

Relationship Between High Caloric Food Consumption and Obesity and Perceived Stress: Study among university students of Lahore

Komal Khan¹, Hasan Murtaza², Ifra Nadeem³, Malalai Shams⁴

Abstract

Background: University students represent a high-risk group for unhealthy dietary behaviours and elevated psychological stress. In Pakistan, rapid urbanisation and academic pressures have intensified reliance on high-caloric convenience foods, with emerging evidence linking such diets to increased BMI and greater perceived stress.

Objectives: This study aimed to assess the relationship between high-calorie food intake, obesity (BMI), and perceived stress among university students in Lahore.

Methodology: A cross-sectional study was conducted among 383 students aged 18–25 using a questionnaire (demographics, FFQ, PSS-10) and anthropometric measurements. Chi-square tests were used for statistical analysis.

Key Findings: Low consumption of milk ($\chi^2=234.781$, $p<0.001$), beef ($\chi^2=72.646$, $p<0.001$), and mutton ($\chi^2=148.817$, $p<0.001$) was linked to higher stress, while regular intake of fish ($\chi^2=156.070$, $p<0.001$) and kidney ($\chi^2=48.503$, $p<0.001$) was associated with lower stress.

Conclusion: High-caloric food intake is linked to both obesity and stress. These findings highlight the need for targeted nutrition and mental health interventions in university settings.

Keywords: Obesity, Stress, High-Calorie Diet, University Students, BMI, Mental Health, FFQ, PSS-10

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¹ Department of Human Nutrition and Dietetics, Superior University Lahore

² Department of Public Health University of the Punjab Lahore

³ Department of Food Science & Nutrition Comsats University Islamabad Sahiwal Campus

⁴ LGS 1A1

Introduction

Obesity and mental health challenges are two pressing public health concerns that are becoming increasingly prevalent among university students. One of the leading contributors to this trend is the excessive consumption of high-caloric foods, such as fast food, processed snacks, and sugary drinks ^{1,2}. These food choices are not only energy-dense but also low in essential nutrients, making them a significant risk factor for weight gain and

poor mental health outcomes ^{3,4}. University students are a particularly vulnerable population because they experience major lifestyle transitions during their academic years ^{5,6}. These changes often involve irregular meal patterns, late-night eating, increased stress due to academic demands, and greater reliance on convenience foods, especially in urban settings like Lahore ^{7,8}. These factors may lead to unhealthy weight gain and increase

susceptibility to mental health disorders, including anxiety, depression, and stress⁹. Although previous studies have investigated how diet, obesity, and mental health are each independently related, there is a lack of focused research on how these factors interact specifically among university populations. This gap is especially important in the context of Pakistan, where dietary transitions and increased urbanization are rapidly influencing youth behavior. Understanding the combined effects of high-calorie food consumption on both physical and mental health is essential for creating effective university-based health programs. The primary objectives of this research are to assess how commonly university students in Lahore consume high-caloric foods and to determine the association between high-caloric food intake and obesity. It also aims to explore the relationship between obesity and mental health outcomes like anxiety, depression, and stress. The secondary objectives are to examine the association between high-caloric food consumption and perceived stress levels, and to provide evidence-based recommendations to improve students' dietary habits and psychological well-being.

By investigating these interconnections within a university setting, this study hopes to contribute meaningful insights that can help inform campus health policies, dietary education, and mental health interventions for young adults.

As a public health problem, both obesity and mental health problems are increasingly found among university students. Changes in lifestyle

during their academic years (e.g, irregular eating times, increased academic stress, eating convenience foods) make university students a vulnerable group^{1,2}. The high consumption of high-calorie foods such as fast food, energy drinks, snacks, and sweetened beverages by university students can have adverse effects on their physical and mental health. These food choices are not only energy-dense but also low in essential nutrients, making them a significant risk factor for weight gain and poor mental health outcomes³. High-calorie foods are energy-dense but nutrient-poor and can lead to weight gain, obesity, and other health problems⁴. University students are a particularly vulnerable population because they experience major lifestyle transitions during their academic years. The emerging adult period is critical for the development of unhealthy lifestyle behaviors. In the meantime, university students are exhibiting many health-risk behaviors that are likely to have negative effects on their health in the long run^{5,6}. Previous studies have shown that stress affects eating behavior and food choice, particularly in young people such as university students⁷. Academic and psychosocial stress is becoming a problem for university students all over the world⁸. The findings of the current study can be used to plan health promotion programs in universities to explain the negative effects of high-calorie foods on physical and mental health⁹. Although previous studies have investigated how diet, obesity, and mental health are each independently related, there is a lack of focused

research on how these factors interact specifically among university populations. This gap is especially important in the context of Pakistan, where dietary transitions and increased urbanization are rapidly influencing youth behavior. Understanding the combined effects of high-calorie food consumption on both physical and mental health is essential for creating effective university-based health programs. The primary objectives of this research are to assess how commonly university students in Lahore consume high-caloric foods and to determine the association between high-caloric food intake and obesity. It also aims to explore the relationship between obesity and mental health outcomes like anxiety, depression, and stress. The secondary objectives are to examine the association between high-caloric food consumption and perceived stress levels, and to provide evidence-based recommendations to improve students' dietary habits and psychological well-being.

By investigating these interconnections within a university setting, this study hopes to contribute meaningful insights that can help inform campus health policies, dietary education, and mental health interventions for young adults.

Materials and Methods

This cross-sectional study was conducted to assess the dietary habits, psychological stress, and anthropometric indicators among university students in Lahore, Pakistan. The target population included students aged between 18 and 25 years, currently enrolled in undergraduate or postgraduate programs across

multiple academic departments. A total of 383 participants were selected using a stratified random sampling technique to ensure equal representation from different faculties and departments. The inclusion criteria required participants to be currently enrolled in the university, within the specified age group, and willing to provide written informed consent. Students who had a self-reported diagnosis of psychiatric disorders, chronic physical illnesses, or were on medication that could influence dietary intake or psychological status were excluded from the study. Data were collected using a structured, self-administered questionnaire, which was divided into three primary sections:

1. Demographic Information:

This section gathered data on variables such as age, gender, marital status, year of study, and place of residence (hostel, home, or rental accommodation). Additional information related to lifestyle patterns, such as smoking status and physical activity, was also included.

2. Food Frequency Questionnaire (FFQ):

A semi-quantitative FFQ was used to evaluate the frequency of consumption of high-caloric foods, including fast food, fried snacks, sugary beverages, and desserts over the past month. Participants were asked to report how often they consumed each food item, with responses recorded on a six-point Likert scale: 0 = Never or once per month, 1 = 1–3 times per week, 2 = Once per week, 3 = Once

per day, 4 = 3 times per day, and 5 = Four or more times per day.

3. Perceived Stress Scale (PSS-10):

The PSS-10, a validated psychological instrument, was used to measure perceived levels of stress¹⁰. The scale comprises 10 items that assess the frequency of stress-related thoughts and feelings over the past month. Based on the total score, participants were classified into low, moderate, or high stress levels, according to standard scoring guidelines. To ensure the validity and reliability of the data collection tool, the questionnaire was reviewed by subject matter experts and tested in a pilot study involving 30 students, with no revisions made thereafter.

4. Anthropometric Measurements

Anthropometric measurements, including height, weight, and waist circumference, were recorded using standard clinical procedures. Body Mass Index (BMI) was calculated and categorized as underweight, normal weight, or overweight based on World Health Organization (WHO) classification standards^{11,12}

Statistical Analysis:

All data collected from the participants were

entered and analyzed using IBM SPSS Statistics version 21. Before analysis, data cleaning procedures were performed to ensure accuracy and completeness, including

checks for missing values, outliers, and inconsistencies. Variables were coded and labeled appropriately for analysis. Descriptive statistics were employed to summarize the basic features of the data. These included frequencies and percentages for categorical variables such as gender, year of study, place of residence, and university type. Additionally, frequencies were calculated for Body Mass Index (BMI) categories, including underweight, normal weight, and overweight, based on WHO classification. Perceived stress levels, categorized as low, moderate, or high according to the PSS-10 scoring system, were also summarized using descriptive statistics. Furthermore, the frequency of high-caloric food consumption across various food categories—such as fast food, fried snacks, sugary beverages, and traditional protein sources like chicken, beef, mutton, milk, fish, and kidney—was also tabulated. To examine relationships between variables, Chi-square tests of independence (χ^2 tests) were conducted. These tests were used to determine whether there were statistically significant associations between the following categorical variables: High-caloric food consumption patterns and perceived stress levels

BMI categories and perceived stress levels

- Gender and BMI categories
- University type (public or private) and

BMI categories

Each test compared the distribution of one categorical variable across the levels of another, identifying whether any observed differences were statistically significant or likely due to random variation.

A p-value less than 0.05 ($p < 0.05$) was considered statistically significant, indicating a less than 5% probability that the observed associations occurred by chance. All significance levels were interpreted at a 95% confidence interval, ensuring a robust level of confidence in the observed relationships. The results of these tests are presented in tabular form for clarity, including the cross-tabulated frequencies, corresponding Chi-square values (χ^2), degrees of freedom (df), and p-values. These tables facilitate interpretation and highlight where statistically meaningful relationships exist.

This analytical approach enabled the identification of key patterns and associations among variables, providing insights into how dietary behaviors, nutritional status, and psychological stress are interrelated within the university student population. The use of Chi-square tests was appropriate due to the categorical nature of the data and the study's focus on associations rather than prediction or causality.

Results

This section presents the findings from the statistical analysis of 383 university students.

Descriptive statistics summarize participant characteristics, food consumption, BMI, and stress levels. Chi-square tests examine associations between key variables

Demographic Characteristics and Key Distributions

The sample comprised 292 (76.2%) females and 91 (23.8%) males. The majority attended public universities (88.3%) and were pursuing BS degrees (96.9%). Most participants were single (89.3%) and lived with family (89.6%). Household income was predominantly above 60,000 PKR (82.0%), and most resided in urban areas (86.7%).showed 53.3% normal weight, 31.1% underweight, and 15.7% overweight. Perceived stress levels were distributed as 39.4% moderate, 36.0% high, and 24.5% low stress

Category	Frequen cy (n)	Percenta ge (%)
BMI Categories		
Underweight	119	31.1
Normal	204	53.3
Overweight	60	15.7
Perceived Stress Scale Categories		
Low stress	94	24.5
Moderate stress	151	39.4
High stress	138	36.0

Table 1: Distribution of BMI Categories and Perceived Stress Scale Categories (N=383)

Association Between BMI Categories and Perceived Stress Scale Categories

A significant association was found between BMI categories and perceived stress levels ($\chi^2 =$

61.582, df = 4, p < 0.001). Underweight students predominantly reported moderate stress (62.2%), with a low proportion in the high-stress category (13.4%). In contrast, normal-weight students showed the highest proportion of high stress (46.6%), while overweight students reported moderate-to-high stress most frequently (46.7% and 45.0%, respectively).

BMI Category	Low Stress n (%)	Moderate Stress n (%)	High Stress n (%)	Total n (%)
Underweight	29 (24.4)	74 (62.2)	16 (13.4)	119 (100.0)
Normal	60 (29.4)	49 (24.0)	95 (46.6)	204 (100.0)
Overweight	5(8.3)	28(46.7)	27(45.0)	60(100.0)

$\chi^2 = 61.582$, df = 4, p < 0.001

Association Between High Caloric Food Consumption and Perceived Stress Scale Categories

Chi-square tests revealed several significant associations between specific high-caloric food items and perceived stress levels. Notably, chicken consumption ($\chi^2 = 82.945$, df = 8, p < 0.001) showed that higher consumption frequencies were associated with moderate stress. Mutton ($\chi^2 = 148.817$, df = 4, p < 0.001) and beef ($\chi^2 = 72.646$, df = 4, p < 0.001) consumption, particularly at

lower frequencies, were linked to higher stress levels. Conversely, regular consumption of fish ($\chi^2 = 156.070$, df = 6, p < 0.001) and kidney ($\chi^2 = 48.503$, df = 4, p < 0.001) was associated with lower stress. Milk consumption ($\chi^2 = 234.781$, df = 8, p < 0.001) also showed a strong association, with lower consumption linked to higher stress

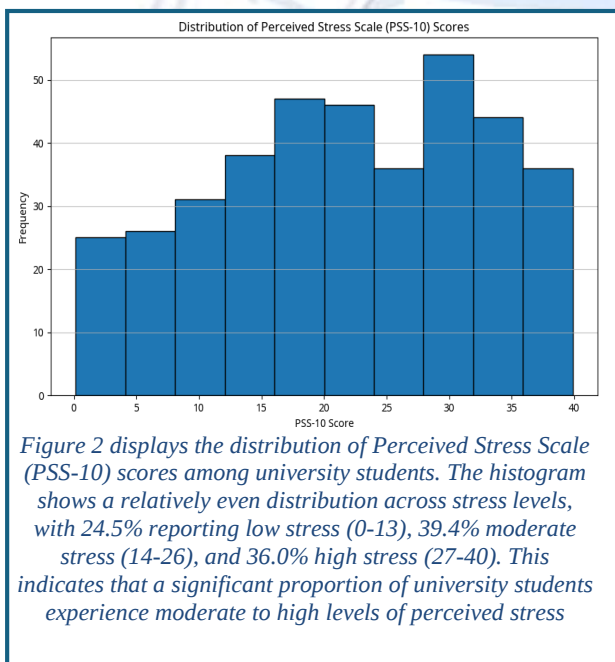
Table 3: Significant Associations Between Selected Food Items and Perceived Stress

Food Item	Chi-Square Value (χ^2)	df	p-value	Key Pattern
Chicken	82.945	8	< 0.001	Higher consumption associated with moderate stress
Mutton	148.817	4	< 0.001	Low consumption associated with high stress
Beef	72.646	4	< 0.001	Low consumption associated with high stress
Milk	234.781	8	< 0.001	Low consumption associated with high stress
Liver	26.101	2	< 0.001	Consumption associated with high stress
Kidney	48.503	4	< 0.001	Regular consumption associated with low stress
Lamb	105.546	4	< 0.001	Low consumption associated with high stress
Eggs	54.423	6	< 0.001	Varied patterns across consumption frequencies
Yogurt	118.531	4	< 0.001	Higher consumption associated with low stress
Ice Cream	65.933	8	< 0.001	Higher consumption associated with moderate stress
Biscuits	183.254	10	< 0.001	Varied patterns across consumption frequencies
Cookies	196.437	8	< 0.001	Varied patterns across consumption frequencies
Pizza	183.254	10	< 0.001	Varied patterns across consumption frequencies
Burgers	95.087	8	< 0.001	Varied patterns across consumption frequencies

Scale Categories(N=383)

Note: All associations were statistically significant at $p < 0.001$. Key patterns represent the most prominent associations observed in the cross-tabulation analysis.

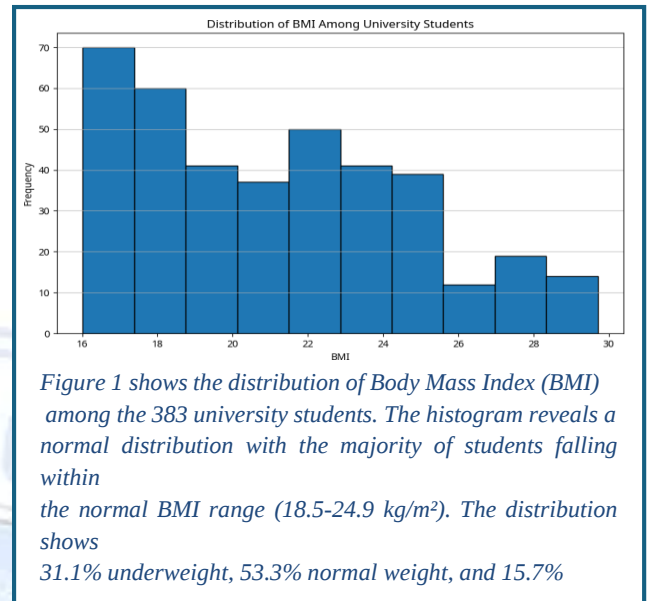
[REVISION REQUIRED – Data check: Biscuits and Pizza are reported with an identical Chi-square value ($\chi^2 = 183.254$) and identical df¹⁰ Identical statistics for two different food items are implausible and indicate a likely copy-paste/data-entry error. Please verify against the source data and correct the affected value.]



Discussion

This study investigated the relationships between high caloric food consumption, obesity, and mental health among university students in Lahore. The findings highlight complex interconnections among dietary habits, BMI, and perceived stress. Significant associations were observed between the

frequency of consuming specific high-caloric



food items and stress levels, and between BMI categories

The varied consumption patterns of high-caloric foods and their associations with stress suggest a nuanced relationship. For instance, while higher chicken consumption was linked to moderate stress, lower intake of mutton, beef, and milk was associated with high stress. that stress influences dietary choices. The strong association of fish and kidney consumption with lower stress levels warrants further nutritional and psychological investigation. The significant association between BMI categories and perceived stress is a key finding. The observation that normal-weight individuals reported higher stress levels than underweight individuals is notable. This may reflect greater academic engagement and performance-related pressures among students with average body weight, a pattern that warrants further

investigation. By contrast, the link between overweight status and moderate-to-high stress (45.0–46.7%) aligns with existing literature on obesity and psychological distress³.

Limitations of this study include its cross-sectional design, which precludes establishing causality. Self-reported data for food consumption and stress may introduce recall bias. Furthermore, the sample from Lahore limits generalizability to other populations. Future research should employ longitudinal designs to explore causal pathways and incorporate objective measures of diet and stress.

Conclusion

This study successfully explored the relationship between high caloric food consumption, obesity, and perceived stress among university students in Lahore. Significant associations were found between specific dietary choices and stress levels, and between BMI categories and perceived stress. These findings underscore the importance of addressing both nutritional status and psychological stress in university health promotion programmers. The results provide valuable insights for developing targeted interventions that promote balanced dietary habits and effective stress management strategies to enhance the overall well-being of university students. Overall, the study highlights the urgent need for integrated health promotion strategies in university settings that address both nutrition and mental

health. Future research should consider longitudinal designs and incorporate objective measures of diet and stress to establish causal links and develop targeted interventions. Ethics Approval: This study was approved by the Institutional Review Board of [Institution Name] (approval no. [XXX], dated [date]). Written informed consent was obtained from all participants before data collection. Conflict of Interest: The authors declare no conflict of interest. Funding: No external funding was received for this study. Author Contributions: KK: conceptualization, data collection, drafting; HM: statistical analysis, results; IN: literature review, introduction, MS; methodology, discussion, revision.

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