

Research Article



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Correlation of Dietary Patterns with Adiposity and Obesity among Young Adult Females

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Keywords: Obesity, Dietary Pattern, Food habits, young adult females, Body Fat Percentage, Body Mass Index (BMI), Adiposity, Non-Communicable Diseases (NCDs).

Abstract

Obesity is a growing health concern globally and dietary patterns are known to be one of the primary contributing factors. Modification of food habits in the young adulthood can prevent obesity resulting in prevention of many non-communicable diseases. The present research was attempted to determine dietary patterns of young adults and prevalence of obesity along with the relationship between obesity and dietary among young adulthood. Close ended questionnaire was used as a tool to determine the relationship between obesity and dietary pattern among 310 females of 4 college and universities. Data analysis was performed using SPSS version 27. Participants demonstrated diverse dietary practices, with regular consumption of cereals (28.3%), fruits (57.6%), vegetables (47.3%), meat (17.7%), eggs (39.9%), and dairy products (55.9%). However, considerable number of respondents consumed fast food (39.5%), soft drinks (21.9%), and bakery products (16.4%), indicating unhealthy food habits. Furthermore, 43.1% of participants reported overeating during emotional stress, while 46.6% frequently skipped breakfast. Only 27.0% selected foods based on their nutritional value. The findings also show that overall prevalence of obesity and overweight was 17.0% by BMI while according to body fat (adiposity measurement) 13.2% individuals had obesity. The p value (<0.05) of egg intake, fast food consumption, choosing food based on nutrients show significant relationship between obesity and dietary patterns. Overall, Individuals with normal body fat tend to have a higher consumption of fruits, vegetables, salads, and dairy products compared to those with high body fat. The result also indicates that individuals with normal body fat tend to have lower consumption rates of bakery products, desserts, and sweet foods compared to those with high body fat. Promoting healthy eating habits and increasing nutrition awareness during young adulthood may contribute to reducing the prevalence of obesity and related non-communicable diseases.

Introduction

Obesity has become one of the most significant public health challenges worldwide and is associated with increased illness and mortality. Multiple factors contribute to obesity, including physical inactivity, unhealthy dietary habits, excessive energy intake, and frequent consumption of energy-dense foods. Obesity is a major risk factor for several non-communicable diseases, including hypertension, cardiovascular diseases, stroke, type 2

diabetes, infertility, and sleep apnea (Ahmad, 2022; Asif et al., 2020; Cleven et al., 2020).

Dietary pattern analysis is widely used to evaluate overall food consumption behaviors and dietary habits within populations (Vepsäläinen & Lindström, 2024). Contemporary evidence suggests that healthy dietary patterns play a crucial role in maintaining optimal body weight and preventing obesity-related diseases (Cena & Calder, 2020; Li et al., 2022).

According to the World Health Organization (WHO), a healthy Body Mass Index (BMI) ranges between 18.5 and 24.9, while a BMI of 30.0 or higher falls within the obesity range (WHO, 2023). The prevalence of obesity has increased substantially over the past decades and is now considered a global epidemic (Ellison-Barnes et al., 2021). According to the world's largest obesity study, involving nearly 20 million adults across most countries, more than one in ten men and one in seven women globally are now obese (WHO, 2023). Pakistan is on the ninth position of obesity, and it is the major risk factor of public health. Obesity rates have increased rapidly among adolescents (Khan et al., 2021; Ibtisam et al., 2023).

Young adulthood is the most important time for making lifelong dietary habits. Depending on fast food, sugary beverages, and highly processed meals is mainly related to increased risk of obesity among university students (Alshammari et al., 2022; Arslan et al., 2023). Similar findings have been reported among university students in Lahore, where unhealthy dietary habits were significantly associated with obesity (Ibtisam et al., 2023).

Recent evidence suggests that young adults, particularly female university students, are increasingly affected by obesity due to poor dietary

Materials and Methods

In this study, convenience sampling was used to study the correlation between obesity and dietary patterns. The research focused on three main objectives: healthy food habits, unhealthy food habits, and eating routines. The study has been conducted from March 2022 to June 2023 for the collection and analysis of data.

Research Design and Target Population

Quantitative cross-sectional survey was used in this study. Target population of 310 include only young adult females from Lahore College for Women University, University of the Punjab, Government Postgraduate College Samanabad, and Government APWA College.

Eligibility Criteria

Inclusive criteria: The study sample comprised of only female students from Intermediate and BS programs. Participants fell within 16 and 24 years.

Results

The result was analyzed and presented step by step according to the objectives of this study with relevant tables and figures.

Objective 1: The Dietary Patterns of Young Adult Females

Health and Well Being

According to the data illustrated in figure 2, majority of the participants (74.9%) consider the combination of healthy diet, regular physical activity, and

choices and modern lifestyle changes (Ashraf et al., 2023; Ibtisam et al., 2023).

Despite the increasing burden of obesity among young adults, limited data are available regarding the association between dietary patterns and obesity among female students in Lahore, Pakistan. Therefore, objectives of the present study were to assess dietary patterns among young female students, determine the prevalence of obesity, and examine the relationship between dietary habits and obesity among obese and non-obese students of Lahore in Pakistan. The findings of this study may provide useful recommendations for college and university cafeterias to promote healthier food choices by offering balanced options such as fruits, vegetables, and lean protein in appropriate portion sizes to avoid overeating and unhealthy dietary practices. Moreover, these findings can help dietetics professionals in designing meal planning strategies to control obesity in young adults. This study also contributes to an academic source for future research work within nutrition and public health fields. Linking young adult females' obesity and dietary patterns provide strong evidence for educational and medical institutions to formulate prevention and treatment programs of obesity.

Exclusive criteria: Anyone suffering from chronic metabolic conditions or following specific medical diets was excluded. Since the focus remained on specific age factor and undergraduate levels, male students and postgraduate scholars (MPhil/PhD) weren't part of this study.

Research Instrument and Data Analysis

For collection of data, we developed a close-ended questionnaire that was divided into three segments: healthy food habits, unhealthy food habits, and eating routines. Ratio of obesity was calculated by Body Mass Index (BMI) and body fat percentages through Durnin formula. Collected data were analyzed via SPSS software to generate descriptive statistics and Pearson's Chi-square tests to determine how dietary patterns correlate with adiposity parameters (Figure 1).

balanced nutrition as equally vital for maintaining good health.

Figure 3 showed that most participants (39.9%) consume moderate amounts of cereals, vegetables, fruits and salad in a week. On the other hand, salad and vegetable consumption was mostly high.

This graph in figure 4 showed that most participants consumed meat more than 3 times per week (67.2%), while egg intake was less. Pulses and dry fruits were mostly eaten in small amounts while dairy products were consumed regularly (41.8%).

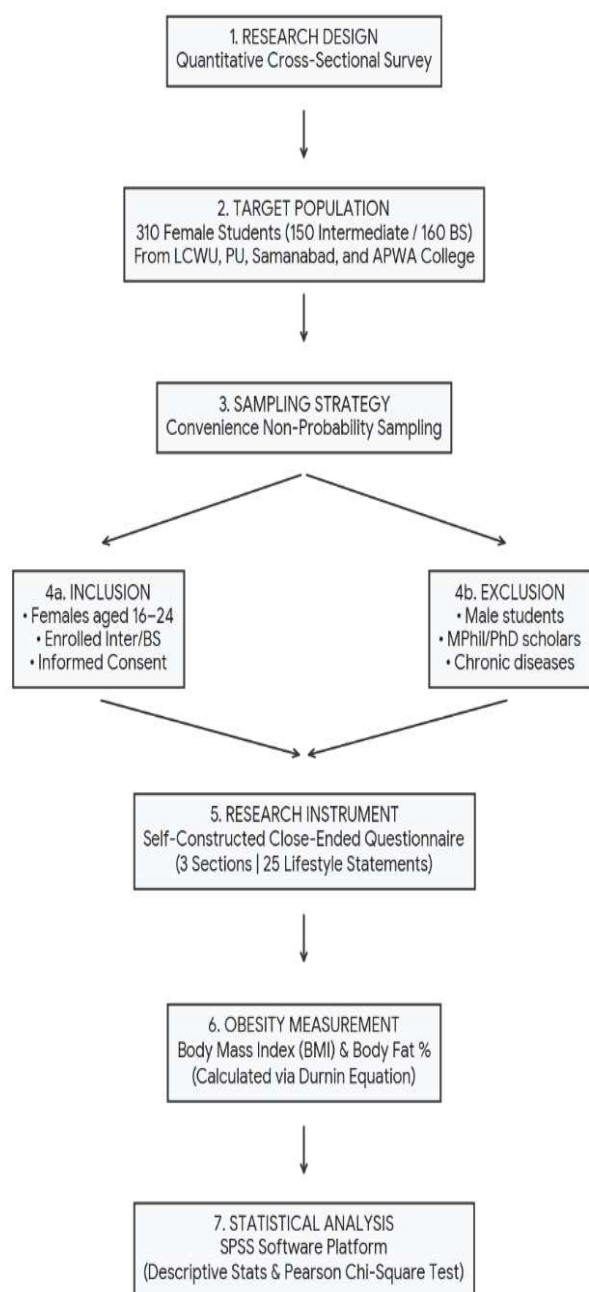


Figure 1: Methodology Structural Framework Hierarchy

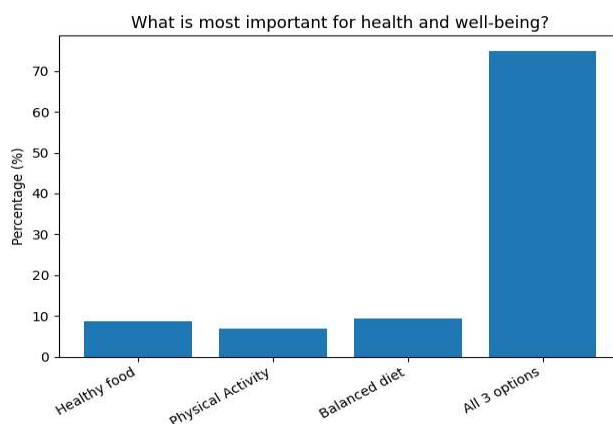


Figure 2: Health and Wellbeing

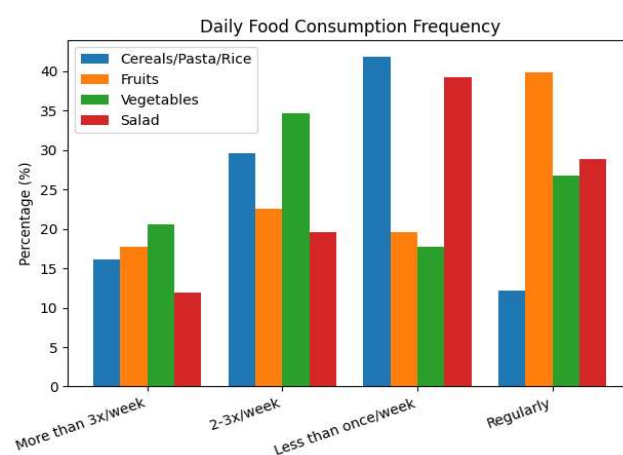


Figure 3: Daily Food Consumption Frequency

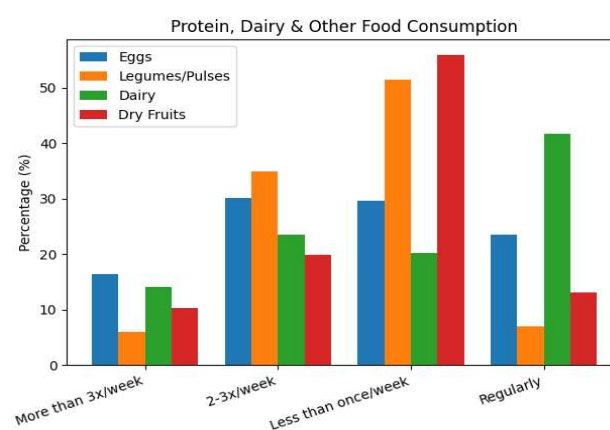


Figure 4: Protein, Dairy & Other Food Consumption

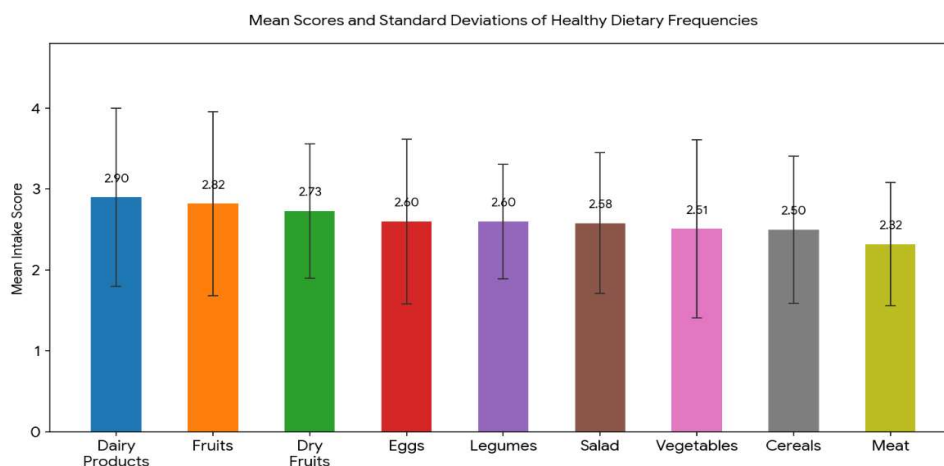


Figure 5: Descriptive Statistics of Healthy Food

The graph in figure 5 illustrated that intake frequency (Mean = 2.90 ± 1.10) of dairy products and fruits (Mean = 2.82 ± 1.14) were high. On the other hand, core meat options presented the lowest

response (Mean = 2.32 ± 0.76). These findings showed that healthy habits were a part of their lives but not adopted regularly as this can cause nutritional deficiencies, digestive issues, and ultimately increase the risk of obesity.

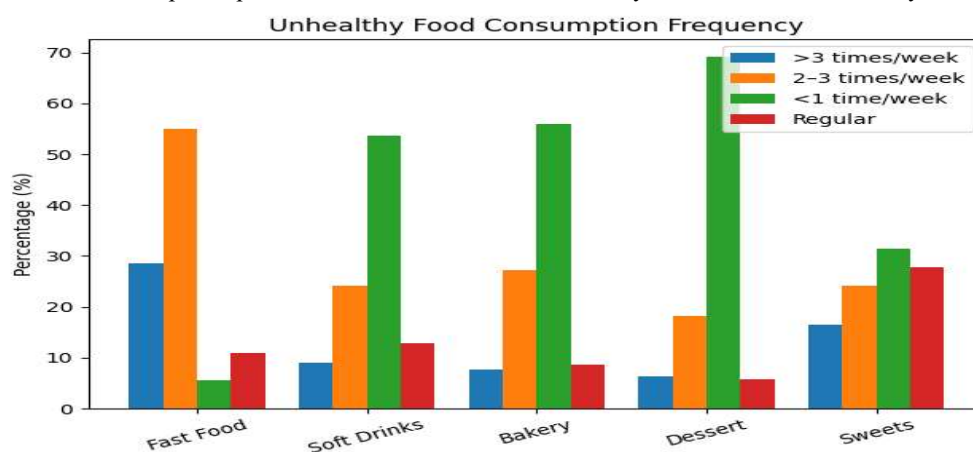


Figure 6: Unhealthy Food Consumption Habits

The graph showed that consumption (83.6%) of fast food was high with common intake of dessert and beverages. These unhealthy habits increased the

body weight, slowed down metabolism and converted the extra calories into body fat.

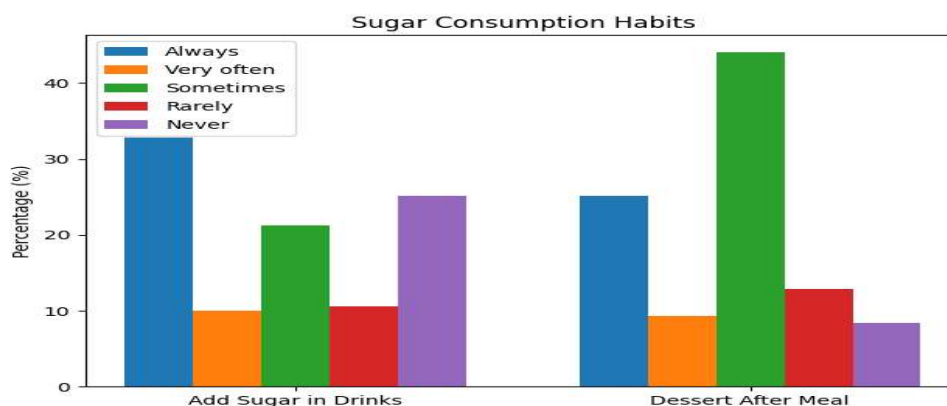


Figure 7: Sugar Consumption Habits

Figure 7 showed that intake (42.8%) of extra sugar and eating (74.5%) more dessert after meal were significantly high. This habit could have made

sudden rise of insulin and led to the accumulation of surplus calories as body fat.

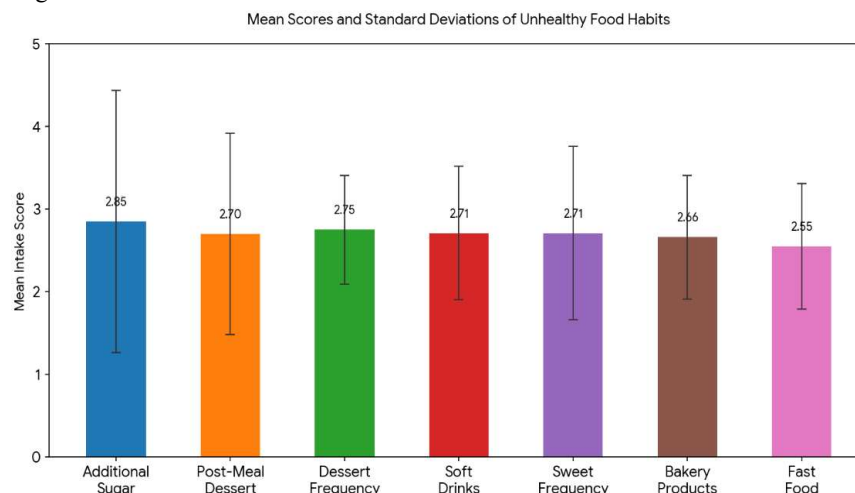


Figure 8: Descriptive statistics of Unhealthy food habits

Graph 8 illustrated that intake frequency (Mean = 2.85 ± 1.59) of additional sugar and dessert (Mean = 2.75 ± 0.66) were high while fast food consumption frequency was (Mean = 2.55 ± 0.76) less compared

to them. These persistent consumption of sugar and dessert expand the calories content and increase the risk of obesity.

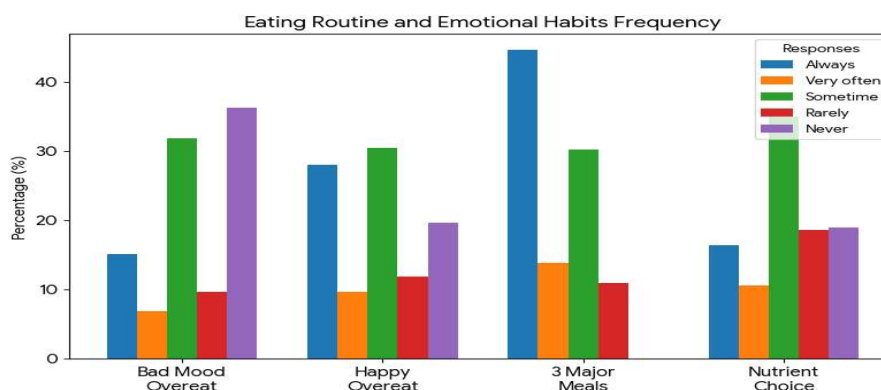


Figure 9: Eating Routine & Emotional Habit

The graph 9 highlighted that emotional habits affected the eating routine significantly. Eating had been increased up to 58.5% in good mood and 38.6% in bad mood resulting in psychological urge toward uncontrolled eating. In addition to this, only few participants adhere to nutrient based food making it harmful for their health.

This graph 10 showed that a huge number 46.6% of participants commonly skip breakfast, which led to over consumption of food in afternoon. Skipping breakfast slowed the metabolic rate later in the day and caused fatigue.

Graph 11 illustrated that frequency (Mean = 3.454 ± 1.424) of overeating during a bad mood and daily snacking (Mean = 3.338 ± 0.961) were higher.

While the frequencies of maintenance to three regular meals and particular meal-skipping were lower among the population. These behavioral habits highlighted that psychological triggers and irregular snacking intervals heavily disrupted normal metabolic cycles, directly acting as key lifestyle drivers for fat storage and chronic obesity among the young females.

Objective 2: Prevalence of Obesity in Youth

Prevalence of obesity in youth was calculated through BMI and body fat percentage.

The figure 12 strongly supported the core objectives of this study by illustrating a substantial 17.0% cumulative prevalence of overweight (14.1%) and obesity (2.9%) among the young females.

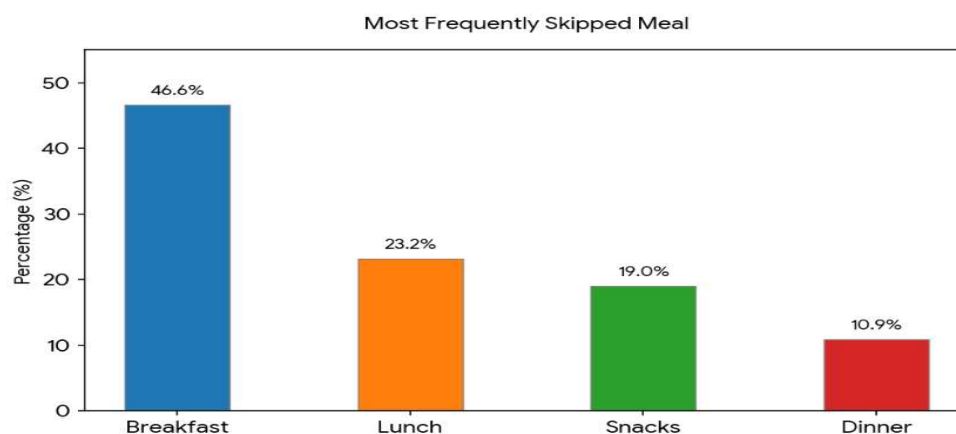


Figure 10: Most Frequently Skipped Meal

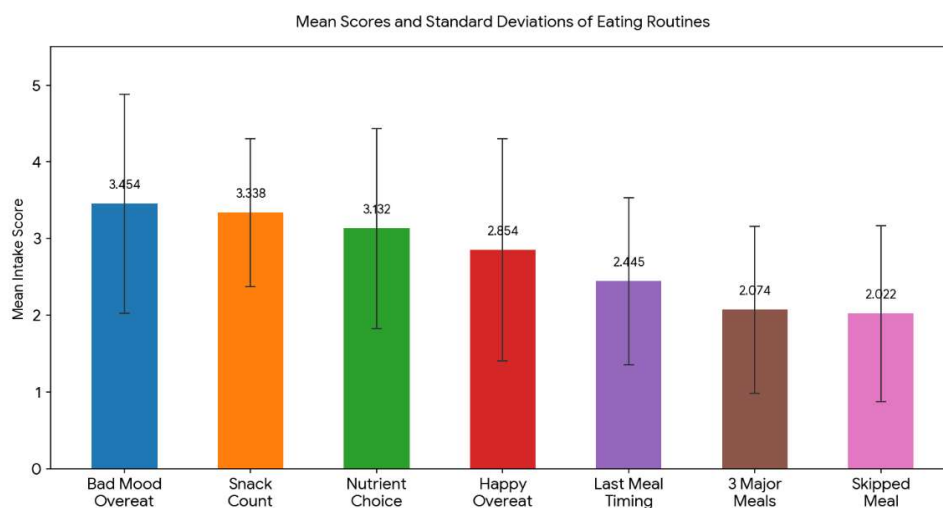


Figure 11: Descriptive statistics of eating routine

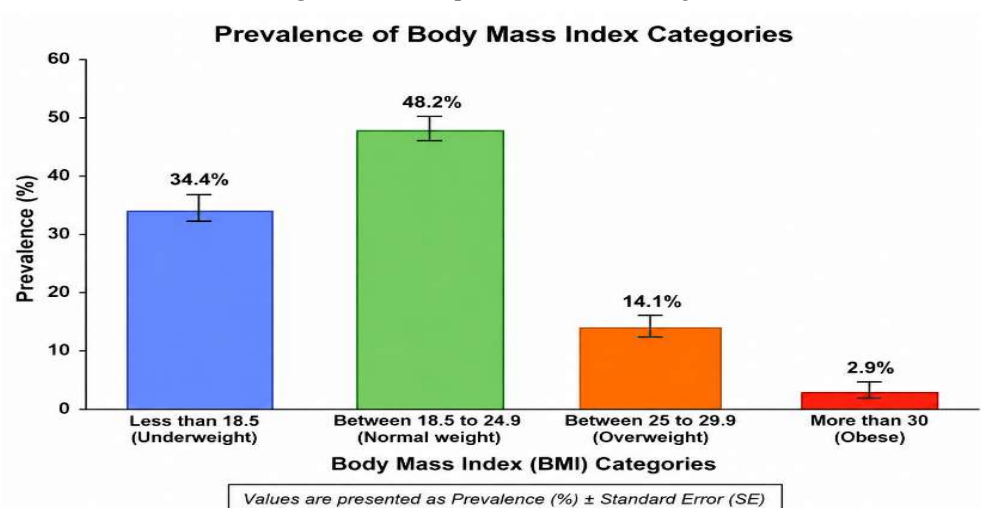


Figure 12: Prevalence of Body Mass Index

Table 1: BMI and normal body fat of youth

			Body fat percentage	
			less than 30%	more than 30%
BMI	Less than 18.5 underweight	% of Total	34.6%	0.0%
	18.5 to 24.9 normal weight	% of Total	47.9%	0.3%
	B/w 25 to 29.9 overweight	% of Total	5.2%	9.1%
	More than 30 Obese	% of Total	0.0%	2.9%
		% of Total	87.7%	12.3%

Table showed that 87.7% of participants had a normal body fat percentage (less than 30%) while only 12.3% were classified as having a high body fat percentage (more than 30%).

Objective 3: Relationship between Obesity and Dietary Pattern among obese and non-obese young Adult

Relationship between obesity and dietary pattern among obese and non-obese was calculated by making a comparison of healthy food habits, unhealthy food habits and eating routine with body fat status.

Table 2: Healthy Food Habits in Normal Body Fat Status

Variable	Option 1	Option 2	Option 3	Option 4	p-value
Healthy Food Habits	Health & Well-being (8.4%)	Healthy Food (6.1%)	Physical Activity (8.4%)	Balanced Diet (64.7%)	> .05
Cereal/Pasta/Bread /Rice	>3 times/week (12.9%)	2–3 times/week (26.2%)	<1 time/week (36.9%)	Regularly (11.7%)	> .05
Fruits	>3 times/week (15.2%)	2–3 times/week (20.1%)	<1 time/week (17.2%)	Regularly (35.3%)	> .05
Vegetable	>3 times/week (17.2%)	2–3 times/week (31.4%)	<1 time/week (16.5%)	Regularly (22.7%)	> .05
Salad	>3 times/week (10.4%)	2–3 times/week (17.8%)	<1 time/week (33.3%)	Regularly (26.2%)	> .05
Type of Meat	Chicken (60.2%)	Mutton (8.4%)	Beef (3.6%)	Fish (3.2%)	> .05
Meat (Frequency)	>3 times/week (12.0%)	2–3 times/week (38.2%)	<1 time/week (33.7%)	Regularly (3.9%)	> .05
Eggs	>3 times/week (13.3%)	2–3 times/week (28.5%)	<1 time/week (24.6%)	Regularly (21.4%)	< .05
Legumes / Pulses	>3 times/week (5.5%)	2–3 times/week (314.4%*)	<1 time/week (44.3%)	Regularly (6.5%)	> .05
Dairy Products	>3 times/week (12.0%)	2–3 times/week (20.4%)	<1 time/week (17.8%)	Regularly (37.5%)	> .05
Dry Fruits	>3 times/week (8.7%)	2–3 times/week (17.8%)	<1 time/week (48.9%)	Regularly (12.3%)	> .05

Table 2 clearly demonstrated that individuals with normal body fat follow highly favorable dietary patterns, with a substantial 64.7% actively adhering to a Balanced Diet. Most participants chose nutrient-

based food. 35.5% of participants consume chicken as lean protein regularly. A significant association ($p < .05$) was found between daily egg intake and healthy body composition.

Table 3: Healthy Food Habits in High Body Fat Status

Variable	Option 1	Option 2	Option 3	Option 4	p-value
Healthy Food Habits	Health & Well-being (0.3%)	Healthy Food (0.6%)	Physical Activity (0.6%)	Balanced Diet (10.7%)	> .05
Cereal/Pasta/Bread /Rice	>3 times/week (2.9%)	2–3 times/week (3.6%)	<1 time/week (5.2%)	Regularly (0.6%)	> .05
Fruits	>3 times/week (2.6%)	2–3 times/week (2.3%)	<1 time/week (2.6%)	Regularly (4.9%)	> .05
Vegetable	>3 times/week (3.2%)	2–3 times/week (3.6%)	<1 time/week (1.3%)	Regularly (4.2%)	> .05
Salad	>3 times/week (1.3%)	2–3 times/week (1.9%)	<1 time/week (6.1%)	Regularly (2.9%)	> .05
Type of Meat	Chicken (7.1%)	Mutton (1.9%)	Beef (0%)	Fish (0.3%)	> .05
Meat (Frequency)	>3 times/week (1.9%)	2–3 times/week (5.5%)	<1 time/week (4.9%)	Regularly (0%)	> .05
Eggs	>3 times/week (3.2%)	2–3 times/week (1.9%)	<1 time/week (5.2%)	Regularly (1.9%)	< .05
Legumes / Pulses	>3 times/week (0.6%)	2–3 times/week (3.9%)	<1 time/week (7.1%)	Regularly (0.6%)	> .05
Dairy Products	>3 times/week (1.9%)	2–3 times/week (3.2%)	<1 time/week (2.6%)	Regularly (4.5%)	> .05
Dry Fruits	>3 times/week (1.6%)	2–3 times/week (2.3%)	<1 time/week (7.1%)	Regularly (1.0%)	> .05

Table 3 clearly demonstrated that individuals with high body fat reflected an adverse trend. These individuals consumed 3.9% additional sugar and 3.6% desserts after meals. A high percentage of

11.3% Fast Food and 10.6% Soft Drinks reinforced the research outcomes that high -calorie and sugary foods were directly correlated with higher adiposity.

Table 4: Unhealthy Food Habits in Normal Body Fat Status

Variable	Option 1	Option 2	Option 3	Option 4	Option 5	p-value
Additional Sugar	Always (28.8%)	Very often (7.8%)	Sometimes (19.7%)	Rarely (9.7%)	Never (21.7%)	> .05
Dessert after meal	Always (21.7%)	Very often (8.4%)	Sometimes (39.5%)	Rarely (11.7%)	Never (6.5%)	> .05
	>3 times/week	2–3 times/week	<1 time/week	Regularly		
Fast Food	7.4%	26.9%	48.5%	4.9%	—	< .05
Soft Drinks	8.4%	20.1%	48.2%	11.0%	—	> .05
Bakery Products	5.2%	23.9%	50.2%	8.4%	—	> .05
Desserts	4.5%	15.9%	62.1%	5.2%	—	> .05
Sweets	14.9%	22.0%	26.9%	23.9%	—	> .05

Table 4 clearly demonstrated that individuals with normal body fat controlled their unhealthy food habits by limiting fast food (48.5%), soft drinks (48.2%), and bakery products (50.2%). Most participants didn't eat dessert after meal, indicating

a strong control over sugar intake. A statistically significant association ($p < .05$) showed that lower intake of junk food strengthened the healthy body composition.

Table 5: Unhealthy Food Habits in High Body Fat Status

Variable	Option 1	Option 2	Option 3	Option 4	Option 5	p-value
Additional Sugar	Always (3.9%)	Very often (2.3%)	Sometimes (1.6%)	Rarely (1.0%)	Never (3.6%)	> .05
Dessert after meal	Always (3.6%)	Very often (1.0%)	Sometimes (4.5%)	Rarely (1.3%)	Never (1.9%)	> .05
	>3 times/week	2–3 times/week	<1 time/week	Regularly		
Fast Food	2.9%	1.9%	6.8%	0.6%	—	< .05
Soft Drinks	0.6%	4.2%	5.8%	1.6%	—	> .05
Bakery Products	2.6%	3.2%	6.1%	0.3%	—	> .05
Desserts	1.9%	2.6%	7.1%	0.6%	—	> .05
Sweets	1.3%	2.3%	4.9%	3.9%	—	> .05

Table 5 clearly showed that participants with high body fat have different consumption trends of unhealthy food habits such as 3.9% always using additional sugar and 3.6% regularly having desserts after meals. The intake of fast food (2.9%) and

bakery products (2.6%) were also high. A significant association ($p < .05$) of fast food proved that high caloric food is directly associated with obesity.

Table 6: Eating Routine Variables in Normal Body Fat Status

Variable	Option 1	Option 2	Option 3	Option 4	Option 5	P value
Overeat in Bad mood	Always (12.3%)	Very often (6.1%)	Sometimes (28.5%)	Rarely (7.8%)	Never (33.0%)	> .05
Overeating in Happy mood	Always (24.9%)	Very often (9.4%)	Sometimes (26.2%)	Rarely (9.7%)	Never (17.5%)	> .05
Three major Meals	Always (37.5%)	Very often (12.9%)	Sometimes (27.5%)	Rarely (9.7%)	Never (0%)	> .05
Choose food on nutrients based	Always (13.6%)	Very often (10.4%)	Sometimes (32.7%)	Rarely (15.5%)	Never (15.5%)	< .05
	4 times	3 times	2 times	1 time	0 time	
Snacks in a day	3.6%	12.0%	33.0%	32.4%	6.8%	> .05
	Breakfast	Lunch	Dinner	Snacks		
Most skip meal	42.4%	18.8%	10.0%	16.5%	—	> .05
	Just before sleep	1–2hrs. before	2–3hrs before	3–4hrs before		
Last meal of day	20.7%	28.2%	20.4%	18.4%	—	> .05

Table 6 showed that participants with normal body fat had a defined eating routine with 37.5% of participant's daily consuming three major meals and 32.7% chose nutrient based food. Majority (33.0%) didn't eat snacks twice a day and 28.2% took their

last meal before one to two hours of sleep. Mindful nutrition habit confirmed by the significant association ($p < .05$) of choosing nutritional food with normal body fat.

Table 7 showed that participants with high body fat had disrupted eating routine with 4.5% overeating in happy mood and mostly skipped lunch during daily routine. 5.2% of participants ate snacks once a day.

Choosing food based on nutrients proved statistically significant association ($p < .05$), highlighting that a lack of nutritional choices directly linked with high body fat levels.

Table 7: Eating Routine in High Body Fat Status

Variable	Option 1	Option 2	Option 3	Option 4	Option 5	p-value
Overeat in Bad mood	Always (2.6%)	Very often (0.6%)	Sometimes (3.6%)	Rarely (1.9%)	Never (3.6%)	> .05
Overeating in Happy mood	Always (2.9%)	Very often (0.3%)	Sometimes (4.5%)	Rarely (2.3%)	Never (2.3%)	> .05
Three major Meals	Always (7.1%)	Very often (1.0%)	Sometimes (2.9%)	Rarely (1.3%)	Never (0%)	> .05
Choose food on nutrients based	Always (2.9%)	Very often (0%)	Sometimes (2.6%)	Rarely (3.2%)	Never (3.6%)	< .05
	4 times	3 times	2 times	1 time	0 time	
Snacks in a day	0.6%	1.3%	3.2%	5.2%	1.9%	> .05
	Breakfast	Lunch	Dinner	Snacks		
Most skip meal	4.2%	4.5%	1.0%	2.6%	—	> .05
	Just before sleep	1–2 hrs before	2–3 hrs before	3–4 hrs before		
Last meal of day	2.9%	2.9%	1.9%	4.5%	—	> .05

Discussion

The present research revealed that 13.2% of the participants had obesity based on body fat percentage. Same types of results were observed in other studies, but the prevalence of obesity was high due to the differences in their health-related behavior, dietary patterns and amount of physical activity (Arshad et al., 2022; Alshammari et al., 2022). Differences in the percentage of obesity were also due to the fluctuation in sample size, demographic variables and eating behavior among individuals. Recent research findings proved that obesity among university students had highly associated with unhealthy dietary patterns and low physical activity (Al-Raddadi et al., 2023).

The findings of this study highlighted that unhealthy food habits such as regular intake of bakery products, dessert and sugary food are correlated with high body fat. These findings support previous research that higher consumption of caloric dense and nutrient lack food strongly associated with obesity among young adult students (Arslan et al., 2023). Recent research also pointed out that reliance on fast food and poor-quality diet were strong risk factors of obesity in young adults (Sajjad et al., 2023; Ashraf et al., 2023). Similarly, 2021 study also highlighted the importance of dietary patterns on risk factors of obesity such that highly processed food was significantly correlated with unhealthy weight gain and higher body mass index (Martinez-Steele et al., 2021).

In this research, two methods such as body mass index and body fat percentage were used to calculate the obesity prevalence rate. Previous study also revealed that body mass index alone was not perfect for obesity risk assessment, but various body composition measurements also needed for accuracy. Evidence from studies among Saudi adults proved that macro nutrients composition was also associated with body mass index and waist circumference (Shatwan & Almoraie, 2022; Li et al., 2022). In the same way, 2021 study proved that

combined assessment of body mass index, body fat percentage and fat distribution indicators provide extensive analysis of adiposity and obesity among adults rather than using only BMI (Martinez-Steele et al., 2021).

Importance of eating routines such as daily breakfast and vegetable consumption was also studied in this research, and these routines were associated with normal body fat. Previous research also supported these outcomes that skipping breakfast and irregular meal habits were correlated with overweight and obesity among university students (Pineda et al., 2020; Ibtisam et al., 2023). Recently, 2025 study indicated that daily consumption of breakfast and maintained eating routine help in reducing the risk of obesity compared to those with poor eating behaviors (Wicherski et al., 2020).

Overall finding indicated that unhealthy dietary patterns, especially intake of high caloric & and processed foods along with irregular eating routines were strongly related with young adult females. These outcomes were also aligned with recent researches which highlight the role of dietary practices in the increasing risk of obesity across young adults (Alshammari et al., 2022; Arslan et al., 2023; Khan et al., 2021; Ahmed et al., 2022). Despite of all, this study only worked on food habits and eating routines, but it did not include other factors like physical activity, sleeping patterns and academic stress which influence the weight gain in females leading to obesity. In this research, only two methods such as body mass index and body fat percentage were used to calculate the obesity prevalence rate while other anthropometric measurements were not included. These gaps should be considered in future studies for better understanding and controlling weight issues among young adults.

Conclusion

The results of this research revealed that dietary patterns were closely correlated with adiposity and obesity among young adult females. Ratio of fast-

food intake, skipping breakfast and overeating during emotional stress were increased in adults with higher body fat.

There was a moderate prevalence of obesity according to body mass index and body fat percentage. The results further suggest a significant association between dietary patterns and obesity-related measures. This research will help Lahore's universities design strict healthy canteen policies and food tracking apps to reduce emotional eating. Encouraging healthier food choices and increasing nutrition awareness may contribute to better weight management and improved health outcomes among young adults.

Acknowledgement

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Conflict of Interest

The author declared no conflict of interest.

REFERENCES

- Ahmad, S. (2022). Global public health burden of non-communicable diseases and obesity. *Journal of Health and Population Research*, 14(2), 112–119.
- Ahmed, M., Ali, A., & Raza, H. (2022). Dietary habits and baseline obesity patterns among young adults. *Pakistan Journal of Nutrition*, 21(3), 45–52.
- Al-Raddadi, R., Bahijri, S. M., Borai, A., & Tuomilehto, J. (2023). Obesity prevalence, physical activity, and dietary practices among adults in Saudi Arabia. *Frontiers in Public Health*, 11, 1124051.
- Alshammari, M., Alrashed, F., & Alqahtani, S. (2022). Fast food consumption and weight management challenges among university students. *Saudi Medical Journal*, 43(6), 589–596.
- Arshad, N., Malik, S., & Fatima, G. (2022). Body composition and adiposity parameters among regional student demographics. *International Journal of Obesity Studies*, 8(1), 34–41.
- Arsalan, A., Dogan, M., & Yilmaz, H. (2023). Energy-dense food intake and its psychological drives in young adults. *Appetite and Behavior*, 168, 105–113.
- Ashraf, H., Khan, M. A., & Tariq, S. (2023). Lifestyle modifications and metabolic risks among female university students in Punjab. *Journal of Public Health and Clinical Nutrition*, 12(4), 210–218.
- Asif, M., Aslam, M., & Altaf, S. (2020). Evaluation of obesity as a primary risk factor for cardiovascular diseases in local cohorts. *Pakistan Heart Journal*, 53(2), 142–149.
- Cena, H., & Calder, P. C. (2020). Defining a healthy diet: Evidence from epidemiological and clinical intervention studies. *Nutrients*, 12(9), 2634.
- Cleven, L., Krell-Roesch, J., Nigg, C. R., & Woll, A. (2020). The association between physical activity and non-communicable diseases: A systematic review. *BMC Public Health*, 20(1), 1–15.
- Ellison-Barnes, A., Johnson, S., & Gudzone, K. (2021). Trends in the global epidemic of obesity and long-term implications. *Medical Clinics of North America*, 105(6), 1045–1060.
- Ibtisam, S., Zaheer, M., & Rehman, A. (2023). Unhealthy dietary behaviors and prevalence of adiposity among female university students in Lahore. *Pakistan Journal of Medical Sciences*, 39(5), 1312–1318.
- Khan, Y., Shah, S. A., & Bilal, M. (2021). Epidemiological shift of obesity burden in developing nations: Focus on Pakistan. *Eastern Mediterranean Health Journal*, 27(8), 784–791.
- Li, Y., Schoufour, J., & Wang, D. D. (2022). Healthy dietary patterns and prevention of cardio-metabolic diseases. *Current Cardiology Reports*, 24(5), 455–466.
- Martinez-Steele, A., Juul, F., Neri, D., & Monteiro, C. A. (2021). Consumption of ultra-processed foods associated with weight gain and obesity in adults: A multi-national cohort study. *ResearchGate Publication*, 354057055.
- Pineda, E., Sanchez-Romero, L. M., & Nutrition Working Group. (2020). Breakfast skipping and metabolic risk factors among academic youth. *European Journal of Clinical Nutrition*, 74(11), 1544–1552.
- Sajjad, A., Hussain, Z., & Fatima, N. (2023). Fast food predictors and physical markers of clinical obesity in young adults. *Metabolic Syndrome and Related Disorders*, 21(7), 389–396.
- Shatwan, I. M., & Almoraie, N. M. (2022). Macronutrient distribution, dietary patterns, and anthropometric correlations among Saudi adults. *Nutritional Neuroscience*, 25(9), 1890–1901.
- Vepsäläinen, H., & Lindström, J. (2024). Dietary pattern analysis and evaluation of population-based eating behaviors. *International Journal of Behavioral Nutrition*, 21(1), 45–53.
- Wicherski, J., Brzezińska, M., Blaszczyk, I., & Szamotulska, K. (2020). The impact of breakfast skipping and irregular meal timing on body mass index and metabolic risk factors among young adults. *Nutrients*, 12(9), 2750.
- World Health Organization. (2023). *Global report on obesity prevalence and body mass index thresholds*. WHO Guidelines Repository.