



Anxiety and Depression among Smoker among University Students: A Systematic Review

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KEYWORDS

Depression; Anxiety; Psychiatric symptoms; Smoking; Students; Systematic review.

ABSTRACT:

Objectives: To systematically evaluate and synthesize existing evidence on the association between depression and smoking among University students.

Methods: A comprehensive search across four databases identified 624 publications. Duplicates were removed using Rayyan QCRI, and relevance screening reduced the selection to 35 full-text articles. After further review, nine studies met the inclusion criteria.

Results: We included nine studies with a total of 9050 participants and more than half of the,]m 4753 (52.5%) were males. Heavy smoking worsens psychological distress and mental health, with depressive symptoms mediating its impact on reduced quality of life. Smoking, often used as a coping mechanism, contributes to dependence and worsened symptoms. Gender disparities show males, especially medical students, are more likely to smoke. Current smokers report higher levels of stress, anxiety, and depression than non-smokers, highlighting the urgent need for targeted interventions in university populations.

Conclusion: This review highlights the strong link between smoking and mental health issues, particularly anxiety and depression, among university students. Smoking worsens these conditions, creating a cycle of dependency and distress. There is an urgent need for integrated mental health and smoking cessation programs that address psychological drivers, such as stress and emotional regulation, while considering demographic and cultural factors. Future research should focus on longitudinal studies to determine causality and evaluate intervention effectiveness. Addressing smoking and mental health together can significantly improve students' well-being and academic outcomes.

Introduction

The significant overlap between smoking and mental health disorders represents a critical public health issue, as smoking substantially contributes to the reduced life expectancy observed in individuals with mental illnesses [1]. Numerous studies indicate a strong positive correlation between smoking and mental health disorders, with smoking prevalence rising alongside the severity of the condition [2, 3].

Individuals with mental health issues are more likely to begin smoking at a younger age, consume cigarettes

more frequently, and exhibit higher levels of nicotine dependence compared to the general population. For instance, a recent survey found that 42% of all cigarettes smoked in England are consumed by individuals with mental health conditions, including those with substance use disorders [4]. Moreover, while smoking rates have declined steadily in the general population over the last two decades, they have remained relatively stable among individuals with mental illnesses [1]. Understanding the mechanisms that drive the high prevalence of smoking in this population is therefore essential. This discussion specifically



examines the relationship between smoking, depression, and anxiety.

Anxiety and depression are prevalent mental health conditions that significantly impact the well-being and academic performance of university students. Smoking is a common coping mechanism among students to alleviate stress and anxiety, but it can also exacerbate mental health issues. The relationship between smoking and mental health disorders, particularly anxiety and depression, is complex and multifaceted, involving both physiological and psychological factors. While previous studies have investigated these issues individually, there is a need for a comprehensive review to consolidate findings and better understand the interplay between smoking, anxiety, and depression in university students. This systematic review aims to fill this gap by synthesizing current evidence, highlighting trends, and identifying potential areas for intervention to improve student mental health and well-being [1-3].

The main objective of this review is to systematically review and synthesize existing literature on the relationship between smoking, anxiety, and depression among university students.

Methods

Search strategy

The PRISMA and GATHER criteria were followed for the systematic review. An overall search was conducted to identify relevant studies related to the relationship between smoking, anxiety, and depression among university students. The following four electronic databases were used by the reviewers for searching: SCOPUS, Web of Science, Cochrane, and PubMed. We removed any duplicates and uploaded all the titles and abstracts we could find through electronic searches onto Rayyan. After that, all the study texts that met the inclusion criteria based on the abstract or title were collected for a full-text examination. Two reviewers

independently evaluated the extracted papers' suitability and discussed any discrepancies.

Study population—selection

The PEO (Population, Exposure, and Outcome) factors were implemented as inclusion criteria for our review: (i) Population: University students, including those who smoke, (ii) Exposure: Smoking behavior, (iii) Outcome: The incidence of anxiety and/ or depression.

Data extraction

Data from studies that satisfied the inclusion requirements were extracted by two objective reviewers using a predetermined and uniform methodology. The following information was retrieved and recorded: (i) First author (ii) Year of publication, (iii) Study design, (iv) Country, (v) Sample size, (vi) Age, (vii) Gender, (viii) Diagnostic tool of depression, (ix) Diagnostic tool of anxiety, (x) Main outcomes.

Quality review

Since bias resulting from omitted factors is frequent in studies in this field, we used the ROBINS-I technique to assess the likelihood of bias since it enables a thorough examination of confounding. The ROBINS-I tool can be used for cohort designs where individuals exposed to different staffing levels are tracked over time and is designed to assess non-randomized studies. Each paper's risk of bias was evaluated independently by two reviewers, and any differences were settled by group discussion [5].

Results

The specified search strategy yielded 624 publications (**Figure 1**). After removing duplicates (n = 398), 226 trials were evaluated based on title and abstract. Of these, 190 failed to satisfy eligibility criteria, leaving just 35 full-text articles for comprehensive review. A total of 9 satisfied the requirements for eligibility with evidence synthesis for analysis.

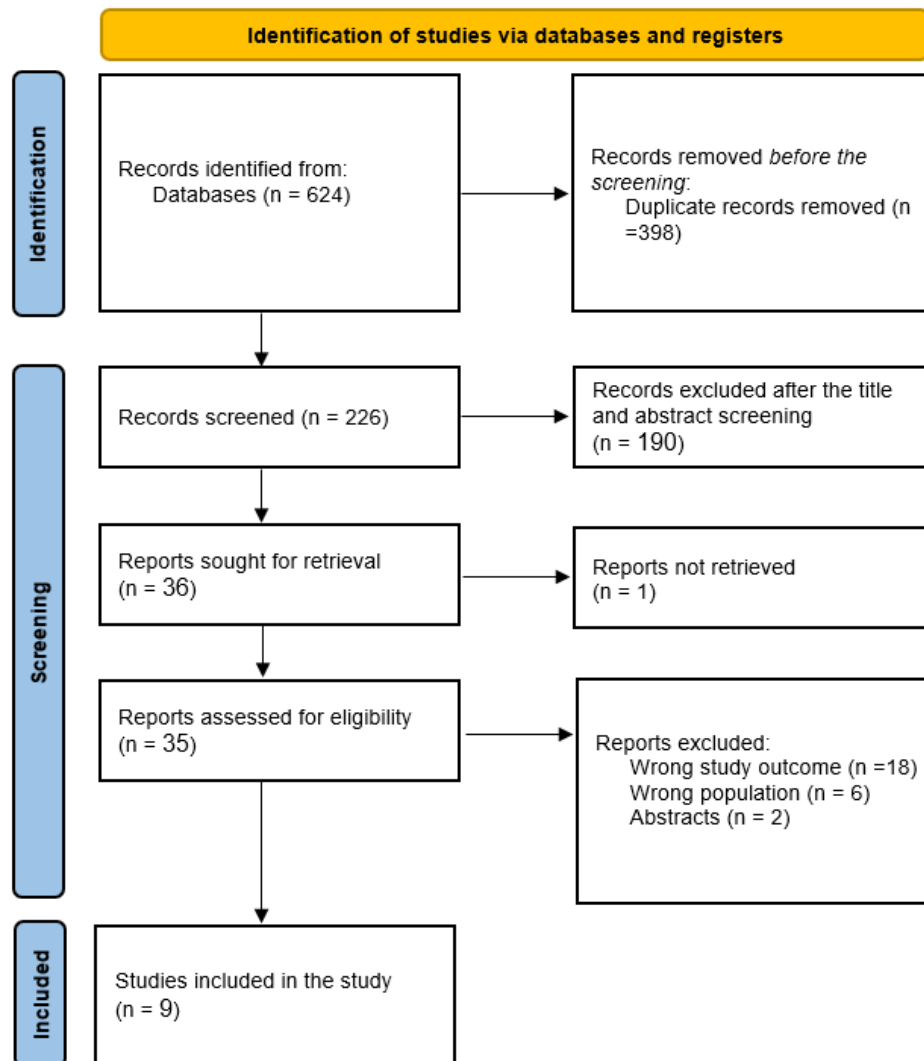


Figure (1): PRISMA flowchart [6].

Sociodemographic and clinical outcomes

We included nine studies with a total of 9050 participants and more than half of the participants 4753 (52.5%) were males. Regarding study designs, all of the included articles were cross-sectional studies [7-15]. Two studies were implemented in Serbia [7, 8], two in the USA [9, 15], one in China [10], one in Iraq [11], one in Turkey [12], one in Malaysia [13], and one in Iran [14]. The earliest study was conducted in 2009 [9] and the latest in 2024 [12].

Based on the main outcomes of the reviewed studies, there is a clear and consistent association between smoking and increased symptoms of anxiety and depression among university students. The findings

suggest that smoking acts as a significant risk factor for exacerbating psychological distress. For instance, heavy smoking appears to amplify symptoms of anxiety and depression compared to moderate or non-smokers, highlighting its negative impact on mental health [7][11].

Additionally, depressive symptoms are often reported as mediating factors in the relationship between smoking and reduced health-related quality of life, emphasizing the broader implications of smoking on mental and physical well-being [8]. Smoking is also linked to a higher likelihood of negative emotional regulation, where it is often perceived as a coping mechanism to alleviate emotional distress, yet ultimately contributes



to a cycle of dependence and heightened depressive symptoms [9].

Moreover, specific demographic trends are noted, such as males being significantly more likely to engage in smoking behaviors compared to females, particularly within medical school populations. This gender disparity aligns with findings that smoking frequency is correlated with depressive symptoms, further emphasizing the interplay between demographic factors and psychological outcomes [12].

In some contexts, current smokers exhibited significantly higher levels of psychological issues, including stress, anxiety, and depression, compared to non-smokers and former smokers. This observation underscores the detrimental effect of continued tobacco use on mental health, reinforcing the need for targeted interventions [13][14]. Additionally, smokers were found to be more likely to experience despair and psychological problems, indicating that smoking might serve as both a symptom and a cause of mental health challenges [10][15].

Table (1): Outcome measures of the included studies

| Study ID | Study design | Country | Sociodemographic | Depression diagnostic tool | Anxiety diagnostic tool | Main outcomes |
|--|-----------------|---------|---|----------------------------|-------------------------|--|
| Stojanovic-Tasic et al., 2016 [7] | Cross-sectional | Serbia | N= 2000 Mean age: 21.5 Males: 43% | HAMD | HAMA | Multivariate logistic regression analysis revealed that depression was one of the independent risk variables for smoking among students (OR = 1.02, p =.013). HAMA claims that there is a link between smoking and anxiety as well (p =.114, p <.001). |
| Milic et al., 2020 [8] | Cross-sectional | Serbia | N= 1624 Mean age: 20.8 Males: 37% | BDI | NA | Higher levels of depressed symptoms acted as a mediating factor in the relationship between smoking and HRQoL impairment among college students in two distinct contexts. |



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|---|-----------------|--------|--|-------|---------|---|
| Schleicher et al., 2009 [9] | Cross-sectional | USA | N= 310 Mean age: 19.1 Males: 50.3% | CES-D | NA | The idea that smoking will lessen negative emotions is one element that explains the association between higher levels of tobacco use and depressed symptoms. |
| Cai et al., 2017 [10] | Cross-sectional | China | N= 1327 Mean age: 19.8 Males: 100% | SDS | SAS | Other smokers were far more likely to experience anxiety and despair than nonsmokers. |
| Ashor, 2012 [11] | Cross-sectional | Iraq | N= 269 Mean age: 18.5 Males: 54.6% | SDS | (HAM-A) | Because heavy smokers are more likely to experience anxiety and depression than non-smokers or moderate smokers, heavy smoking tends to exacerbate these symptoms rather than lessen them. |
| Ürün Ünal & Marakoğlu, 2024 [12] | Cross-sectional | Turkey | N= 1117 Mean age: 22 Males: 44.1% | BDI | NA | Males were around 2.5 times more likely than girls to be active smokers, accounting for over 20% of medical school students. The frequency of smoking and depressive symptoms are significantly correlated. |



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|--|-----------------|----------|--|--------------|--------------|---|
| Saravanan & Heidhy, 2014 [13] | Cross-sectional | Malaysia | N= 719 Mean age: 21.6 Males: 40.8% | DASS-21 | DASS-21 | Compared to past and non-smokers, current smokers showed higher levels of psychological issues (stress, anxiety, and depression). |
| Mousavi et al., 2010 [14] | Cross-sectional | Iran | N= 483 Mean age: 23.1 Males: 51.5% | HSCCL | HSCCL | Signs and symptoms of anxiety, depression, and other psychological problems were more common in smokers. |
| Sa et al., 2010 [15] | Cross-sectional | USA | N= 1201 Mean age: 26 Males: % | Pre-designed | Pre-designed | An increase in smoking was substantially correlated with levels of anxiety, depression, and acculturative stress (p <.05). |

Table (2): Risk of bias assessment using ROBINS-I

| Study ID | Bias due to confounding | Bias in the selection | Bias in the classification | Bias due to deviations | Bias due to missing | Bias in the measure | Bias in the selection | Overall bias |
|---|-------------------------|-----------------------|----------------------------|------------------------|---------------------|---------------------|-----------------------|--------------|
| Stojanovic-Tasic et al., 2016 [7] | Mod | Mod | Low | Low | Low | Low | Low | Low |
| Milic et al., 2020 [8] | Low | Low | Low | Low | Low | Low | Mod | Low |
| Schleicher et al., 2009 [9] | Low | Mod | Low | Low | Low | Mod | Low | Low |
| Cai et al., 2017 [10] | Mod | Mod | Low | Low | Low | Low | Low | Low |
| Ashor, 2012 [11] | Low | Low | Low | Low | Low | Low | Mod | Low |
| Ürün Ünal & Marakoğlu, 2024 [12] | Mod | Mod | Low | Low | Low | Mod | Mod | Moderate |
| Saravanan & | Mod | Low | Low | Low | Low | Mod | Mod | |



| | | | | | | | | |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|----------|
| Heidhy, 2014 [13] | | | | | | | | Moderate |
| Mousavi et al., 2010 [14] | Mod | Mod | Low | Low | Low | Mod | Low | Moderate |
| Sa et al., 2010 [15] | Mod | Mod | Low | Low | Low | Mod | Mod | Moderate |

Discussion

This systematic review highlights a strong and consistent association between smoking and mental health issues, particularly anxiety and depression, among university students. The findings reveal that smoking is often used as a coping mechanism to manage psychological distress; however, it tends to exacerbate symptoms over time, particularly among heavy smokers. A dose-response relationship is evident, with increased smoking frequency and intensity correlating with higher levels of anxiety and depression. Furthermore, depressive symptoms frequently act as mediators in the relationship between smoking and impaired quality of life, demonstrating the interconnected nature of smoking and mental health challenges.

Fluharty *et al.* found regarding whether smoking causes depression and anxiety, whether depression and anxiety cause smoking or increased smoking habit, or whether there is a reciprocal relationship between the two, they discovered generally conflicting results. This contradictory data points to the necessity of future research concentrating on alternative approaches, including MR, in order to make more robust causal conclusions [16].

Multiple theories have been suggested to elucidate the elevated prevalence of smoking among individuals experiencing depression and anxiety. The self-medication theory posits that people resort to smoking to mitigate their psychological symptoms, implying that such symptoms may drive the initiation or continuation of smoking habits [17-19]. Conversely, another hypothesis proposes that smoking itself may provoke depression or anxiety by disrupting neural pathways,

thereby heightening sensitivity to environmental stressors. Research from animal models demonstrates that chronic nicotine exposure destabilizes the hypothalamic-pituitary-adrenal axis, leading to excessive cortisol production and alterations in the monoamine neurotransmitter system, which governs stress responses. These disturbances appear to resolve following nicotine cessation [20, 21].

The link between smoking and depression/anxiety may also be **reciprocal**, wherein smoking is initially used to manage distress but subsequently aggravates it over time [22]. Alternatively, no direct causation may exist; the connection could stem from overlapping risk factors, such as genetic predispositions or other confounding variables [22, 23]. Furthermore, smokers may misinterpret the temporary relief from nicotine withdrawal as genuine symptom improvement. Due to nicotine's brief half-life, withdrawal symptoms like heightened anxiety and negative mood rapidly emerge after abstinence. Consequently, the alleviation of these withdrawal effects upon smoking may be mistakenly perceived as an authentic anxiolytic benefit [19]. This misinterpretation reinforces the belief that smoking enhances mood, further complicating the intricate relationship between smoking and mental health.

The evidence presented in this review has several important implications for clinical practice, particularly in university and youth-focused settings. Integrating smoking assessments into routine mental health screenings is crucial, as smoking is intricately linked to anxiety and depression. This integration would enable early identification of students at risk and ensure that their mental health challenges are addressed holistically. Smoking cessation programs must also go beyond traditional approaches by incorporating stress



management techniques and emotional regulation strategies, which are often underlying factors driving smoking behaviors.

Strengths and limitations

This review possesses several strengths that enhance its contribution to understanding the relationship between smoking and mental health among university students. It synthesizes findings from diverse geographical regions and populations, offering a global perspective on this critical issue. By focusing on university students—a particularly vulnerable and under-researched group—the review provides tailored insights into a population facing significant academic and social pressures. Additionally, the use of validated diagnostic tools for anxiety and depression in many of the included studies enhances the reliability of the findings.

However, some limitations must be acknowledged. The majority of the included studies relied on cross-sectional designs, limiting the ability to establish causality between smoking and mental health outcomes. This limitation highlights the need for longitudinal studies to better understand how smoking behaviors and mental health issues evolve over time. There was also notable heterogeneity in diagnostic tools, sample sizes, and cultural contexts, which makes it challenging to generalize findings across all university student populations. Furthermore, underrepresentation of certain groups, such as non-smokers or individuals from diverse cultural and socioeconomic backgrounds, may introduce bias into the findings. These limitations underscore the importance of interpreting the results cautiously while recognizing the need for further research.

Conclusion

In conclusion, this systematic review underscores the significant and complex relationship between smoking and mental health, particularly anxiety and depression, among university students. Smoking not only coexists with these mental health conditions but also exacerbates their severity, creating a cycle of dependency and psychological distress. The findings highlight the urgent need for integrated mental health and smoking cessation programs tailored to university populations. Such programs should address the underlying psychological drivers of smoking, including stress and emotional

regulation, while also considering demographic and cultural differences. Future research should prioritize longitudinal studies to establish causality and assess the effectiveness of interventions. By tackling smoking and mental health simultaneously, universities and healthcare providers can make significant strides in improving the overall well-being and academic success of students

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