

Exploring the Impact of Lifestyle Factors, Socioeconomic Status, and Gender on Obesity Risk in Pakistan

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ABSTRACT

Obesity is a growing global health crisis with important corollaries for individuals and health services. The risk factors of obesity are explored through this study as they relate to diet, lifestyle behaviors, socioeconomic status, and gender differences. High sugar consumption is considered one of the contributing factors to obesity as such consumption results in higher caloric intake while reducing the nutritional quality. On the other hand, obesity risk is inversely related to the consumption of regular fruit and vegetables because they are low in calories and high in fiber. Lifestyle factors such as physical inactivity and inadequate sleep also play critical roles in the development of obesity. A reduced risk is linked to physical activity, whereas insufficient sleep disrupts hormonal balance which in turn increases appetite and cravings for unhealthy foods. Also, occupation and socioeconomic factors, especially sedentary work environments increase obesity risk. There is also gender disparity in prevalence of obesity; women are more vulnerable to obesity because of biological and sociocultural factors. The Health Belief Model (HBM) is utilized to explain how individual's perceptions of health risks affect behavior. A structured questionnaire was used to conduct a cross sectional survey of 499 adults in Karachi with respect to dietary habits, physical activity, sleeps patterns and socioeconomic status. The effects of these factors on obesity were examined using binary logistic regression using SPSS. The findings indicate that to tackle obesity, there is no one size fits all solution, but an integrated strategy needs to be adopted through the combination of lifestyle modification interventions, dietary interventions, tailored public health approaches that seek to reduce obesity risk among heterogeneous populations.

Keywords: Obesity, Dietary Habits, Physical Activity, Socioeconomic Status, Health Belief Model

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INTRODUCTION

Obesity is among the public health problems that are growing throughout the world, and a significant increase in prevalence rates is noted especially in developing countries like Pakistan (Tanzil & Jamali, 2016). Poor dietary habits, lack of physical activity, and socio economic conditions (Siddiqui

et al., 2018) are the contributing factors to obesity. Sugary beverages, junk food, and a sedentary lifestyle are lifestyle choices in Pakistan which have very high correlation with rising obesity rates (Tanzil & Jamali, 2016; Siddiqui et al., 2018). Although the issue of concern is on the rise, there is little research done on the association between these factors and obesity in the Pakistani context.

The objectives of this study are to determine the relationship between lifestyle factors, including diet, physical activity, and sleep, and obesity in Pakistan (Malovic and Bjelica, 2021). The purpose is to determine how many factors such as the intake of sugary beverages, junk food, fruits and vegetables, and activity levels play a role in obesity (Tzenios, Chahine, & Tazanios, 2023). In addition, the study will also examine how socio demographic factors such as gender, age and income affect obesity risk (Ferreira et al., 2021). It is known that socio-economic status is an important determinant of obesity, and people in lower socio economical groups are exposed to higher risk because of limited access to healthy food and opportunities for physical activity (Malovic & Bjelica, 2021).

This research is based on the residents of big cities in Pakistan including Karachi, Hyderabad and Sukkur to understand the various causes of obesity in different socio-economic settings (Siddiqui et al., 2018). Existing studies such as those by Baumeister and Härter (2007) and Mohajan and Mohajan (2023), have already established association between obesity and mental health or associated diseases, but this study goes beyond the two parameters and considers various lifestyle and socio demographic factors in order to fill the gap in literature on the obesity trends among Pakistani population.

The findings from this study will provide valuable insights for public health initiatives targeting obesity prevention and management, particularly in

resource-limited settings, and help inform strategies to reduce the obesity burden in Pakistan.

Objectives of the Study:

1. To examine the role of dietary habits, including the consumption of sugary beverages and fruits, in influencing the risk of obesity.
2. To explore the impact of lifestyle factors such as sleep patterns, physical activity levels, and occupation type on obesity risk.
3. To assess the influence of gender on the likelihood of obesity, considering the interplay between behavioral factors and socio-demographic characteristics.
4. To identify the key factors that contribute to obesity risk in different demographic groups and provide recommendations for obesity prevention strategies.

Research Questions:

1. How do dietary habits, specifically sugary beverage consumption and fruit intake, affect the risk of obesity?
2. What is the relationship between sleep patterns, physical activity duration, and obesity risk?
3. How does occupation type influence the risk of obesity, and does being self-employed offer any protective effects?
4. What role does gender play in determining obesity risk, and are there significant differences in obesity outcomes between males and females?

5. How can these findings inform targeted obesity prevention strategies for different demographic groups?

Literature Review

Obesity is a global health crisis with crucial impact for individual health and for the healthcare system (Kim & Popkin, 2006). Obesity is a multifactorial risk factor with both lifestyle behaviors and dietary habits being involved. Time and again research illustrates that to be obese, one should be consuming more sugary beverages and less of one's own traditional diets. Research has it that high consumption of sugary drinks equates to a greater caloric intake and poor nutritional quality that possibly creates weight gains (Siddiqui et al., 2018). In addition, fruit and vegetable intake has been frequently reviewed for its preventive role against obesity. While there has been mixed evidence of the strength of the relationship, common consumption of fruits and vegetables is associated with decreased risk of obesity due to their low caloric density and high fiber content (Ferreira et al., 2021).

Alongside on the dietary habits, these lifestyle factors like physical activity and sleep patterns are critical for defining obesity risk. You can find consistently shown to have protective effects against obesity, that is, maintaining energy balance and managing weight (Mohajan & Mohajan, 2023). People who are regularly physically active actually burn a lot more calories and their metabolism is improved and this can help with weight loss and prevent weight gain (Martínez-González et al.,

1999). However, inadequate sleep duration has been shown to be a major risk factor for obesity, as it is associated with poorer eating habits and less physical activity that lead to weight gain (Baumeister & Härter, 2007). Specifically, excess sleep deprivation has been shown to trigger hormonal imbalances that make it easier to become overweight and to crave high calorie foods (Stengel et al., 2003).

The literature has also explored the role of socioeconomic status and occupation in obesity. It was reported that people who work in more sedentary occupations, especially those with irregular or longer working hours, are more prone to be obese (Malovic & Bjelica, 2021). On the other hand, a sedentary job together with insufficient time for physical activity can result in increased energy consumption and fewer opportunities for physical activity (Seidell & Halberstadt, 2015). However, self employed individuals who mostly have more autonomy of their daily routines are found to have healthier lifestyle pattern, including more physical activity which may reduce obesity risk (Siddiqui et al., 2018). Additionally, the self employed may be more flexible in scheduling meal planning or healthier food choices to aid in weight management (Ainsworth, 2017).

Last, gender differences in obesity risk are well established and with studies consistently finding that females are more likely to be obese than males (Ferreira et al., 2021). It may be attributed to a combined biological, psychological, and sociocultural factors such as hormonal fluctuations,

lifestyle choices and societal pressures to have a certain body image (Tzenios, Chahine, & Tazanios, 2023). Furthermore, this gender difference is also determined by the combination of sedentary behaviors and unhealthy dietary habits, especially in urban settings where women do not have enough time for physical activity (Al-Jawaldeh & Abbass, 2022).

The Health Belief Model (HBM) lends itself very well to the study of obesity because it helps explain how individuals' perceptions of health risks shape behavior. Dedeli and Fadiloglu (2011) stated that if people feel at risk for obesity, they are more likely to practice health promoting behaviors like eating healthier or increasing physical activity, if they believe that the consequences of obesity are serious (perceived severity). Additionally, individuals must believe that the benefits of adopting healthier behaviors outweigh the barriers (perceived benefits vs. perceived barriers), such as time constraints, lack of motivation, or financial limitations (Romano & Scott, 2014). In the context of obesity prevention, the HBM suggests that individuals who are aware of the health risks associated with obesity and believe that making changes to their lifestyle can lead to improved health outcomes are more likely to take action (O'Connell et al., 1985).

Incorporating the HBM into this discussion helps illuminate how individuals' health beliefs shape their engagement with behaviors that can mitigate obesity risk. For instance, those who perceive themselves to be at high risk for obesity and believe in the effectiveness of physical activity and dietary

changes are more likely to adopt these behaviors, despite barriers they may face (O'Connell et al., 1985). Therefore, the HBM is an essential theoretical framework for understanding the psychological factors that drive behavior change and can guide interventions aimed at reducing obesity through increased awareness and education about the risks of obesity and the benefits of healthy lifestyle changes (Romano & Scott, 2014).

This integration of lifestyle factors, dietary habits, socioeconomic influences, and gender differences, framed by the Health Belief Model, offers a comprehensive understanding of obesity risk and provides a basis for developing more targeted and effective interventions to combat obesity on both individual and societal levels (Malik, Willett, & Hu, 2013; Tanzil & Jamali, 2016; Hasselbalch, 2010).

METHODOLOGY

The purpose of this study was to determine the effect of lifestyle factors, diet, and gender on the obesity risk using quantitative research design. The surveys were self administered to 500 participants and stratified random sampling was used to ensure a varied sample on demographics. The dietary habits (e.g., sugary beverage consumption, fruit and vegetable intake), the physical activity levels, the sleep duration and the socioeconomic factors (occupation and income) were the key independent variables. First, the measures for lifestyle factors and dietary habits were recorded as continuous variables in SPSS for analysis, then converted to categorical ones. To assess the dependent variable,

Obesity Risk, Body Mass Index (BMI) and Waist Circumference were applied based on WHO standards. To analyze the relationship between lifestyle factors, dietary habits, gender and obesity risk, binary logistic regression was used. This method was able to ascertain the likelihood of obesity relying on the independent variables. Furthermore, the study was ethically ensured as it sought informed consent from the participants, kept the confidentiality and invited the participants to withdraw from the study at any time.

The respondent profile indicates a balanced gender distribution with 50% male and 50% female participants. The majority of respondents is aged 26-35 (40%) and employed (70%), with most located in Karachi (60%). Income distribution shows 40% earn between 30k-60k, while 20% fall within each of the other income brackets.

Individual Dietary Habits

The binary logistic regression model was evaluated using the -2 Log Likelihood statistics. In Step 1, the -2 Log Likelihood value was 548.658, which decreased to 541.971 in Step 2. This reduction indicates an improvement in model fit with the addition of variables. The estimation process concluded at the fifth iteration as the parameter estimates stabilized, changing by less than 0.001.

This suggests that the model achieved convergence and the final parameter estimates are reliable. In the first stage of the study, we evaluated the impact of sugary beverage consumption and fruit intake on

obesity risk. In Step 1, the variable Sugary_Bev was a significant predictor of obesity status ($\chi^2 = 6.616$, $df = 2$, $p = .037$). Specifically, individuals in the high sugary beverage consumption category (Sugary_Bev(1)) were 3.23 times more likely to be at risk of obesity compared to the reference group ($B = 1.171$, $p = .017$). Moderate consumption (Sugary_Bev(2)) was not significantly associated with obesity ($p = .608$).

In Step 2, Eat_Fruits was added to the model. Both variables collectively remained significant contributors to obesity risk (Sugary_Bev: $\chi^2 = 6.246$, $p = .044$; Eat_Fruits: $\chi^2 = 6.525$, $p = .038$). Daily fruit consumption (Eat_Fruits(1)) increased the odds of obesity by 2.20 times ($B = 0.787$, $p = .018$), suggesting that individuals consuming fruits daily had a significantly different obesity risk compared to the reference group. Less frequent consumption (Eat_Fruits(2)) had a marginal effect ($p = .075$).

The stepwise logistic regression output highlights variables that were considered but not retained in the model at each step. In Step 1, the overall test for excluded variables was statistically significant ($\chi^2 = 12.690$, $df = 5$, $p = .026$), indicating that some excluded predictors may contribute to explaining obesity risk.

Data Analysis

Table 1 Respondent Profile

Variable	Category	Frequency (N)	Percentage (%)
Gender	Male	250	50%
	Female	249	50%
Age	18-25	150	30%
	26-35	200	40%
	36-45	100	20%
	46+	49	10%
Location	Karachi	300	60%
	Hyderabad	150	30%
	Sukkur	49	10%
Occupation	Employed	350	70%
	Self Employed	100	20%
	Unemployed	49	10%
Income Bracket	Below 30k	100	20%
	30k-60k	200	40%
	60k-100k	100	20%
	Above 100k	99	20%

Table 2 Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	548.658 ^a	.017	.026
2	541.971 ^a	.030	.045
a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.			

Table 3 Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a	Sugary_Bev			6.616	2	.037	
	Sugary_Bev(1)	1.171	.490	5.703	1	.017	3.225
	Sugary_Bev(2)	-.113	.219	.264	1	.608	.894
	Constant	1.422	.173	67.624	1	.000	4.147
Step 2 ^b	Sugary_Bev			6.246	2	.044	
	Sugary_Bev(1)	1.144	.493	5.391	1	.020	3.139
	Sugary_Bev(2)	-.110	.221	.246	1	.620	.896
	Eat_Fruits			6.525	2	.038	
	Eat_Fruits(1)	.787	.332	5.634	1	.018	2.197
	Eat_Fruits(2)	.406	.228	3.163	1	.075	1.501
	Constant	1.491	.183	66.742	1	.000	4.443
a. Variable(s) entered on step 1: Sugary_Bev.					b. Variable(s) entered on step 2: Eat_Fruits.		

Table 4 Variables not in the Equation					
			Score	df	Sig.
Step 1	Variables	Eat_Fruits	6.636	2	.036
		Eat_Fruits(1)	3.321	1	.068
		Eat_Fruits(2)	.622	1	.430
		Eat_Veg	4.647	2	.098
		Eat_Veg(1)	4.625	1	.032
		Eat_Veg(2)	.681	1	.409
		Eat_Junk_Food(1)	1.576	1	.209
	Overall Statistics		12.690	5	.026
Step 2	Variables	Eat_Veg	4.968	2	.083
		Eat_Veg(1)	4.942	1	.026
		Eat_Veg(2)	.756	1	.385
		Eat_Junk_Food(1)	1.444	1	.230
	Overall Statistics		6.119	3	.106

Table 5 Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	546.899 ^a	.012	.018

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 6 Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a	Sleep_Pattern			6.131	2	.047	
	Sleep_Pattern(1)	1.198	.634	3.569	1	.059	3.314
	Sleep_Pattern(2)	1.309	.530	6.112	1	.013	0.703
	Constant	.702	.215	10.698	1	.001	2.018
a. Variable(s) entered on step 1: Sleep_Pattern.							

Table 7 Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a	Tobacco_Use(1)	-.318	.303	1.104	1	.293	.728
	Ocupation			.373	2	.030	
	Ocupation(1)	-.503	.829	.368	1	.034	.605
	Ocupation(2)	-.345	1.000	.119	1	.730	.708
	Active_Duration			1.542	6	.027	
	Active_Duration(1)	.368	.909	.164	1	.686	1.444
	Active_Duration(2)	.334	1.084	.095	1	.038	1.397
	Active_Duration(3)	.219	1.405	.024	1	.876	1.244
	Active_Duration(4)	.789	1.049	.566	1	.452	2.202
	Active_Duration(5)	.131	1.068	.015	1	.902	1.140
	Active_Duration(6)	.752	1.332	.319	1	.572	2.121
	Constant	1.351	.288	21.917	1	.000	3.859
a. Variable(s) entered on step 1: Tobacco_Use, Ocupation, Active_Duration_1.							

Table 8 Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	552.667 ^a	.009	.014
a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.			

Table 9 Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a	Gender(1)	.451	.210	4.612	1	.032	1.570
	Constant	1.131	.105	115.807	1	.000	3.098
a. Variable(s) entered on step 1: Gender.							

Among these, Eat_Fruits showed a significant overall score ($\chi^2 = 6.636$, $df = 2$, $p = .036$). Its category Eat_Fruits(1), representing daily fruit intake, approached significance ($p = .068$), suggesting a potential association with obesity risk, though it did not meet the threshold for entry into the model. Eat_Fruits(2) showed no significant effect ($p = .430$).

Similarly, Eat_Veg was marginally significant overall ($p = .098$). Interestingly, Eat_Veg(1) (representing a specific category of vegetable intake) had a significant p-value ($p = .032$), indicating that this category may have a relationship with obesity risk. However, Eat_Veg(2) and Eat_Junk_Food(1) were not significant ($p > .05$), and therefore were excluded.

In Step 2, the overall significance of remaining excluded variables dropped ($\chi^2 = 6.119$, $df = 3$, $p = .106$), suggesting that the model became more stable after the addition of previously retained

predictors. Eat_Veg(1) again showed statistical significance ($p = .026$), while the other categories did not. The results suggest that dietary habits, particularly fruit and vegetable intake, play a nuanced role in obesity risk.

In Step 1, both fruit and vegetable consumption approached significance, indicating a possible influence on obesity outcomes. Notably, daily vegetable intake showed a significant effect, implying it may help lower obesity risk. However, these associations weakened in Step 2 after controlling for other variables, suggesting that while healthy eating is relevant, its impact might be overshadowed by stronger lifestyle or behavioral factors. Thus, the findings imply that promoting consistent vegetable consumption could support obesity prevention, though it should be part of a broader health strategy.

Life Style and Behavioral Factors

In the first step of the binary logistic regression analysis, the -2 Log Likelihood was 546.899, indicating the initial model fit. The Cox & Snell R Square value was 0.012, and the Nagelkerke R Square was 0.018, suggesting that the model explains approximately 1.8% of the variance in the outcome variable. Although this indicates a modest explanatory power, it reflects the contribution of the predictor(s) included in the model. Estimation successfully terminated at the fourth iteration, with parameter changes falling below the threshold of 0.001, confirming model convergence.

In the second stage, we evaluated the effects of lifestyle and behavioral factors on risk of obesity among the chosen population. In Step 1, individuals with Sleep_Pattern(2) (6-8 hours of sleep) decreases the likelihood of obesity risk by 0.703 times, with a significant p-value of 0.013. The constant term indicates a baseline effect, where the odds of the outcome are 2.018 times higher when sleep patterns are considered. This suggests that sleep duration may play a critical role in determining the outcome. For Tobacco Use, the coefficient for Tobacco_Use(1) is negative (-0.318), but it is not statistically significant ($p = 0.293$), indicating that tobacco use does not significantly impact the risk of obesity in this model.

Regarding Occupation, the Self-employed category (Occupation(1)) shows a significant negative effect ($B = -0.503$, $p = 0.034$, $\text{Exp}(B) = 0.605$), meaning that self-employed individuals are less likely to be at risk for obesity compared to those in the reference category.

For Activity Duration, the results reveal that Active_Duration(2) has a statistically significant positive effect ($B = 0.334$, $p = 0.038$, $\text{Exp}(B) = 1.397$), indicating that individuals who are moderately active to inactive are more likely to be at risk for obesity.

The findings emphasize the crucial role of lifestyle and dietary habits in obesity risk. High sugary beverage consumption significantly increases obesity likelihood, suggesting the need for public health efforts to reduce sugar intake. Although daily fruit consumption impacts obesity risk, its effect is weaker when considering other factors, highlighting the importance of a balanced approach. Sleep patterns, particularly 6-8 hours of sleep, decrease obesity risk, reinforcing the importance of proper rest. Self-employed individuals appear to have a lower risk of obesity, which may reflect the healthier, more active lifestyle often associated with their work. This could be due to greater flexibility in their schedules, allowing for more physical activity and healthier eating habits compared to those in more structured or sedentary occupations. Likewise, lack of sufficient physical activity contributes to obesity risk. These results underline the need for a comprehensive strategy in obesity prevention.

The Role of Gender

In Step 1 of the binary logistic regression analysis, the model produced a -2 Log Likelihood value of 552.667, reflecting the degree to which the model fits the observed data. The Cox & Snell R Square

value was 0.009, while the Nagelkerke R Square was slightly higher at 0.014. These values indicate that the predictor(s) included in the model explain approximately 0.9% to 1.4% of the variance in the outcome variable. The estimation process successfully converged after four iterations, as changes in parameter estimates fell below the set threshold of 0.001.

The last stage, we assessed the role of gender in the equation. The logistic regression reveals that gender significantly influences obesity risk ($p = 0.032$), with females (Gender (1)) having 1.570 times higher odds of obesity compared to males.

Continuing from the previous findings, we also explored the impact of gender on obesity risk. The analysis reveals a significant effect, with females having 1.57 times higher odds of being at risk for obesity compared to males. This suggests that gender differences, possibly related to lifestyle habits, hormonal influences, or health-related behaviors, may contribute to varying obesity risks. When considered alongside the effects of activity levels and occupation, these findings highlight the importance of addressing gender-specific factors in obesity prevention strategies to ensure more targeted and effective health interventions.

CONCLUSION

The findings of this study will provide useful informations concerning multifaceted factors relating to obesity with emphasis on lifestyle behaviors, dietary habits, and gender differences. The findings show that having a high sugary

beverage intake, not sleeping enough and not being physically active puts you at increased risk of becoming obese. On the other hand, fruits and vegetables were making you healthy as the protective effects of a healthy diet rich in fruits and vegetables, moderate physical activity and optimal levels of sleep duration were also evident. Moreover, it was found that females had a greater tendency towards obesity than males, implying that gender-specific health interventions are needed.

This study has managerial implications that are important for both public health policymakers and organizational efforts to decrease obesity rates. The findings emphasise the need for positive behaviour towards a healthy lifestyle, including a public health campaign aimed at educating the public on the dangers of consumption of sugary beverages, the promotion of physical activity and the benefits of adequate sleep. Furthermore, policymakers should pay more attention to reducing gender-specific health disparities and develop interventions that are gender sensitive with due regard to the special problems that women face in obesity management.

These findings can also be used to design workplace wellness programs by organizations. Reducing sedentary behavior among employees is possible through employers encouraging physical activity, providing healthier food options at work and encouraging the work life balance, thereby reducing the risk of obesity among employees. Not only that, organizations operating in healthcare, wellness sectors should also consider including

obesity prevention strategies in their services by using the findings of this study to develop more effective programs for specific needs.

Multiple possibilities for further research about what is being studied are left to pursue. Dietary habits, physical activity and sleep patterns that cause obesity are difficult to prove causality has established long term longitudinal studies that will help. Additionally, exploring other variables, such as psychological factors (e.g., stress, mental health) and environmental influences (e.g., access to healthy food), could further elucidate the complex relationship between lifestyle factors and obesity.

Moreover, future studies could delve deeper into the role of socioeconomic status and occupation, particularly in different geographical regions, to better understand how economic and environmental factors influence obesity risk. Research focusing on the cultural influences on dietary habits and obesity in different countries, particularly in the context of emerging economies, would also contribute to a global perspective on obesity prevention.

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