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PREVALENCE AND PREDICTORS OF OBESITY AMONG FEMALE TEACHERS OF DISTRICT PESHAWAR

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Abstract

The study investigated obesity levels among female teachers in the Peshawar district, analyzing data from 334 married and unmarried participants. It assessed various demographic factors, including educational qualifications, family structure, age, weight, height, and BMI. The findings revealed significant associations between BMI and several factors for married female teachers, such as the frequency of consuming bakery items, eating habits, fast food consumption, sleeping hours, lunch facilities, dinner times, physical activity, and the intake of fizzy drinks. In contrast, no significant links were found between BMI and vegetable or carbohydrate consumption. To quantify the impact of these factors on BMI, an ordinal logistic regression model was utilized. The results indicated that age, weight, fizzy drink consumption, weekly beef intake, fast food consumption, normal sleep duration, and height significantly affected the BMI of female teachers. These insights underscore the importance of addressing dietary and lifestyle factors to combat obesity within this population and highlight the need for targeted health interventions and educational programs to promote healthier living among female educators.

Keyword: Obesity, Female, BMI, age, weight, height

1. Introduction

1.1 Obesity: A Global Epidemic

Obesity is a condition characterized by an excessive accumulation of body fat, resulting from a chronic energy imbalance where caloric intake exceeds energy expenditure. It is commonly measured using the Body Mass Index (BMI), a simple and widely used tool to classify individuals based on their weight relative to their height. According to the World Health Organization (WHO), an individual with a BMI of 25 to 29.9 is considered overweight, while a BMI of 30 or above is categorized as obese. While the BMI is not a perfect measure of body fat, it is the most practical and consistent tool available for large-scale epidemiological studies [1]. Obesity has emerged as one of the most pressing public health issues of the 21st century. It is now recognized as a global epidemic, with rates of obesity tripling since the 1970s. Worldwide, more than 1.9 billion adults are overweight, and over 650 million are classified as obese, according to the WHO. The rising rates of obesity are contributing to an increase in the prevalence of non-communicable diseases (NCDs), including type 2 diabetes, cardiovascular disease, certain cancers, and musculoskeletal disorders. These conditions collectively lead to millions of premature deaths each year and place a significant burden on healthcare systems worldwide [2]. The rapid increase in obesity is not limited to high-income countries. It is now growing at an alarming rate in low and middle-income countries, where urbanization, changing diets, and reduced physical activity contribute to an obesogenic environment. As countries like Pakistan undergo rapid economic and social transformations, they are increasingly facing the dual burden of malnutrition—undernutrition and obesity coexisting within the same population [3-6].

1.2 Obesity in Pakistan: An Emerging Crisis

In Pakistan, the obesity crisis is escalating, with alarming rates of overweight and obesity observed across various population groups. According to recent estimates, approximately 22% of the adult population in Pakistan is obese. The problem is particularly pronounced among women, who are more likely to be obese than men, with cultural,

biological, and socioeconomic factors contributing to this disparity. Pakistan now ranks among the countries with the highest rates of obesity in South Asia, reflecting a growing public health concern that demands immediate attention [7].

Several factors contribute to the rising rates of obesity in Pakistan, including:

Dietary patterns: Traditional Pakistani diets, rich in carbohydrates, fats, and sugar, contribute significantly to weight gain. The high consumption of processed and energy-dense foods, coupled with a decrease in the intake of fruits and vegetables, has created an unhealthy dietary environment.

Physical inactivity: Urbanization and technological advancements have reduced physical activity levels among the population. Sedentary lifestyles, long working hours, and limited opportunities for recreational physical activity are common, particularly among urban populations [8-12]. Socioeconomic factors: Poverty and lack of education are important contributors to obesity in Pakistan. Low-income families often rely on cheap, energy-dense foods that are high in fat and sugar. Additionally, a lack of awareness about healthy eating and physical activity contributes to unhealthy behaviors.

Cultural influences: In many parts of Pakistan, being overweight is often associated with affluence and prosperity, especially among women. This cultural perception may discourage individuals from taking steps to reduce their weight or adopt healthier lifestyles [13].

The rising rates of obesity in Pakistan have serious implications for the country's healthcare system. Obesity is a major risk factor for noncommunicable diseases (NCDs), which are responsible for a significant proportion of premature deaths in the country. The increasing prevalence of conditions such as hypertension, diabetes, and cardiovascular diseases, all linked to obesity, is placing a growing burden on healthcare resources [14].

1.3 Why Focus on Female Teachers?

Female schoolteachers represent a unique and critical demographic in the context of public health. As educators and role models, they are not only responsible for shaping the minds of future generations but also play a crucial role in influencing the health behaviors of children and adolescents. The health of teachers can have far-reaching implications, both within and outside the classroom [15]. In the cultural context of Pakistan, women—especially those in teaching positions—often carry dual responsibilities. In addition to their professional duties, they are typically responsible for managing household chores, childrearing, and caregiving roles. These multiple responsibilities can lead to increased stress, irregular eating patterns, limited time for physical activity, and other unhealthy lifestyle habits that contribute to weight gain and obesity [16].

There are several compelling reasons to focus specifically on female teachers when investigating obesity:

1. Role Models for Students: Teachers serve as influential figures in the lives of their students, especially in their formative years. The health behaviors exhibited by teachers, including their dietary habits, exercise routines, and overall lifestyle, can significantly impact the attitudes and behaviors of students. Addressing obesity among teachers, therefore, has the potential to create a ripple effect, encouraging healthier behaviors among students.

2. Occupational Stress and Lifestyle: The teaching profession is demanding and often comes with significant stress. Long working hours, administrative tasks, and classroom management responsibilities may leave little time for teachers to focus on their health. Stress, combined with sedentary work and poor eating habits, can lead to weight gain and obesity over time. Investigating these occupational factors can shed light on how professional stress contributes to obesity and identify potential areas for intervention [17].

3. Impact on Women's Health: In Pakistan, women face unique challenges that may exacerbate their risk of obesity. Cultural expectations, societal pressures, and gender roles often prioritize the needs of the family over individual health. Women are often expected to prioritize caregiving and household responsibilities, leaving them with limited time or resources to focus on their health. This study aims to highlight these challenges and offer potential solutions to address obesity within this specific population [18].

4. Public Health Implications: Female teachers are a key demographic for public health initiatives. Improving the health and well-being of teachers can have broader implications for community health, as teachers are often seen as leaders and role models in society. Healthy teachers are likely to be more productive, have fewer absences due to illness, and advocate for healthy living within their communities [19-20]. Understanding the prevalence and predictors of obesity among female teachers can provide valuable insights for designing public health interventions that target not only teachers but also the wider population.

1.4 Broader Public Health Context

The importance of addressing obesity among female teachers extends beyond their health outcomes. As key influencers within their communities, teachers play a vital role in shaping public perceptions of health and wellness. A healthier teaching workforce can positively impact student behaviors, promote healthier school environments, and improve educational outcomes.

2. Literature review

The prevalence of obesity and overweight is becoming alarmingly high worldwide, affecting both developed and underdeveloped countries. Over the last three decades, the issue has grown significantly across many nations. By 2030, approximately 573 million adults are expected to be obese, with 1.35 billion overweight [5]. Rising obesity rates have been observed in regions like Japan, where the rate increased from 16.7% to 46% between 1976-1980, and China, where it surged from 3.7% to 19% from 2000-2002 [3]. Pakistan has also seen a sharp rise in obesity in recent years, ranking highest among SAARC countries, with 23% of its population affected [17]. Obesity-related health issues are prevalent among Pakistani schoolchildren, with socioeconomic status (SES) and high meat consumption identified as key risk factors [10]. Among women, factors like depression, menstrual irregularities, overeating, and thyroid dysfunction contribute to rising obesity levels, with a strong link observed between obesity and infertility. Obese women often experience irregular menstrual cycles and complications in pregnancy, with abdominal obesity increasing the risk of miscarriages. Although lifestyle changes, such as regular exercise, can help control obesity, pharmacological and surgical interventions may also be effective [11-13].

In children, 17% are overweight, and 7.5% are obese. Obesity is more common among boys than girls, with urban children from higher SES backgrounds at greater risk [24]. A study by J. Clin. Invest. 199 explored energy utilization abnormalities in post-obese women compared to those who had never been obese. Over four years, post-obese women regained an average of 10.9 kg, while the control group remained slim, suggesting that weight gain in women may be linked to lifestyle factors such as inactivity rather than reduced energy needs [25].

The International Physical Activity Questionnaire (IPAQ) was used to assess physical activity (PA) levels among 350 obese individuals. The study found that 72.6% of the participants were physically inactive, with multivariable logistic regression revealing a strong association between inactivity and factors such as a BMI above 33 kg/m² and a family history of obesity. Inactive females living in extended families were twice as likely to be inactive compared to those from nuclear families, while males from extended families were six times more likely to be inactive [27].

In Pakistan, urban women bear a significantly higher obesity burden than their rural counterparts. Among children and adolescents, girls across all age groups tend to be more overweight and obese than boys. A study identified child obesity as a complex syndrome in Pakistan, linking leptin hormone mutations with severe obesity [28]. A cross-sectional study in Karachi highlighted the underestimation of weight among overweight and obese adults, particularly in older individuals and those unaware of their ideal weight [29]. Obesity rates among rural women in Peshawar were also alarming, with 53.4% overweight and 26.9% obese. Factors such as age, marriage, and hypertension were strongly linked to obesity in this region [33]. Similarly, a study of female medical students in Karachi found a high prevalence of obesity (34%), with a notable relationship between obesity and hypertension. Contributing factors included excessive consumption of soft drinks, diet drinks, meat, and sedentary lifestyles. The study emphasized the need for early intervention and lifestyle changes to combat obesity in younger populations [34].

Globally, obesity is recognized as a growing health issue, affecting both developed and developing nations. In Egypt, for example, more than one-third of the population is obese, with the prevalence more than double among women (46%) compared to men (22%). Factors such as age, wealth, urbanization, and physical inactivity contribute to this trend [35]. In Pakistan, multiple risk factors are linked to obesity, including family history and metabolic conditions like diabetes. Studies have shown that metabolic syndrome, driven by obesity, is a significant risk factor for cardiovascular disease and type 2 diabetes, particularly in Asian countries [37]. Research indicates that 25% of Pakistanis are overweight or obese, with females, urban residents, and individuals with high meat intake and SES at higher risk. Obesity is most prevalent in females aged 35-54 (42.8%), while rates among younger age groups are also notable [38]. Another study from Pakistan's northern regions found positive correlations between BMI, age, and hypertension, with obesity more common among women in skilled professions and men in government service [39].

3. Study Objectives

The overarching goal of this study is to assess the prevalence and predictors of obesity among female schoolteachers in District Peshawar. More specifically, the study aims to achieve the following objectives:

1. To estimate the prevalence of obesity among female teachers in District Peshawar. Understanding the extent of the obesity problem in this group is essential for developing targeted health interventions.
2. To identify key risk factors associated with obesity, including lifestyle factors such as diet, physical activity, stress levels, and sleep patterns. By examining these factors, the study seeks to identify modifiable behaviors that contribute to obesity and offer insights into potential intervention strategies.
3. To investigate differences in obesity prevalence between married and unmarried female teachers. Marriage and family responsibilities can influence eating habits, physical activity, and stress levels. This study aims to explore how these social and familial factors impact obesity among teachers.
4. To examine the occupational factors contributing to obesity in female teachers. Teaching is a profession that can involve long hours, sedentary work, and high levels of stress. This study will investigate how these occupational factors contribute to weight gain and identify opportunities for workplace wellness programs.
5. To provide evidence-based recommendations for policymakers, schools, and public health professionals on how to address obesity among female teachers. These recommendations will aim to promote healthier lifestyles, improve workplace environments, and reduce the prevalence of obesity-related diseases in this population.

4. Methodology of the Study

The research methodology outlines the approaches taken to collect, analyze, and interpret the data. This section discusses the study population, sampling techniques, data collection tools, and statistical methods used in the study.

3.1 Study Population

The target population for this study was female schoolteachers working in government schools in District Peshawar. The district was selected for its diverse population and concentration of schools in both urban and suburban areas. Peshawar is the capital of Khyber Pakhtunkhwa, and it is home to a substantial number of educational institutions. Female teachers were chosen as the focus group due to their dual role in education and as influential figures within their communities and households. The population of interest included female teachers from junior, middle, high, and higher secondary schools. Teachers working in private schools were excluded to ensure uniformity in terms of employment status and workplace conditions, which could have introduced additional variables into the study.

3.2 Prevalence

Prevalence in this study refers to the proportion of female teachers in the sample who are categorized as obese, based on their BMI. The formula used to calculate prevalence is:

$$Prevalence = \frac{No.of\ people\ in\ tthe\ sample\ with\ characteristic}{total\ no.of\ people\ in\ the\ sample} \quad (1)$$

3.3 Sample Size

This study was based on primary data collected from female teachers in District Peshawar. To ensure the sample size was statistically representative of the population, a sample size determination formula was used. The sample size was calculated using Yamane's (1967) formula for a known population size of 2001 female teachers (as identified by the Annual School Census 2017-2018). The formula is given by:

$$n = \frac{N}{1+Ne2} = 333 \quad (2)$$

Thus, the required sample size was determined to be 333 respondents, ensuring that the study results would be generalizable to the broader population of female schoolteachers in District Peshawar.

3.4 Sampling Technique

A stratified random sampling technique was used to select the schools and participants. The stratification was based on geographical zones within District Peshawar. The district was divided into four key zones for this purpose:
1. Hayatabad to University Town
2. Abdara to Tehkal Payan
3. Cantonment to Civil Quarters
4. Civil Quarters to Pakha Ghulam

These zones were chosen due to their varied socio-economic backgrounds and concentration of government schools. Within each zone, schools were further stratified by educational level (junior, middle, high, and higher secondary schools) to ensure that the sample reflected a diverse range of teaching environments and teacher demographics.

Once the schools were stratified by zone and educational level, simple random sampling was applied within each stratum to select the schools and teachers to participate in the study. This method ensured that every teacher within the identified strata had an equal chance of being selected, reducing selection bias and improving the representativeness of the sample.

3.5 Measurement Tool: Questionnaire Development and Validation

A structured questionnaire was developed to collect data on various factors related to obesity, including demographic characteristics, lifestyle behaviors, physical and mental health, and eating habits. The questionnaire was designed in consultation with a medical expert from Lady Reading Hospital, Peshawar, to ensure that all health-related questions were scientifically valid and aligned with the objectives of the study.

The questionnaire was divided into three sections:

1. Demographic Information: This section captured data on age, marital status, number of children, years of teaching experience, and living arrangements (e.g., joint or nuclear family). The aim was to understand how these factors might contribute to obesity.

2. Lifestyle Information: Questions in this section focused on the teachers' dietary habits, physical activity, sleep patterns, and daily routines. Specific questions were included about the frequency of consuming fast food, sugary drinks, and high-fat foods, as well as participation in physical exercise.

3. Physical and Mental Health: This section inquired about the teachers' health conditions, including any chronic diseases (e.g., hypertension or diabetes), mental health concerns (e.g., depression or stress), and the use of medications such as antidepressants. The aim was to identify any health-related factors that may correlate with obesity.

Questionnaire Pre-testing and Validation: Before administering the questionnaire to the full sample, a pilot study was conducted with 30 female teachers from schools outside the selected zones to test the clarity, relevance, and reliability of the questions. The pre-test allowed the researchers to identify any ambiguities or confusing wording. Based on the feedback from the pilot study, minor adjustments were made to improve question clarity and structure. For instance, certain questions about dietary intake were rephrased to align better with local eating habits and terminologies familiar to the respondents.

Content Validity: The questionnaire was reviewed by experts in nutrition, public health, and education to ensure that it adequately covered the factors related to obesity without omitting any crucial elements. Their feedback helped refine the content to ensure that it accurately reflected the objectives of the study.

Reliability Testing: The questionnaire's internal consistency was evaluated using Cronbach's alpha to assess the reliability of the lifestyle and health-related questions. The alpha score for the lifestyle section was 0.82, indicating a high level of reliability.

3.6 Data Analysis

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics such as frequency tables and cross-tabulations were used to present the prevalence of obesity and related demographic characteristics. Chi-square tests were employed to determine the association between obesity and categorical variables, such as eating habits and physical activity. For inferential statistics, Ordinal Logistic Regression was used to model the relationship between the BMI categories (underweight, normal, overweight, and obese) and the independent variables such as age, dietary habits, and physical activity. This model was chosen due to the ordinal nature of the BMI categories, allowing for an analysis of the cumulative effects of various predictors on obesity.

$$Pr\ o\ b(Y_i \geq j|X) = \frac{1}{1+exp[-(\alpha_j + \sum_{i=1}^{k}\beta_i X_i)]} \qquad ,j = 1,..,m-1 \tag{3}$$

Alternately, the model is expressed as:

$$\ln\left[\frac{\Pr ob(Y_i \geq j \mid \boldsymbol{X})}{\Pr ob(Y_i < j \mid \boldsymbol{X})}\right] = \alpha_j + \sum_{i=1}^{k}\beta_i X_i \qquad j = 1,..,m-1 \tag{4}$$

Where$X$represents a (k×1) vector of explanatory variables; β_is are the unknown parameters; and m represents categories of the ordinal dependent variable. The unknown parameters $\beta_i's$ are estimated by the Maximum Likelihood Estimation (MLE) method.

5. Statistical Analysis of the study

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Statistical analysis of the data regarding the body mass index (BMI) and related factors of married and unmarried females. The data regarding the various characteristics of obesity level of female teacher working in schools. The data was collected from the 334 working females in various school of district Peshawar. The working females were either married or unmarried. Descriptive statistics includes tabulation, graphical presentation, and summary statistics. The chi-square test association was used to determine the association between the obesity level of unmarried working females with various related factors. Whereas the inferential statistics include the modeling of level of obesity of married working females using ordinal logistic regression.

5.1 Descriptive Statistics

Table 4.1: Frequency Distribution of BMI Obesity

		Frequency	Percent
	Underweight	16	4.8
	Normal	59	17.7
	Overweight	94	28.1
	Obese	165	49.4
Total		334	100.0

The above table 4.1 presents the prevalence of obesity level in female teachers in schools of district Peshawar. The table defined that out of 334 females, 16 females are underweight with the percentage of 4.8, there are 59 females with normal obesity with the percentage of 17.7. The table also defines that 94 females observed with overweight having a percentage of 28.1 while largest frequency observed in the category of BMI i.e. Obese. The frequency of obese category found 165 with the percentage of 49.4 in the working females' schoolteachers in district Peshawar.
The following figure 4.1 defines the sector diagram of the qualification level of female schoolteachers in district Peshawar.

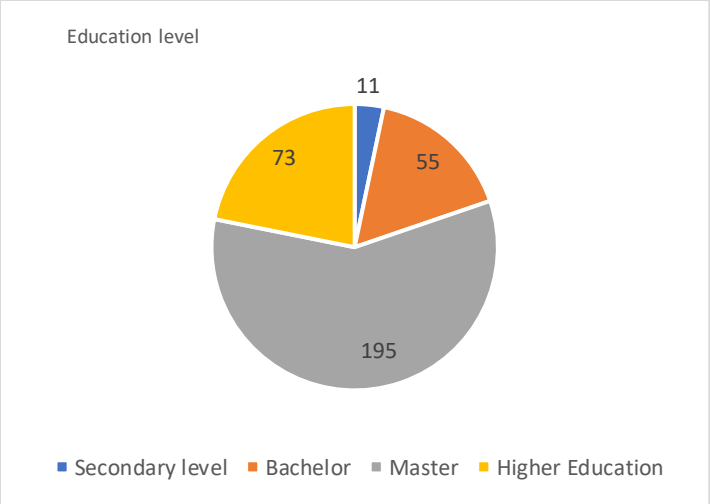

Fig 4.1: Sector Diagram of Qualification level of female schoolteachers

The sector diagram indicates that out of the sample data, the largest sector of female schoolteachers having a master's degree i.e. 195 females have master's degree as a qualification. 73 females have higher education i.e. either M. Phil. or Ph.D. presented by the purple sector of the sector diagram. 55 out of the sample female schoolteachers have bachelor's degrees while only 11 female schoolteachers have below bachelor's qualification.

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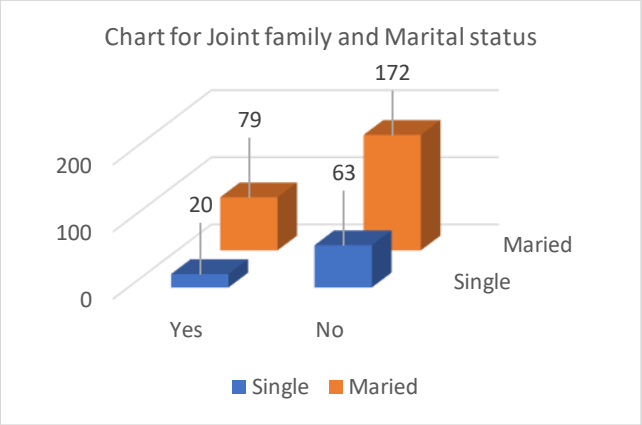

Fig 4.2: Multiple Bar chart of joint family system and marital status

The above figure 4.2 presents the multiple bar charts of the joint family system and the marital status of the female schoolteachers in district Peshawar. The chart defines that there are 20 female schoolteachers are single and having joint family system while 79 schoolteachers are married and having joint family system. Whereas 63 schoolteachers' females are single and don't live in joint family system while 172 schoolteachers found married and don't live in joint family system.

The following bar chart as Fig 4.3 presents the salary of female schoolteachers in district Peshawar.

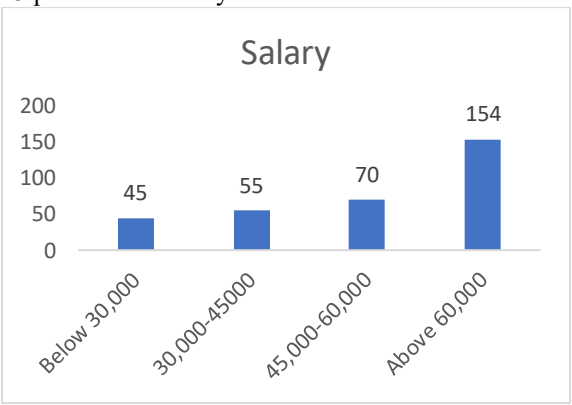

Fig 4.3: Bar chart of Salary of female schoolteachers in District Peshawar

The bar chart shows that there found 45 female schoolteachers having below 30,000 salary per month whereas 55 females school teachers having 30 to 45 thousand salary per month. The chart defines that there found 70 females have salaries 45 to 60 thousand per month while 154 females' schoolteachers found with more than 60,000 salaries per month. The following table indicates the descriptive statistics regarding the various factors related to female schoolteachers working in district of Peshawar.

Table 4.2: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	334	22	61	36.70	9.057
Weight	334	36	105	70.01	13.218
Height	334	4.5	6.2	5.313	.2410
BMI	334	15.50	46.63	27.3251	5.21974
N (listwise)	334				

The above table defines that the data was collected from 334 school teachers females having an average age is 36.70 years with a standard deviation of 9.057 years. The average weight of the schoolteachers working in the district of Peshawar was found as 70.01 Kg with a standard deviation of 13.218 Kg. Similarly, the average height of the female schoolteachers found as 5`.313`` with a standard deviation of 0.241 inches. The average BMI of 334 female schoolteachers found as 27.325 units with a standard deviation of 5.2197 units.

5.2 Chi-Square Test of Association

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To find the association of various factors responsible for obesity in unmarried women, a chi-square test of association was performed. The following tables indicate the output of the chi-square test association and cross tables between the factors and the obesity level in unmarried females.

Table 4.3 BMI_OBES1 * take vegetables in a week? Crosstabulation

		how often do you take vegetables in a week?					Chi-Square (P-value)
		Everyday	every alternative day	twice a week	Once a week	Total	
BMI_OBES1	Underweight	2	2	5	1	10	15.88 (0.069)
	Normal	11	14	5	2	32	
	Overweight	6	5	8	1	20	
	Obese	3	14	2	2	21	
Total		22	35	20	6	83	

The above table 4.3 shows the cross tabulation between BMI and eating vegetables. To test the association between the BMI and eating vegetables per week, Chi-square test of association was used. The chi square statistic found as 15.88 with a p-value of 0.069. As the p-value is greater than 0.05 level of significance, there the null hypothesis of no significant association between BMI and vegetables in a week being failed to reject and concluded that two factors are independent.

Table 4.4: BMI_OBES1 * how often do you eat bakery items? Crosstabulation

		how often do you eat bakery items?			Total	Chi-Square (P-value)
		Everyday	I eat sometimes	I dont eat		
BMI_OBES1	Underweight	2	4	4	10	14.504 (0.024)
	Normal	6	17	9	32	
	Overweight	1	18	1	20	
	Obese	5	15	1	21	
Total		14	54	15	83	

Above table 4.4 is the cross-tabulation of BMI and no: of times eating bakery items. To test the association between the BMI and taking bakery items per week, Chi-square test of association was used. The chi square statistic found as 14.504 with a p-value of 0.024. As the p-value is less than 0.05 level of significance, there the null hypothesis of no significant association between BMI and having bakery item in a week is rejected and concluded that the BMI is associated with the eating of bakery items per week.

Table 4.5: BMI_OBES1 * take carbohydrates (rice/potatoes)? Crosstabulation

		how often do you take carbohydrates (rice/potatoes)?					Chi-Square (P-value)
		ince a week	twice a week	once a month	I don't eat	Total	
BMI_OBES1	Underweight	4	6	0	0	10	6.561 (0.683)
	Normal	12	13	4	3	32	
	Overweight	9	10	1	0	20	
	Obese	9	7	3	2	21	
Total		34	36	8	5	83	

The above table 4.5 shows the cross tabulation between BMI and no: of times taking carbohydrates. To test the association between the BMI and eating vegetables per week, Chi-square test of association was used. The chi square statistic found as 6.561 with a p-value of 0.683. As the p-value is greater than 0.05 level of significance, there the null hypothesis of no significant association between BMI and taking carbohydrates in a week being failed to reject and concluded that BMI is independent of taking carbohydrates.

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Table 4.6 BMI_OBES1 * how do you find your eating habits? Crosstabulation

		how do you find your eating habits?				Chi-Square (P-value)
		I eat on time	I eat everything anytime	I eat in intervals	Total	
BMI_OBES1	Underweight	7	2	1	10	10.739 (0.097)
	Normal	21	4	7	32	
	Overweight	10	6	4	20	
	Obese	6	10	5	21	
Total		44	22	17	83	

The above table 4.6 shows the cross tabulation between BMI and eating habits. To test the association between the BMI and eating habits, Chi-square test of association was used. The chi square statistic found as 10.739 with a p-value of 0.097. As the p-value is greater than 0.05 level of significance, there the null hypothesis of no significant association between BMI and eating habits is rejected and concluded that two BMI is independent of eating habits in married women.

Table 4.7 BMI_OBES1 * fastfood Crosstabulation

		Fastfood					Chi-Square (P-value)
		I avoid taking fast food	once a month	once a week	everydday	Total	
BMI_OBES1	Underweight	7	3	0	0	10	124.44 (0.000)
	Normal	6	24	2	0	32	
	Overweight	0	0	18	2	20	
	Obese	0	0	6	15	21	
Total		13	27	26	17	83	

The above table 4.7 is the cross tabulation between BMI and eating fast foods. To test the association between the BMI and eating fast food per week, Chi-square test of independency was used. The chi square statistic found as 124.44 with a p-value of 0.000. As the p-value is smaller than 0.05 level of significance, there the null hypothesis of no significant association between BMI and eating fast food in a week is rejected and concluded that two factors i.e. BMI and eating fast food in a week are significantly associated.

Table 4.8 BMI_OBES1 * sleeping hours Crosstabulation

		Sleeping hours				Chi-Square (P-value)
		4 to 5 hours	5 to 7 hours	above 7 hoours	Total	
BMI_OBES1	Underweight	6	2	2	10	38.16 (0.000)
	Normal	5	22	5	32	
	Overweight	1	5	14	20	
	Obese	10	2	9	21	
Total		22	31	30	83	

The above table is the crosstabulation of BMI with sleeping hours of married women. The table shows that BMI being categorized as underweight, normal, overweight and Obese. Also, the variable sleeping hours being categorized as 4 to 5 hours, 5 to 7 hours and above 7 hours. To test association between the two factors, chi-square test of association was used. The chi-square value found as 38.16 with the p-value as 0.000. As p-value is too low (i.e. less than 0.05) leading toward to the rejection of the null hypothesis and concluding that there is significant association between the two BMI and sleeping habits of married females.

Table 4.9 BMI_OBES1 * home lunch Crosstabulation

		Home lunch		Total	Chi-Square (P-value)
		no	yes		
BMI_OBES1	Underweight	9	1	10	11.648 (0.009)
	Normal	19	13	32	
	Overweight	7	13	20	
	Obese	7	14	21	
Total		42	41	83	

The above table 4.9 is the cross-tabulation between BMI and having a home lunch facility. To test the association between BMI and having a home lunch facility, the Chi-square test of independence was used. The chi-square statistic found as 11.648 with a p-value of 0.009. As the p-value is smaller than 0.05 level of significance, there the null hypothesis of no significant association between BMI and having a home lunch facility is rejected, and concluded that married working females are more obese facilitated by the home lunch option.

Table 4.10: BMI_OBES1 * physical activity Crosstabulation

		Physical activity		Total	Chi-Square (P-value)
		yes	no		
BMI_OBES1	Underweight	10	0	10	36.557 (0.000)
	Normal	21	11	32	
	Overweight	1	19	20	
	Obese	4	17	21	
Total		36	47	83	

The above table 4.10 is the cross tabulation between BMI and physical activity exercise by married women. To test the association between the BMI and physical activity, Chi-square test of association was used. The chi square statistic found as 36.557 with a p-value of 0.000. As the p-value is smaller than 0.05 level of significance, there the null hypothesis of no significant association between factors is rejected and concluded that two factors i.e. BMI and physical exercise are significantly associated.

Table 4.11 BMI_OBES1 * dinnertime Crosstabulation

		dinnertime				Total	Chi-Square (P-value)
		I don't take dinner	before 7 pm	7 to 10 pm	late night		
BMI_OBES1	Underweight	9	1	0	0	10	135.13 (0.000)
	Normal	6	26	0	0	32	
	Overweight	2	0	12	6	20	
	Obese	0	0	2	19	21	
Total		17	27	14	25	83	

The above table 4.11 is the cross tabulation between BMI and dinner time i.e. time of taking dinner. To test the association between the BMI and dinner time, Chi-square test of association was used. The chi square statistic found as 135.13 with a p-value of 0.000. As the p-value is smaller than 0.05 level of significance, there the null hypothesis of no significant association between factors is rejected and concluded that two factors i.e. BMI and dinner time are significantly associated at 5% level of significance.

Table 4.12 BMI_OBES1 * lunch break Crosstabulation

		Lunch break			Total	Chi-Square (P-value)
		i don't eat at school	i take lunch at home	fast food		
BMI_OBES1	Underweight	8	2	0	10	56.29 (0.000)
	Normal	1	23	8	32	
	Overweight	4	11	5	20	
	Obese	0	5	16	21	
Total		13	41	29	83	

The above table 4.12 is the cross tabulation between BMI and lunch break. To test the association between the BMI and lunch break, Chi-square test of association was used. The chi square statistic found as 56.29 with a p-value of 0.000. As the p-value is smaller than 0.05 level of significance, there the null hypothesis of no significant association between BMI and lunch break is rejected and concluded that two factors i.e. BMI and lunch break are significantly associated at 5% level of significance.

Table 4.13: BMI_OBES1 * antidepressants Crosstabulation

		antidepressants		Total	Chi-Square (P-value)
		no	yes		
BMI_OBES1	Underweight	10	0	10	46.226 (0.000)
	Normal	32	0	32	
	Overweight	7	13	20	
	Obese	5	16	21	
Total		54	29	83	

The above table 4.13 is the cross tabulation between BMI and anti-depression felt by the married women. To test the association between the BMI and anti-depressant feeling, Chi-square test of association was used. The chi square statistic found as 46.226 with a p-value of 0.000. As the p-value is smaller than 0.05 level of significance, there the null hypothesis of no significant association between BMI and anti-depressant feeling is rejected and concluded that two factors i.e. BMI and anti-depressant feeling are significantly associated at 5% level of significance.

The table 4.14 is the cross tabulation between BMI and taking fuzzy drinks by the married women. To test the association between the BMI and taking fuzzy drinks, Chi-square test of association was used. The chi square statistic found as 31.83 with a p-value of 0.000. As the p-value is smaller than 0.05 level of significance, there the null hypothesis of no significant association between BMI and taking fuzzy drinks is rejected and concluded that two factors i.e. BMI and taking fuzzy drinks found significantly associated at 5% level of significance.

Table no. 4.14: BMI_OBES1 * fizzy drinks Crosstabulation

		Fizzy drinks		Total	Chi-Square (P-value)
		No	yes		
BMI_OBES1	Underweight	10	0	10	31.83 (0.000)
	Normal	23	9	32	
	Overweight	5	15	20	
	Obese	3	18	21	
Total		41	42	83	

5.3 Ordinal Logistic Regression

To determine the impact of various factors regarding the BMI in the females, ordinal logistic regression model was fitted. The BMI was categorized as underweight, normal overweight and obese. As the variable BMI is ordinal in nature i.e. there observed a natural order that why ordinal logistic regression was used. The following table 4.a represents the model summary of the ordinal logistic regression model.

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Table 4.15: Pseudo R-Square

Cox and Snell	.303
Nagelkerke	.448
McFadden	.150

Link function: Logit.

Table 4.15 defines the model summary of ordinal logistic regression model with the category of BMI of females. The table defines the value of Cox & Snell R Square Nagelkerke R Square and McFadden. These statistics are the measure of goodness of fit of the ordinal logistic model. These statistics explain the amount of variations in the response variable's success category because of the explanatory variables. The values of the statistics define the amount of variation in the value of the response variable i.e. BMI in females ranging from 30.3 % to 44.8 % due to variations in the set of the explanatory variables related to BMI.

The following Table 4.16 indicates the goodness of fit result which can be used to determine how better the model fits the data.

Table 4.16: Goodness-of-Fit

	Chi-Square	df	Sig.
Pearson	98.87	704	.061
Deviance	182.52	704	.000

The value of the Pearson chi-square statistics and Deviance chi-square statistics are being used to assess the goodness of fit of the model. The value of the Pearson chi-square test statistic was observed as 98.87 with the P-value as 0.061. The P-value is more than 5% level of significance indicating that the model summary is statistically insignificant and fits the data well. The following table 4.d indicates the model fitting information which can be used as well to assess the goodness of fit model.

Table 4.17 Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	586.870			
Final	.000	586.870	28	.000

Link function: Logit.

In Table 4.17, the second row labeled "Final" shows the significance of the regression coefficients in the model. The Chi-square test statistic is 586.870 with a significance value of 0.000. Since the p-value is less than the 5% significance level, this indicates that the final model is statistically significant and predicts the response variable better than the intercept-only model. Below is an explanation of the significance tests and the regression coefficients for each explanatory variable.

The regression coefficients represent the predicted change in the log odds of falling into a higher BMI category compared to a lower BMI category for a one-unit increase in the independent variable while holding other factors constant. The output in Annexure-A shows that for a one-unit increase in Q8, the log odds of females being in the obese category increase by 7.02 units compared to being in lower BMI categories. Similarly, for a one-unit increase in Q9, there is a predicted decrease in the log odds of females being in the obese BMI category compared to lower BMI categories. Females who consume fizzy drinks daily have higher predicted log odds of being in the obese BMI category than those who do not. Specifically, the log odds of being obese increase by 1.976 units for every unit increase in fizzy drink consumption. The table also shows that consuming beef once or twice a week is significant, as the p-value is less than 5%. Females who consume beef once or twice a week have lower log odds of being in the obese BMI category, with decreases of 6.54 units and 4.76 units, respectively, compared to those who consume beef more frequently. Additionally, females who consume fast food twice a week have a higher predicted probability of being in the obese BMI category with each unit increase in fast food consumption.

Females with normal sleep durations have a lower predicted probability of being in the obese BMI category. The table indicates that females with normal or fewer sleeping hours have lower log odds of being in the obese category

compared to those with longer sleep durations. For an increase in Q15, the log odds of females being in the obese BMI category increased by 2.371 units.

6. Discussion and Conclusion

Data on the obesity levels of female teachers working in schools was gathered from a sample of 334 married and unmarried women employed in various schools within the Peshawar district. The study aimed to examine key factors contributing to obesity, leveraging descriptive statistics such as tabulation, graphical presentations, and summary statistics. A chi-square test was employed to explore the relationship between obesity levels and several related factors in unmarried working females. This comprehensive analysis sought to shed light on the prevalence and distribution of obesity among the female teacher population in the district, while also evaluating the impact of socioeconomic, lifestyle, and dietary factors. The study revealed striking findings regarding the distribution of obesity levels. Out of the 334 participants, 16 women were classified as underweight, constituting only 4.8% of the sample. In contrast, 59 participants, or 17.7%, were found to have a normal BMI, which is considered to be within a healthy range. Interestingly, 94 women, representing 28.1%, fell into the overweight category, while the largest group of 165 participants, making up 49.4% of the sample, were categorized as obese. This prevalence of obesity highlights a critical concern regarding the health and well-being of female teachers in Peshawar, raising important questions about the potential underlying causes and lifestyle choices that contribute to such high obesity rates within this population. Further analysis examined the qualifications of the participating teachers. A sector diagram visualized the qualification levels, showing that the majority of the women (195) held a master's degree. This accounted for the largest sector of the diagram, reflecting the relatively high educational attainment of the sample. Another 73 participants held advanced degrees, either M.Phil. or Ph.D., indicating that a significant portion of these women had pursued higher education. A smaller group of 55 women had a bachelor's degree, while only 11 participants had qualifications below the bachelor's level. This data underscores that most female teachers in the district have a solid educational foundation, yet this does not seem to directly mitigate the obesity risk, suggesting that other factors play a more dominant role in influencing their BMI. A multiple bar chart was utilized to explore the relationship between marital status and family structure, specifically focusing on the joint family system. The analysis indicated that 20 single female teachers lived in joint families, while 79 married teachers were also part of joint family systems. Conversely, 63 single female teachers and 172 married ones did not live in joint families. This distinction could offer valuable insights into the social dynamics and potential stressors related to family life, which may contribute to obesity levels among these women. For instance, living in a joint family system may affect meal planning, dietary habits, and physical activity routines, which could ultimately influence BMI. In addition to family structure, the study analyzed salary distribution among the female teachers. It was found that 45 teachers earned less than 30,000 PKR per month, while 55 earned between 30,000 and 45,000 PKR. A further 70 teachers reported earning between 45,000 and 60,000 PKR, and the largest group, 154 women, earned more than 60,000 PKR per month. The variations in income levels could potentially influence access to healthier food options, engagement in physical activities, and overall lifestyle choices, which may contribute to differences in BMI within the population. Descriptive statistics were also computed for various physical characteristics of the female teachers. The average age of the participants was 36.7 years, with a standard deviation of 9.057 years, reflecting a wide range of ages. The average weight was found to be 70.01 kg, with a standard deviation of 13.218 kg, while the average height was measured at 5 feet 3 inches (standard deviation of 0.241 inches). The average BMI among the women was 27.325 units, indicating a general trend toward overweight and obesity, with a standard deviation of 5.2197 units. This snapshot of physical characteristics reinforces the need to address obesity as a public health concern among female schoolteachers in Peshawar. Several cross-tabulations were conducted to explore associations between BMI and various lifestyle and dietary habits. For instance, a cross-tabulation between BMI and vegetable consumption per week yielded a chi-square statistic of 15.88 with a p-value of 0.069, indicating no significant association between BMI and vegetable intake. However, a significant association was found between BMI and the consumption of bakery items, with a chi-square value of 14.504 and a p-value of 0.024. This result indicates that frequent consumption of bakery items is associated with higher BMI levels, potentially contributing to the rising obesity rates among female teachers. Other significant associations were discovered, such as the relationship between BMI and fast food consumption. The chi-square test revealed a highly significant result, with a p-value of 0.000, indicating that frequent consumption of fast food is strongly associated with higher BMI. Similarly, associations were found between BMI and sleeping hours (p-value 0.000), home lunch facilities (p-value 0.009), physical activity (p-value less than 0.05), and dinner time (p-value 0.000). These lifestyle factors appear to play a crucial role in determining BMI, and interventions aimed at improving dietary habits, sleep patterns, and physical activity levels may

help address the obesity issue. Ordinal logistic regression was employed to further analyze the impact of various factors on BMI. BMI was categorized into four groups: underweight, normal, overweight, and obese. Since BMI is an ordinal variable with a natural order, this method was appropriate for identifying key predictors. The analysis revealed that factors such as age, weight, consumption of fizzy drinks, beef consumption (once or twice a week), fast food consumption, normal sleep duration, and height had a significant impact on BMI. The chi-square value for the final model was 586.870, with a p-value of 0.000, indicating that the model was statistically significant and provided a better prediction of BMI compared to an intercept-only model. The study highlighted several key factors contributing to obesity among female schoolteachers in the Peshawar district. Significant associations were found between BMI and dietary habits, including the frequency of bakery items and fast food consumption, as well as lifestyle factors like sleep duration, lunch facilities, dinner time, physical activity, and fizzy drink consumption. However, no significant associations were observed with vegetable consumption or carbohydrate intake. Ordinal logistic regression confirmed that factors such as age, weight, fizzy drink consumption, beef intake, fast food consumption, sleep duration, and height significantly impacted the BMI of female teachers. These findings underscore the need for targeted interventions and health awareness programs to address obesity and promote healthier lifestyles among female teachers in the district.

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Appendix -A

Parameter Estimates

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	[BMI_OBES1 = 1.00]	-76.017	54.093	1.975	1	.160	-182.037	30.003
	[BMI_OBES1 = 2.00]	-54.951	53.198	1.067	1	.302	-159.218	49.316
	[BMI_OBES1 = 3.00]	-40.303	52.898	.581	1	.446	-143.981	63.374
Location	Q8	.702	.135	26.927	1	.000	.437	.967
	Q9	-15.620	3.714	17.693	1	.000	-22.899	-8.342
	Q2	.069	.055	1.577	1	.209	-.038	.176
	[Q7=1]	.825	.869	.903	1	.342	-.877	2.528
	[Q7=2]	0[a]	.	.	0	.	.	.
	[antidepressants=1]	.464	1.034	.201	1	.654	-1.563	2.491
	[antidepressants=2]	0[a]	.	.	0	.	.	.
	[fizzydrks=1]	-1.976	1.014	3.798	1	.051	-3.964	.011
	[fizzydrks=2]	0[a]	.	.	0	.	.	.
	[beef=1]	-6.542	2.762	5.611	1	.018	-11.956	-1.129
	[beef=2]	-4.763	2.014	5.596	1	.018	-8.710	-.817
	[beef=3]	-1.554	.893	3.031	1	.082	-3.304	.195
	[beef=4]	0[a]	.	.	0	.	.	.
	[fastfood=1.00]	-3.145	2.163	2.114	1	.146	-7.385	1.095
	[fastfood=2.00]	-4.110	1.798	5.226	1	.022	-7.634	-.586
	[fastfood=3.00]	-1.501	1.008	2.216	1	.137	-3.477	.475
	[fastfood=4.00]	0[a]	.	.	0	.	.	.
	[sleepinghrs=1.00]	-19.490	9.233	4.456	1	.035	-37.587	-1.393
	[sleepinghrs=2.00]	-18.769	9.132	4.224	1	.040	-36.667	-.870
	[sleepinghrs=3.00]	-17.883	9.059	3.897	1	.048	-35.638	-.127
	[sleepinghrs=4.00]	0[a]	.	.	0	.	.	.
	[Q27=1]	-4.257	2.881	2.183	1	.140	-9.905	1.390
	[Q27=2]	0[a]	.	.	0	.	.	.
	[Q18=1]	-1.738	3.023	.331	1	.565	-7.662	4.186
	[Q18=2]	-1.213	2.951	.169	1	.681	-6.997	4.571
	[Q18=3]	-2.002	3.029	.437	1	.509	-7.938	3.934
	[Q18=4]	0[a]	.	.	0	.	.	.
	[Q17=1]	3.962	50.640	.006	1	.938	-95.291	103.214
	[Q17=2]	4.285	50.633	.007	1	.933	-94.953	103.524
	[Q17=3]	2.844	50.634	.003	1	.955	-96.397	102.085
	[Q17=4]	0[a]	.	.	0	.	.	.
	[Q16=1]	.773	2.970	.068	1	.795	-5.048	6.594
	[Q16=2]	.996	2.946	.114	1	.735	-4.778	6.771
	[Q16=3]	1.369	3.010	.207	1	.649	-4.530	7.267
	[Q16=4]	0[a]	.	.	0	.	.	.
	[Q15=1]	2.531	1.716	2.174	1	.140	-.833	5.895
	[Q15=2]	2.371	1.309	3.282	1	.070	-.194	4.936
	[Q15=3]	1.447	1.286	1.265	1	.261	-1.074	3.968
	[Q15=4]	0[a]	.	.	0	.	.	.

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Link function: Logit.
a. This parameter is set to zero because it is redundant.
ss