Anxiety Mediates the Social Support–Well-Being Link in Medical Graduate Students, with Alcohol and Tobacco Use as Moderators

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ABSTRACT

Postgraduate medical trainees are exposed to intense stressors that frequently undermine their overall happiness and life satisfaction. While prior research has established that strong social networks can bolster psychological well-being, exactly how and under what conditions this occurs in medical postgraduates has remained largely unknown. This research investigated the pathways linking perceived social support to subjective well-being in this specific group, with a particular focus on two key processes: (1) whether anxiety acts as an intermediary factor, and (2) whether the use of alcohol and tobacco alters the strength of these connections. Nine hundred postgraduate medical students (average age 27.01 years, SD = 3.33) affiliated with The Second Affiliated Hospital of Nanchang University took part in the study. Participants filled out standardized questionnaires assessing levels of social support, anxiety symptoms (GAD-7), alcohol and tobacco consumption habits, and overall subjective well-being. Results from structural equation modeling showed that higher social support was linked to greater well-being both directly and indirectly through lower levels of anxiety (partial mediation). Additionally, heavier alcohol and tobacco use weakened the protective effect of reduced anxiety on well-being (moderation effect).
These findings clarify the mechanisms by which supportive relationships benefit postgraduate medical trainees and underscore the complicating role of substance use. The study offers a solid evidence base for designing targeted mental health programs aimed at strengthening well-being in this demanding population.

Keywords: Subjective well-being, Medical students, Anxiety, Social support, Alcohol and tobacco use

Introduction

As postgraduate enrollment in China has grown, concerns about students' mental health have intensified. Individuals aged 25–35—typical of this group—face pressures from multiple areas, including academics, finances, employment, interpersonal relationships, and marriage, making them particularly susceptible to both psychological and physical strain [1]. Medical postgraduates face additional stressors, such as navigating relationships with lab personnel, peers in clinical rotations, and interactions with patients, which can amplify the pressure [2]. Moreover, internships in hospitals and medical schools are well-documented sources of stress, with students often juggling financial challenges, demanding academic requirements, and personal life stressors simultaneously [3].

The concept of well-being has gained recognition as a key indicator of societal and individual health. For instance, the UK government highlighted well-being as a marker of social progress in 2010 [4]. Research increasingly shows that well-being contributes to better physical and mental health, longer lifespan, prevention of mental illness, and more positive life attitudes [5-7]. Individuals with higher levels of well-being are often more creative, resilient, socially connected, productive, and live longer [8]. Encouraging well-being can help postgraduate

medical students better manage the stressors inherent in their studies and training [9]. Given the extended duration and intensity of medical education, prioritizing the well-being of medical students is essential [10].

Despite this, there remains limited understanding of the mechanisms influencing subjective well-being in postgraduate medical students. Most prior research has explored correlations between well-being and external factors [11-13], but few studies have examined the internal processes or interactions between multiple contributing variables. Building on existing literature, this study applies a structural equation modeling approach to examine how social support may influence postgraduate medical students' subjective well-being, including potential mediating and moderating pathways. This approach aims to clarify the underlying mechanisms and provide guidance for interventions to enhance students' well-being.

Social support and subjective well-being

Social support encompasses emotional, instrumental, and informational components [14]. Emotional support—such as encouragement, attention, and companionship during challenges—has been identified as particularly impactful for well-being, notably among healthcare students [15]. Subjective well-being is a multifaceted construct reflecting overall life satisfaction, the presence of positive emotions, and the absence of negative emotions [16]. Humanistic psychology suggests that meeting individuals' fundamental needs enhances subjective well-being, consistent with Maslow's hierarchy of needs, particularly the needs for love, belonging, and self-esteem [17].

Emotional support fosters a sense of value and belonging, helping individuals perceive themselves as cared for and respected [14]. In addition, social support reinforces self-esteem and perceived self-worth, which are important predictors of subjective well-being [18, 19]. Numerous studies have shown that students' interactions with peers and faculty positively influence their well-being [20], and emotional support in particular can significantly predict higher levels of subjective well-being [21, 22]. Overall, social support is widely recognized as a key factor enhancing well-being across populations, including healthcare professionals [23, 24].

Anxiety as a mediating factor

Anxiety is a common mental health concern arising from prolonged stress and can act as a mediating factor between social support and subjective well-being [25]. Individuals with strong social support systems can better access assistance from family, friends, or colleagues, which helps them manage negative emotions and life stressors. Thus, social support acts as a coping resource, enabling students to maintain life satisfaction even under pressure [26]. Prior studies indicate that social support is negatively associated with anxiety, reducing the likelihood of experiencing excessive stress [27].

Within the context of medical education, being part of supportive groups and having positive social connections enhances well-being [28]. Adequate social support may reduce anxiety associated with the acquisition of medical knowledge and clinical skills [29]. Conversely, higher levels of anxiety are linked to lower subjective well-being [30]. Postgraduate students frequently experience anxiety and depression, which can significantly impair well-being [31]. Goal theory suggests that well-being arises when needs are met or personal goals are achieved, generating positive emotions that enhance life satisfaction [32]. Empirical studies further show that personality traits affect well-being through emotional balance, the net difference between positive and negative affect [33].

Taken together, social support can satisfy students' needs for security, belonging, and self-esteem, which helps alleviate anxiety and enables them to face challenges more effectively. This, in turn, can enhance their subjective well-being. Based on these observations, the following hypothesis is proposed:

Hypothesis 1: Anxiety mediates the effect of social support on subjective well-being among postgraduate medical students.

The influence of alcohol and tobacco use

While social support can help reduce anxiety and promote well-being in postgraduate medical students, other factors may shape how strong this effect is. Within the framework of risk and resilience, certain behaviors or conditions—such as alcohol and tobacco consumption—can amplify stress or weaken protective influences, thereby impacting students' mental health and overall satisfaction with life [34].

Alcohol and tobacco are particularly relevant in this context because their use is common among students under academic pressure and can serve as a coping mechanism for stress or negative emotions [35, 36]. However, frequent consumption of these substances is linked to poorer mental health outcomes, higher anxiety levels, and

diminished subjective well-being [37, 38]. Conversely, reducing alcohol and tobacco use has been associated with improvements in emotional health and life satisfaction [39].

It is also possible, according to the challenge model, that social support may still provide protective effects even in the presence of these risk factors, helping students cope with stress and buffer negative impacts [40]. To date, few studies have examined how alcohol and tobacco use interact with social support and anxiety to influence the well-being of postgraduate medical students.

Hypothesis 2: The use of alcohol and tobacco moderates the relationship between social support and subjective well-being, including both the direct effect and the indirect effect through anxiety.

Present study

Drawing from existing research, this study aims to explore how social support affects the well-being of postgraduate medical students and whether anxiety serves as a mediator in this relationship. Additionally, it investigates whether alcohol and tobacco use changes the strength or direction of these associations. By clarifying these pathways, the study seeks to provide a better understanding of the factors influencing students' mental health and to inform strategies that could enhance their subjective well-being.
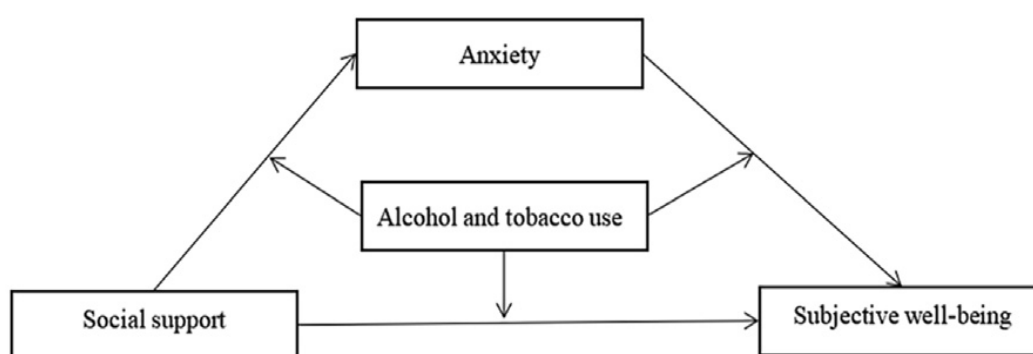

Figure 1. The moderated mediation model. Hypothesis 1: Anxiety serves as a pathway through which social support affects the subjective well-being of postgraduate medical students. Hypothesis 2: Alcohol and tobacco consumption alters the impact of social support on subjective well-being, both directly and indirectly through its effect on anxiety.

Materials and Methods

Participants and procedure

Prior to data collection, Monte Carlo simulations were conducted to determine the appropriate sample size for the study, following procedures outlined by Thoemmes *et al*. (2010) and Huang *et al*. (2021) [41, 42]. Using path coefficients from prior research and preliminary surveys [24, 43, 44], it was estimated that a sample of at least 850 participants would provide sufficient statistical power (greater than 0.90) for detecting effects in the structural model.

Ethical approval for this study was obtained from the Medical Research Ethics Committee of The Second Affiliated Hospital of Nanchang University. Informed consent was secured from all participants and institutional administrators before the survey began. Participants were recruited from the graduate programs at the hospital. Individuals with a history of psychiatric disorders, as reported in prior surveys or institutional records, were excluded.

The study was conducted as a campus-wide survey of all 933 postgraduate medical students, all of whom volunteered to participate. Questionnaires were distributed via WeChat QR codes in class groups, and two trained volunteers were available in each group to assist with any questions. Three attention-check items were included to ensure response validity; only participants who answered all items correctly were included in the final analysis. Each participant received course credit for completing the survey. After excluding invalid responses, the final sample consisted of 900 students, with 453 males (50.33%). Participants' ages ranged from 22 to 57 years, with a mean age of 27.01 years (SD = 3.33).

Measures

Social support

The Social Support Rating Scale (SSRS) was employed to assess social support across three domains: subjective support, objective support, and utilization of support [45]. The scale contains ten items, with total scores ranging from 11 to 62. Cronbach's alpha values for the subscales ranged from 0.60 to 0.66, and the overall scale reliability in this study was 0.72.

Anxiety

Anxiety levels were measured using the 7-item Generalized Anxiety Disorder Scale (GAD-7) [46], with scores ranging from 0 to 28. Participants rated items on a 4-point scale. The Chinese version of GAD-7 has been shown to be reliable and valid [47], and Cronbach's alpha in the current study was 0.93.

Alcohol and tobacco use

Alcohol and tobacco consumption was assessed with the Tobacco and Alcohol Use Questionnaire [48], which includes four items measuring both frequency and quantity of use on a six-point scale. Total scores ranged from 0 to 24. Previous studies have reported Cronbach's alpha between 0.80 and 0.82 for this instrument [49-51]. In the present study, the reliability coefficients for the tobacco and alcohol subscales were 0.84 and 0.90, respectively, and 0.72 for the total scale.

Subjective well-being

Subjective well-being was measured using a single-item scale asking participants, "In general, how happy are you?" [52], rated on a 7-point Likert scale. This scale has been widely used in prior research [53, 54]. To establish criterion validity, the Satisfaction With Life Scale [55] was used, with a Cronbach's alpha of 0.91 in this study. The correlation between the single-item well-being measure and life satisfaction scale was 0.69.

Results and Discussion

Assessment of common method bias

To evaluate potential common method bias, Harman's single-factor test was performed. The first factor accounted for 31.59% of the total variance, below the 40% threshold, indicating that common method bias was unlikely to affect the study's results.

Preliminary analyses

Correlation analyses revealed that social support was positively associated with subjective well-being, while showing a negative relationship with anxiety. Anxiety, in turn, was positively related to alcohol and tobacco use and negatively associated with subjective well-being. Additionally, alcohol and tobacco consumption exhibited a negative correlation with subjective well-being **(Table 1)**.

Common method bias

To assess the potential for common method bias, the Harman single-factor test was conducted. Results indicated that the first factor accounted for only 31.59% of the variance, well below the 40% threshold, suggesting that common method bias was not a concern in this study.

Preliminary analysis

The correlation results indicated that higher levels of social support were linked to greater subjective well-being, whereas social support was associated with lower anxiety. Anxiety showed a positive relationship with alcohol and tobacco use and a negative relationship with subjective well-being. In addition, alcohol and tobacco consumption was inversely related to subjective well-being **(Table 1)**.

Table 1. Correlations between variables.

Variable	1	2	3	4	Mean (M)	SD
1. Social Support	—				35.81	6.43
2. Anxiety	-0.28***	—			8.60	2.92
3. Alcohol and Tobacco Use	-0.002	0.11***	—		1.11	0.37

4. Subjective Well-Being	0.43***	-0.36***	-0.07*	—	4.89	0.92

Note. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$. N = 900.

Testing for the mediation model

To examine Hypothesis 1, which proposed that anxiety mediates the effect of social support on subjective well-being, we conducted a mediation analysis using PROCESS macro (Model 4). After controlling for participants' age and gender, results showed that higher social support was associated with lower levels of anxiety ($\beta = -0.28$, $p < 0.001$, bootstrap 95% CI [−0.19, -0.06]). In turn, greater anxiety predicted reduced subjective well-being ($\beta = -0.26$, $p < 0.001$, bootstrap 95% CI [−0.35, -0.22]). The direct effect of social support on subjective well-being remained significant ($\beta = 0.37$, $p < 0.001$, bootstrap 95% CI [0.31, 0.42]), indicating that anxiety only partially mediated this association. The indirect effect via anxiety was 0.07 (bootstrap 95% CI [0.05, 0.10]), accounting for 16.28% of the total effect **(Figure 2)**. These findings confirm support for Hypothesis 1.

Figure 2. Anxiety as a mediator. This model shows that anxiety partially accounts for the effect of social support on postgraduate medical students' subjective well-being, with age and gender included as control variables. Values on the paths represent standardized coefficients. Note. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$. N = 900.

Testing for the moderating role of alcohol and tobacco use in the mediation model

We then tested whether alcohol and tobacco consumption influenced the indirect and direct associations between social support and subjective well-being through anxiety **(Figure 3)**. Moderation analyses were conducted using PROCESS macro (Model 59). The first analysis examined whether alcohol and tobacco use affected the relationship between social support and anxiety, while the second examined its impact on the links from social support to subjective well-being and from anxiety to subjective well-being.

Controlling for age and gender **(Table 2)**, social support predicted lower anxiety among students ($\beta = -0.28$, $p < 0.001$, 95% CI [−0.34, -0.22]). However, alcohol and tobacco consumption did not significantly change this effect ($\beta = -0.002$, $p > 0.05$, 95% CI [−0.06, 0.06]). In contrast, the negative association between anxiety and subjective well-being was significantly influenced by alcohol and tobacco use ($\beta = 0.06$, $p < 0.05$, 95% CI [0.01, 0.10]).

To further explore this interaction, simple slope analyses were performed. For students reporting lower levels of alcohol and tobacco use (M-1SD), greater anxiety was linked to reduced subjective well-being (β_simple = -0.36, $p < 0.001$). Among students with higher use (M+1SD), this negative effect of anxiety was stronger (β_simple = -0.53, $p < 0.001$) **(Figure 4)**. These results suggest that substance use amplifies the harmful impact of anxiety on students' well-being.

Meanwhile, social support remained positively associated with subjective well-being ($\beta = 0.37$, $p < 0.001$, 95% CI [0.31, 0.43]), and this direct path was not moderated by alcohol and tobacco use ($\beta = -0.03$, $p > 0.05$, 95% CI [−0.10, 0.03]). Overall, findings indicate that while social support generally enhances subjective well-being, alcohol and tobacco use exacerbates the negative effect of anxiety, offering partial support for Hypothesis 2.
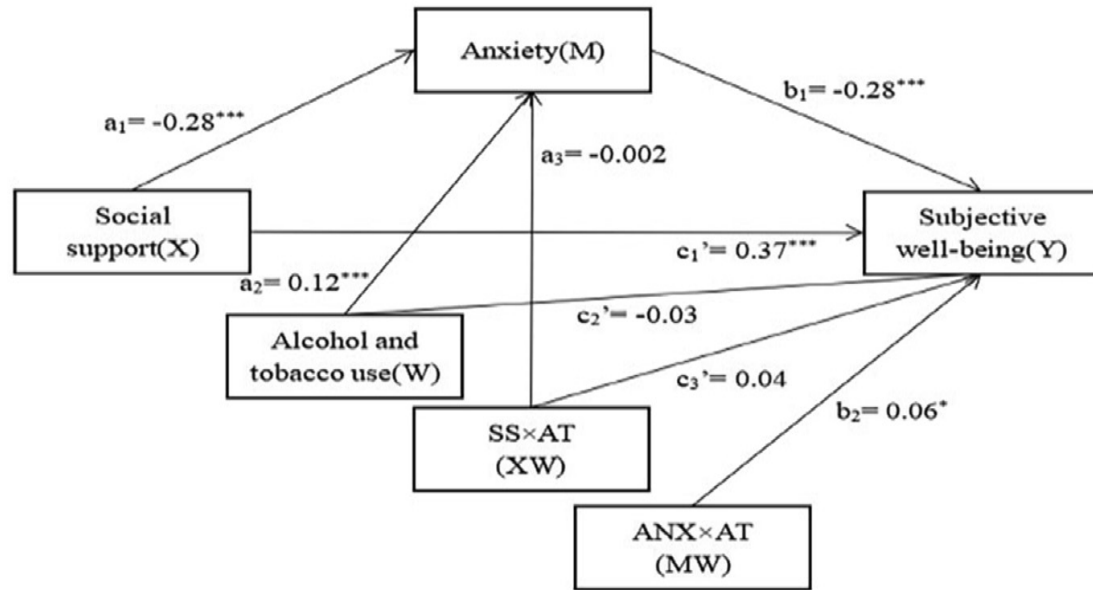
Figure 3. The moderated mediation model for subjective well-being. Note. $*p < 0.05$, $**p < 0.01$, $***p < 0.001$. N = 900. Note. SS = social support, ANX = anxiety, AT = alcohol and tobacco use, SWB = subjective well-being. N = 900.
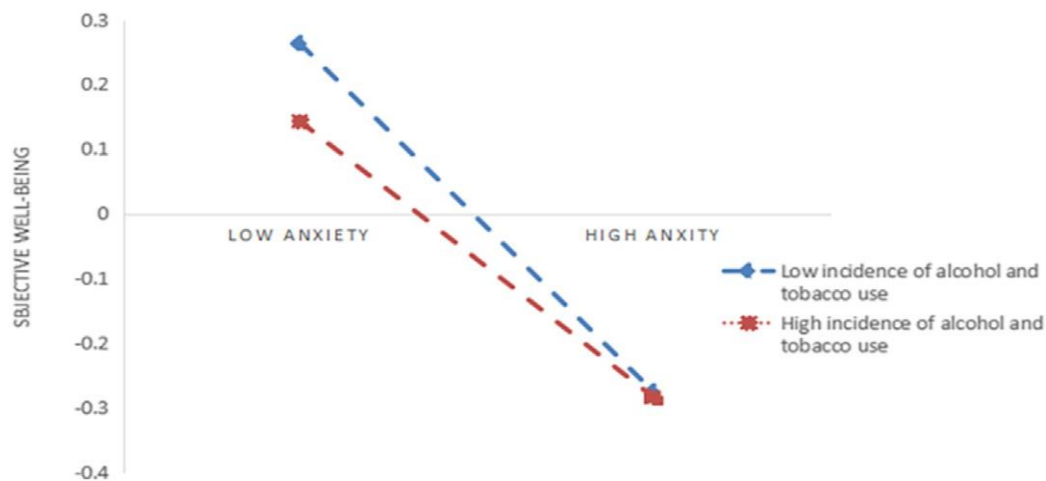

Figure 4. Influence of alcohol and tobacco use on the anxiety–subjective well-being relationship. This plot depicts how the negative impact of anxiety on subjective well-being differs for students reporting lower (M−1SD) versus higher (M+1SD) levels of alcohol and tobacco consumption. Sample size: N = 900.

Table 2. Testing the moderated mediation effects of social support on subjective well-being of postgraduate medical students.

Model	Predictor	Coefficient (β)	SE	t	95% CI
Model 1 (Anxiety, ANX)	Age	0.001	0.01	0.37	[-0.01, 0.03]
	Gender	0.13	0.07	1.96	[-0.0002, 0.26]
	Social Support (SS)	-0.28	0.03	-8.70	[-0.34, -0.22]
	Alcohol & Tobacco Use (AT)	0.12	0.03	3.62	[0.06, 0.19]
	SS × AT	-0.002	0.03	-0.06	[-0.06, 0.06]
	R²	0.10			
	F	18.83			
Model 2 (Subjective Well-Being, SWB)	Age	-0.01	0.01	-1.12	[-0.03, 0.01]
	Gender	0.21	0.06	3.58	[0.10, 0.33]
	Social Support (SS)	0.37	0.03	12.19	[0.31, 0.43]
	Alcohol & Tobacco Use (AT)	-0.03	0.03	-1.02	[-0.10, 0.03]
	SS × AT	0.04	0.03	1.38	[-0.02, 0.01]

Anxiety (ANX)	-0.28	0.03	-9.04	[-0.34, -0.22]
ANX × AT	0.06	0.02	2.66	[0.01, 0.10]
R²	0.27			
F	47.11			

Extensive research has shown that having a supportive social network plays a critical role in improving well-being [56-58]. In particular, medical students with stronger social connections tend to report higher levels of subjective well-being [10], which is in line with the findings of the current study. However, how exactly social support affects well-being, and which factors might influence this process, remains unclear. Investigating these mechanisms is especially important for postgraduate medical students, who face high academic and clinical pressures.

Using structural equation modeling, the present study explored the impact of social support on students' well-being, examining anxiety as a potential mediator and alcohol and tobacco use as a potential moderator. Our results indicate that social support not only directly enhances well-being but also indirectly improves it by lowering anxiety. Additionally, alcohol and tobacco consumption influenced the later stage of this pathway: the negative effect of anxiety on well-being was stronger among students who frequently consumed these substances.

Anxiety as a mediator

The analysis revealed that students with stronger social support experienced lower levels of anxiety. This finding highlights the protective role of social support, consistent with previous studies [59-61]. Social support offers both emotional and practical resources, helping students manage stressful situations more effectively. By contrast, those with limited social connections are more vulnerable to anxiety when encountering challenges [62].

Our findings also confirmed that higher anxiety is linked to lower subjective well-being. Postgraduate medical students, in particular, may experience heightened anxiety due to long training periods, complex coursework, and demanding clinical responsibilities [63]. The partial mediation effect suggests that reducing anxiety is a key pathway through which social support improves well-being. This underscores the importance of strategies that strengthen social support networks while addressing students' anxiety to maximize their overall well-being.

Taken together, social support and anxiety are intertwined factors that jointly shape well-being. Supportive social environments provide both material and emotional benefits, directly improving life satisfaction while buffering stress. Interventions that consider these multiple dimensions of support are likely to be most effective in enhancing postgraduate medical students' well-being.

Alcohol and tobacco use as moderators

The study also identified that alcohol and tobacco use modifies the relationship between anxiety and subjective well-being. Students who used these substances more frequently were more strongly affected by anxiety, leading to a greater reduction in their well-being.

Social support provides external resources that help individuals cope with stress, including guidance, encouragement, and tangible assistance [64]. Previous studies indicate that strong interpersonal support reduces stress and promotes positive emotions, which in turn enhances life satisfaction [65-68].

Nevertheless, some students attempt to manage stress from medical training through alcohol or tobacco use [69, 70]. While these substances may temporarily reduce tension, repeated reliance can impair coping strategies, decrease satisfaction, and increase vulnerability to anxiety, ultimately lowering subjective well-being [71]. In other words, alcohol and tobacco use intensifies the negative consequences of anxiety on well-being.

Interestingly, alcohol and tobacco use did not influence the direct positive effect of social support on well-being. This may be because social support represents tangible external resources, whereas anxiety is an internal emotional state. Consequently, while social support benefits well-being both directly and by reducing anxiety, alcohol and tobacco mainly amplify the emotional impact of stress rather than affecting external resources.

Implications

Promoting and maintaining subjective well-being is crucial for safeguarding the psychological health of postgraduate medical students. Monitoring their well-being can also yield broader social benefits, laying a strong foundation for the training of competent physicians within the national healthcare system.

First, since social support significantly influences students' subjective well-being, efforts should be made to enhance their connections with family, peers, and the university environment. University hospitals can support this by offering courses or workshops focused on interpersonal skills, thereby equipping students to build effective social networks and strengthen communication with friends, classmates, and family members.

Second, the mediating role of anxiety in the link between social support and well-being indicates that supportive relationships can help reduce stress and anxiety during postgraduate training, which in turn enhances overall well-being. Interventions targeting anxiety management may therefore complement the benefits of social support.

Finally, alcohol and tobacco use were shown to exacerbate the negative effects of anxiety on well-being. Students who frequently consumed these substances experienced greater reductions in subjective well-being under stress. University hospitals should prioritize mental health programs that teach healthy emotional coping strategies, discourage excessive drinking and smoking, and promote sustainable lifestyle habits, thereby mitigating the detrimental effects of anxiety and substance use.

Limitations and future directions

This study has several limitations that should be considered. First, the cross-sectional design limits the ability to infer causality between social support, anxiety, alcohol/tobacco use, and well-being. Future research should consider longitudinal approaches to better determine causal relationships. Second, all participants were recruited from a single university hospital, which may limit the generalizability of the findings. Expanding the sample to include multiple institutions would enhance representativeness. Finally, the study focused exclusively on the postgraduate training period, a unique stage in medical education. Further research is needed to explore how these relationships may manifest at other stages of medical training or in different student populations.

Conclusion

This study examined how social support affects the subjective well-being of postgraduate medical students, considering the mediating role of anxiety and the moderating role of alcohol and tobacco use. The results indicate that anxiety partially mediates the relationship, highlighting the importance of emotional regulation in the link between social support and well-being. Moreover, alcohol and tobacco use intensifies the negative effects of anxiety on well-being, emphasizing the need to address substance use in this population.

Theoretically, these findings provide insight into the mechanisms through which social support influences well-being. Practically, they suggest that interventions promoting strong social networks, effective anxiety management, and reduced alcohol and tobacco consumption can significantly enhance the psychological health and life satisfaction of postgraduate medical students.

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