Saudi Arabia's historic medical institutions have already embraced integrated, problem-based, and community-oriented curricula.[39] In addition, finance is one of the major factor for stress in developing countries; but in case of Saudi Arabia, it is of less concern as the majority of medical students enjoy generally healthy lives.[40]

To manage stress and burnout, a number of solutions have been suggested. Students can adjust by using strategies that include engagement processes like problem solving, constructive reflection, and emotional expression.[41-43] Extracurricular activities such as physical

Table 4: Association between burnout and stress (*N*=732)

Stress level	Overall burnout		P†
	No (*n*=355), *n* (%)	Yes (*n*=377), *n* (%)	
Low stress	16 (69.6)	7 (30.4)	<0.001*
Moderate stress	337 (51.0)	324 (49.0)	
High stress	2 (4.2)	46 (95.8)	
Stress Level	**Exhaustion**		**P†**
	No (*n*=400), *n* (%)	Yes (*n*=332), *n* (%)	
Low stress	19 (4.8)	4 (1.2)	<0.001*
Moderate stress	375 (93.8)	286 (86.1)	
High stress	6 (1.5)	42 (12.7)	
Stress Level	**Disengagement**		**P†**
	No (*n*=374), *n* (%)	Yes (*n*=358), *n* (%)	
Low stress	14 (3.7)	9 (2.5)	<0.001*
Moderate stress	357 (95.5)	304 (84.9)	
High stress	3 (0.8)	45 (12.6)	

*Statistically significant at *P*<0.05, †Chi-squared test

Table 5: Multiple logistic regression model of predictors of burnout (*N*=732)

Variable	OR (95% CI)	P	AOR (95% CI)	P
Stress				
Low stress	Reference		Reference	
Moderate stress	2.19 (0.89-5.41)	0.08	2.99 (1.02-8.79)	0.04*
High stress	52.57 (9.88-279.62)	<0.001*	67.67 (10.99-416.68)	<0.001*
Age	0.79 (0.73-0.88)	<0.001*	0.83 (0.73-0.94)	0.003*
Gender				
Male	Reference		Reference	
Female	2.76 (2.04-3.72)	<0.001*	2.15 (1.43-3.24)	<0.001*
College				
Dental	Reference		Reference	
Medical	3.37 (2.76-5.45)	<0.001*	3.04 (1.95-4.74)	<0.001*
GPA				
<3	Reference		Reference	
3-4	0.23 (0.12-0.43)	<0.001*	0.25 (0.12-0.54)	<0.001*
>4	0.55 (0.29-1.03)	0.06	0.58 (0.27-1.23)	0.15
BMI				
Normal	Reference		Reference	
Overweight	0.76 (0.55-1.04)	0.09	0.88 (0.59-1.33)	0.55
Obese	5.35 (2.74-10.47)	<0.001*	2.66 (1.19-5.91)	0.02*
Smoking				
Current smokers	Reference		Reference	
Ex-smokers	0.32 (0.13-0.79)	0.01*	0.35 (0.12-1.03)	0.06
Nonsmokers	0.15 (0.08-0.28)	<0.001*	0.15 (0.07-0.33)	<0.001*
Family income (SR/month)				
≤9999	Reference		Reference	
10,000-14,999	0.35 (0.18-0.67)	0.002*	0.43 (0.19-0.92)	0.03*
15,000-19,999	0.16 (0.09-0.29)	<0.001*	0.31 (0.15-0.63)	0.001*
≥20,000	0.17 (0.09-0.29)	<0.001*	0.32 (0.16-0.64)	0.01*
Birth order				
1st	Reference		Reference	
2nd	1.79 (1.21-2.67)	0.004*	1.74 (1.07-2.81)	0.02*
3rd+	4.78 (3.36-6.81)	<0.001*	2.63 (1.68-4.12)	<0.001*

*Statistically significant at *P*<0.05. OR - Odds ratio; AOR - Adjusted odds ratio; CI - Confidence interval; GPA - Grade point average; BMI - Body mass index; SR - Saudi Riyal

Table 6: Multiple linear regression model of predictors of stress (*N*=732)

Variable	β (95% CI)	P	Adjusted β (95% CI)	P
Stimulant abuse				
No	Reference		Reference	
Yes	1.97 (−0.76-4.71)	0.15	0.56 (−1.79-2.89)	0.64
Burnout				
No	Reference		Reference	
Yes	3.30 (2.79-3.82)	<0.001*	0.28 (0.25-0.32)	<0.001*
Age	−0.29 (−0.47-−0.12)	0.001*	−0.29 (−0.54-−0.05)	0.02*
Gender				
Male	Reference		Reference	
Female	−0.12 (−0.69-0.45)	0.66	−1.09 (−1.62-−0.57)	<0.001*
GPA				
>4	Reference		Reference	
<3	−0.97 (−2.09-0.14)	0.08	0.72 (0.19-1.24)	0.007*
3-4	−1.19 (−2.29-−0.09)	0.03*	0.11 (−0.86-1.08)	0.82
Physical exercise				
None	Reference		Reference	
Once/week	−0.17 (−0.86-0.51)	0.62	0.34 (−0.25-0.93)	0.26
Twice/week	−0.17 (−0.98-0.63)	0.67	1.23 (0.53-1.92)	0.001*
More than twice/week	1.62 (0.49-2.74)	0.005*	1.51 (0.53-2.48)	0.002*

*Statistically significant at *P*<0.05. β - Beta coefficient; CI - Confidence interval; GPA - Grade point average

exercise have been associated with lower stress and burnout levels.[42] Nevertheless, our study showed a paradoxical association between physical exercise and stress, where more frequent exercise was independently associated with higher levels of stress. Some of the reasons to explain this paradoxical finding in our study is that stress may be perceived as a normal component of the medical student's life.[44] On the other hand, intense physical activity may constitute a coping strategy for students who perceive higher levels of stress.

Limitations

This was a single-center study, and thus its findings cannot be generalized to other regions and universities of Saudi Arabia. In addition, the inherent limitations of a cross-sectional, self-reported study design are applicable, including that causality cannot be determined and that there is a risk of recall/response bias. Further, the potential confounding effect of depression and anxiety was not accounted for while evaluating the determinants of burnout. The study also did not assess the bidirectionality between burnout and stress and stimulant abuse. The number of participants who reported stimulant abuse was low, which compromised both the internal and external validity of its association with burnout and stress. Different identification methods of stimulant-abusing medical and dental students can be used in future studies to obtain larger samples to study the association. Finally, alcohol consumption or other drugs/sedatives were not considered for this study; however, this was done to avoid information bias, notably social desirability bias, given that these are strictly prohibited in Saudi Arabia and its consumption have severe penalties.

CONCLUSION

High levels of burnout and stress were evident among medical and dental students in this study, with no correlation between burnout and stimulant abuse. However, all students who report abusing stimulants experience burnout. These findings highlight the need for policymakers to devise strategies with remedial measures and for the early identification of students experiencing burnout and stress. There is also a need for future mixed methods studies that can explore the important causes of stress and burnout through qualitative studies including focus group discussions and/or in-depth interviews.

Ethical consideration
The study was conducted in accordance with the Declaration of Helsinki. The study was approved by the Research Ethics Committee at Taibah University, Madinah,

Saudi Arabia (Study reference no. TUCDREC/20181219/ Bahlaq; Date of approval: 23/12/2018).

Data availability statement
The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

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Conflicts of interest
There are no conflicts of interest.

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