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Physical Activity, Body Mass Index and Generalized Anxiety Disorder: Unraveling the Multifaceted relationships among University Students

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ABSTRACT

Objective: To evaluate the association between body mass index, score for generalized anxiety disorder and international physical activity status among university students.

Methodology: This Cross-sectional design was used to collect data from 385 students in Lahore, Pakistan from May 2025 to Aug 2025. GAD-7, and IPAQ questionnaires were used to assess anxiety and physical activity levels. Participants were recruited through random sampling. Inclusion Criteria was Participants must be between 18 and 24 years old and currently enrolled in a university in Lahore with no diagnosed mental disorders. While Participants with any diagnosed medical or psychiatric conditions were excluded from study. Data was analyzed using SPSS to examine correlations between anxiety, BMI and physical activity.

Results: With a near-equal gender distribution, 40.78% were overweight and 6.23% obese. Most had minimal anxiety (68.57%) and low physical activity (98.18%). There was a statistically significant association of generalized anxiety disorder (GAD) status with BMI and gender (p = 0.000), whereas insignificant association with physical activity (p = 0.224).

Conclusion: The study emphasizes the importance of targeted interventions to improve mental health and promote physical activity among young adults, considering the observed associations between anxiety, BMI, and eating behaviors.

Keywords: BMI, Generalized anxiety disorder (GAD), International Physical Activity Questionnaire, Physical activity

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Introduction

According to Fifth edition of a manual for the statistics and diagnosis of Mental Health Disorders, Generalized Anxiety Disorder (GAD) is defined as "excessive worry over things that happen to you or your life".[1] Generalized Anxiety Disorder (GAD) manifests as fatigue, sleep disturbance, prolonged muscle aches and increased muscle soreness, irritability and impaired concentration.[2] As evidenced by research based studies, depression and anxiety correlates with higher incidence of morbidity and suicidal risks,[3] and are serious disabling conditions.[4] Anxiety and depression are the main contributors to disability and are primary causes of disease burden across the globe, accounting for about 970 million cases of common mental disorders among people.[5]

For identification of Generalized Anxiety Disorder (GAD), in addition to experiencing uncontrollable and ongoing worry, a minimum of three of the following six signs of psychological or physiological arousal must be present in an individual: sensation tense, restless, or on edge; trouble focusing or having a blank mind because of worry; worry-related sleep disturbances; tense muscles; irritability; and exhaustion.[6] The hallmarks of generalized anxiety disorder include widespread anxiety and accompanying physical symptoms that last for at least six months and significantly impair daily functioning.[7] A family history of anxiety, being a woman, and, in certain situations, a relationship to autism spectrum disorders are other prevalent risk factors for anxiety disorders.[8]

WHO defines physical activity as "any bodily movement produced by skeletal muscles that requires energy expenditure," and it is "a significant measure for improving both health mental and physical [9] The World Health Organization (WHO) reports that various studies have indicated that incidence of mental health issues changes across settings and is approximately 22%.[10] In the world, 3.7% of people are predicted to have from Generalized Anxiety Disorder (GAD) at some stage during their life. [11]

BMI as a variable is very relevant to anxiety, as numerous past studies confirmed this. In a meta-analysis of prospective cohort studies, greater baseline BMI predicted amplified risk of incident anxiety symptoms. [12] Another research depicted greater anxiety scores for moderate to high BMI indices [13] Past literature also stated that physical activity has a positive influence on anxiety and depression. Hence, it is obligatory to encourage university students and assess this aspect of their life. [14]

Furthermore, a survey for national representation that took place in in the United States discovered the life expectancy that is 7.9 years lower among people with anxiety disorders than that of people without these disorders. [15] Higher prevalence rates emphasize how crucial it is to treat clinically diagnosed as well as subthreshold anxiety in order to enhance mental health outcomes. [16] Addressing mental health issues among college students have become a latest concern among community [17]

Like other nations, obesity is also a major current concern among Pakistani young adults.[18] University students in Pakistan have mis-perceptions concerning their body weight.[19] One more study on university students of Pakistan observed obesity as a main issue amongst the adult populace and recognized major correlations of obesity with BMI, stress, physical inactivity, and diet.[20] A past study found an association between the GAD and obesity measure. [21]

The move to a college/university is a big life transition that can affect one's physical and mental well-being. Newer things at a newer academic place can tip the balance towards anxiety, especially Generalized Anxiety Disorder. At the same time, numerous students slip into the sedentary lifestyle routines, and weight-associated measures for instance Body Mass Index (BMI) are on the riser side. Understanding how BMI, physical activity (PA), and GAD interlace is crucial for designing future health interventions. University students juggle the academic pressures, often irregular schedules and new social environments. These factors congregate to create a perfect storm for both mental-health challenges and weight-related changes. There is much less evidence based studies exploring the association between generalized anxiety disorder (GAD) and international physical activity status (IPAQ) among young participants in Pakistan, so there is need for such study. The objective of this study was to evaluate the association between body mass index, score for generalized anxiety disorder and international physical activity status among university students.

Methodology

This cross-sectional research was conducted in Lahore from May 2025 to Aug 2025. The study population consisted of young adults aged 18-24 years. Participants were selected by random sampling through a computer-generated process.

Sample size was calculated by using following formula, $n= (Z\alpha/2)^2 [P(1-P)]/d^2$, where n is the sample size, Z is confidence level (95%) and $(Z\alpha/2) =1.96$, P is the proportion (50%). Using these parameters, the calculated sample size is 385 participants

Inclusion Criteria was Participants must be between 18 and 24 years old and currently enrolled in a university in Lahore with no diagnosed mental disorders. While Participants with any diagnosed medical or psychiatric conditions were excluded from study.

Data collection tools included were questionnaires and Anthropometric Parameters: Measurements such as weight (kg), and BMI (kg/m^2). BMI was calculated by dividing a person's weight in kilograms by their height in meters squared. Three trained data collectors were

engaged for the process of data collection, who had a weighing scale/machine to measure weight in kilograms and a tape to measure height in meters of every participant. To gather data, the study employed two established validated questionnaires, each targeting

different aspects of the research:

- GAD-7 (Generalized Anxiety Disorder-7) (22): This self-report instrument is frequently used to evaluate the severity of generalized anxiety disorder and screen for it. It is made up of seven items that assess how frequently anxiety symptoms have occurred during the previous two weeks. The GAD-7 is a trustworthy and validated tool that gives participants' anxiety levels some insight. It has displayed good outcomes in different situations and populaces, for instance in adolescents, and university students.

- IPAQ (International Physical Activity Questionnaire) (23) The IPAQ is designed to measure level of physical activity across various intensities, including vigorous, moderate, and low activities. It helps in assessing the amount of physical activity performed by individuals on a weekly basis and provides a comprehensive view of their activity patterns.

This research was carried out after approval from an ethical review committee of Health services academy, Islamabad. Informed written consent was also taken from all the participants beforehand collecting data. Data confidentiality and privacy of participants was maintained, and they were informed about this before data collection. Urdu-version of consent form was explained to each participant, so that they could easily comprehend it, also indicating that they are allowable to refuse participation at any time in this research.

Data analysis was conducted using IBM SPSS (version 21). The analysis plan involved performing descriptive statistics to summarize anthropometric measurements and sociodemographic parameters, including means, standard deviations, frequencies, and percentages. Chi square test was applied to explore the relationships between anxiety scores and physical activity patterns. P-value less than 0.05 was considered statistically significant.

Results

A total of 385 participants were enrolled in this study with almost equal gender distribution. Males were 193 (50.13%) while females were 192 (49.87). Table I showed BMI categories.

Overall, the majority of participants reported experiencing anxiety-related problems several days within the last two weeks, with 60.52% indicating this frequency. Conversely, only a small fraction, 3.12%, experienced these issues nearly every day. A smaller percentage, 4.68%, faced difficulties with worrying over half the days, and 3.64% nearly every day. In terms of restlessness that makes it hard to sit still, 72.99% did not experience this problem, while 17.4% did so on several

days. When considering irritability, 41.56% of participants reported becoming easily annoyed or irritable

Table 1: Body Mass Index (BMI) categories of participants

BMI Categories					
Underweight			19 (4.94)		
Normal			185 (48.05)		
Overweight			157 (40.78)		
Obese			24 (6.23)		
	Range	**Min**	**Max**	**Mean**	**SD**
Weight (kg)	93	40	115	69.99	9.92
Body Mass Index (BMI)	28	16.4	35.4	24.60	2.71
Age (years)	70	18	28	23.44	1.94

Table II: Generalized anxiety disorder parameters observed among young adults.

Generalized Anxiety Disorder; N (%)	**Not at all**	**Several Days**	**Over half the days**	**Nearly Everyday**
1. Over the last two weeks, how often have you been bothered by the following problems?	113 (29.35)	233 (60.52)	27 (7.01)	12 (3.12)
2. Not being able to stop or control worrying	258 (67.01)	95 (24.68)	18 (4.68)	14 (3.64)
3. Worrying too much about different things	187 (48.57)	138 (35.84)	51 (13.25)	9 (2.34)
4. Trouble relaxing	230 (59.74)	109 (28.31)	39 (10.13)	7 (1.82)
5. Being so restless that it is hard to sit still	281 (72.99)	67 (17.4)	27 (7.01)	10 (2.6)
6. Becoming easily annoyed or irritable	111 (28.83)	160 (41.56)	92 (23.9)	22 (5.71)
7. Feeling afraid, as if something awful might happen	262 (68.05)	85 (22.08)	19 (4.94)	19 (4.94)

on several days, with 23.9% experiencing this symptom over half the days. Finally, regarding feelings of fear as if something awful might happen, 68.05% of participants did not experience these feelings at all. Generalized anxiety disorder (GAD) parameters are summarized in table II.

The severity of the GAD symptoms is used to categorize the participants. Majority of the participants, 264 individuals (68.57%), fall into the "Minimal" anxiety category. A smaller portion, 80 individuals (20.78%), experiences "Mild" anxiety. Moreover, 31 (8.05%) are classified under "Moderate" anxiety. However, only 10 (2.6%) are categorized as having "Severe" anxiety. The GAD scores go from 0 to 21, where 0 denotes no anxiety symptoms at all and 21 is the highest degree of anxiety severity that the study found. With an average GAD score of 4.45, the population is generally thought to experience mild symptoms of anxiety. The GAD scores show a moderate degree of variability, with a standard deviation of 3.64.

The results from the International Physical Activity Questionnaire (IPAQ) assessment of young adults (18-24 years) were also reported. The data shows distinct patterns in the frequency of vigorous, moderate, and walking activities among the participants. In terms of vigorous physical activities, only 94 individuals (24.42%) reported engaging in these activities at least once during the last week. 92.21% partakers reported walking for at least ten minutes at a time on at least one day during the previous week. As shown in table III.

The GAD status is categorized into four levels: Minimal, Mild, Moderate, and Severe. Among males, the majority (77.72%) fall into the Minimal category of GAD. While the majority (59.38%) females also falls into the Minimal category. The p-value (0.000) for the association between gender and GAD score indicates that the differences in GAD status between males and females were statistically significant.

Participants were categorized into four BMI groups: Underweight, Normal, Overweight, and Obese. Among underweight individuals, a notable 47.37% fall into the Mild GAD category, and a smaller proportion (26.32%) experience Minimal GAD. Moderate and Severe GAD are observed in 15.79% and 10.53% of underweight participants, respectively, indicating that underweight individuals may be more prone to higher levels of anxiety. For those with a normal BMI, the majority (64.86%) experience Minimal GAD, while 20% fall into the Mild category. Moderate GAD is observed in 11.35% of participants with a normal BMI, and Severe GAD is present in 3.78%. The p-value for the association between BMI and GAD status is also 0.000, indicating a statistically significant relationship. Analysis of the association between gender, body mass index (BMI), and the status of generalized anxiety disorder (GAD) among young adults is presented in table IV.

As measured by the International Physical Activity Questionnaire (IPAQ), an overwhelming majority of the participants, 378 individuals (98.18%), fall into the "Low" physical activity category. In contrast, only a small fraction of the participants, 7 individuals (1.82%),

Table III: International Physical Activity Questionnaire (IPAQ) assessment of young adults

International Physical Activity Questionnaire (IPAQ); N (%)	Yes	No
During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?	94 (24.42)	291 (75.58)
During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis?	137 (35.58)	248 (64.42)
During the last 7 days, on how many days did you walk for at least 10 minutes at a time?	355 (92.21)	30 (7.79)

Table IV: Association of gender and body mass index (BMI) against the generalized anxiety disorder (GAD) status for young adults.

Gender	GAD Status				P value
	Minimal	Mild	Moderate	Severe	
Male	150 (77.72)	32 (16.58)	7 (3.63)	4 (2.07)	0.000*
Female	114 (59.38)	48 (25)	24 (12.5)	6 (3.13)	
BMI					
Underweight	5 (26.32)	9 (47.37)	3 (15.79)	2 (10.53)	0.000*
Normal	120 (64.86)	37 (20)	21 (11.35)	7 (3.78)	
Overweight	122 (77.71)	28 (17.83)	6 (3.82)	1 (0.64)	
Obese	17 (70.83)	6 (25)	1 (4.17)	0 (0)	

were classified as having "Moderate" physical activity.

No statistically significant association was observed between GAD status and physical activity level among participants (p = 0.224), as shown in Table V.

Table V: Association of generalized anxiety disorder (GAD) and international physical activity status (IPAQ) among participants

Generalized Anxiety Disorder Status	IPAQ Status		P value
	Moderate	Low	
Minimal	4 (1.5)	260 (98.5)	0.224
Mild	1 (1.30	79 (98.8)	
Moderate	1 (3.2)	30 (96.8)	
Severe	1 (10.0)	9 (90.0)	

Discussion

Anxiety is a widespread disorder that impacts a large number of people. Study showed that 3.7% of people have generalized anxiety disorder (GAD) in their lifetime.[24] Furthermore, an analysis shows that the lifetime prevalence of subthreshold GAD, which encompasses symptoms that fall short of the GAD diagnostic criteria, is approximately 12.4% (25). Anxiety ailments set a substantial burden on society as well as patients.[26]

In this study, nearly half (48.05%) of the participants were having normal BMI, while 40.78% were overweight and 6.23% were obese. This is not in harmony with the findings of another research where, 20% were overweight, 12.9% were obese while 53.6% were having normal BMI.[27] The severity of the GAD symptoms is used to categorize the participants. Majority (68.57%), of the participants of this study fall into the "Minimal" anxiety category. A smaller portion (20.78%) experienced "Mild" anxiety, 8.05% were classified under "Moderate" anxiety. However, only 2.6% were categorized as having "Severe" anxiety. With an average GAD score of 4.45, the population is generally thought to experience mild symptoms of anxiety. This is comparable to another research where over 50% of the subjects reported having at least mild anxiety, and 25% reported having moderate to severe anxiety.[28]

In this research, almost all (98.18%) subjects showed low IPAQ score, whereas merely 1.82% subjects showed moderate IPAQ score. This is opposite to the results reported by another researcher where one-fourth participants reported low while half of the subjects reported moderate score. [23]

In this study, there was a statistical significant association between generalized anxiety disorder (GAD) status and gender, where p-value was 0.000, this is similar to another study where there was also a significant association between these variable.[29] In this research, p-value for the association between BMI and generalized anxiety disorder (GAD) status was 0.000, indicating a statistically significant relationship, which is contrary to the results of another study (p-value 0.65).[30]

The hypothalamic-pituitary-adrenal (HPA) axis is the most extensively studied physiological stress system. Possible mechanisms explaining our finding could be excess body fat intensifies cortisol secretion, and protracted hyper-cortisolism sensitizes the stress response, pre-disposing to anxiety [(31)]. Greater BMI co-occurs often with less physical-activity, which itself is associated to poorer mood as well as heightened anxiety (32). Patients having any disorder/discomfort especially mental health issues should be helped and their quality of life should also be improved. [4, 33, 34]

In this research, there was no statistically significant correlation (p = 0.224) between GAD status and levels of physical activity. This is identical as reported by another researcher (p-value 0.543).[35] This is also in line with another research where generalized anxiety disorder (GAD) had an insignificant relationship with low and moderate physical activity levels.[36] This might be due to sleep disturbance. Poor sleep is a predictor of both heightened anxiety and low PA. If sleep wasn't controlled, it might alter the PA-GAD link.[32]

This research will help in future policy implications as it will inform contextually relevant health-promotion strategies and interventions directing youth well-being in educational settings. Universities should prioritize interventions addressing both mental and physical health. This might include nutrition counseling, tailored fitness programs, and stress-management workshops Universities should also encourage regular physical activity through accessible fitness facilities. campus-wide events.

Conclusion

GAD had a significant association with gender and BMI. Considering the observed relationship between BMI, anxiety, and physical activity levels, this research highlights the significance of focused strategies to enhance mental health and encourage physical activity in young adults.

Limitations: BMI has significant limits, when it comes to evaluating those persons who could have additional body adiposity & comprehending the diversity of obesity. Small sample size and short duration were also the main limitations of this study.

Future Recommendations:

1. Causal relationships b/w GAD, physical activity and BMI should be established in future via longitudinal studies
2. Health promotion programs: Develop programs promoting the physical activity and healthy weight management to lessen GAD symptoms.
3. Integrated care: Encourage health care workers to assess mental and physical health together.
4. Personalized treatment: Always establish treatment plans considering the inter-play between GAD, physical activity, and BMI.
5. For GAD symptoms and BMI, routine screening should be done.
6. Evidence-based techniques for example cognitive-behavioral skills and mindfulness-based exercises should be targeted.
7. Structured physical-activity programs must be integrated into regular curriculum (e.g., campus-wide sports challenges, short activity breaks) to encourage movement without adding any academic pressure.

References

1. American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5. Washington (DC): American Psychiatric Association; 2013.
2. Alatawi A, Alghamdi A, Albalwi A, Altayar M, Jalal M, Frah EA. Prevalence of generalized anxiety disorder (GAD) among Saudi medical students and associated risk factors. Int J Res Stud Med Health Sci. 2020;5(9):1–9. https://doi.org/10.22259/ijrsmhs.0509001
3. Moitra M, Santomauro D, Degenhardt L, Collins PY, Whiteford H, Vos T, et al. Estimating the risk of suicide associated with mental disorders: a systematic review and meta-regression analysis. J Psychiatr Res. 2021;137:242–249. https://doi.org/10.1016/j.jpsychires.2021.02.053
4. Baqi A, Shaikh SP, Zia MS, Javaid MM, Malik MS, Zia Q. Determinants of anxiety in amputees owed to traumatic and non-traumatic causes in Quetta. Ann Pak Inst Med Sci. 2022;18(3):175–180. https://doi.org/10.48036/apims.v18i3.671
5. GBD Mental Disorders Collaborators. Global, regional, and national burden of 12 mental disorders in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet Psychiatry. 2022;9(2):137–150. https://doi.org/10.1016/S2215-0366(21)00395-3
6. Rowa K, Waechter S, Hood HK, Antony MM. Generalized anxiety disorder. In: Psychopathology: History, Diagnosis, Empirical Foundations. 3rd ed. 2017. p. 149–186. https://doi.org/10.1002/9781394258949.ch4
7. Kim Y-K. Panic disorder: current research and management approaches. Psychiatry Investig. 2019;16(1):1. https://doi.org/10.30773/pi.2019.01.08
8. American Psychiatric Association. Anxiety disorders: DSM-5 selections. Washington (DC): American Psychiatric Publishing; 2015.
9. Schoufour JD, Tieland M, Barazzoni R, Ben Allouch S, van der Bie J, Boirie Y, et al. The relevance of diet, physical activity, exercise, and persuasive technology in the prevention and treatment of sarcopenic obesity in older adults. Front Nutr. 2021;8:661449. https://doi.org/10.3389/fnut.2021.661449
10. Ibbad S, Baig LA, Ahmer Z, Shahid F. Prevalence of anxiety and depression in high school students of Karachi, Pakistan. Pak J Med Sci. 2022;38(4 Pt 2):916–921. https://doi.org/10.12669/pjms.38.4.5093
11. Stein DJ, Kazdin AE, Ruscio AM, Chiu WT, Sampson NA, Ziobrowski HN, et al. Perceived helpfulness of treatment for generalized anxiety disorder: a World Mental Health Surveys report. BMC Psychiatry. 2021;21:1–14. https://doi.org/10.1186/s12888-021-03363-3
12. Mammen G, Faulkner G. Physical activity and the prevention of depression: a systematic review of prospective studies. Am J Prev Med. 2013;45(5):649–657. https://doi.org/10.1016/j.amepre.2013.08.001
13. Haghighi M, Jahangard L, Ahmadpanah M, Bajoghli H, Holsboer-Trachsler E, Brand S. The relation between anxiety and BMI—is it all in our curves? Psychiatry Res. 2016;235:49–54. https://doi.org/10.1016/j.psychres.2015.12.002
14. Han B, Du G, Yang Y, Chen J, Sun G. Relationships between physical activity, body image, BMI, depression and anxiety in Chinese college students during the COVID-19 pandemic. BMC Public Health. 2023;23(1):24. https://doi.org/10.1186/s12889-022-14917-9
15. Pratt LA, Druss BG, Manderscheid RW, Walker ER. Excess mortality due to depression and anxiety in the United States: results from a nationally representative survey. Gen Hosp Psychiatry. 2016;39:39–45. https://doi.org/10.1016/j.genhosppsych.2015.12.003
16. Haller H, Cramer H, Lauche R, Gass F, Dobos GJ. The prevalence and burden of subthreshold generalized anxiety disorder: a systematic review. BMC Psychiatry. 2014;14:128. https://doi.org/10.1186/1471-244X-14-128
17. Khan MN, Akhtar P, Ijaz S, Waqas A. Prevalence of depressive symptoms among university students in Pakistan: a systematic review and meta-analysis. Front Public Health. 2021;8:603357. https://doi.org/10.3389/fpubh.2020.603357
18. Lasi FF, Mahmood A, Samejo B, Khayyam U, Waseem MH, Sangrasi SA. The relationship between physical activity, obesity and overweight among university-going students of Jamshoro, Sindh. J Riphah Coll Rehabil Sci.

2020;8(1):25–32. https://doi.org/10.5455/JRCRS.2020080106

19. Khalid M, Khan SA, Awan M, Asif K, Waseem M, Tariq MI. Correlation between body mass index, body perception and physical activity among university students. Foundation Univ J Rehabil Sci. 2023;3(2):38–43. https://doi.org/10.33897/fujrs.v3i2.306
20. Shah R, Iqbal A, Farooq S, Khalid S, Jabeen S, Mehmood Z, et al. Factors affecting obesity among adults attending the University of Lahore Teaching Hospital, Pakistan. Diet Factor J Nutr Food Sci. 2024;5(3):35–39. https://doi.org/10.54393/df.v5i03.177
21. Nameni G, Jazayeri S, Salehi M, Esrafili A, Hajebi A, Motevalian SA. Association between visceral adiposity and generalized anxiety disorder (GAD). BMC Psychol. 2024;12(1):49. https://doi.org/10.1186/s40359-024-01542-x
22. Villarreal-Zegarra D, Paredes-Angeles R, Mayo-Puchoc N, Arenas-Minaya E, Huarcaya-Victoria J, Copez-Lonzoy A. Psychometric properties of the GAD-7 (General Anxiety Disorder-7): a cross-sectional study of the Peruvian general population. BMC Psychol. 2024;12(1):183. https://doi.org/10.1186/s40359-024-01688-8
23. Blasco-Peris C, Climent-Paya V, Vetrovsky T, García-Álvarez MI, Manresa-Rocamora A, Beltrán-Carrillo VJ, et al. International Physical Activity Questionnaire Short Form and accelerometer-assessed physical activity: concurrent validity using six cut-points in HF patients. ESC Heart Fail. 2024;11(1):126–135. https://doi.org/10.1002/ehf2.14514
24. Ruscio AM, Hallion LS, Lim CC, Aguilar-Gaxiola S, Al-Hamzawi A, Alonso J, et al. Cross-sectional comparison of the epidemiology of DSM-5 generalized anxiety disorder across the globe. JAMA Psychiatry. 2017;74(5):465–475. https://doi.org/10.1001/jamapsychiatry.2017.0056
25. Bentley KH, Franklin JC, Ribeiro JD, Kleiman EM, Fox KR, Nock MK. Anxiety and its disorders as risk factors for suicidal thoughts and behaviors: a meta-analytic review. Clin Psychol Rev. 2016;43:30–46. https://doi.org/10.1016/j.cpr.2015.11.008
26. Agha MA, Noreen K, Javaid MM, Agha MH. Mental health and eating patterns: relationship between body mass index, generalized anxiety disorder and three-factor eating scores among university students in Lahore. JRMC. 2025;29(3). https://doi.org/10.37939/jrmc.v29i3.2938
27. Alhazmi A, Aziz F, Hawash MM. Association of BMI and physical activity with academic performance among female students of Health Colleges of King Khalid University, Saudi Arabia. Int J Environ Res Public Health. 2021;18(20):10912. https://doi.org/10.3390/ijerph182010912
28. Fonseca NKdO, Costa MdA, Gosmann NP, Dalle Molle R, Gonçalves FG, Silva AC, et al. Emotional eating in women with generalized anxiety disorder. Trends Psychiatry Psychother. 2023;45:e20210399. https://doi.org/10.47626/2237-6089-2021-0399
29. Nameni G, Jazayeri S, Salehi M, Esrafili A, Hajebi A, Motevalian SA. Association between visceral adiposity and generalized anxiety disorder (GAD). BMC Psychol. 2024;12(1):49. https://doi.org/10.1186/s40359-024-01542-x
30. DeJesus RS, Breitkopf CR, Ebbert JO, Rutten LJF, Jacobson RM, Jacobson DJ, et al. Associations between anxiety disorder diagnoses and body mass index differ by age, sex and race: a population-based study. Clin Pract Epidemiol Ment Health. 2016;12:67–72.
31. Ma L, Liu X, Yan N, Gan Y, Wu Y, Li Y, et al. Associations between different cortisol measures and adiposity in children: a systematic review and meta-analysis. Front Nutr. 2022;9:879256. https://doi.org/10.3389/fnut.2022.879256
32. Dymek A, Zielińska M, Englert-Bator A, Dereń K, Łuszczki E. Generalized anxiety disorder and obesity: overlapping neuroendocrine, metabolic, and behavioral pathways. Nutrients. 2025;17(17):2835. https://doi.org/10.3390/nu17172835
33. Javaid MM, Ahmad I, Mansoor E, Ali SI, Bairam S, Umair M, et al. Socioeconomic status: a lethal weapon in deteriorating the satisfaction level attributed to thalassemia management in Pakistan. Ann Pak Inst Med Sci. 2024;20(4):795–799. https://doi.org/10.48036/apims.v20i4.1207
34. Javaid MM, Zehra M, Khalid SN, Mahmood U, Ullah A, Kanju AH, et al. Association between socio-demographic factors and oral health impact profile of pregnant women. [Journal details not provided]. 2024;14(4):400–404.
35. Czenczek-Lewandowska E, Leszczak J, Wyszyńska J, Baran J, Weres A, Lewandowski B. The role of physical activity in the reduction of generalized anxiety disorder in young adults in the context of COVID-19 pandemic. Int J Environ Res Public Health. 2022;19(17):11086. https://doi.org/10.3390/ijerph191711086
36. ul Ain N, Arif M, Dar MS, Habiba UE, Shah M, Naseeb U. Assessment of anxiety among people with various physical activity levels during lockdown in Karachi, Pakistan. Avicenna J Med. 2023;13(3):163–168. https://doi.org/10.1055/s-0043-1770934