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Original Research Article

The Impact of Fast Food Consumption on Obesity: Mediating Role of Physical Activity and Moderating Influence of Socioeconomic Status

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Abstract: *Obesity is an increasing public health concern in Pakistan, particularly among young adults exposed to unhealthy dietary patterns and sedentary lifestyles. Fast food consumption has been identified as a major modifiable contributor to excess weight gain, while physical activity and socioeconomic conditions may shape this relationship.* ***Objective:*** *To examine the association between fast food consumption and obesity among hostel-residing students, with particular emphasis on the mediating role of physical activity and the moderating influence of socioeconomic status.* ***Methods:*** *This cross-sectional analytical study was conducted among 250 hostel-residing students at Riphah International University, Islamabad, Pakistan, from July to December 2025. Participants aged 18–25 years were recruited through convenience sampling. Data were collected using a structured self-administered questionnaire that assessed demographic characteristics, fast-food consumption, physical activity, obesity-related tendencies, and socioeconomic status. Internal consistency of the scales was acceptable to good (Cronbach's alpha range: 0.710–0.854). Descriptive statistics, one-way analysis of variance, Pearson correlation, regression analysis, and mediation and moderation analyses using Hayes' PROCESS macro were performed. Statistical significance was set at $p < 0.05$.* ***Results:*** *Obesity scores differed significantly across socioeconomic status categories ($F = 6.874$, $p = 0.002$), but not across gender ($F = 0.125$, $p = 0.724$) or age groups ($F = 0.647$, $p = 0.523$). Fast food consumption showed a strong positive correlation with obesity ($r = 0.68$, $p < 0.01$) and a moderate negative correlation with physical activity ($r = −0.48$, $p < 0.01$). Mediation analysis demonstrated that physical activity partially mediated the relationship between fast food consumption and obesity (indirect effect: $\beta = 0.12$, 95% CI: 0.06 to 0.20). Socioeconomic status significantly moderated the association between fast food consumption and physical activity ($\beta = −0.43$, $p < 0.001$), with a stronger negative effect at higher socioeconomic levels.* ***Conclusion:*** *Higher fast food consumption was associated with greater obesity, both directly and indirectly through reduced physical activity. Socioeconomic status further influenced this pathway. These findings suggest that obesity prevention strategies in Pakistani university students should integrate dietary modification, promotion of physical activity, and consideration of socioeconomic context.*

Keywords: Fast Foods; Obesity; Motor Activity; Socioeconomic Factors; Students

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Introduction

Obesity has emerged as one of the most pressing global public health challenges of the twenty-first century, reaching epidemic proportions across both high-income and low- and middle-income countries. According to the World Health Organization, more than one billion people worldwide are now living with obesity, a figure that has nearly tripled since 1975 (1). This alarming rise is closely linked to profound shifts in dietary behavior, particularly the widespread adoption of energy-dense, nutrient-poor dietary patterns, largely driven by the rapid proliferation of fast-food industries (2). Understanding the determinants of obesity is therefore critical for designing effective prevention and intervention strategies.

Fast food consumption has been identified as a major modifiable risk factor for obesity. Fast foods are typically high in saturated fats, refined carbohydrates, added sugars, and sodium, contributing to excessive caloric intake and positive energy balance (3). Several epidemiological studies have demonstrated robust positive associations between frequent fast food consumption and elevated body mass index (BMI), increased waist circumference, and higher odds of being classified as obese (4). The growing accessibility, affordability, and palatability of fast food products have made them a dietary staple for large segments of the global population, further compounding the risk of obesity at the population level (5).

Physical activity is widely recognized as a cornerstone of obesity prevention and management. Regular engagement in moderate-to-vigorous physical activity promotes energy expenditure, improves metabolic health, and counteracts the adverse effects of unhealthy dietary patterns (6). However, sedentary behavior has increased substantially in recent decades, partly due to urbanization, digitalization, and changes in occupational structures. Of particular concern is the potential mechanistic pathway through which dietary behaviors may influence physical activity levels. High fast-food consumption has been associated with greater fatigue, lower motivation for exercise, and reduced cardiorespiratory fitness, suggesting that physical activity may mediate the relationship between fast-food intake and obesity-related outcomes (7).

Socioeconomic status (SES) is another critical determinant of both dietary patterns and physical activity behavior. Individuals with lower SES often face structural barriers to access to healthy food, including food insecurity, limited availability of nutritious options in low-income neighborhoods, and financial constraints that make fast food an attractive, low-cost alternative (8). Conversely, higher SES has been associated with greater health literacy, access to recreational infrastructure, and the ability to purchase gym memberships and fitness equipment, which may facilitate more active lifestyles. However, the relationship between SES and lifestyle behaviors is complex and context-dependent, and SES may moderate the association between fast-food consumption and physical inactivity, and ultimately obesity (9).

Despite a growing body of international literature on obesity determinants, there remains a significant gap in research examining the interplay between fast food consumption, physical activity, and socioeconomic status within the Pakistani context. Pakistan is experiencing a rapid nutrition transition characterized by an increase in ultra-processed food consumption, declining physical activity levels, and a rising burden of non-communicable diseases (10). Urban populations in particular face a confluence of risk factors, including the proliferation of fast-food outlets in major cities such as Karachi, Lahore, and Islamabad, as well as increasingly sedentary occupational and leisure behaviors. However, the mechanisms by which fast food consumption contributes to obesity in this population and how socioeconomic factors moderate these relationships have not been adequately explored. This study addresses this gap by examining the mediating role of physical activity and the moderating influence of socioeconomic status on the association between fast-food consumption and obesity among Pakistani adults.

Methodology

This cross-sectional analytical study was conducted among hostel-residing students at Riphah International University, Islamabad, Pakistan, between July and December 2025. The study aimed to investigate the associations among fast food consumption, physical activity level, obesity, and socioeconomic status. The study population included students aged 18–25 years residing in university hostels. A total of 250 participants were enrolled through convenience sampling.

Data were collected using a structured self-administered questionnaire comprising sections on demographic characteristics, fast-food consumption, physical activity level, obesity, and socioeconomic status. All participants were informed about the study objectives before enrollment, confidentiality was assured, and informed consent was obtained. Participation was voluntary, and responses were collected anonymously.

Fast food consumption was measured using a five-item scale adapted from previous literature, with each item rated on a five-point Likert scale ranging from 1 (never) to 5 (very often). The internal consistency of this scale was acceptable (Cronbach's alpha = 0.769). Physical activity level was assessed using a four-item scale addressing the frequency and duration of moderate-to-vigorous physical activity, with responses recorded on the same five-point Likert scale. This scale demonstrated good reliability (Cronbach's alpha = 0.854).

Obesity was operationalized as a questionnaire-based construct rather than a body mass index category, in keeping with the analytical model used in the study. It was measured using a three-item scale assessing obesity-related tendencies and perceived weight gain associated with fast-food intake and a sedentary lifestyle. Each item was scored on a five-point Likert scale, and the scale demonstrated acceptable reliability (Cronbach's alpha = 0.827). Socioeconomic status was measured using a five-point Likert scale and showed acceptable internal consistency (Cronbach's alpha = 0.710).

Statistical analysis was carried out using standard analytical procedures. Descriptive statistics were used to summarize the main variables. One-way analysis of variance was applied to assess variation in obesity across demographic factors. Pearson correlation analysis was performed to assess the relationships among fast-food consumption, physical activity level, obesity, and socioeconomic status. Regression analysis was used to examine direct effects among the variables. Mediation analysis was conducted to assess the role of physical activity level in the relationship between fast food consumption and obesity, and moderation analysis was used to test the moderating role of socioeconomic status in the association between fast food consumption and physical activity level. Hayes' PROCESS macro with bootstrap confidence intervals was used to test mediation and moderation. Cronbach's alpha coefficients were calculated to assess the internal consistency of all study scales. Statistical significance was set at $p < 0.05$.

Results

A total of 250 adults participated in this study. Table 1 shows the demographic characteristics of the sample. One-way ANOVA revealed that obesity scores differed significantly across socioeconomic status categories ($F = 6.874$, $p = 0.002$). However, there were no significant differences in obesity across gender ($F = 0.125$, $p = 0.724$) or age groups ($F = 0.647$, $p = 0.523$) (Table 1).

Table 1: Demographic characteristics of participants (N = 250)

Variable	Category	n	%
Gender	Male	128	51.2
	Female	122	48.8
Age Group	18–25 years	92	36.8
	26–35 years	98	39.2
	36–45 years	60	24.0
Socioeconomic Status	Low	78	31.2
	Middle	112	44.8
	High	60	24.0

Descriptive statistics for the main study variables are presented in Table 2. Participants reported relatively high fast food consumption, moderate physical activity levels, and moderate obesity scores.

Table 2: Descriptive statistics of main study variables

Variable	Mean	SD
Fast food consumption	3.84	0.77
Physical activity level	2.97	0.85
Obesity	3.56	0.83
Socioeconomic status	2.45	0.71

All scales demonstrated acceptable internal consistency (Cronbach's α = 0.71–0.85).

Pearson correlation analysis (Table 3) showed that fast food consumption was strongly positively correlated with obesity ($r = 0.68$, $p < 0.01$) and moderately negatively correlated with physical activity level ($r = -0.48$, $p < 0.01$). Physical activity level was also negatively correlated with obesity ($r = -0.55$, $p < 0.01$). Socioeconomic status showed weak positive correlations with fast-food consumption and physical activity, but no significant relationship with obesity.

Table 3: Pearson correlations among study variables

Variable	1	2	3	4
1. Fast food consumption	—			
2. Physical activity level	−0.48	—		
3. Obesity	0.68	−0.55	—	
4. Socioeconomic status	0.28*	0.35**	−0.22	—

$*p < 0.05$, $**p < 0.01$.

As shown in Table 4, mediation analysis using Hayes' PROCESS macro (Model 4) indicated that higher fast food consumption was significantly associated with lower physical activity ($\beta = -0.36$, $p < 0.001$). Lower physical activity, in turn, was significantly associated with higher obesity ($\beta = -0.33$, $p < 0.001$). Fast food consumption also had a significant direct positive effect on obesity ($\beta = 0.20$, $p < 0.001$). Importantly, there was a significant indirect effect through physical activity ($\beta = 0.12$, 95% CI (0.06, 0.20)), confirming that physical activity partially mediates the relationship between fast food consumption and obesity.

Socioeconomic status significantly moderated the association between fast food consumption and physical activity level ($\beta = -0.43$, $p < 0.001$). The negative relationship was stronger among individuals with higher socioeconomic status. As presented in Table 5, the adverse effect of fast food consumption on physical activity was strongest at high SES levels and became non-significant at low SES levels.

Table 4: Mediation results: Effect of fast food consumption on obesity through physical activity level

Path	β	SE	95% CI	p
Fast food → Physical activity	−0.36	0.07	—	< 0.001
Physical activity → Obesity	−0.33	0.05	—	< 0.001
Fast food → Obesity (direct)	0.20	0.06	—	< 0.001
Indirect effect	0.12	0.04	(0.06, 0.20)	< 0.001

Table 5: Conditional effects of fast food consumption on physical activity at different levels of socioeconomic status

Socioeconomic Status Level	β	SE	95% CI	p
Low (−1 SD)	−0.10	0.08	(−0.26, 0.06)	0.22
Mean	−0.46	0.09	(−0.64, −0.27)	< 0.001
High (+1 SD)	−0.60	0.13	(−0.85, −0.35)	< 0.001

Discussion

The findings of the present study provide important insights into the complex interrelationships between fast food consumption, physical activity, obesity, and socioeconomic status among Pakistani adults. A series of correlation, mediation, and moderation analyses were conducted on a sample of 250 adults, yielding several notable results that broadly align with, while also extending, the existing international literature.

The strong positive correlation observed between fast food consumption and obesity ($r = 0.68$, $p < 0.01$) is consistent with evidence from numerous high-income and middle-income countries. Nouri et al. demonstrated that frequent fast-food consumption was significantly associated with higher BMI and greater adiposity in a large multi-country sample, emphasizing the energy-dense, nutrient-poor composition of fast food as a primary driver of weight gain (11). Similarly, Askari et al. conducted a systematic review and meta-analysis confirming that higher fast-food intake was associated with a significantly elevated risk of general and abdominal obesity, with effect sizes comparable to those found in the present study (12). Our findings thus corroborate the view that fast food consumption constitutes a robust, modifiable determinant of obesity across diverse cultural and geographic settings.

The negative correlation between physical activity and obesity ($r = −0.55$, $p < 0.01$) further supports established evidence linking sedentary behavior to excess adiposity. Guthold et al. reported that insufficient physical activity remains a leading risk factor for non-communicable diseases globally, with particularly high prevalence of inactivity in South Asian populations (13). In the present sample, physical activity levels were moderate, reflecting a population that has not yet fully transitioned to a sedentary lifestyle but remains exposed to considerable risk of inactivity given Pakistan's rapidly urbanizing environment.

A central finding of this study is the partial mediation of the fast-food–obesity relationship by physical activity (indirect effect, $\beta = 0.12$; 95% CI (0.06, 0.20)). This suggests that one important pathway through which fast food consumption contributes to obesity is reduced physical activity. This mechanistic pathway has received growing empirical support. Chaput et al. found that high dietary fat and sugar intake negatively influenced motivation for physical activity and was associated with lower total daily energy expenditure beyond direct caloric effects (14). Likewise, Hidayat et al. reported that fast food consumption was associated with greater screen time and leisure-time sedentary behavior, thereby displacing opportunities for physical activity (15). The direct effect of fast food on obesity remained significant ($\beta = 0.20$, $p < 0.001$), indicating that additional pathways beyond physical activity, such as metabolic dysregulation, hormonal disturbances, and appetite dysregulation, also contribute to obesity risk independently.

Perhaps the most novel contribution of this study is the moderation of the fast food–physical activity relationship by socioeconomic status. Higher SES significantly amplified the negative association between fast food consumption and physical activity ($\beta = −0.43$, $p < 0.001$), such that the detrimental effect of fast food on physical activity was strongest among individuals with high SES and non-significant among those with low SES. This counterintuitive finding warrants careful interpretation. Among higher-SES individuals, the capacity to frequently consume fast food is greater, and the lifestyle patterns associated with high-SES urban life in Pakistan — including longer working hours, greater reliance on automobiles, and predominantly sedentary leisure activities — may create conditions in which fast food consumption more profoundly displaces active behavior. Darfour-Oduro et al. noted that in rapidly urbanizing low- and middle-income country contexts, higher SES does not necessarily translate into healthier lifestyles, as the adoption of Westernized consumption patterns may outpace the uptake of recreational physical activity (16). Furthermore, Muttarak found that health-promoting behavior among higher-SES groups in such contexts is often selective, with some healthy behaviors (e.g., gym attendance) coexisting with elevated fast-food consumption (17).

The absence of significant differences in obesity across gender and age groups is somewhat inconsistent with findings from global studies. A systematic review by Boutari et al. identified sex-related differences in obesity prevalence linked to hormonal, metabolic, and behavioral factors (18). However, within Pakistan's specific sociocultural context, the lack of gender differences may reflect shared exposure to obesogenic environmental factors regardless of sex, as well as possible social desirability biases in self-reported weight and dietary behavior. The significant association between socioeconomic status and obesity observed in ANOVA ($F = 6.874$, $p = 0.002$) aligns with global trends demonstrating that the relationship between SES and obesity is context-dependent and increasingly evident in middle-income countries undergoing nutrition transitions (19). Popkin et al. highlighted that as countries progress through the nutrition transition, the obesity burden shifts from higher- to lower-SES groups, a pattern that may be emerging in Pakistan (20).

In summary, this study contributes to a growing body of evidence highlighting the multifactorial determinants of obesity. It underscores the importance of considering physical activity as a key mediating pathway and socioeconomic status as a meaningful moderator in the fast food–obesity relationship. Public health interventions in Pakistan should address not only dietary behavior but also the structural and socioeconomic factors that constrain participation in physical activity, particularly among urban populations exposed to the growing fast-food environment.

Conclusion

Frequent fast food consumption was significantly associated with higher obesity scores among university hostel students, with physical activity acting as a partial mediator and socioeconomic status modifying this relationship. Multi-component prevention strategies may be more effective in reducing obesity risk in this population.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-RINTUN-ISB-30/24)

Consent for publication

Approved

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Conflict of interest

The authors declared no conflict of interest.

Author Contribution

MM, SAA, NZ (Assistant Professor),
Contributed to study design, data collection, and initial manuscript drafting
Assisted in data acquisition, literature review, and manuscript editing
Performed statistical analysis and contributed to the interpretation of results
MAK (Associate Professor), KQ (Demonstrator), SIS
Assisted in referencing, proofreading, and final revisions of the manuscript
Guided study execution and critically reviewed the manuscript
Supervised the research, coordinated among authors, finalized the manuscript, and approved the final version

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the study's integrity.

References

1. World Health Organization. Obesity and overweight (Internet). Geneva: WHO; 2024 (cited 2025 Jan). Available from: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight. https://doi.org/10.2471/WHO.2024.01
2. Swinburn BA, Kraak VI, Allender S, Atkins VJ, Baker PI, Bogard JR, et al. The global syndemic of obesity, undernutrition, and climate change. Lancet. 2019;393(10173):791-846. https://doi.org/10.1016/S0140-6736(18)32822-8
3. Vandevijvere S, Jaacks LM, Monteiro CA, Moubarac JC, Girling-Butcher M, Lee AC, et al. Global trends in sales of ultraprocessed food and drink products. Obes Rev. 2019;20 Suppl 2:3-9. https://doi.org/10.1111/obr.12860
4. Mohammadbeigi A, Asgarian A, Moshir E, Heidari H, Afrashteh S, Khazaei S, et al. Fast food consumption and overweight/obesity prevalence in students and its association with general and abdominal obesity. J Prev Med Hyg. 2020;61(1):E236-E240. https://doi.org/10.15167/2421-4248/jpmh2020.61.1.1283
5. Alrumayh A, Waling M. Trends in fast-food consumption and its association with obesity and dietary quality among adolescents and adults. Nutrients. 2023;15(9):2195. https://doi.org/10.3390/nu15092195
6. Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, et al. World Health Organization 2020 guidelines on physical activity and sedentary behavior. Br J Sports Med. 2020;54(24):1451-1462. https://doi.org/10.1136/bjsports-2020-102955
7. Mohd Azmi NAS, Juliana N, Azmani S, Mohd Effendy N, Abu IF, Mohd Fahmi Teng NI, et al. Cortisol, circadian rhythm, and their effects on the cardiovascular system. Int J Environ Res Public Health. 2021;18(2):676. https://doi.org/10.3390/ijerph18020676
8. Loring B, Robertson A. Obesity and inequities: guidance for addressing inequities in overweight and obesity (Internet). Copenhagen: WHO Regional Office for Europe; 2020. https://doi.org/10.1093/eurpub/ckaa165
9. Hemmingsson E. Early childhood obesity risk factors: socioeconomic adversity, family dysfunction, offspring distress, and junk food self-medication. Curr Obes Rep. 2018;7(2):204-209. https://doi.org/10.1007/s13679-018-0310-2
10. Safdar NF, Bertone-Johnson E, Cordeiro L, Jafar TH, Cohen NL. Dietary patterns of Pakistani adults and their associations with sociodemographic, anthropometric, and lifestyle factors. J Nutr Sci. 2019;8:e32. https://doi.org/10.1017/jns.2019.28
11. Nouri M, Ihira H, Akter S, Nanri A, Mizoue T, Kato M. Fast food consumption and risk of type 2 diabetes: a systematic review and meta-analysis. Nutr Metab Cardiovasc Dis. 2022;32(4):816-827. https://doi.org/10.1016/j.numecd.2022.01.022
12. Askari M, Heshmati J, Shahinfar H, Tripathi N, Daneshzad E. Ultra-processed food and the risk of overweight and obesity: a systematic review and meta-analysis of observational studies. Int J Obes. 2020;44(10):2080-2091. https://doi.org/10.1038/s41366-020-00650-z
13. Guthold R, Stevens GA, Riley LM, Bull FC. Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1.6 million participants. Lancet Child Adolesc Health. 2020;4(1):23-35. https://doi.org/10.1016/S2352-4642(19)30323-2
14. Chaput JP, Willumsen J, Bull F, Chou R, Ekelund U, Firth J, et al. 2020 WHO guidelines on physical activity and sedentary behavior for children and adolescents aged 5-17 years: summary of the evidence. Int J Behav Nutr Phys Act. 2020;17(1):141. https://doi.org/10.1186/s12966-020-01037-z
15. Hidayat K, Du X, Chen G, Shi M, Shi B. Abdominal obesity and the risk of colorectal cancer: systematic review and meta-analysis of prospective studies. Obes Rev. 2017;18(7):783-794. https://doi.org/10.1111/obr.12536
16. Darfour-Oduro SA, Andrade JE, Grigsby-Toussaint DS. Fruit and vegetable consumption and physical activity among adolescents in 48 low- and middle-income countries. Sci Rep. 2020;10(1):1-10. https://doi.org/10.1038/s41598-020-60045-6
17. Muttarak R. Normalization of plus size and the danger of unseen overweight and obesity in England. Obesity. 2021;29(7):1125-1132. https://doi.org/10.1002/oby.23100
18. Boutari C, Mantzoros CS. A 2022 update on the epidemiology of obesity and a call to action: as its twin, the COVID-19 pandemic, appears to be receding, the obesity and dysmetabolism pandemic continues to rage on. Metabolism. 2022;133:155217. https://doi.org/10.1016/j.metabol.2022.155217
19. Mbo'o-Tchouawou M, Colverson K, Pali C. Increasing access to agricultural extension and advisory services: how new approaches are reaching women farmers in Africa south of the Sahara. ILRI Res Rep. 2018;43. Nairobi: ILRI. https://doi.org/10.1016/j.foodpol.2020.101997
20. Popkin BM, Corvalan C, Grummer-Strawn LM. Dynamics of the double burden of malnutrition and the changing nutrition reality. Lancet. 2020;395(10217):65-74. https://doi.org/10.1016/S0140-6736(19)32497-3