

Original Research Article

Psychological distress among college students during high air pollution: a cross-sectional correlational study

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Received: 25 July 026

Revised: 11 August 2026

Accepted: 13 August 2026

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ABSTRACT

Background: Air pollution is the fourth leading global risk factor for human health and is associated with major causes of mortality, including stroke. Developing nations bear a greater burden of its health and economic consequences. Emerging evidence indicates that air pollution also negatively impacts mental well-being, with prolonged exposure to pollutants such as PM_{2.5} linked to emotional distress and impaired cognitive and social functioning.

Methods: The present study employed a cross-sectional correlational design with a sample of 257 college students. Data was collected between October 2025 and January 2026. Participants completed the Beck anxiety inventory, perceived stress scale, and mood and feelings questionnaire. Data was analyzed using t tests, Pearson correlation, one-way ANOVA, and linear regression in SPSS.

Results: AQI showed a significant positive correlation with mood and feelings scores. Anxiety was strongly and positively associated with both perceived stress and mood disturbances. Female participants reported significantly higher anxiety and perceived stress than males. Participants residing in areas with poor to severe AQI demonstrated higher anxiety and mood-related scores compared to those in satisfactory AQI areas.

Conclusions: The findings suggest that deteriorating air quality may be associated with adverse psychological outcomes among young adults. Although the associations were modest, they highlight the importance of environmental factors as contributors to mental health and underscore the need for further research.

Keywords: Air pollution, Anxiety, Perceived stress, Mood and feelings, Young adults

INTRODUCTION

Air pollution is identified as the fourth leading risk factor for global human health being linked to major causes of death worldwide by stroke (26%), ischemic heart disease (20.2%), and primary cancers of the trachea, bronchus, and lung (19%), trailing only behind high blood pressure, dietary risks, and tobacco.¹⁻³

It significantly contributes to early mortality and disease, representing the foremost environmental health challenge of the twenty-first century.⁴

Developing nations have experienced a greater economic burden from air pollution compared to their developed counterparts. For example, in 2019, India recorded around 1.67 million deaths attributable to air pollution.⁵ The country also has one of the highest annual average exposures to ambient particulate matter PM_{2.5} surpassing the National Ambient Air Quality Standards established by the World Health Organization.⁶

The notable increase in air pollution in November following Diwali each year in the capital can be attributed to the emissions by burning firecrackers during the

festival and from Burning crop residue that has been associated with the release of gases such as SO₂, NO₂, CO₂, N₂O, and CH₄ thus contributing to the city's dangerous winter smog.^{7,8} Other than the above discussed reasons contributors to ambient particulate matter pollution include biomass burning for residential and commercial purposes, windblown mineral dust, coal combustion for energy production, industrial emissions, agricultural residue burning, waste incineration, construction activities, brick kilns, transportation, and diesel generators.⁹⁻¹²

Emerging research indicates that air pollution has a negative impact on mental well-being as reported by the World Health Organization, more than 300 million individuals globally were affected by mental health issues in 2015, marking an 18 percent increase since 2005.¹³ Extended exposure to air contaminants like PM_{2.5} worsens emotional distress and hinders cognitive and social abilities, which may lead to academic struggles, familial tensions, and social instability.¹⁴⁻¹⁶

A study carried out in 2003 and 2007 on the same group of individuals revealed that exposure to air pollution in the year preceding the survey significantly influenced mental health. Participants were substantially more prone to sadness, low mood, depression.¹⁷

New studies have also demonstrated a correlation between air pollution and various mental health issues, such as reduced work capacity, decreased productivity, memory issues, negative mood, irritability, poor sleeping patterns, depression, anxiety, and stress, particularly affecting vulnerable populations in urban settings.¹⁸⁻²⁴

Increasing evidence suggests that air pollution can also affect the central nervous system, with research indicating detrimental impacts on cognitive and behavioral functions, poor attention spans, lower intelligence quotients (IQ), memory issues, and academic performance.²⁵⁻³⁰

Rationale of the study

Prior research has predominantly focused on the impact of air pollution on traditionally vulnerable populations, such as children, pregnant women, and the elderly. However, relatively limited attention has been given to young adults, particularly college students, who represent a critical yet understudied group potentially susceptible to environmental stressors. This population often experiences unique academic, social, and developmental pressures, which may interact with environmental factors to influence psychological well-being. The present study aims to address this gap by examining the short-term psychological effects of seasonal increases in air pollution during the winter months among college students. Specifically, the research evaluates variations in anxiety and mood levels in response to fluctuations in air quality. Conducted in the national capital region, where air

pollution levels tend to rise significantly during the onset of winter, this study provides a contextually relevant examination of how acute environmental changes may affect mental health. By exploring the association between deteriorating air quality and psychological well-being in young adults, this research contributes to the growing body of literature on environmental determinants of mental health.

The findings aim to highlight the need for more inclusive research frameworks that consider young adults as a potentially at-risk population and may inform public health strategies and policy interventions designed to safeguard mental well-being in highly polluted urban settings.

Aim of the study

The present study aimed to examine the relationship between air quality and psychological well-being, specifically mood and feelings disturbance, perceived stress, and anxiety levels among college students.

Objectives

Objectives were to assess the relationship between air quality, mood and feelings, perceived stress and anxiety levels among college students, to assess differences in mood and feelings, perceived stress, and anxiety based upon gender, to examine differences in mood disturbance, perceived stress, and anxiety across different air quality index (AQI) categories and to assess whether AQI predicts mood and feelings disturbances among college students.

Hypothesis

H1

There will be a relationship between air quality and psychological wellbeing (mood and feelings disturbance, perceived stress, and anxiety) among college students.

H2

There will be a difference between male and female students in mood and feelings disturbance, perceived stress, and anxiety levels.

H3

There will be differences in mood and feelings disturbance, perceived stress and anxiety across different categories of AQI.

H4

AQI will be associated with mood disturbance among college students.

METHODS

Participants

The study included 257 young adults recruited through purposive sampling and snowball sampling. Young adults ranged in age from 18-25 years. Inclusion criteria required young adults to be enrolled in college (IILM University) at the time of data collection.

Both male and female college students were included in the study additionally residing in Delhi NCR during the study period. Inclusion criteria also required participants to comprehend English.

Exclusion criteria

Individuals below 18 years or above 25 years of age were excluded from the study. Participants who were not enrolled at IILM University during the data collection period and were not residing in the Delhi NCR region at the time of data collection. Young adults enrolled as PhD scholars were not included. Additionally young adults with current or past history of any diagnosed psychiatric condition were excluded from the study.

Study design

The study adopted a correlational and cross-sectional research design. This design was considered appropriate as the study aimed to examine naturally occurring relationships between air pollution levels and psychological variables without manipulating any conditions. The sample consisted of 257 young adults currently enrolled in college.

Data collection

Data was collected over a period of four months (October 2025-January 2026). Young adults were administered with three tools namely, Beck anxiety inventory, perceived stress scale and mood and feelings questionnaire.³¹⁻³³ Demographic information including gender and residential area was collected. AQI values corresponding to participants residential locations were extracted from Central Pollution Control Board.¹¹

Statistical procedure

Data was manually entered on the excel and AQI values corresponding to participants' residential locations were added from Central Pollution Control Board (CPCB). The data was further checked for missing values, and it was systematically cleaned. In the analysis of data SPSS software was used, through various tests such as t test, Pearson correlation, One way ANOVA and Simple linear regression.

Correlations were investigated between air quality, mood and feelings, perceived stress, and anxiety levels. T test

was utilized to compare gender based on mood and feelings, perceived stress, and anxiety levels. One way ANOVA was used to examine differences in mood disturbance, perceived stress, and anxiety across different AQI categories. To assess whether air quality will be associated with mood disturbance among college students' simple linear regression was utilized.

RESULTS

Pearson correlations were run to examine the relationship between AQI, anxiety, mood and feelings, Perceived stress. AQI was positively correlated with mood and feelings ($r=0.122$, $p=0.051$). Anxiety was positively and strongly correlated with mood problems ($r=0.664$, $p<0.001$) and perceived stress ($r=0.548$, $p<0.001$). Similarly, mood problems were strongly associated with perceived stress ($r=0.622$, $p<0.001$).

An independent samples t test was conducted to examine gender differences in anxiety, mood and feelings, and perceived stress. Results indicated a significant difference in anxiety levels between males and females. Female participants (22.15 ± 12.46) reported significantly higher anxiety compared to male participants (17.28 ± 12.13) ($p=0.003$). For mood and feelings, no statistically significant gender difference was observed. Male participants (7.93 ± 5.66) and female participants (8.91 ± 5.78) reported comparable levels ($p=0.198$). However, perceived stress showed a statistically significant gender difference. Female participants (20.97 ± 5.96) reported significantly higher perceived stress compared to male participants (16.55 ± 6.96) ($p<0.001$).

An independent samples t test was conducted to examine differences in anxiety, fear of recurrence, and perceived stress based on AQI categories. Participants residing in areas with poor to severe AQI (201-500) reported higher mean anxiety scores (21.56 ± 12.32) compared to those living in satisfactory AQI areas (51-100) (19.13 ± 12.77). However, this difference did not reach statistical significance, ($p=0.125$). A statistically significant difference was observed for mood and feelings. Participants living in poor to severe AQI conditions (9.20 ± 5.81) reported significantly higher mood and feelings compared to those in satisfactory AQI areas (7.74 ± 5.58) ($p=0.044$). For perceived stress, participants in poor AQI areas (19.63 ± 6.27) showed slightly higher stress levels than those in satisfactory AQI areas (19.34 ± 7.13); however, this difference was not statistically significant, ($p=0.731$).

A simple linear regression analysis was conducted to examine whether Air Quality Index (AQI) predicts mood and feelings. The regression model approached statistical significance, $F(1, 255)=3.85$, $p=0.051$, $R^2=0.015$, indicating that AQI explained approximately 1.5% of the variance in mood and feelings.

Table 1: Correlation of AQI, anxiety, mood and feelings, perceived stress.

Variables		AQI	Anxiety	Mood and feelings	Perceived stress
AQI	Pearson correlation		0.079	0.122	0.032
	Sig. (2 tailed)		0.209	0.051	0.615
	N		257	257	257
Anxiety	Pearson correlation	0.079		0.664	0.548
	Sig. (2 tailed)	0.209		0.000	0.000
	N	257		257	257
Mood and feelings	Pearson correlation	0.122	0.664		0.622
	Sig. (2 tailed)	0.051	0.000		0.000
	N	257	257		257
Perceived stress	Pearson Correlation	0.032	0.548	0.622	
	Sig. (2 tailed)	0.615	0.000	0.000	
	N	257	257	257	

Table 2: Gender differences in anxiety, mood and feelings, and perceived stress.

Variables	Gender	N	Mean±SD	T	Df	P	Std. error difference
Anxiety	Male	85	17.28±12.136	-2.972	255	0.003	1.638
	Female	172	22.15±12.461	-2.999	171.476	0.003	1.623
Mood and feelings	Male	85	7.93±5.656	-1.292	255	0.198	0.761
	Female	172	8.91±5.784	-1.301	170.846	0.195	0.756
Perceived stress	Male	85	16.55±6.960	-5.285	255	0.000	0.836
	Female	172	20.97±5.956	-5.015	146.391	0.000	0.881

Table 3: Differences in anxiety, mood and feelings, and perceived stress across AQI categories.

AQI category		N	Mean±SD	T	Df	P	Std. error difference
Anxiety	Satisfactory (51 to 100)	108	19.13±12.771	-1.540	255	0.125	1.581
	Poor, very poor and severe (201-500)	149	21.56±12.316	-1.531	225.726	0.127	1.590
Mood and feelings	Satisfactory (51 to 100)	108	7.74±5.581	-2.022	255	0.044	0.722
	Poor, very poor and severe (201-500)	149	9.20±5.811	-2.035	235.920	0.043	0.718
Perceived stress	Satisfactory (51 to 100)	108	19.34±7.125	-0.344	255	0.731	0.839
	Poor, very poor and severe (201-500)	149	19.63±6.265	-0.337	212.314	0.737	0.856

Table 4: Simple linear regression predicting mood and feelings from AQI.

Variables	Sum of squares	Df	Mean Square	F	Sig.
Regression	125.744	1	125.744	3.845	0.051
Residual	8338.536	255	32.700		
Total	8464.280	256			

DISCUSSION

The aim of the study was to assess the relationship between air quality and psychological well-being, perceived stress, and anxiety levels among college students. The current research also demonstrates differences in mood disturbance, perceived stress, and anxiety across different AQI categories. Study included 257 young adults recruited through purposive sampling and snowball sampling. Data was collected over a period

of four months (October 2025-January 2026). Young adults were administered with three tools namely, Beck anxiety inventory, Perceived Stress Scale and Mood and Feelings Questionnaire.

Demographic information, including gender and residential area, was also collected. AQI values corresponding to participants residential locations were extracted from Central Pollution Control Board.¹¹

The first objective of the study was to examine the relationship between air quality, mood and feelings, perceived stress, and anxiety levels among college students. To assess these associations, Pearson correlation analyses were conducted between AQI and the psychological variables, including anxiety, mood and feelings, and perceived stress. Mood and feelings showed positive correlation with AQI and perceived stress. Anxiety showed positive correlation with mood and feelings and perceived stress as demonstrated in Table 1. The current findings align with earlier studies that emphasize the psychological effects of air pollution on young adults. A nationwide study involving almost 12,000 university students in China identified a significant connection between elevated regional air pollution levels and heightened perceived mental stress.³⁴ Likewise, another study discovered that poor air quality was closely linked to increased depression and reduced life satisfaction in Chinese undergraduate students.³⁵ Additionally, prior research in India revealed a significant correlation between air quality and mental well-being, with greater pollutant levels tied to elevated anxiety and depression scores, suggesting that poorer air quality leads to heightened psychological distress.³⁶

The second objective was to assess differences in mood and feelings, perceived stress, and anxiety based upon gender. An independent samples t test was conducted to examine gender differences in anxiety, mood and feelings, and perceived stress. Results in Table 2 indicated a significant difference in anxiety levels between males and females, where female participants reported significant higher anxiety compared to male participants. For mood and feelings, no statistically significant gender difference was observed, male and female participants reported comparable levels. However, perceived stress showed a statistically significant gender difference where female participants reported significantly higher perceived stress compared to male participants in our study. Research conducted in India suggests that female students may experience greater psychological distress overall. For instance, a study in Maharashtra reported that female college students had significantly higher levels of anxiety, stress, and depression compared to males.³⁷ Previous findings also suggest gender differences in psychological reactions to environmental stressors. For example, the connection between short-term exposure to air pollutants and anxiety-related hospital visits was stronger in females.³⁸ Nevertheless, the impact of gender is not always consistent; previous study observed that male students were 1.6 times more likely than their female counterparts to face mental health issues related to air pollution, highlighting complex gender disparities.³⁵

To examine differences in mood disturbance, perceived stress, and anxiety across different air quality categories, an independent samples t test was conducted. Table 3 shows participants residing in areas with poor to severe AQI reported higher mean anxiety scores compared to

those living in satisfactory AQI areas. A statistically significant difference was observed in mood and feelings across AQI categories. Participants residing in areas with poor to severe AQI reported significantly higher scores on mood and feelings compared to those living in areas with satisfactory AQI levels. Regarding perceived stress, participants in poor AQI areas demonstrated slightly higher stress levels than those residing in areas with satisfactory AQI. A research study focusing on rural households revealed consistent findings.³⁶ Notable variations in mental health outcomes were identified among different AQI categories, with individuals exposed to poorer or moderate air quality indicating increased levels of anxiety and depressive symptoms.

A simple linear regression analysis was conducted in Table 4 to examine whether the air quality predicts mood and feelings among the participants. The results indicated that the regression model approached statistical significance, suggesting a potential association between AQI levels and mood and feelings. Specifically, AQI accounted for approximately 1.5% of the variance in mood and feelings. Although the proportion of variance explained by AQI was relatively small, the findings suggest that air quality may have a modest influence on individuals emotional experiences. Though our findings did not indicate a strong association between AQI and stress levels. However, a relationship was observed between AQI and mood. From a psychological perspective, environmental stressors often first influence the affective component of experience, such as mood, which may subsequently contribute to other psychological outcomes, including stress. It is possible that with a larger sample size, this indirect relationship might have been more clearly reflected in stress levels. This implies that poorer air quality could be associated with subtle changes in mood and emotional states among college students. However, the low percentage of explained variance also indicates that mood and feelings are likely influenced by multiple other psychological, environmental, and social factors beyond air quality. Therefore, while AQI may play a role, it should be considered as one of several contributing factors affecting emotional well-being.

CONCLUSION

The results of this study offer initial evidence indicating that deteriorating air quality might be linked to variations in psychological conditions, including heightened anxiety and mood swings. While the strength of these associations seems somewhat limited, they still emphasize the importance of environmental elements like air pollution as potential influencers of mental health among young adults. Crucially, even minor psychological shifts at the individual level could lead to significant public health issues when viewed across larger communities exposed to consistently poor air conditions. These results reinforce the necessity of expanding current viewpoints on mental health by integrating environmental

factors along with conventional psychosocial influences. Additionally, the findings highlight the necessity for ongoing research employing longitudinal and multi-method strategies to enhance our understanding of causal pathways and their long-term impacts. From a practical perspective, the research advocates for the inclusion of mental health factors in environmental and public health policies, especially in densely polluted urban areas. Improving air quality could not only enhance physical health but also significantly contribute to the psychological well-being of vulnerable and frequently neglected groups, like college students.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Malhotra P, Khurana R. Psychological distress among college students during high air pollution: a cross-sectional correlational study. *Int J Community Med Public Health* 2026;13:xxx-xx.