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Academic burnout and its association with psychological factors among medical students in Guangxi, China

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Abstract:

BACKGROUND: Academic burnout is prevalent among medical students and is directly related to psychological distress. However, little is known about academic burnout among medical students in Guangxi and its associations with psychological health. This study aimed to determine the associations between psychological factors and academic burnout among medical students.

MATERIALS AND METHODS: A cross-sectional study was conducted among 1067 medical students at Guangxi Medical University from November 2023 to April 2024, with a stratified sampling method. Data were collected using web-based online software. Hierarchical linear regression analyses were used to examine the association between psychological factors and academic burnout.

RESULTS: Most of the students were female (55.3%), with a mean age of 20.6 years (SD = 1.4), and the mean overall academic burnout (OAB) was 57.3 (SD = 9.3). More than half (53.1%) reported a learning duration of 8 hours or more per day, and 66.2% reported sufficient reward promotion. Perceived stress was positively associated with OAB ($\beta = 0.203$, $P < 0.001$), whereas self-efficacy and self-esteem were negatively associated with OAB ($\beta = -0.598$, $P < 0.001$ for self-efficacy; $\beta = -0.192$, $P < 0.001$ for self-esteem), after adjusting for all predictors.

CONCLUSION: Academic burnout was influenced by psychological factors such as perceived stress, self-efficacy, and self-esteem. Thus, consideration of these factors could be useful to identify medical students who are susceptible to burnout and poor mental health and design appropriate interventions or university strategies of learning motivation and educational environment to reduce and prevent burnout in this population.

Keywords:

Burnout, medical students, psychological, self-efficacy, self-esteem, stress

Introduction

Academic burnout is a syndrome of emotional exhaustion, depersonalization, and a low sense of personal accomplishment, caused by learning pressure or a lack of interest in learning.[1] Medical students are more likely than other students to experience academic burnout. It is prevalent from the outset of medical training, with multi-institutional studies indicating that at least 50% of medical students may meet burnout criteria at some point during their studies.[2,3]

Because medicine is a profession with high occupational requirements, medical students must study for a longer year than other disciplines due to course content and a heavy study load. Additionally, medical students live in a test-oriented education system, which makes learning itself a vast source of pressure, so they are more prone to academic burnout.[4,5]

Burnout in medical schools can negatively impact students' academic development and overall wellbeing. Burnout syndrome may significantly affect the learning capabilities of medical students, causing physical

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and psychological disturbances such as insomnia, weakness, stress, depression, and low self-esteem and self-efficacy.[2,6] Psychological factors crucially influence students' academic performance and burnout. Some studies have suggested that those experiencing poorer mental health overall were also more likely to experience burnout.[2,7] Academic burnout impacts the quality of medical services. Additionally, it damages the professional development of medical students, weakens their personal and professional qualities, and leads to increased medical errors, lower quality of patient care, and lower patient satisfaction.[8]

In China, medical undergraduates must undertake 8 years of training before beginning practice at a healthcare institution: 5 years of school study and 3 years of standardized residency training. Thus, medical students face heavy learning tasks and psychological pressure, which makes them prone to the risk of burnout.[9] A systematic survey showed that 38.1%–53.8% of medical students had a burnout level higher than average.[10] In Guangxi, China, previous studies have revealed that around 46.7% of medical students experienced academic burnout and 48.33% had potential burnout.[11] Additionally, evidence has shown that students in Guangxi who experienced academic pressure (e.g., lack of leisure time, too many obligations or responsibilities, heavy extracurricular activities, and lack of time for sleep) had higher levels of emotional exhaustion. Consequently, they may be more likely to experience academic burnout and psychological problems.[12] Although academic burnout has been reported in other areas of China, evidence suggests that its observed incidence among medical students depends on the sociocultural context and the tools used to measure burnout.[2,10] Furthermore, the Chinese government is concerned about college students' learning burnout problem and has taken measures to cope with this problem. For example, the special actions plan for strengthening and improving students' mental health in the new era (2023–2025). This plan aims to educate and manage students' mental health and improve the school environment for learning.[2,10] Also, academic burnout can have serious implications for students' wellbeing and academic performance, and it may also impact their mental health.[2,7] Therefore, it is necessary to pay attention to the academic burnout issue.

Despite the recognition of academic burnout among medical students, limited research on it exists in Guangxi, particularly concerning its association with psychological factors.[11-14]

Moreover, medical students are in a critical period of physical and mental development while learning knowledge and skills. Given that most medical students will inevitably become doctors and specialize in a particular profession, as a result, they experience more mental stress and academic pressure than other college students. Also, it may lead them face more burnout.[10,12] Therefore, identifying the factors that lead to burnout in medical students is crucial. This study aimed to examine academic burnout and its relationship with psychological factors among medical students. We hypothesized that academic burnout is influenced by study-related organizational factors and psychological factors. Insights gained from this study will provide a better understanding of academic burnout and can enable us to identify students who are at risk of burnout and psychological distress as well as develop possible evidence-based interventions to prevent it and improve psychological health among medical students.

Materials and Methods

Study design and setting

A cross-sectional was conducted from November 2023 to April 2024 among medical students at Guangxi Medical University, China.

Study participants and sampling

Eligible participants were (a) medical students aged 18–25 years who studied in the three majors of clinical medicine, order-oriented medicine, or preventive medicine; (b) those with no reported communication or mental health problems; and (c) those who were willing to participate. Individuals who provided incomplete responses were excluded. The sample size estimation was calculated using Daniel's formula $' = \frac{NZ_{/2}P(1\ P)}{d^2(N-1) + Z_{/2}{}^2P(1-P)}$,[15] with an estimator of the proportion of burnout among medical students (46.65%) reported by Lu[11]; with 95% confidence intervals and an expected precision of 3%, the minimum sample size was 960 students plus 10% for nonresponse adjustment, which equaled 1067 students. The stratified sampling technique was used to enroll the students who met the eligible criteria. First, we divided them into three strata as three majors. Second, in each stratum, students were selected as participants using the lottery method from each major and excluded if they were absent or unwilling to participate.

Data collection tool and technique

Theoretical framework

The theoretical framework used to guide this study is the social exchange theory (SE), which has been widely used in burnout research. This theory considers that burnout occurs when the students feel that their contributions and efforts are not equally valued in relation to the outcomes of their work.[1,10] Students may exhibit fatigue when students' resources, interests, and abilities conflict with expectations and demands. If this imbalance persists over

time, burnout eventually sets in.[1,2] The SE model social exchange model includes three levels of social exchange with recipients, colleagues, and the organization as a whole. It provides a perspective to analyze the phenomenon of learning burnout. By focusing on the exchange relationship at the individual, psychological, and organizational levels, we can better understand the causes of students' learning burnout.[3,10,16]

Predictor variables

A self-administered questionnaire based on online software was developed based on the literature review and consisted of three parts.

Part 1: Sociodemographic and organizational factors. The sociodemographic variables included gender, place of residence, parents' educational backgrounds, and monthly family income. All variables were categorized, except for age, grade point average (GPA), and college entrance examination score (CES), which were continuous. The organizational variables included learning duration and reward promotion (e.g., academic outcomes or personal achievement/satisfaction as reward), which were categorized as dichotomous.

Part 2: Psychological factors, composed of self-efficacy, perceived stress, and self-esteem.

Self-efficacy: The questionnaire developed by Liang[17] was used to measure learning self-efficacy. The scale consists of two independent dimensions: learning ability efficacy and learning behavior efficacy, rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). A higher total score indicates higher self-efficacy (Cronbach's alpha was 0.91, indicating good internal consistency).

Perceived stress: The Chinese Perceived Stress Scale (CPSS), translated and validated by Yang and Huang[18] and Cohen *et al*.[19] was used to assess perceived psychological stress. This is a 14-item scale with two dimensions: tension and loss of control. The CPSS is rated on a 4-point Likert scale, ranging from 1 (almost never) to 4 (usually). Higher scores indicate a greater level of perceived stress (Cronbach's alpha was 0.82, indicating good internal consistency).

Self-esteem: Self-esteem was measured using the Rosenberg Unidimensional Self-esteem Scale, the most widely used scale to measure this for individuals.[20] It has shown good reliability and validity in empirical studies related to medical students in China.[21] This is a 10-item scale rated on a 4-point Likert scale, ranging from 1 (strongly disagree) to 4 (strongly agree). Higher scores indicate higher self-esteem (Cronbach's alpha was 0.78, indicating good internal consistency).

Outcome variables

Part 3: The primary outcome of this study was academic burnout. The Chinese College Student Academic Burnout Scale, developed by Lian *et al*.[22] based on the classic Maslach Burnout Scale (MBI), was used to measure academic burnout. The scale includes three dimensions: low mood (LM), improper behavior (IB), and low sense of achievement (LA). It is rated on a 5-point Likert scale, ranging from 1 (completely inconsistent) to 5 (completely consistent). The total score reflects the degree of academic burnout of students, with higher scores indicating a higher degree of academic burnout (Cronbach's alpha was 0.81, indicating good internal consistency).

Data analysis

Descriptive statistics were performed for all variables. The normality of the data was analyzed using the Kolmogorov–Smirnov test. All the continuous variables were normally distributed. To examine correlations, we applied pointbiserial for the gender, place of residence, learning duration, and reward promotion variables; polyserial correlation for the parents' educational backgrounds and monthly family income variables; and Pearson's correlation for all other variables. Variables that were statistically significant in the bivariate analysis were included in the multivariate analysis. Hierarchical linear regression analyses were performed to assess the association between potential predictors such as sociodemographic, organizational, and psychological variables and academic burnout, after adjusting for all other predictors. In Model 1, sociodemographic and organizational variables were added; in Model 2 (the final model), psychological factors were put into Model 1. All analyses were conducted using SPSS version 23.0 (IBM Corp., Armonk, NY, USA). The level of significance was set at $P < 0.05$.

Ethical consideration

After providing them with the research information, all participants then provided written informed consent, and a self-reported questionnaire was administered to the students for data gathering. This study (project ID. 6809007/2568) was approved by the Ethics Committee for Research Involving Human Subjects at Mahasarakham University (ref. no. 406-364/2023).

Results

Sample characteristics

Most participants (55.3%) were female, with a mean age of 20.6 years (SD = 1.4). Their mean GPA and CES were 2.9 (SD = 0.6) and 556.5 (SD = 39.5), respectively. Approximately 62.9% of participants resided in rural areas, around 62.8% of fathers and 70.4% of mothers had completed junior high school or lower, and 53.3% of participants had a monthly family income of less

than 5000 CNY. Over half (53.1%) reported a learning duration of 8 hours or more per day, and 66.2% had sufficient reward. The mean scores for self-efficacy, perceived stress, and self-esteem were 73.1 (SD = 10.9), 32.3 (SD = 6.7), and 32.2 (SD = 4.5), respectively. The mean scores for overall academic burnout (OAB), LM, IB, and LA were 57.3 (SD = 9.3), 23.7 (SD = 5.2), 17.6 (SD = 3.5), and 15.9 (SD = 3.3), respectively [Table 1].

Bivariate correlations

Table 2 shows that higher learning duration and perceived stress were positively correlated with OAB and all dimensions ($P < 0.05$), whereas high levels of monthly family income, GPA, CES, reward promotion, self-efficacy, and self-esteem were significantly negatively correlated with OAB and all other dimensions ($P < 0.05$).

Table 1: Distribution of sociodemographic, psychological, organization, and academic burnout factors of the participants

Variables	Total (*n*=1067)	
	Number	Percentage
Sociodemographic factors		
Gender		
Male	477	44.7
Female	590	55.3
Place of residence		
Urban	396	37.1
Rural	671	62.9
Monthly family income (CNY)		
<5000	569	53.3
5000-10000	404	37.9
>10000	94	8.8
Father's education background		
Junior high school or lower	670	62.8
Senior high school	250	23.4
Junior college or higher	147	13.8
Mother's education background		
Junior high school or lower	752	70.4
Senior high school	205	19.2
Junior college or higher	110	10.4
Organizational factors		
Learning duration (hour/day)		
<8	500	46.9
≥8	567	53.1
Reward promotion		
Insufficient reward	361	33.8
Sufficient reward	706	66.2
	Mean	SD
Age (y)	20.6	1.4
GPA	2.9	0.6
College entrance examination score (CES)	556.5	39.5
Psychological factors		
Self-efficacy	73.1	10.9
Perceived stress	32.3	6.7
Self-esteem	32.2	4.5
Academic burnout		
Overall academic burnout (OAB)	57.3	9.3
Low mood dimension (LM)	23.7	5.2
Improper behavior dimension (IB)	17.6	3.5
Low achievement (LA)	15.9	3.3

Standard deviation, SD; Chinese Yuan, CNY; Grade point average, GPA

Associations of psychological factors with academic burnout

In the hierarchical linear regression analysis for OAB and three dimensions, Model 1 revealed that learning duration was strongly positively associated with OAB and all dimensions ($P < 0.05$). In contrast, GPA and reward promotion were independently and negatively associated with OAB and all dimensions ($P < 0.05$), after controlling for all other predictors [Table 3]. In Model 2, after adding psychological factors, perceived stress was positively associated with OAB ($\beta = 0.203$, $P < 0.001$), LM ($\beta = 0.335$, $P < 0.001$), IB ($\beta = 0.149$, $P < 0.001$), and LA ($\beta = 0.107$, $P < 0.001$). Self-efficacy and self-esteem were negatively associated with OAB ($\beta = -0.598$, $P < 0.001$ for self-efficacy; $\beta = -0.192$, $P < 0.001$ for self-esteem), LM ($\beta = -0.114$, $P < 0.001$ for self-efficacy; $\beta = -0.103$, $P < 0.001$ for self-esteem), IB ($\beta = -0.141$, $P < 0.001$ for self-efficacy; $\beta = -0.107$, $P < 0.001$ for self-esteem), and LA ($\beta = -0.118$, $P < 0.001$ for self-efficacy; $\beta = -0.102$, $P = 0.001$ for self-esteem), after adjusting for all predictors. GPA, learning duration, and reward promotion remained significantly associated with OAB and all dimensions, identical to those in Model 1 [Table 4].

Discussion

This study revealed that higher levels of academic burnout were associated with negative psychological outcomes, including low self-efficacy and self-esteem and higher perceived stress. The results demonstrated a strong association between low self-efficacy and greater levels of OAB as well as all aspects (LM, IB, and LA). Consistent with previous studies, poor self-efficacy could predict an increase in burnout.[14,17,23-27] One explanation for this is that individuals with low self-efficacy cannot manage failure, cope with problems emotionally, are helpless in the face of pressure, and lack confidence in their learning ability. These may affect their learning enthusiasm, with failure to reach expected learning goals and lack of achievement, and ultimately contribute to academic burnout.[25-27]

Our results also showed that higher perceived stress was positively associated with more OAB and all domains. This finding is consistent with previous research, which has suggested that heightened levels of stress and poor coping strategies may be key contributors to the development of burnout.[8,9,18,25,28-30] Excessive stress can lead to irritability, nervous breakdowns, low mood, a lack of spirit, difficulty concentrating, and poor learning efficiency.[27,29] For many students, stress arouses

Table 2: Correlation between selected variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Age	1																
2. Gender	-0.020	1															
3. Place of residence	0.030	0.033	1														
4. Monthly family income	-0.085	-0.024	-0.314**	1													
5. Father's education backgrounds	-0.095	-0.037	-0.394**	0.318**	1												
6. Mother's education backgrounds	-0.067	-0.067*	-0.405**	0.322**	0.682**	1											
7. Learning duration	-0.002	0.116**	-0.062*	0.056	0.098**	0.073*	1										
8. Reward promotion	-0.067	0.008	0.008	0.022	0.011	-0.001	0.125**	1									
9. GPA	-0.085	0.200**	-0.077*	0.104**	0.045	0.028	0.095**	0.044	1								
10. CES	0.042	-0.026	-0.186**	0.151**	0.081**	0.095**	0.011	-0.044	0.376**	1							
11. Self-efficacy	-0.034	-0.008	-0.115**	0.115**	0.124**	0.125**	0.155**	0.180**	0.139**	0.071*	1						
12. Perceived stress	-0.108	0.003	-0.082**	0.079**	0.077*	0.070*	0.072*	0.066*	0.042	0.076*	-0.324**	1					
13. Self-esteem	-0.057	0.080**	-0.116**	0.119**	0.088**	0.070*	0.056	0.152**	0.143**	0.033*	0.343**	-0.007	1				
14. OAB	0.052	-0.062*	0.107**	-0.104**	-0.061*	-0.035	0.208**	-0.235**	-0.227**	-0.059*	-0.604**	0.020*	-0.342**	1			
15. LM	0.058	-0.095**	0.047	-0.069*	0.056	0.022	0.146**	-0.171**	-0.177**	-0.039*	-0.276**	0.174**	-0.252**	0.852**	1		
16. IB	0.024	-0.064*	0.099**	-0.111**	-0.058	-0.041	0.221**	-0.180**	-0.241**	-0.030*	-0.476**	0.018*	-0.306**	0.837**	0.607**	1	
17. LA	0.029	0.040	0.123**	-0.069*	-0.109**	-0.089**	0.124**	-0.203**	-0.106**	-0.072*	-0.758**	0.307**	-0.247**	0.601**	0.199**	0.354**	1

Grade point average, GPA; College entrance examination score, CES; Overall academic burnout, OAB; Low mood, LM; Improper behavior, IB; Low achievement, LA. *P<0.05; **P<0.01; ***P<0.001. Gender (1=male, 2=female); Place of residence (1=urban, 2=rural); Monthly family income (1=less than 5000, 2 =5000-10000, 3=more than 10000); Father's education backgrounds (1=Junior high school or lower, 2=Senior high school, 3=Junior college or higher)

Table 3: Hierarchical multiple linear regression for academic burnout in medical students (model 1)

Variables	Model 1															
	Overall academic burnout				Low mood				Improper behavior				Low sense of achievement			
	B	SE	β	*P*	*B*	SE	β	*P*	*B*	SE	β	*P*	*B*	SE	β	*P*
Gender	-0.239	0.563	-0.013	0.671	-0.565	0.323	-0.054	0.080	-0.600	0.211	-0.062	0.778	0.385	0.209	0.097	0.065
Place of residence	1.394	0.636	0.172	0.029	0.394	0.365	0.137	0.280	0.467	0.239	0.165	0.051	0.532	0.236	0.177	0.024
Monthly family income	-0.674	0.455	-0.047	0.139	-0.373	0.261	-0.047	0.154	-0.287	0.171	-0.053	0.094	-0.025	0.169	-0.013	0.930
Father's education backgrounds	-0.342	0.522	-0.126	0.513	0.122	0.299	0.103	0.943	-0.166	0.196	-0.094	0.738	-0.298	0.193	-0.164	0.124
Mother's education backgrounds	0.448	0.572	0.132	0.434	0.373	0.328	0.148	0.255	0.282	0.215	0.116	0.703	-0.207	0.212	-0.101	0.972
Learning duration	3.243	0.637	0.151	<0.001	1.213	0.365	0.102	0.001	1.348	0.239	0.168	<0.001	0.682	0.236	0.088	0.004
Reward promotion	-4.154	0.574	-0.211	<0.001	-1.673	0.329	-0.153	<0.001	-1.088	0.216	-0.148	<0.001	-1.393	0.213	-0.197	<0.001
GPA	-2.913	0.471	-0.199	<0.001	-1.265	0.270	-0.156	<0.001	-1.282	0.177	-0.235	<0.001	-0.365	0.175	-0.070	0.037
CES	-0.006	0.008	-0.025	0.427	-0.003	0.004	-0.021	0.525	-0.007	0.003	-0.076	0.119	-0.003	0.003	-0.040	0.221
	$R^2_{\text{Overall academic burnout}}$=0.139, F=18.489, P<0.001				$R^2_{\text{Low mood}}$=0.080, F=9.970, P<0.001				$R^2_{\text{Improper behavior}}$=0.130, F=17.176, P<0.001				$R^2_{\text{Low sense of achievement}}$=0.081, F=10.187, P<0.001			

Grade point average, GPA; College entrance examination score, CES. B, unstandardized coefficients; SE, standard error; β, standardized coefficients; *P*, *P*-value

Table 4: Hierarchical multiple linear regression for academic burnout in medical students (model 2)

Variables	Model 2 (final model)															
	Overall academic burnout				Low mood				Improper behavior				Low sense of achievement			
	B	SE	β	*P*	*B*	SE	β	*P*	*B*	SE	β	*P*	*B*	SE	β	*P*
Gender	-0.637	0.454	-0.034	0.161	-0.648	0.300	-0.163	0.231	-0.138	0.192	-0.120	0.472	0.150	0.142	0.092	0.292
Place of residence	0.786	0.514	0.410	0.126	0.194	0.340	0.018	0.568	0.343	0.217	0.147	0.114	0.249	0.161	0.136	0.122
Monthly family income	-0.108	0.368	-0.088	0.769	-0.154	0.243	-0.109	0.526	-0.139	0.156	-0.126	0.371	0.186	0.115	0.113	0.107
Father's education backgrounds	-0.140	0.422	-0.081	0.740	-0.015	0.279	-0.002	0.956	0.317	0.179	0.003	0.124	-0.142	0.132	-0.080	0.284
Mother's education backgrounds	0.586	0.471	0.421	0.214	0.352	0.312	0.144	0.259	0.521	0.199	0.022	0.145	0.114	0.148	0.072	0.440
Learning duration	1.800	0.518	0.184	0.001	0.985	0.343	0.830	0.004	0.938	0.219	0.116	<0.001	0.123	0.162	0.116	0.004
Reward promotion	-2.059	0.469	-0.106	<0.001	-1.072	0.310	-0.099	0.001	-0.485	0.198	-0.166	0.014	-0.502	0.147	-0.271	0.001
GPA	-1.648	0.380	-0.114	<0.001	-0.752	0.251	-0.193	0.003	-0.914	0.161	-0.168	<0.001	-0.118	0.119	-0.013	0.008
CES	-0.080	0.006	-0.035	0.170	-0.040	0.004	-0.030	0.334	-0.097	0.003	-0.085	0.104	-0.053	0.002	-0.036	0.108
Self-efficacy	-0.507	0.023	-0.598	<0.001	-0.147	0.015	-0.114	<0.001	-0.440	0.010	-0.141	<0.001	-0.219	0.007	-0.118	<0.001
Perceived stress	0.306	0.037	0.203	<0.001	0.279	0.025	0.335	<0.001	0.185	0.016	0.149	<0.001	0.158	0.012	0.107	<0.001
Self-esteem	-0.189	0.053	-0.192	<0.001	-0.118	0.035	-0.103	<0.001	-0.183	0.022	-0.107	<0.001	-0.131	0.016	-0.102	0.001
	$R^2_{\text{Overall academic burnout}}$=0.467, R^2 Change $_{\text{Overall academic burnout}}$=0.328, F=71.556, P<0.001				$R^2_{\text{Low mood}}$=0.241, R^2 Change $_{\text{Low mood}}$=0.161, F=25.874, P<0.001				$R^2_{\text{Improper behavior}}$=0.326, R^2 Change $_{\text{Improper behavior}}$=0.196, F=39.433, P<0.001				$R^2_{\text{Low sense of achievement}}$=0.598, R^2 Change $_{\text{Low sense of achievement}}$=0.517, F=121.432, P<0.001			

Grade point average, GPA; College entrance examination score, CES. B, unstandardized coefficients; SE, standard error; β, standardized coefficients; *P*, *P*

feelings of fear, incompetence, uselessness, anger, and guilt, which eventually result in academic burnout and serious contemplation of leaving study.[8,9] Also, when individuals feel stressed due to a perceived loss or lack of resources, such as time, effort, or desired outcomes in their academic pursuits, it may contribute to burnout.[9,18]

Our findings showed a negative association between self-esteem and OAB in all its aspects. This is consistent with prior research indicating that lower self-esteem significantly and negatively predicts academic burnout. Individuals with low self-esteem tend to lack good motivation to learn, thus exhibiting more academic burnout.[5,21,26,31-33] Self-esteem is plausibly one factor that increases academic motivation and consequently reduces academic burnout. High self-esteem can result in educational motivation, and low self-esteem can result in a lack of motivation.[32] Individuals with poor self-esteem struggle to show off their talents, lack confidence, feel guilty, find concentrating on their studies difficult, and may eventually experience academic burnout.[33,34]

Interestingly, we found a negative association between GPA, reward promotion, and OAB in all its aspects. Previous research has similarly reported that students with a high risk of academic burnout had the lowest GPA.[4,23,35-37] Sufficient reward also significantly reduces academic burnout.[36,37] One explanation for GPA is that learning performance contributes to academic burnout. Students who exhibit signs of academic burnout typically have negative learning and poor learning efficiency, pass fewer courses, and have a lower GPA.[24,36] Regarding reward promotion, studies have found that students receive rewards for their efforts during the learning process. This can stimulate their learning enthusiasm, enhance their confidence in their learning ability, improve their learning efficacy, and reduce the occurrence of burnout.[36,37] However, students perceive a lack of meaningful rewards or opportunities in their environment, leading to feelings of exhaustion and disengagement, which contribute to burnout.[23] Some evidence suggests that society, schools, and parents should give them more attention, resources, and support, which can help students reduce academic burnout and pressure.[23,36]

Our results revealed that higher learning duration was positively associated with OAB and all dimensions; consistent with previous studies, students who spent much learning time were prone to experience academic burnout.[4,16,23,38] Students with prolonged periods of learning may be confronted with stress, discouragement, annoyance, and exhaustion, leading to a high tendency to experience academic burnout.[38] However, some studies indicated that if the student's learning duration is due to high demands, students who allocate a longer duration

for learning experience a greater academic burnout due to learning demands.[16,23]

Limitations and recommendations

This study has some limitations. First, it was cross-sectional, which precludes the possibility of establishing temporality and causality. Thus, longitudinal studies to test the causal relationships are needed. Second, our participants were drawn from medical students in Guangxi Province, which may limit its generalizability to those in other settings, although it may still reflect academic burnout and psychological health specific to medical students. Therefore, further studies should recruit participants from different settings. Third, this study only focused on the correlations between self-esteem, perceived stress, self-efficacy, and academic burnout. Psychological resources such as resilience,[31] personality,[8,21] and adaptation[39] may also be related to academic burnout, which can be further explored in subsequent studies. Despite these limitations, our study had the advantage of a large sample size and controls for a wide range of covariates. It also provides insight into academic burnout and its association with adverse mental health outcomes, particularly self-efficacy and self-esteem, which contribute to increasing educational motivation and learning efficiency and consequently reducing the academic burnout.[25,32] Moreover, our study also provided further insights that educational environments, such as study-related organizational factors (e.g., long learning duration and lack of reward promotion), contribute to academic burnout. These may be beneficial to health providers, teachers, and university health centers, who should be more concerned and able to identify medical students who are at risk of academic burnout and psychological distress. Besides, it also provides guidance for future planning to establish an appropriate educational environment to reduce and prevent academic burnout among medical students, which may lead to academic achievement. Furthermore, longitudinal research is required to better understand academic burnout and how it affects students during the medical education process. Interventions should also be developed to reduce academic burnout and improve mental health among medical students.

Conclusions

This study demonstrated that higher academic burnout was strongly associated with psychological (e.g., self-efficacy, perceived stress, and self-esteem) and other factors (e.g., GPA, learning duration, and reward promotion). These findings provide a specific-region perspective on the potential factors in academic burnout that may be able to identify medical students at risk of academic burnout in region contexts. Moreover, university-based interventions or strategies for improvement in educational environments may be needed to reduce academic burnout and promote mental health among medical students.

Ethical approval

This study was approved by the Ethics Committee for Research Involving Human Subjects at Mahasarakham University (ref. no. 406-364/2023).

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Conflicts of interest

There are no conflicts of interest.

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