

LIFE STYLE FACTORS AND DIETARY PATTERN CORRELATION WITH BODY MASS INDEX, MENSTRUAL HEALTH AND ACADEMIC OUTCOMES AMONG FEMALE STUDENTS OF UNIVERSITIES IN SIALKOT, PAKISTAN

Muhammad Rashid^{a*}, Khadija Bibi^b, Asma Talib^b, Faiza Taskeen^b, Ansa Butt^b, Laiba Noob^b, & Summaiya Haqnawaz^b

^aDepartment of Allied Health Sciences, Grand Asian University Sialkot, Punjab, Pakistan

^bDepartment of Biosciences, Grand Asian University Sialkot, Punjab, Pakistan

*Correspondence to: Dr. Muhammad Rashid, Assistant Professor, Department of Allied Health Sciences, Grand Asian University Sialkot, Punjab, Pakistan, 0331-9650639, Email: muhammad.rashid@gaus.edu.pk. <https://orcid.org/0000-0002-2612-7048>

KEYWORDS:

Life Style Factors, Dietary Pattern, Body Mass Index, Menstrual Health, Polycystic Ovary Syndrome (PCOS), Female Reproductive Health

CITE THIS ARTICLE:

Rashid, M., Bibi, K., Talib, A., Taskeen, F., Butt, A., Noob, L., & Haqnawaz, S. (2026). Lifestyle factors and dietary pattern correlation with body mass index, menstrual health and academic outcomes among female students of universities in Sialkot, Pakistan. Pakistan Journal of Positive Psychology, 3(3), 196-203.

ABSTRACT

The university life phase is causing changes in female student's lifestyle, dietary habits reduced morning walking or physical activities and increased psychological stress; all these are affecting their health for the long term. This analysis was done from 1st January 2026 to 28th February 2026 at Grand Asian University, Sialkot. Female students of an age group between 17-30 years participated in this study. We performed a chi-square test for statistical significance and Bonferroni correction for statistical reliability. The coding of these analyses was created and run using the Jupyter Notebook of Anaconda Navigator 1.9.12. In this analysis, it was observed that the majority of students were underweight, followed by overweight and obese. The prevalence of Polycystic Ovary Syndrome (PCOS) was observed (13.8%) and the majority of the participants (21.2%) were not sure about it. Eating habits like eating fried food and sugary beverage intake were very dominant in female students and sometimes ignoring of meal due to stress and during exams with (40.1%) participants, although (34.7%) left it often. The majority of participants' eating habits changed during university life. Lifestyle factors like late-night eating, sitting behaviour, never exercising, low sleep duration, were found very common and in a high percentage of female students of Sialkot. Good lifestyle factors and healthy dietary patterns should be adopted to overcome it.

I. INTRODUCTION

The phase of university life represents a significant lifestyle change in the younger generation. The current prevalence of overweight and obesity is an emerging health concern for the whole world, but the younger university generation is not resistant to this trend (Mustofa, 2025). Body Mass Index (BMI) is a common method of employing the height and weight of adults to widely place them into obese, overweight, underweight, and normal weight categories. The BMI of an individual is important in the identification of future potential health concerns and has been broadly used as a predictor in the identification of many public health guidelines. BMI can be determined by imperial (US) or metric units (Nuttall, 2015). BMI is not just a single metric to find out weight status associated with health issues. It is also linked with lifestyle factors like physical activities, diet, mental health and sleeping patterns. A study conducted in Punjab, Pakistan concluded that BMI is significantly associated with quality of diet, sleep duration and physical activities (Butt, 2025). Moreover, dietary habits such as skipping breakfast, high consumption

of fast food along with sugary beverages are very common in university students that cause to contribute to their weight gain (Arslan, 2023). Currently, it is reported that sedentary behaviours, use of screens in dark rooms, low brightness, and high usage of screens with no eye protectors are risk factors that cause Computer Vision Syndrome in females with high frequency than males (Rashid, 2026).

Numerous studies have shown that the population in Asian show a higher general body fat and risk of cardiovascular disease (CVD) at lower BMI measurements than those of European ancestry. The WHO has tackled this problem and has recommended revised cutoff points for BMI categories in the Asian population (Misra, 2015). The WHO evaluates three hundred million of them to be obese and over one billion adults to be overweight (WHO, 2002). The frequency of obesity and overweight has elevated quickly over the past decade worldwide (Ng, 2014). This has raised serious public health issues due to the correlation between obesity and overweight, and elevated risk of a broad range of chronic diseases, such as CVD, type 2 diabetes mellitus (T2DM), and many other all-cause mortality (Whitlock, 2009; Abdullah, 2010). Much less researched and even low discussed is being done of underweight. Underweight people are at increased risk of menstrual irregularities, immune-deficient and osteoporosis (Montero, 1996; Black, 2003; Chumlea, 1999). Dietary patterns play an essential role in preserving the health of populations (Turconi, 2008). Menstrual health of females, including period pain, is significantly affected by a poor diet, high stress, obesity and BMI (Siregar, 2026). PCOS, an endocrine disorder in females, is also linked with lifestyle factors. A study conducted in Pakistan reported that healthy lifestyle factors like daily physical activity and good eating habits along with nutritional counseling in female students can positively affect female reproductive characteristics and polycystic ovarian morphology and PCOS, respectively (Neisi, 2026; Mohsin, 2021). The prevalence of PCOS among Pakistani students is at a high percentage of 52%, and it is an alarming situation. Moreover, overweight and obese students are significantly facing irregular menstrual problems (Neisi, 2026; Mohsin, 2021; Strete, 2025).

In Pakistan, particularly in the cities of major industrial centers like Sialkot, there is a growing population of females that are adopting modern education and fronting the university phase. This study aims to explore the complex relationship between dietary patterns, physical activity, mental stress and other lifestyle behaviours (Sleep Duration), and their correlation with BMI, menstrual health outcomes (including PCOS and period pain), and academic performance among female students in Sialkot. Understanding all these things will influence health outcomes in this demographic, and it plays an important role in developing effective public health interventions.

II. METHOD

Participants

This survey analysis was done from 1st January 2026 to 28th February 2026 at Grand Asian University, Sialkot. Female students of an age group between 17-30 years participated in this study. Those female students who provided complete information and attempted an almost >85% questionnaire were included in this study and those who did not provide complete information and attempt <85% equations were excluded from this cross-sectional analysis. A total of n=502 female students participated in this analysis that fulfils our inclusion criteria.

Measures

A total of 30 questions, along with their options, were created by using the Google form and forwarded to students of different programs and different semesters of Grand Asian University Sialkot after taking their verbal consents. All these questions, along with detailed analysis, are available in analysis chapter.

Procedure

Informed consent was obtained from all female participants, and the study was approved by the Departmental Ethical Review Board of Grand Asian University Sialkot (GAUS-2026-003). After importing all data its pre-analysis was done on Microsoft Excel 2010 installed in Windows 10 pro. We performed chi-square test for statistically significance and Bonferroni correction for statistical reliability. The coding of these analyses was created and run by using Jupyter Notebook of Anaconda Navigator 1.9.12. To run this model, this graphical user interface (GUI) was installed in Microsoft Windows 7 (32-bit). For the optimization of coding and to overcome troubleshooting a support was taken from Deep-seek, library that use for this analysis are available.

III. RESULTS

Overall, n-502 female students from the Grand Asian University participated in this study. The participants had a mean age of 21.5 ± 2.9 years (range: 17-30 years). Participants had a mean BMI of 22.70 ± 3.90 kg/m², with a median value of 22.00 kg/m². Science programs female students accounted for a high percentage for n-271(57.4%) of the study population, while the rest were from other disciplines. Regarding academic achievement, n-167(37.2%) students had a Grade Point Average (GPA) between 2.5 to 3.0, followed by n-135(30.1%) with a GPA from 3.0 to 3.5. According to the BMI grouping, most participants had BMI values within normal body weight. However, n-110(22.3%) students were observed underweight, followed by overweight and obese with n-76(15.4%) and n-40(8.1%) respectively, as shown in figure 1. These findings denote that although the majority of respondents sustained a healthy body weight, a substantial percentage were either under-weight or exceeded the normal BMI category. Around n-248(49.9%) of the female participants were suffering from menstrual pain. Concerning Polycystic Ovary Syndrome (PCOS), n-69(13.8%) was observed and the majority of the participants' n-106(21.2%) were not sure about it, as shown in supplementary file 1. Obesity running in families was a factor for n-93(18.6%) of individuals, over half of the group about n-260(52.0%) don't have obesity in their family history, with the remaining n-146(29.2%) were unsure. In this analysis, it was analyzed that per day, n-197(39.2%) of individuals consumed only 1-2 liters of water and n-183(36.5%) of female student's water intake less than 1 liter of water, so this water intake was usually very insufficient. Half of the participants, about n-227(45.5%) sometimes felt starvation after meals. On the other hand, n-137(27.5%) was often suffering post-meal hunger. Mixed meals like home and non-homemade were the most frequently consumed daily food type at n-228(45.5%), closely followed by home-cooked meals at n-157(31.1%). About breakfast habits, n-177(35.3%) of people never skipped breakfast, though n-163(32.6%) skipped it once or twice-weekly. Bread (Roti) was the primary breakfast staple for n-306(51.2%) of respondents.

The habit of eating fried food is very dominant in female students the percentage of participants who take it sometimes is higher with n-147(29.4%) followed by those who take it 3-4 times per week, then once a week than those who consume it on a daily basis with n-134(26.8%), n-124(24.8%) and n-89(17.8%) respectively. Bakery items were a weekly staple for n-166(33.2%) of participants, while 104 (21.8%) ate them on a daily basis. Protein-rich foods were eaten by n-174(34.9%) of participants with the frequency of three to four times weekly. Sugary beverage intake was also a common habit, as n-157(31.4%) of participants reported daily consumption and n-140(28%) consumed them on a weekly basis. About snacking, n-165(33.1%) ate snacks three to four times weekly, followed by those who take in as daily basis as n-125(25.1%). Fruits were the most chosen snack for the majority of the participants with n-133(33.7%) of individuals, then dry fruits n-105(26.6%) as comprehensive detail shown in supplementary file 1. Ignoring meal due to stress and during exams was usual; n-199(40.1%) individuals sometimes ignored their meal due to it, although n-172(34.7%) implements it often. Late night (after 10:00pm) eating was very common among female students as n-208(41.9%) of the group stated this habit. Sitting behaviour was also prominent; n-152(30.4%) of individuals remained seated for 3-6 hours daily, while n-145(29%) students were sitting for 6-9 hours. Morning Walk was the most standard mode of physical activity, which was selected by n-161(49.8%) of participants. While n-174(34.9%) reported never exercising, only n-30(6.0%) engaged in physical activity five or more times weekly. Sleep data revealed that while n-158(31.6%) achieved an ideal 8-9 hours of sleep, a large portion of n-211(42.2%) only slept for 5-7 hours. The majority of the students agree n-308(62%) that after joining university their eating habits changes as shown in Figure 1, and they feel tired and low energy due to these eating habits.

Figure I: Descriptive Statistical Analysis

To examine how health-related variables are associated with a Chi-Square test of independence was performed. Health-related variables include lifestyle factor, BMI, and dietary habits, academic performance, menstrual health and other variables related to health as shown in table 1. The relationships observed in all the 15 tested associations were approved and after applying Bonferroni correction (adjusted $\alpha = 0.0033$), they stayed significant as shown in Table 2. A statistically significant association ($p < 0.005$) of PCOS was analyzed between BMI, family history of obesity and menstrual pain. The Body Mass Index (BMI) also showed significant associations with several lifestyle and dietary variables, as BMI was significantly associated with physical activity frequency, fried food consumption, sugary drink and daily water intake. A significant relationship was found between GPA and breakfast frequency, whereas changes in eating habits were also significant, with semester numbers indicating that eating patterns differed substantially across academic semesters. Menstrual or period pain was significantly associated with sleep duration, meal skipping due to stress or exams, and water intake. All these associations showed moderate to strong effect sizes. Fatigue/tiredness was also significant with way of life-related variables like physical activity, sleep duration frequency and water intake as shown in table 1. All analyzed associations remained statistically reliable after the Bonferroni correction, verifying the resilience of the findings in several comparisons as shown in table 2.

Table I: Chi-Square Tests Between Different Variables

Variable 1	Variable 2	Chi-Square	p-value	Degrees of Freedom	Cramer's V	Significant
PCOS	BMI	488.3086	0.0	6	0.7192	True
PCOS	Period Pain	483.3501	0.0	4	0.7156	True
PCOS	Family Obesity	628.1038	0.0	4	0.8157	True
BMI	Physical activity	593.9333	0.0	9	0.6476	True
BMI	Fried Food	588.3019	0.0	12	0.6446	True
BMI	Sugary Drinks	777.3002	0.0	12	0.7409	True
BMI	Water Intake	598.0993	0.0	9	0.6499	True
GPA	Breakfast Frequency	880.2550	0.0	9	0.7884	True
Period Pain	Sleep Hours	469.8927	0.0	6	0.7055	True
Period Pain	Skip Meals Stress	369.8025	0.0	4	0.6259	True
Period Pain	Water Intake	588.7801	0.0	6	0.7898	True
Tiredness	Sleep Hours	874.4447	0.0	9	0.7858	True
Tiredness	Physical Activity	1015.8962	0.0	9	0.8470	True
Water Intake	Tiredness	934.3276	0.0	9	0.8123	True
Eating Habits Changed	Semester Group	413.5261	0.0	6	0.6619	True

Table II: Associations Significant after Bonferroni correction

Variable 1	Variable 2	P-Value
PCOS	BMI	0
PCOS	Period Pain	0
PCOS	Family Obesity	0
BMI	Physical Activity	0
BMI	Fried Food	0
BMI	Sugary Drinks	0
BMI	Water Intake	0
GPA	Breakfast Frequency	0
Period Pain	Sleep Hours	0
Period Pain	Skip Meals Stress	0
Period Pain	Water Intake	0
Tiredness	Sleep Hours	0
Tiredness	Physical Activity Freq	0
Water Intake	Tiredness	0
Eating Habits Changed	Semester Group	0

BONFERRONI CORRECTED SIGNIFICANCE ($p < 0.05/n$)* Number of tests: $n=15$ * Bonferroni corrected alpha: 0.00333

IV. DISCUSSION

The present study identified the relationship between Polycystic Ovary Syndrome (PCOS), lifestyle factors, and body mass index (BMI) among female university students. These results emphasize the importance of body weight and lifestyle-related factors in the reproductive health of women. According to BMI classification, the majority of the participants had BMI values that fell within the normal body weight range. However, 22.3% of students were observed to be underweight, followed by overweight and obese with 15.4% and 8.1% respectively. This is comparable to Tanveer et al. (2024), which demonstrated that 19.4% are overweight and 10.7% obese within Pakistani school-aged children. The comparatively lower rates in our analysis may be because of the differences in respondents' characteristics or BMI categories. In other countries, like Saudi Arabia, the frequency of obesity was reported 36% (Al-Quwaidhi, 2014). The existing frequency of distinct body weights demonstrates contrasting variations worldwide. A cross-sectional study conducted among n-2,032 male and female U.S. high school students (grades 9-12) reported that they were overweight, normal weight, and underweight, with frequencies of 47.4%, 51.2%, and 1.5% respectively (Brenner, 2004). Another study conducted among n-360 first year female undergraduate students in South Africa reported 10% and 7.2% to be overweight and underweight (Cilliers, 2006). Countries bear the highest burden of obesity worldwide, such as Lebanon 36 to 38%, Qatar 34 to 45%, and Papua New Guinea 79 to 80%, obese population (Tanzil, 2016). Nevertheless, our underweight percentage (22.3%) was greater than their 16.8%, possibly considering regional socioeconomic differentiation (Tanveer, 2024).

In case of eating habits, it was observed that the highest proportion of participants (29.4%) consumed fried foods occasionally, followed by (26.8%) who consumed them 3-4 times per week. Additionally, (24.8%) participants ate fried foods once a week, whereas (17.8%) on a daily basis. A total of (31.4%) participants reported consuming sugary beverages on a daily basis, while (28.0%) consumed them on a weekly basis. These results are coherent with Amgain and Neupane (2019), who indicated that 68.6% of nursing students' intake fast food and that tea/coffee consumption was substantially associated with menstrual disorders ($p=0.031$) (Amgain, 2019). Skipping meals due to stress or during examination periods was also a frequent practice among the participants. The largest proportion (40.1%), reported that they sometimes skipped meals due to it, whereas (34.7%) indicated that they did it often. Amgain and Neupane (2019) likewise demonstrated that skipping meal behavior was substantially correlated with menstrual disorders ($p=0.03$) (Amgain, 2019). Late-night eating was a common dietary habit among

the female students as (41.9%) and with regard to sleep patterns, the high percentage (42.2%) slept for only 5-7 hours. These results are coherent with Dhar et al. (2023), who demonstrated that <6 hours' sleep was considerably correlated with an elevated risk of menstrual problems ($p < 0.05$). Their analysis also emphasized that unhealthy lifestyle habits, involving irregular eating patterns, contribute to menstrual problems between young women and adolescents (Dhar, 2023).

A considerable proportion of the participants (34.9%), reported that they never engaged in any form of physical exercise, whereas only (6.0%) participated in physical activity five or more times per week and prolonged sedentary behaviour was also highly prevalent among the participants. A total of (30.4%) students reported remaining seated for 3-6 hours per day, while (29.0%) spent 6-9 hours sitting daily, which corresponds with their analysis that a sedentary lifestyle is associated with menstrual problems (Amgain, 2019). In the current study, regarding Polycystic Ovary Syndrome (PCOS), (13.8%) participants reported being diagnosed with it and (21.2%) were unsure of their PCOS status. This result is significantly coherent with Dhar et al. (2023), who performed cross-sectional research between young women and adolescents in West Bengal, India, and demonstrated a PCOS frequency of 14.14% among their study population. Additionally, Dhar et al. (2023) demonstrated that around 67% of their respondents were not under any confirmed diagnosis or were unaware of their menstrual disorders. This emphasizes a significant gap in awareness and diagnosis of PCOS among young females in South Asian populations (Dhar, 2023).

V. CONCLUSION

In Sialkot, the major percentages of female students were underweight, followed by the overweight and obese. Unhealthy eating habits like eating fried food, high consumption of sugary beverages, ignoring meals due to stress during exams, late night eating, in addition to a poor lifestyle including, prolonged sedentary behaviour, never physically exercising, and low sleeping hours are dominantly observed in female students of Sialkot. High percentages of participants suffer from menstrual pain followed by Polycystic Ovary Syndrome (PCOS). A statistically significant association of PCOS was analysed between BMI, family history of obesity and menstrual pain. BMI was significantly associated with physical activity frequency, fried food consumption, sugary drink and daily water intake. Menstrual/period pain associated with sleep duration, meal skipping due to stress or exams, and water intake. Its awareness should be enhanced for females through social media, seminars and campaigns so that students can adopt healthy lifestyle factors and dietary patterns.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Funding

The author received no funding from any organizations.

VI. REFERENCES

- Mustofa, V. F., Aryudaningrum, N., Wulandari, E., & Zakaria, M. (2025). Determinants of menstrual pain severity among female medical students: a cross-sectional study. *Jurnal Cakrawala Promkes*, 7(2), 132-142.
- Nuttall, F. Q. (2015). Body mass index: obesity, BMI, and health: a critical review. *Nutrition today*, 50(3), 117.
- Butt, M. S., Saleem, J., Zakar, R., Aiman, S., Bukhari, G. M. J., & Fischer, F. (2024). Comparison of physical activity levels and dietary habits between women with polycystic ovarian syndrome and healthy controls of reproductive age: a case-control study. *BMC Women's Health*, 24(1), 29.
- Arslan, N., Aslan Ceylan, J., & Hatipoğlu, A. (2023). The relationship of fast food consumption with sociodemographic factors, body mass index and dietary habits among university students. *Nutrition & Food Science*, 53(1), 112-123.
- Rashid, M., Sultan, F., Shamas, Z., Shakeel, A., Tariq, H., & Iftikhar, A. (2026). In Digital Era Prevalence and Risk Factors of Computer Vision Syndrome among Students of Punjab, Pakistan. *Pakistan Journal of Positive Psychology*, 3(2), 188-198.

- Misra, A. (2015). Ethnic-specific criteria for classification of body mass index: a perspective for Asian Indians and American Diabetes Association position statement. *Diabetes technology & therapeutics*, 17(9), 667-671.
- World Health Organization. (2002). *The world health report 2002: reducing risks, promoting healthy life*. World Health Organization.
- Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., ... & Gakidou, E. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The lancet*, 384(9945), 766-781.
- Whitlock G, Lewington S, Sherliker P, et al. Prospective Studies Collaboration. (2009). Body-mass index and cause-specific mortality in 900 000 adults: collaborative analyses of 57 prospective studies. *The Lancet*, 373(9669), 1083-1096.
- Abdullah, A., Peeters, A., de Courten, M., & Stoelwinder, J. (2010). The magnitude of association between overweight and obesity and the risk of diabetes: a meta-analysis of prospective cohort studies. *Diabetes research and clinical practice*, 89(3), 309-319.
- Montero, P., Bernis, C., Fernandez, V., & Castro, S. (1996). Influence of body mass index and slimming habits on menstrual pain and cycle irregularity. *Journal of biosocial Science*, 28(3), 315-323.
- Black, R. E., Morris, S. S., & Bryce, J. (2003). Where and why are 10 million children dying every year?. *The lancet*, 361(9376), 2226-2234.
- Chumlea, W. C., & Guo, S. S. (1999). Body mass and bone mineral quality. *Current opinion in rheumatology*, 11(4), 307-311.
- Turconi, G., Guarcello, M., Maccarini, L., Cignoli, F., Setti, S., Bazzano, R., & Roggi, C. (2008). Eating habits and behaviors, physical activity, nutritional and food safety knowledge and beliefs in an adolescent Italian population. *Journal of the American College of Nutrition*, 27(1), 31-43.
- Siregar, S., Bar, A., Rezekiyah, S., & Karwiti, W. (2026). Article RETRACTED due to malpractice Physical Activity, Sleep Quality, Diet Quality and Menstrual Health in Female Adolescents. *Retos*, 82.
- Neisi, A., & Parham, S. (2026). Diet and lifestyle behaviours in relation to academic performance among university students: a cross-sectional study. *Nutrition & Food Science*, 56(2), 377-390.
- MOHSIN, S. N., BARKAT, M., AHMAD, A., MUDDASSIR, A., & JAMEEL, R. (2021). Frequency and determinants of obesity/overweight among undergraduate students. *Age (years)*, 23, 2-24.
- Strete, E. G., Cincu, M. G., & Sălcudean, A. (2025). Disordered eating behaviors, perceived stress and insomnia during academic exams: A study among university students. *Medicina*, 61(7), 1226.
- Al-Quwaidhi, A. J., Pearce, M. S., Critchley, J. A., Sobngwi, E., & O'flaherty, M. (2014). Trends and future projections of the prevalence of adult obesity in Saudi Arabia, 1992-2022. *Eastern Mediterranean Health Journal*, 20(10), 589.
- Brener, N. D., Eaton, D. K., Lowry, R., & McManus, T. (2004). The association between weight perception and BMI among high school students. *Obesity research*, 12(11), 1866-1874.
- Cilliers, J., Senekal, M., & Kunneke, E. (2006). The association between the body mass index of first-year female university students and their weight-related perceptions and practices, psychological health, physical activity and other physical health indicators. *Public Health Nutrition*, 9(2), 234-243.
- Tanzil, S., & Jamali, T. (2016). Obesity, an emerging epidemic in Pakistan-a review of evidence. *J Ayub Med Coll Abbottabad*, 28(3), 597.
- Tanveer, M., Asghar, E., Tanveer, U., Roy, N., Zeba, A., Al-Mhanna, S. B., ... & Batrakoulis, A. (2024). Association of nutrition behavior and food intake with overweight and obesity among school-aged children and adolescents in Pakistan: a cross-sectional study. *AIMS Public Health*, 11(3), 803.
- Amgain, K., & Neupane, S. (2019). Effects of bmi and food habits on menstrual characteristics among adolescent girls. *Europasian Journal of Medical Sciences*, 1(1), 53-61.
- Dhar, S., Mondal, K. K., & Bhattacharjee, P. (2023). Influence of lifestyle factors with the outcome of menstrual disorders among adolescents and young women in West Bengal, India. *Scientific Reports*, 13(1), 12476.