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The mechanism of sleep quality's effect on academic burnout: examining the mediating role of perceived stress

Ali Zakiei¹, Habibolah Khazaie¹, Mahdis Azadi², Sarina Mohsenpour² and Saeid Komasi^{1,3*}

Abstract

Background Given the importance of sleep during young adulthood and the role of students as key societal assets, investigating psychological factors related to stress and academic burnout is essential. Therefore, the present study aimed to examine the relationship between sleep quality and academic burnout, with the mediating role of perceived stress.

Methods This cross-sectional study was conducted among students at Kermanshah University of Medical Sciences in 2024. Data analysis was performed on 476 participants, of whom 316 (66.4%) were female, with a mean age of 22.6 ± 4.8 years. Data were collected using the Pittsburgh Sleep Quality Index, Perceived Stress Scale, and Academic Burnout Inventory.

Results The results indicated a significant positive relationship between sleep quality and perceived stress, as well as academic burnout. Additionally, the findings revealed that the indirect effect of subjective sleep quality on academic burnout through perceived stress was significant ($\beta = 0.13, p < 0.001$). Similarly, the indirect effect of sleep latency on academic burnout was significant ($\beta = 0.10, p < 0.001$), as was the indirect effect of daytime dysfunction ($\beta = 0.09$) on academic burnout through perceived stress ($p < 0.001$). The total indirect effect of sleep quality on academic burnout via perceived stress was significant, with a standardized coefficient of 0.18 ($p < 0.001$).

Conclusions It can be concluded that reduced sleep quality leads to academic burnout by increasing perceived stress levels. Therefore, it is recommended that policymakers and educational planners prioritize improving students' sleep quality and organize appropriate workshops to address perceived stress among students.

Keywords Academic burnout, College students, Mediation analysis, Perceived stress, Sleep quality

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Introduction

In the past, research on burnout primarily focused on practicing physicians [1]; however, in recent years, more attention has been paid to medical students, who similarly experience burnout. This form of burnout, known as academic burnout, shares the core characteristics of occupational burnout but is specific to educational environments and affects students exclusively [2]. Academic burnout is one of the issues impacting educational systems at all levels, leading to the wastage of human resources and associated costs [3]. Among medical students, academic burnout represents a major challenge [4, 5], with potential detrimental effects on mental health and academic progress [6]. In fact, academic burnout has become a fundamental factor affecting students' mental health [7]. Conversely, burnout among future healthcare professionals (medical students) will have implications for public health [8]. Recently, researchers have shown increased interest in the topic of academic burnout among college students [9].

Burnout is a negative state of physical and mental exhaustion, accompanied by strong feelings of failure, frustration, and inefficacy [10]. Academic burnout comprises three components: emotional exhaustion, cynicism, and reduced academic efficacy [11]. Emotional exhaustion refers to feelings of pressure and fatigue, especially due to excessive academic workload. Cynicism manifests as a negative attitude and indifference toward the academic environment, along with diminished interest in academic tasks and responsibilities. Reduced academic efficacy pertains to feelings of poor academic performance and a lack of sense of accomplishment in coursework and overall academic progression [12]. Academic burnout plays a significant role in declining academic performance and motivation [13]. In other words, students experiencing academic burnout are more likely to have lower grades, poorer academic progress, and higher dropout rates [14].

Various factors contribute to academic burnout, with social environments and stress being among the most significant. Stress has been identified as a key factor associated with academic burnout and has a considerable impact on it [15]. Stress is defined as a complex psychological process experienced when an individual perceives a threat or danger in their environment [16]. The effect of a stressful event on an individual largely depends on their perception of the stress. This concept, known as *perceived stress*, refers to the degree of stress individuals attribute to life situations [17]. Given that entering university is a critical stage of personal development, with increasing pressure to acquire knowledge and skills, students face additional challenges, such as peer pressure, competition, limited socioeconomic resources, and being away from home and family—all of which act as stressors

[7]. Therefore, paying attention to perceived stress in students is essential. Moreover, perceived stress has been identified as a significant risk factor for academic burnout [18].

Previous research indicates that sleep quality affects multiple functional domains, including psychological issues and physical health [19–21]. Additionally, sleep quality can be a factor influencing academic burnout [22]. Studies have examined the relationship between sleep problems and academic burnout [23–25], but the mechanism by which sleep quality affects academic burnout remains unclear. It appears that perceived stress may play a mediating role in this relationship, as increased sleep problems and reduced sleep quality can have detrimental cognitive effects [26–28]. Given that perceived stress refers to an individual's cognitive appraisal of stress, reduced sleep quality may amplify this perception, thereby increasing the risk of academic burnout. Conversely, poor sleep quality can itself act as a stressor [29], further magnifying the effects of perceived stress on academic burnout.

Considering the importance of sleep during young adulthood and the role of students as vital societal assets, investigating psychological factors related to stress and academic burnout is essential. Academic burnout, especially in demanding fields such as medical sciences, can negatively impact students' academic performance and quality of life. Therefore, the present study aimed to examine the relationships among sleep quality, perceived stress, and academic burnout, as well as the mediating role of perceived stress in the relationship between sleep quality and academic burnout.

Methods

Design and context

This cross-sectional study was conducted among college students at Kermanshah University of Medical Sciences during the fall semester of 2024. This university, a public institution in western Iran (Kermanshah city), offers medical programs including medicine, pharmacy, public health, nursing, and paramedical sciences to both Iranian and international students.

Participants and procedure

The sample comprised 480 students from various faculties, selected via convenience sampling. An optimal sample size of 468 was determined using an online sample size calculator (<https://wnarifin.ocpu.io/sscalc/www/ssrmsea.html>) to meet the requirements of structural equation modeling. This calculation was based on an expected Root Mean Square Error of Approximation (RMSEA) of 0.05, 20 degrees of freedom, a desired power level of 80% ($1 - \beta$), and a significance level of 0.05 (α), accounting for an anticipated dropout rate of 10%. All students were

invited to participate through social media platforms such as Instagram and Telegram. Inclusion criteria were being Iranian, aged 18 to 50, fluent in Persian, with no addiction to illegal substances, and not having taken psychiatric medication in the past 4 weeks. Data from four individuals were discarded due to more than 20% missing information. The final sample consisted of 476 participants (66.4% female). Participants received explanations regarding questionnaire completion and provided written informed consent. All participants completed three self-report questionnaires: the Pittsburgh Sleep Quality Index (predictor), the Bresó Academic Burnout Inventory (outcome), and the Perceived Stress Scale (mediator).

Ethical considerations

All participants provided informed consent to participate in the research. Given the collection of sensitive health information, particular care was taken to protect participants' privacy and securely manage the data. The participants were assured that their responses would remain anonymous and confidential, and that they could withdraw from the study at any time. The confidentiality and anonymity of all questionnaire responses were strictly maintained throughout the research process, ensuring that personal data remained private and secure at every stage. The study was approved by the university's ethics committee (Code: IR.KUMS.REC.1403.354).

Instruments

Pittsburgh sleep quality index (PSQI) To assess participants' current sleep quality, the PSQI was used. This self-report questionnaire consists of 18 items categorized into seven components. Each item is scored from 0 to 3, with the total score reflecting the individual's sleep quality over the past month [30]. The overall score ranges from 0 to 21, with higher scores indicating poorer sleep quality [31]. The Persian version of the questionnaire [32], validated for the Iranian population and demonstrating acceptable psychometric properties ($\alpha=0.81$), was employed in this study. In the current sample, Cronbach's alpha for this questionnaire was 0.77.

Bresó Academic Burnout Inventory: This questionnaire assesses three dimensions of academic burnout: academic exhaustion, academic cynicism, and academic inefficacy. It consists of 15 items: academic exhaustion (5 items, e.g., "Course materials are exhausting"), academic cynicism (4 items, e.g., "I feel disinterested in course materials"), and academic inefficacy (6 items, e.g., "I feel unable to cope with academic challenges"). All items are rated on a 5-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree). Higher scores indicate greater academic burnout [33]. The alpha coefficients for the subscales, as reported by Bresó et al. (2007), were 0.70, 0.82, and 0.75, respectively [33]. The Iranian

adaptation of this questionnaire demonstrated strong psychometric properties. Specifically, the content validity ratio (CVR), content validity index (CVI), and Cronbach's alpha all exceeded 0.8, indicating excellent validity and internal consistency. Additionally, the kappa coefficient ranged from 65 to 82.5%, reflecting substantial to almost perfect inter-rater reliability. These results underscore the questionnaire's appropriateness and reliability for use in Iranian populations [34]. In this study, Cronbach's alpha for the total scale was 0.89.

Perceived Stress Scale (PSS): Developed by Cohen et al. (1983), this scale consists of 14 items rated on a 4-point Likert scale ("Never" to "Very often"), with each item scored from 0 to 4. Participants respond to statements such as: "In the last month, how often have you been upset because of something unexpected?" and "In the last month, how often have you felt that difficulties were piling up so high that you could not overcome them?" Higher scores indicate greater perceived stress [35, 36]. In this study, Cronbach's alpha for this scale was 0.84.

Data analysis

Data analysis was performed using the free version of JASP software (version 0.19.0.0) for descriptive statistics, including mean and standard deviation. All statistical tests were two-tailed, with significance set at $p < 0.05$. Continuous variables were reported as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. The assumptions of parametric statistics were checked by examining skewness and kurtosis values for normality. Pearson's correlation coefficient was used to assess associations between variables. Path analysis was conducted to predict academic burnout (outcome) based on sleep quality subscales (predictors) via perceived stress (mediator). The analysis focused on evaluating direct, indirect, and total effects for each predictor. Results included standardized beta coefficients and their standard errors, as well as R^2 values for both the outcome and mediator variables. Path coefficient estimates were also reported.

Results

The data analysis was conducted on 476 participants, of whom 316 (66.4%) were female, with a mean age of 22.6 ± 4.8 years. Table 1 presents the demographic characteristics of the sample and the mean values of the study variables stratified by demographic features. In the total sample, the mean academic burnout score was 41.84 ($SD=9.95$). Based on these results, 164 students (34.5%) exhibited low levels of academic burnout, 294 (61.8%) moderate levels, and 18 (3.8%) high levels. Regarding sleep quality, findings indicated that 215 participants (45.2%) had poor sleep quality. The mean total PSQI score across the sample was 6.67 ($SD=3.42$).

Table 1 Demographic characteristics of the studied sample and mean variables

Variables	N (%)	Sleep quality	Academic burnout	Stress perceived
Sex				
Female	316 (66.4)	6.58 ± 3.36	16.34 ± 3.89	29.22 ± 8.06
Male	160 (33.6)	6.82 ± 3.55	16.36 ± 3.42	26.34 ± 8.06
p	0.001	0.477	0.953	0.001
Education				
BA	270 (56.7)	6.51 ± 3.55	16.12 ± 4.26	28.74 ± 8.21
MA	39 (8.2)	6.15 ± 3.16	15.48 ± 3.83	26.61 ± 6.19
MD	162 (34)	6.94 ± 3.14	16.98 ± 3.92	28.07 ± 7.17
PhD	5 (1.1)	10.20 ± 5.35	15 ± 2.45	28.40 ± 7.57
p	0.001	0.049	0.073	0.408
Marital status				
Married	36 (7.6)	6.22 ± 3.31	14.69 ± 3.80	26.22 ± 5.03
Single	440 (92.4)	6.70 ± 3.43	16.48 ± 4.12	28.05 ± 7.88
p	0.001	0.417	0.012	0.087
Residency				
Dormitory	150 (31.5)	6.54 ± 3.15	16.65 ± 4.09	27.81 ± 7.43
Private home	76 (16)	6.23 ± 3.80	16.13 ± 4.02	27.28 ± 8.36
Living with parents	230 (48.3)	6.93 ± 3.50	16.39 ± 4.12	29.17 ± 7.83
Living with spouse	20 (4.2)	6.20 ± 2.82	14.50 ± 4.07	26.60 ± 4.68
p	0.001	0.375	0.166	0.120
Age group				
18–25	409 (85.9)	6.66 ± 3.45	16.49 ± 4.10	28.42 ± 7.82
25–35	51 (10.7)	6.78 ± 3.05	15.78 ± 4.30	28.80 ± 7.29
35–50	16 (3.4)	6.43 ± 3.96	14.50 ± 3.54	24.62 ± 5.30
p	0.001	0.936	0.095	0.140

Table 2 Correlation coefficients between all variables

Variables	1	2	3	4	5	6	7	8	9
1. Subjective sleep quality	1								
2. Sleep latency	0.40**	1							
3. Sleep duration	0.40**	0.22**	1						
4. Sleep efficiency	0.28**	0.18**	0.57**	1					
5. Sleep disturbances	0.30**	0.20**	0.13**	0.09*	1				
6. Sleep medication	0.19**	0.15**	0.20**	0.08	0.21**	1			
7. Daytime dysfunction	0.41**	0.17**	0.22**	0.16**	0.36**	0.20**	1		
8. Sleep quality (global)	0.70**	0.56**	0.72**	0.64**	0.45**	0.45**	0.59**	1	
9. Stress	0.40**	0.34**	0.20**	0.12**	0.21**	0.11*	0.33**	0.40**	1
10. Academic burnout	0.37**	0.26**	0.14**	0.08*	0.17**	0.15**	0.32**	0.35**	0.52**

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)

Pearson's correlation coefficient was used to examine the relationships between sleep quality, academic burnout, and perceived stress; the results are shown in Table 2. The correlation between the total sleep quality score and perceived stress was $r=0.40$, and between sleep quality and academic burnout was $r=0.35$. Additionally, perceived stress and academic burnout were correlated at $r=0.52$ —all correlations were significant at $p<0.001$. Among the sleep quality components, subjective sleep quality showed the highest correlation with academic burnout ($r=0.37$). Further analysis revealed correlations of 0.39 between sleep quality and the exhaustion

subscale, 0.31 with cynicism, and 0.17 with academic inefficacy. Similarly, perceived stress correlated with academic burnout subscales at 0.46, 0.40, and 0.44, respectively—all significant at $p<0.001$.

Path analysis was employed to predict academic burnout from sleep quality components via perceived stress; results are presented in Tables 3 and 4. As shown in Table 3, perceived stress had a significant direct effect on academic burnout with a standardized coefficient of 0.41 ($p<0.001$). Among sleep quality components, only subjective sleep quality ($\beta=0.23$) and daytime dysfunction ($\beta=0.13$) had direct effects on academic burnout,

Table 3 Direct effects of path analysis

Paths	Estimate	St. Error	Z-value	p	95% CI
Stress- Academic burnout	0.41	0.04	9.51	< 0.001	0.33 / 0.50
Subjective sleep quality- Academic burnout	0.23	0.07	3.54	< 0.001	0.09 / 0.36
Sleep latency - Academic burnout	0.05	0.05	0.98	0.328	-0.05 / 0.14
Sleep duration - Academic burnout	-0.03	0.05	-0.60	0.550	-0.12 / 0.07
Sleep efficiency - Academic burnout	-0.03	0.05	-0.66	0.510	-0.12 / 0.06
Sleep disturbances - Academic burnout	-0.05	0.09	-0.51	0.613	-0.22 / 0.13
Sleep medication - Academic burnout	0.08	0.06	1.37	0.171	-0.03 / 0.19
Daytime dysfunction- Academic burnout	0.13	0.05	2.72	0.007	0.04 / 0.23
Subjective sleep quality- Stress	0.31	0.07	4.42	< 0.001	0.17 / 0.45
Sleep latency - Stress	0.24	0.05	4.77	< 0.001	0.14 / 0.34
Sleep duration - Stress	0.04	0.05	0.67	0.500	-0.07 / 0.14
Sleep efficiency - Stress	-0.03	0.05	-0.60	0.549	-0.13 / 0.07
Sleep disturbances - Stress	0.07	0.09	0.76	0.446	-0.11 / 0.26
Sleep medication - Stress	-0.03	0.06	-0.43	0.667	-0.14 / 0.09
Daytime dysfunction - Stress	0.22	0.05	4.21	< 0.001	0.12 / 0.32

Table 4 Indirect effects for predicting academic burnout based on sleep quality components through perceived stress

Paths	Estimate	St. Error	Z-value	p	95% CI
Subjective sleep quality - Academic burnout	0.13	0.03	4.005	< 0.001	0.07 / 0.19
Sleep latency - Academic burnout	0.10	0.02	4.26	< 0.001	0.05 / 0.14
Sleep duration - Academic burnout	0.01	0.02	0.67	0.501	-0.03 / 0.06
Sleep efficiency - Academic burnout	-0.01	0.02	-0.60	0.550	-0.05 / 0.03
Sleep disturbances - Academic burnout	0.03	0.04	0.76	0.448	-0.05 / 0.04
Sleep medication - Academic burnout	-0.01	0.02	-0.43	0.667	-0.06 / 0.04
Daytime dysfunction- Academic burnout	0.09	0.02	3.85	< 0.001	0.04 / 0.13

whereas other components showed no significant direct effects. Conversely, subjective sleep quality ($\beta=0.31$), sleep latency ($\beta=0.24$), and daytime dysfunction ($\beta=0.22$) directly affected perceived stress. Collectively, the model explained 32% of the variance in academic burnout ($R^2 = 0.32$).

Table 4 indicates that the indirect effect of subjective sleep quality on academic burnout through perceived stress was significant, with a standardized coefficient of 0.13 ($p<0.001$). The indirect effect of sleep latency on academic burnout was also significant ($\beta=0.10$, $p<0.001$), as was the effect of daytime dysfunction ($\beta=0.09$, $p<0.001$) via perceived stress.

In a separate analysis, the total sleep quality score was used as the independent variable. The results showed a significant direct effect of the total sleep quality score on perceived stress ($\beta=0.40$, $p<0.001$), a direct effect of perceived stress on academic burnout ($\beta=0.45$, $p<0.001$), and a direct effect of the total sleep quality score on academic burnout ($\beta=0.17$, $p<0.001$). The indirect effect of total sleep quality on academic burnout via perceived stress was also significant, with a standardized coefficient of 0.18 ($p<0.001$). Figure 1 shows path plot for direct and indirect effects of all sleep quality components on academic burnout.

Discussion

The present study aimed to examine the relationship between sleep quality, perceived stress, and academic burnout among college students, as well as to investigate the mediating role of perceived stress in the relationship between sleep quality and academic burnout. The results revealed that the mean academic burnout level among students was moderate, and variables such as age, gender, academic level, and place of residence showed no significant association with academic burnout. Additionally, findings indicated that 45.2% of students had poor sleep quality. The details of these findings are discussed below.

Relationship between sleep quality and perceived stress

Our results demonstrate a significant positive correlation between the total sleep quality score and perceived stress, indicating that greater sleep problems are associated with higher levels of perceived stress. In this context, a study [37] found that sleep quality significantly influences the relationships among amygdala reactivity (a brain region involved in processing negative emotions), negative affect, and perceived stress—consistent with our findings.

While most previous research has explored the relationship between stress and sleep quality [38–40], the current study specifically investigated perceived stress as the dependent variable. This is because perceived stress

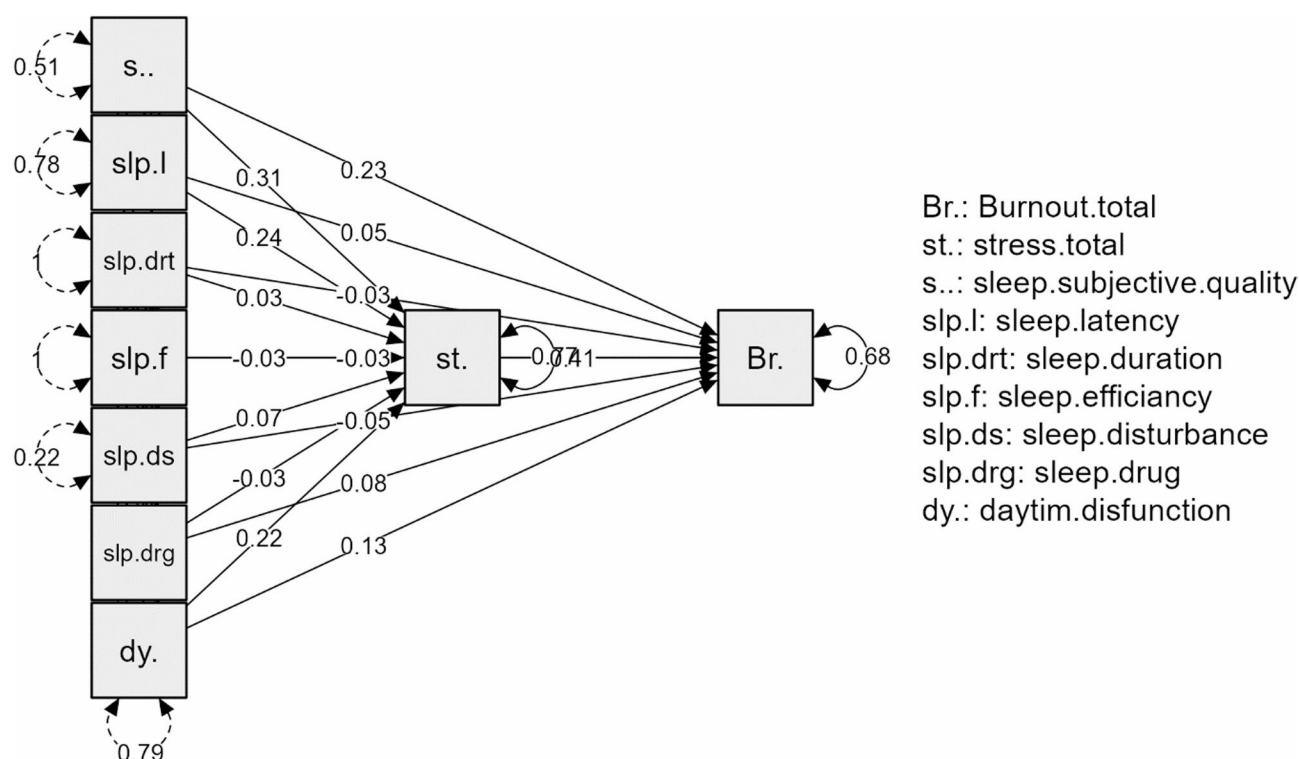


Fig. 1 Path plot for direct and indirect effects

reflects an individual's subjective assessment of their stress levels at a given time [41]. It does not measure actual stress but rather one's cognitive appraisal of stress, which constitutes a cognitive function. The self-reported perceived stress assesses individuals' perceptions of life situations as exceeding their coping capacity [41]. Given that this tool emphasizes participants' judgments about their coping abilities [35], perceived stress can be considered a component of cognitive functioning. Since poorer sleep quality is associated with decreased cognitive performance [42–44], these findings are theoretically justified.

Relationship between sleep quality and academic burnout

Our results showed positive relationships between sleep quality and both overall academic burnout and its subscales, indicating that greater sleep problems are associated with higher levels of academic burnout, while better sleep quality corresponds to lower burnout. One study found a significant positive relationship, where sleep quality could predict 37% of the variance in academic burnout [22]. Another study demonstrated associations between sleep quality and academic burnout in medical students [45]. However, contrasting findings indicated that PSQI scores only correlated with the emotional exhaustion and cynicism subscales [46].

Regarding the interpretation of these results, it is important to note that poor sleep quality is associated

with depression [47]. Therefore, it can be posited that reduced sleep quality may contribute to academic burnout through depression, a relationship that has been previously confirmed [48]. Additionally, poor sleep quality can directly lead to academic burnout via cognitive dysfunction [49], emotional regulation problems [50], and decreased physical energy. Sleep disturbances can result in fatigue [51], decreased motivation, and feelings of inefficacy [52] in performing academic tasks—core components of academic burnout.

Several mechanisms may explain this relationship. First, poor sleep quality may impair emotional regulation and cognitive functioning [29, 53], making students more vulnerable to stress and less capable of managing daily challenges. Second, inadequate sleep can activate the body's stress response systems, leading to increased secretion of stress hormones such as cortisol [54]. Elevated cortisol levels can further disrupt sleep and intensify feelings of stress. Third, the relationship between sleep and stress is likely bidirectional: stress can cause sleep problems, and poor sleep quality can increase stress, creating a self-perpetuating cycle that exacerbates both issues [55, 56].

Relationship between perceived stress and academic burnout

Our study results demonstrated a positive relationship between perceived stress and academic burnout,

indicating that higher perceived stress is associated with greater academic burnout among medical students [45]. Several studies have confirmed the link between perceived stress and academic burnout [8, 17, 57]. Additionally, another study found that perceived stress is a significant predictor of academic burnout [18]. Therefore, our findings are consistent with previous research.

High levels of perceived stress impair cognitive functions [58, 59], such as memory and decision-making, which are crucial for academic success. This cognitive pressure, along with emotional exhaustion, compounds burnout. Furthermore, elevated stress levels excessively strain cognitive resources [60], making it difficult for students to concentrate, retain information, and complete tasks. This overload leads to mental fatigue and perceived reductions in cognitive performance [61], both of which are key components of academic burnout.

The mediating role of perceived stress in the relationship between sleep quality and academic burnout

Our results indicated that sleep quality components and perceived stress can both predict academic burnout. Moreover, we found that sleep quality has an indirect effect on academic burnout, with perceived stress serving as a mediator in this relationship. These findings underscore the critical roles that sleep quality and perceived stress play in predicting academic burnout. Specifically, individuals with better sleep quality tend to experience less academic burnout, primarily because this relationship is mediated through perceived stress. Optimal sleep reduces perceived stress levels, which, in turn, decreases the likelihood of academic burnout. Essentially, perceived stress acts as a crucial link connecting sleep quality with academic burnout. These results emphasize the importance of strategies aimed at reducing stress and improving sleep quality as essential interventions to prevent academic burnout. Prioritizing stress management and promoting healthy sleep habits are vital steps toward enhancing academic well-being.

Currently, it appears that poor sleep quality exacerbates perceived stress, which then intensifies burnout symptoms. This effect can be explained by the fact that poor sleep quality increases physiological stress markers (e.g., cortisol levels) [62] and diminishes resilience against daily challenges, thereby elevating perceived stress levels.

The findings of this study further highlight that certain components of sleep quality—specifically subjective sleep quality and disruptions in daily functioning—exert a direct influence on both academic burnout and perceived stress. Subjective sleep quality, which reflects an individual's perception of how well they are sleeping [63], plays a particularly important role: when students perceive their sleep as inadequate, they are more likely to experience fatigue and low energy throughout the day. This

sense of depletion can directly contribute to academic burnout. Additionally, disruptions in daily functioning—characterized by issues such as daytime sleepiness, reduced concentration, and irritability—can significantly impair academic performance [64]. These disruptions not only hinder students' ability to succeed academically but also elevate feelings of stress and exhaustion, ultimately increasing the risk of burnout.

Limitations

Our study had several limitations, including a cross-sectional design that precludes causal inferences, reliance on self-report questionnaires potentially subject to response bias, and a nonclinical student sample that limits the generalizability of the findings to other populations. Nonetheless, the research highlights the critical link between sleep quality, perceived stress, and academic burnout in young adults, emphasizing the need for interventions aimed at improving sleep quality among students. Clinically, this underscores the importance of addressing sleep issues as a means to reduce perceived stress and, subsequently, academic burnout. Practitioners can develop targeted workshops and programs focusing on sleep hygiene and stress management techniques. Additionally, educational institutions should implement policies that promote healthier sleep environments and provide mental health resources, ultimately fostering a more supportive academic atmosphere and enhancing student well-being.

Given the cross-sectional nature of this study, causality cannot be established; therefore, future research should examine the effects of sleep problems and sleep duration on students' stress and academic burnout through longitudinal studies. Moreover, the reliance on self-reported measures can be a limitation when assessing behaviors such as sleep quality. Future studies should incorporate objective tools, such as actigraphy or polysomnography, to measure sleep more accurately. Finally, since this study was conducted in Iran with students from Kermanshah University of Medical Sciences, caution should be exercised when generalizing the findings. It is recommended that these variables be investigated in other populations and cultural contexts.

Although this study advances our understanding of the relationship between sleep quality and academic burnout, it is important to further explore the potential influence of cultural and contextual factors specific to Iranian medical students. Factors such as heightened academic pressures, unique social expectations, and the demanding nature of medical education in Iran may interact with sleep quality and stress in distinctive ways. Future research investigating these influences could significantly deepen our understanding of these associations and contribute to the development of more effective, culturally sensitive interventions for this population.

Conclusion

Based on the present findings, it can be concluded that sleep quality directly affects perceived stress and academic burnout. Additionally, perceived stress serves as a mediating factor in the relationship between sleep quality and academic burnout. In other words, poorer sleep quality leads to higher perceived stress, which subsequently contributes to increased academic burnout. Therefore, it is recommended that policymakers and educational planners prioritize strategies to improve students' sleep quality. Furthermore, organizing educational workshops on stress management and sleep hygiene for students could be beneficial.

Abbreviations

PSS	Perceived Stress Scale
PSQI	Pittsburgh Sleep Quality Index
RMSEA	Root Mean Square Error of Approximation
SD	Standard deviation

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Author contributions

A.Z., H.K., and S.K. collaboratively designed and conducted the study. M.A. and S.M. collected data and administered the research. A.Z. analyzed the data and prepared the first draft with the support of H.K. and S.K. The critical review process was performed by H.K. and S.K. All authors have seen and approved the manuscript.

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Data availability

Data will be made available upon request from the corresponding author.

Declarations

Ethics approval and Consent for publication

The study protocol is consistent with the Helsinki Declaration (<https://www.wma.net/policies-post/wma-declaration-of-helsinki/>) and all participants provided informed consent to participate in the research. This research was approved by the ethics committee of the Kermanshah University of Medical Sciences (Code: IR.KUMS.REC.1403.354).

Consent for publication

Not Applicable.

Competing interests

The authors declare no competing interests.

Clinical trial number

Not applicable.

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