

PAIN CATASTROPHIZING, ANXIETY, AND THEIR RELATIONSHIP WITH HEADACHE BURDEN AND QUALITY OF LIFE AMONG UNIVERSITY STUDENTS: A CROSS-SECTIONAL ANALYSIS

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Abstract

Headache disorders are highly prevalent among university students and have a negative impact on academic achievement, mental health and quality of life. Psychological factors including pain catastrophizing and anxiety could play a role in headache induced disability, but evidence in Pakistan is limited. This study aimed to investigate the correlation between pain catastrophizing with anxiety, headache burden, and the quality of life of university students.

The method used was Analytical Cross Section Study and the population consisted of University students of five public Universities in Pakistan. The participants filled a structured questionnaire that included socio-demographic data, the Pain Catastrophizing Scale (PCS), Generalized Anxiety Disorder-7 (GAD-7), Headache Impact Test-6 (HIT-6), and the World Health Organization Quality of Life-BREF (WHOQOL-BREF). IBM SPSS Statistics version 29 was used for descriptive statistics, Pearson's correlation and multiple linear regression analysis. P values <0.05 were deemed significant. The 842 students were the ones that ended up in the final analysis. There was a significant positive correlation between headache burden and pain catastrophizing ($r = 0.56$, $p < 0.001$) as well as anxiety ($r = 0.52$, $p < 0.001$). Demographic and lifestyle factors did not affect the association between these two variables and headache burden. Headache burden was negatively correlated with quality of life ($r = -0.61$, $p < 0.001$), and was the most powerful predictor of poor quality of life in the regression model. Pain catastrophizing and anxiety were found to be positively correlated with headache burden and quality of life among University students. The results of

this study emphasize the need to incorporate psychological evaluation and mental health care into university health services in order to minimize disability associated with headaches and enhance students' well-being.

This study aimed to assess the relationship between pain catastrophizing, anxiety, headache burden, quality of life and university students in Pakistan.

INTRODUCTION

Headache disorders are one of the most prevalent neurological illnesses in the world, and can be a major source of disability, especially among young adults. Students at universities are particularly prone to headaches due to stress related to studies, excessive screen time, erratic sleep habits and poor lifestyle habits. Headaches are a significant public health issue in educational environments and can adversely impact concentration, academic achievement, social relationships and wellbeing. (dos Santos, de Oliveira et al. 2021)

Aside from biological factors, psychological attributes are also significant in the perception and effect of pain. Pain catastrophizing is the tendency to experience exaggerated negative cognitive and emotional reactions to real and/or perceived pain, and is related to higher levels of pain intensity, more functional disability and poorer health outcomes. People who have higher catastrophizing scores tend to think of pain as unbearable, look at pain experiences in greater detail, and feel helpless about controlling pain. Likewise, anxiety is prevalent in university students, and has been associated with heightened pain sensitivity, frequent headaches, and diminished psychological health. Previous research indicates that anxiety and pain catastrophizing often occur together, and can interact to exacerbate pain perception and headache-related disability (Ghazy, Mohamed et al. 2025).

The burden of headache is more than just the headache, and can have a significant impact on quality of life. Frequent and severe headaches in a student can lead to decreased participation in academic work, decreased productivity, emotional stress, and social dysfunction. Relatively few studies have explored the interaction of pain catastrophizing and anxiety on headache burden and quality of life. (dos Santos, de Oliveira et al. 2021) In addition, few studies have been

conducted in Pakistan and most of them focused on the prevalence of headache instead of the associated psychological factors that lead to headache burden and impair quality of life. (Jakuš, Horvat Tišlar et al. 2026)

These relationships are significant in designing appropriate interventions for both the psychological health and headache management of university students. Knowing some of the psychological factors that can be modified could help in early screening and help to implement campus-based mental health and pain management programmes. (Samir, Elgammal et al. 2025)

This study was therefore designed to explore the association between pain catastrophizing, anxiety, headache burden and quality of life among the university students in Pakistan. In particular, the study aimed to determine if increases in pain catastrophizing and anxiety were related to increases in headache burden and decreases in quality of life. (Jakuš, Horvat Tišlar et al. 2026)

MATERIALS AND METHODS

Study Design and Setting

The cross-sectional analytical study was carried out on university students in five public sector universities of Pakistan from February 2026 to July 2026. To increase the diversity of the study population, the selected institutions were distributed across the country.

The number of study subjects and the size of the sample.

The study encompassed undergraduate and postgraduate students aged 18 years and above and enrolled in regular academic study during the study period. Only students who completed the questionnaire and had a physician diagnosis of a neurological disorder other than primary headache disorders or severe psychiatric illness were excluded.

The minimum sample size was determined by Cochran's formula for cross sectional studies, with the assumption of a 50% prevalence, a 95% confidence level and a 5% margin of error. A total of 900 students were invited to participate to improve statistical power and to make up for potential non-response. Only questionnaires that were completed were used in the final analysis, which included data from 842 participants (excluding any that were incomplete). (Samir, Elgammal et al. 2025)

Sampling Technique

A multi-stage sampling technique was used. Initially, five public universities were purposively selected from different provinces of Pakistan. After that, faculties and departments were randomly chosen in each university. Department-wise sub-sample was then proportionately selected using convenience sampling to recruit the eligible students.

Data Collection Tool

A structured, self-administered questionnaire was used to gather data and comprised five sections. Socio-demographic and academic information such as age, gender, faculty, residence, monthly family income, sleep duration, daily screen time, physical activity, caffeine consumption, smoking status, and previous history of headache were recorded in the first section. In the first section, socio-demographic and academic information were recorded including age, gender, academic year, faculty, residence, monthly family income, sleep duration, daily screen time, physical activity, caffeine consumption, smoking status, and previous history of headache.

The Pain Catastrophizing Scale (PCS) was used to assess pain catastrophizing, and consisted of 13 items that captured rumination, magnification, and helplessness. The Generalized Anxiety Disorder-7 (GAD-7) was used to assess anxiety symptoms. The Headache Impact Test (HIT-6) was used to quantify headache burden and the World Health Organization Quality of Life-BREF (WHOQOL-BREF) was used to assess quality of life. The more severe the symptoms, the higher the

score for PCS, GAD-7, and HIT-6; the higher the score for WHOQOL-BREF, the better the quality of life (Ataya, Bannoud et al. 2024).

Data Collection Procedure

With permission from the institutions, students were contacted in their scheduled classes. The aim of the study was described and informed consent was requested prior to participation. There was voluntary participation and anonymity was done during the study. It took about 15–20 minutes to fill out the questionnaire.

Ethical Considerations

The Institutional Research Ethics Committee gave ethical clearance before data was collected. The informed consents were obtained from all participants. The collected data was anonymized and unique identification codes were used to ensure confidentiality and anonymity.

Statistical Analysis

Data were entered into Microsoft Excel, and analyzed using IBM SPSS Statistics version 29. Continuous variables were reported as the mean $\pm$ standard deviation (SD); categorical variables were reported as frequencies and percentages. (Seng, Shapiro et al. 2022)

Shapiro-Wilk test was used to determine the normality of continuous variables. Independent-samples t-test and one-way analysis of variance (ANOVA) were used to compare mean scores across demographic groups, as appropriate. Pearson's correlation coefficient was used to analyze the relationships between pain catastrophizing, anxiety, headache burden and quality of life. Multiple linear regression analysis was carried out to identify the independent predictors of headache burden and quality of life after adjusting for the potential confounding variables. A two-tailed p-value of <0.05 was considered statistically significant. (Ataya, Bannoud et al. 2024)

RESULTS

A total of 900 students were invited to participate. After excluding 58 questionnaires due to

incomplete responses, data from 842 participants were included in the final analysis, yielding a response rate of 93.6%.

Sociodemographic Characteristics

The mean age of the participants was 21.4 ± 2.3 years (range: 18–29 years). Females constituted 56.8% ($n = 478$) of the sample, while 43.2% ($n =$

364) were males. Most participants were undergraduate students (81.5%), and approximately two-thirds (67.3%) reported sleeping less than seven hours per night. Nearly half of the participants (48.6%) reported daily screen time exceeding six hours.

Table 1. Sociodemographic Characteristics of Participants ($n = 842$)

Variable	Frequency (n)	Percentage (%)
Age (years)		
18–20	294	34.9
21–23	381	45.2
≥ 24	167	19.9

Gender

Male	364	43.2
Female	478	56.8

Education Level

Undergraduate	686	81.5
Postgraduate	156	18.5

Sleep Duration

<7 hours	567	67.3
≥ 7 hours	275	32.7

Daily Screen Time

<6 hours	433	51.4
≥ 6 hours	409	48.6

Pain Catastrophizing, Anxiety, Headache Burden, and Quality of Life

The mean Pain Catastrophizing Scale (PCS) score was 23.8 ± 9.6 , while the mean GAD-7 score was

8.9 ± 5.1 . The average HIT-6 score was 56.7 ± 8.4 , indicating a moderate headache burden in the study population. The mean WHOQOL-BREF overall score was 63.9 ± 11.8 .

Table 2. Descriptive Statistics of Study Variables

Variable	Mean $\pm$ SD	Possible Range
Pain Catastrophizing Scale (PCS)	23.8 ± 9.6	0–52
GAD-7 Anxiety Score	8.9 ± 5.1	0–21
HIT-6 Headache Burden	56.7 ± 8.4	36–78
WHOQOL-BREF Overall Score	63.9 ± 11.8	0–100

Correlation Analysis

Pearson's correlation analysis demonstrated a significant positive correlation between pain

catastrophizing and anxiety ($r = 0.49$, $p < 0.001$). Both pain catastrophizing ($r = 0.56$, $p < 0.001$) and anxiety ($r = 0.52$, $p < 0.001$) were positively

associated with headache burden. Quality of life showed significant negative correlations with pain catastrophizing ($r = -0.48$, $p < 0.001$), anxiety ($r = -0.54$, $p < 0.001$), and headache burden ($r = -0.61$, $p < 0.001$).

Table 3. Pearson Correlation Among the Main Study Variables

Variables	PCS	GAD-7	HIT-6	WHOQOL
PCS	1			
GAD-7	0.49**	1		
HIT-6	0.56**	0.52**	1	
WHOQOL	-0.48**	-0.54**	-0.61**	1

$p < 0.001$

Predictors of Headache Burden

Multiple linear regression analysis was performed after adjusting for age, gender, sleep duration, and daily screen time. Pain catastrophizing and anxiety

remained significant independent predictors of headache burden. Short sleep duration and prolonged screen time were also independently associated with higher HIT-6 scores.

Table 4. Multiple Linear Regression Predicting Headache Burden (HIT-6)

Predictor	β	95% CI	p-value
Pain Catastrophizing	0.37	0.28-0.46	<0.001
Anxiety	0.29	0.20-0.38	<0.001
Sleep <7 hours	0.15	0.08-0.22	<0.001
Screen Time ≥ 6 hours	0.12	0.05-0.19	0.002
Female Gender	0.09	0.02-0.16	0.011

Model statistics: Adjusted $R^2 = 0.41$, $F = 118.6$, $p < 0.001$.

Predictors of Quality of Life

In the regression model, headache burden, anxiety, and pain catastrophizing were

independently associated with lower WHOQOL-BREF scores. Headache burden showed the strongest negative association with quality of life.

Table 5. Multiple Linear Regression Predicting Quality of Life

Predictor	β	95% CI	p-value
Headache Burden	-0.42	-0.51 to -0.33	<0.001
Anxiety	-0.26	-0.34 to -0.18	<0.001
Pain Catastrophizing	-0.19	-0.27 to -0.11	<0.001
Sleep <7 hours	-0.11	-0.18 to -0.04	0.004

Model statistics: Adjusted $R^2 = 0.47$, $F = 139.8$, $p < 0.001$.

Overall, the findings indicate that higher levels of pain catastrophizing and anxiety were associated with a greater headache burden. Furthermore, headache burden demonstrated a strong inverse relationship with quality of life. Even after adjustment for demographic and lifestyle variables, pain catastrophizing and anxiety remained significant independent predictors of

headache burden, while headache burden emerged as the strongest predictor of reduced quality of life. These patterns are consistent with findings reported in previous research.

Discussion

This study aimed to explore the association between pain catastrophizing, anxiety, headache

burden and quality of life in university students in Pakistan. The results showed that pain catastrophizing and anxiety significantly correlated with increased headache burden, and the higher the headache burden the worse the quality of life. These associations were still observed when controlling for demographic and lifestyle factors, indicating that psychological factors have an important role in headache-related disability among university students. (Mingels, Dankaerts et al. 2021)

Moderate to high headache burden was reported by a significant number of participants, suggesting that headache is a prevalent health issue in this population. Academic workload, exam stress, excessive screen time, disrupted sleep patterns and social stressors are common experiences during university life and can all play a role in the incidence and/or duration of headache. The same has been found in research among university students in other countries, which found headaches were among the most common factors affecting academic performance and daily functioning. (Bruemmer 2025)

Pain catastrophizing was a strong predictor of headache burden. Higher catastrophizing scores were associated with higher headache-related disability, as there has been increasing evidence that maladaptive cognitive responses can increase pain perception. Catastrophic thinking involves overthinking of pain, magnifying the potential consequences and a sense of helplessness. These cognitive patterns can lead to heightened awareness of pain, heightened emotional distress, and decreased coping efficacy, all of which can lead to increased functional impairment. In previous studies, conducted in chronic pain and migraine populations, pain catastrophizing has been shown to be associated with greater pain intensity, disability, and healthcare utilization. (Tekaya, Said et al. 2024)

There was also an independent association between anxiety and headache burden. Those with higher scores for anxiety reported greater headache-related impairment than those with lower scores for anxiety. This finding is in line with previous studies that showed a strong link between

anxiety disorders and primary headache disorders, such as migraine and tension-type headache. Anxiety can affect headache in a number of ways, such as through increased muscle tension, increased activity of the autonomic nervous system, sleep disturbances, and changes in pain modulation. On the other hand, recurrent headaches can be a source of psychological distress, implying a complex and possibly bidirectional relationship. (Reina-Varona, Madroñero-Miguel et al. 2025)

There is also a positive relationship between pain catastrophizing and anxiety, which further highlights the interrelatedness between the psychological factors. Catastrophizing thoughts about pain were more common among anxious students, a pattern that could perpetuate negative emotions and lead to greater disability associated with headache. This interaction points out the fact that psychological factors should not be evaluated alone but together when evaluating headache burden (Ruiz-Marrara, Antunes et al. 2026).

The study also revealed a strong correlation between headache burden and the decrease in quality of life. Participants with higher headache-related disability had less overall wellbeing, indicating that headache affects physical, emotional, academic and social functioning. Chronic headaches can make it harder to focus, attend school, get involved in school, and have difficulty with relationships. This is consistent with previous studies that have found that as headache worsens, health-related quality of life worsens as well.

The lifestyle factors analysed had an association with headache burden, with shorter sleep and longer screen time being the factors. The results agree with previous research that showed insufficient sleep and overuse of digital devices can lead to or make worse headaches in young adults. As more and more academic tasks are done using digital technology, students' exposure to these risk factors may also be rising. Therefore, promoting healthy sleep habits and balanced screen use could be considered practical measures to reduce headache related issues in university environments (Yousefi Afrashteh, Abbasi et al., 2023).

This study's results have relevance to public health. Headache disorders should not be viewed as a singular clinical symptom, but rather as a major student health problem in the university. Mental health screening, stress management, psychological counseling, and mental health education on healthy coping strategies could be used to help decrease anxiety and maladaptive cognitions related to pain. The addition of such strategies to the university health services may have a positive impact on the psychological health of students, on disability caused by headache and on the quality of life.

There are a number of limitations to this study. First, because of its cross-sectional design, it is difficult to make causal inferences between psychological factors and headache burden. Secondly, the administration of self-administered questionnaires may have resulted in recall and response bias. Third, the study's findings may not be applicable to students at private universities or to young adults not attending universities. However, the study sample size was relatively large and geographically diverse, and the primary study variables were measured using standardized and validated instruments, thus enhancing the reliability of the results. (Yousefi Afrashteh, Abbasi et al. 2023)

The results overall highlight the important role of pain catastrophizing and anxiety in headache burden and quality of life among university students. Considering these psychological factors could offer opportunities for early intervention and enhance mental health and headache outcomes in this population. (Mirmohammadi, Ghoreyshi Rad et al. 2026)

CONCLUSION

In this study, it was found that there was a significant relationship between pain catastrophizing and anxiety in terms of headache burden in university students. Students who had higher levels of catastrophic thinking and anxiety had higher headache-related disability, and this was associated with lower quality of life. Headache burden was found to be the most significant predictor of decreased quality of life, which

indicates that headache had significant impact on students' physical, emotional and academic health. Overall, the results highlight the need for psychological evaluation and mental health resources in university health care for better headache management and students' well-being.

RECOMMENDATIONS

The following recommendations are made based on the results of this study:

- Routine screening programs to detect pupils with high levels of anxiety and headache-related disability should be developed within the university setting.
- Cognitive-behavioral approaches to decrease pain catastrophizing and coping should be included in counseling and psychological support services.
- Health promotion programs should promote adequate sleep, stress management, regular physical activity and healthy screen-time habits to reduce the risk of headaches.
- The multidisciplinary management of recurrent headaches should be reinforced between university health centers, psychologists and health professionals.

STRENGTHS OF THE STUDY

- The sample size for the study was relatively large with university students from different public universities of Pakistan.
- Pain catastrophizing, anxiety, headache burden and quality of life were assessed using standardized and internationally validated instruments.
- Important demographic and lifestyle factors were included in the multiple regression analysis, allowing for more robust estimation of the associations observed.

LIMITATIONS

- Since the cross-sectional design does not allow for causal inferences, the results cannot be used to determine causality.
- Self-reported information can be subject to recall and social desirability bias.

- The findings of the study may not be generalizable, as the study population was restricted to public-sector universities.
- No clinical confirmation was done for the diagnosis of headache and clinical features relied on the participants' self-report.

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Finding

This study was not funded by any outside sources.

Conflict of Interest

The authors have no conflict of interest to declare with regard to the publication of this study.

Data Availability Statement

The data supporting the findings of this study are available upon reasonable request from the corresponding author.

Ethical Approval

The Institutional Research Ethics Committee approved the study. The ethical principles of the Declaration of Helsinki were followed in all procedures.

Informed Consent

All subjects gave informed written consent for their participation in the study.