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PREVALENCE OF OVERWEIGHT AND OBESITY AMONG UNDER GRADUATE STUDENTS: A CROSS SECTIONAL ANALYSIS

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Abstract: **The study aims to investigate the prevalence of obesity and overweight among undergraduate students in relation to different socio-demographic factors, physical activity, food habit and perception about fast food. A cross-sectional study was conducted among 103 under graduate students. Of them 64 were males (62.1%) and 39 were females (37.9%) from age 18 to 24 years. Data were collected using Convenience sampling method. Data on several socio-demographic factors (including gender, age, and others) were obtained by the means of semi-structured questionnaire. Body Mass Index (BMI) was calculated to find overweight and obesity.14.6% of the sample population were overweight and 3.9% were obese. The average BMI for male was 22.52±3.96 and for female it was 20.88±2.72. The value is significantly different by gender (p=0.024). Further the BMI has significant difference by physical activities (inactive, moderate and active) (p=0.000). Factor analysis was done for Likert scale questionnaire. Kaiser-Meyer-Olkin Measure of Sampling Adequacy was 0.715>0.5 and Bartlett's Test of Sphericity (p<0.05) showed the validity of Likert scale questionnaire. Correlation matrix showed that there exists no multicollinearity. Omnibus test of model coefficient and Hosmer and Lemeshow test showed good fit of model for binary logistic regression for obesity as dependent variable with weight and physical activity as independent variables. The odd ratio for weight was 1.219 with CI (1.098, 1.361) and odd ratio for physical activity was 0.164.This findings highlight the importance of promoting and encouraging physical exercise as a component of BMI maintenance strategies.**

Keywords: **Body Mass Index (BMI), Fast Food, Prevalence, Students**

I. INTRODUCTION:

The issue of overweight and obesity is rapidly escalating and posing a significant health concern in contemporary times. Obesity is a complex condition influenced by various factors and has profound physical and mental health implications (Maślak et al., 2020). Overweight and obesity are defined by the World Health Organization (WHO) as the abnormal or excessive accumulation of fat that offers a health risk(WHO, 2024)

The main metric used to assess obesity and overweight is body mass index (BMI). Adults' BMI, also referred to as the Quetelet index, is a measurement that shows how well-nourished they are. It is determined by dividing a person's weight in kilograms by the square of their height in meters (kg/m^2). In England, the National Health Service (NHS) considers a BMI over 25 as overweight and over 30 as obese, while below 18.5 is classified as underweight, and between 18.5 and 25 (inclusive) is considered normal or healthy weight (NHS, 2019).

Individual-specific traits as well as societal socioeconomic and environmental factors might have an impact on one's weight and general health.

The body and its obesity is defined through the science basis. It is defined as 'body is identified and measured according to the scientific norm (Dhungana, 2023).' It presents that body possesses constructionist idea in the society.The household environment in which individuals reside has a more significant impact on health outcomes than individual factors(Amarasinghe & D'Souza, 2012).

Obesity, preventable yet widespread health condition, has emerged as a global epidemic, affecting public health on multiple levels (Safaei et al., 2021). Existing literature suggests that only a few studies have been carried out on the prevalence of obesity among young students. Hence, this study aims to determine the prevalence of overweight and obesity in a young population while examining various demographic factors, dietary habits, and physical activities. Implementing multilevel interventions is essential to address this problem effectively and prevent the escalating adverse consequences of overweight and obesity (Stein & Colditz, 2004).

II. MATERIALS AND METHODS

The study was conducted among 103 undergraduate students from engineering colleges in Kathmandu Valley. In order to collect data, a convenient sampling technique was used. A

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semi-structured questionnaire was designed and sent to the respondents through mail. Data related to different socio-demographic variables (gender, age and others) were obtained. Also, the height and weight of students were taken in feet and kg respectively. Respondents who were unable to provide exact height and weight were measured in college clinics to obtain required data. In order to know the perception about obesity and other factors, different likert scale questions were asked to respondents from lower scale to higher scale in a order of strongly disagree to strongly agree. BMI was calculated using Quatelet's Scale (Brewer & Kubn, 2010). The data were collected in Oct/Nov 2023. Data were collected, tabulated, presented, analyzed and interpreted using suitable statistical methods. Data analysis was done using the Statistical software Statistical Package for Social Science Version 25. Some analysis was done using Microsoft Office Excel 2010 as well.

Under descriptive statistics, percentage, frequency, median, mean, standard deviation related to demographic variables were obtained. Under inferential statistics, parametric hypothesis tests such as t-test, ANOVA or F test and non parametric Chi-square test was done to know the relationship or association between different variables. Correlation matrix is analyzed to test the multicollinearity among variables (Brewer & Kubn, 2010). To evaluate the reliability of the likert questions, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and the Bartlett's Test of Sphericity were used. Binary logistic regression was performed to find the odd ratio of different explanatory variables effect on dependent variable.

III. RESULTS AND DISCUSSIONS:

This study was conducted among 103 students aged 18 to 24 to investigate the prevalence of overweight and obesity. The sample consisted of 64 male (62.1%) and 39 female students (37.9%). The students' average weight was measured to be 60.24 kg, ranging from a minimum of 36 kg to a maximum of 88 kg. Similarly, the average height was found to be 165.54±9.51 cm, with a range of 139.70 cm to 187.96 cm.

The Quatelet's Scale was used to determine Body Mass Index (BMI), which is computed by dividing weight (in kg) by the square of height (in meters). The average BMI for the students was found to be 21.90±3.61 kg, with a range of 14.24 kg to 33.74 kg. The median BMI of 21.20 indicates that 50% of the students have a BMI lower than 21.20, while the other 50% have a BMI higher than 21.20.

According to the National Health Service (NHS) guidelines, 15 students (14.6%) were classified as overweight, while four students (3.9%) were classified as obese. Additionally, 17 students (16.5%) were categorized as underweight, and 67 students (63.1%) were classified as having a normal or healthy weight.

Further analysis of the data revealed that the average BMI for male students was 22.52±3.96, while the average BMI for female students was 20.88±2.72.

To assess the association between height and weight, the researcher calculated the correlation coefficient (r), which was found to be 0.532, revealed a moderate positive association between students' weight and height. This result supports the common understanding that taller people often weigh more than shorter persons. Additionally, the coefficient of determination, which quantifies the proportion of the variation in weight explained by height, was determined to be 0.283. This suggests that height accounts for about 28.3% of the difference in weight, with other factors accounting for remaining 71.7%.

Furthermore, the study investigated the students' perception of fast food. The survey results showed that the majority of students (46.6%) preferred MOMO as their favorite fast food, followed by Chowmin and other options, as depicted in Figure 1.

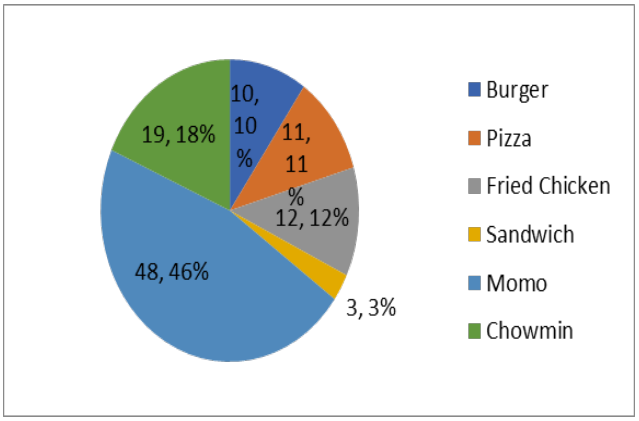

Figure 1: Student Preferred Fast Food Item (Source: Questionnaire Survey).

The survey findings revealed that 49.51% respondents believed that fast food is unhealthy, whereas only 4.85% respondents held the opinion that fast food is not unhealthy. Interestingly, the survey findings also highlighted that a substantial number of respondents, specifically 45.64% individuals, were either unsure or unaware of whether fast food is healthy or unhealthy. This indicates that significant portion of the participants was unaware or confused regarding the health implications of consuming fast food. It is crucial to understand that the lack of clarity among the respondents may be brought on by a number of issues, such as limited access to reliable information, conflicting media messages, or a general lack of interest or concern regarding the effects of fast food on health.

The survey also aimed to identify the reasons why students consume fast food. The results indicated that over 50% of the students consumed fast food primarily for its taste. Figure 2 presents the percentages associated with other reasons for consuming fast food.

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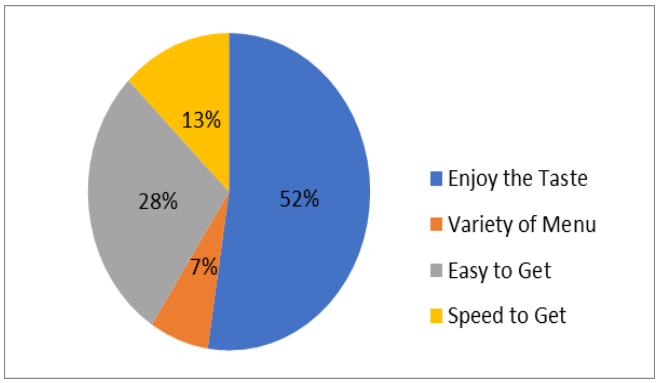

Figure 2: Reason for consuming fast food (Source: Questionnaire Survey).

According to below mentioned Table 1, the respondents strongly agreed that fast food offers a variety of options. They also agreed that consumption of fast food can lead to obesity. However, their response was neutral regarding the statement that fast food is expensive.

Table 1.

Response of Students on Likert Scale Questions:	**Mean**	**S.D**
Fast food consumption result in the obesity.	3.86	0.919
Fast food is expensive.	3.17	0.971
Fast food offers a variety	4.21	0.709

An independent sample t-test was conducted to determine the significance of BMI with respect to gender. The p-value of 0.024 shows a significant difference in BMI between genders. The fact that there is a significant difference in BMI between the genders is in line with earlier study in this field (Atikovic et al., 2014). Males and females typically have varied physical compositions, including differing distributions of fat and muscular mass. The disparities in BMI across genders can be attributed to these biological factors (Ben Mansour et al., 2021).

Additionally, the study looked at how college students' BMI and eating patterns (vegetarian or not) related to one another. An Independent sample t test result ($p=0.118<0.05$) implies that the BMI is not directly impacted by the study participants' choice of a vegetarian or non-vegetarian diet. Other elements, such food quality, portion sizes, and general dietary patterns, might have a bigger impact on under graduate students' weight status (Vadera et al., 2010).

Figure 3 illustrates the distribution of respondents by gender across different physical activity categories: Inactive, Moderate, and Active. Out of the total 103 respondents, 54(52.43%) engaged in moderate physical activity, 28(27.18%) were inactive, and 21(20.39%) were classified as active.

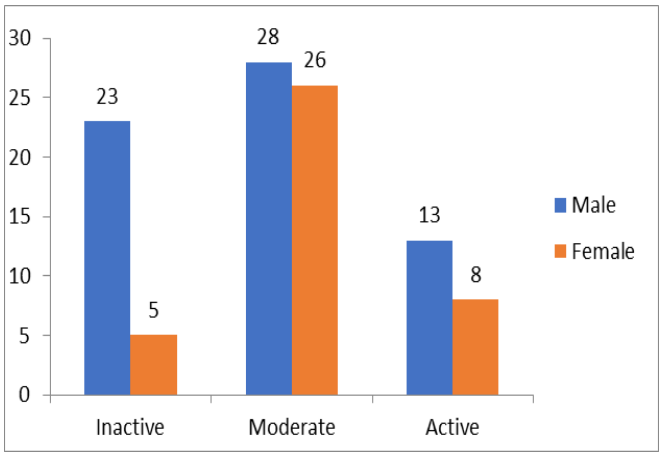

Figure 3: Distribution of respondents by gender and physical activity categories (Source: Questionnaire Survey).

The study conducted a One-way ANOVA or F test to determine if there was a significant difference in BMI based on different categories of physical activities. The p-value (0.00) was below the significance level (0.05), indicating that there is a significant difference in BMI between the various levels of physical activities. These findings are consistent with earlier studies showing a significant correlation between physical activity and BMI (Cox, 2017; Hong et al., 2016). These results add to the growing body of evidence about how physical activities affects BMI and demonstrate the value of supporting and encouraging physical activity as part of BMI maintenance measures.

Questionnaires assessing respondents' perception of fast food were analyzed using a Likert scale. The correlation matrix (Table 2) indicated that there is no multicollinearity, as the independent variables were not highly correlated. Factor analysis was conducted on the Likert scale questionnaire. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (0.715) exceeded the recommended threshold of 0.5, indicating that there is enough variation in the data to perform factor analysis. Bartlett's Test of Sphericity also supported this finding, as the obtained p-value was less than 0.05. Two components were extracted, with eigen values of 2.310 and 1.060, respectively (Table 3). The first component explained 38.408% of the observed variation, while the second component explained 17.768%. Together, these two components accounted for 56.177% of the total variation.

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Table 2: Correlation Matrix

	Adult preferring fast Food	Fast food influenced by advertisement	Fast food consumption result in the obesity.	Fast food is expensive.	Fast food trend will increase	Fast food offers a variety
Adult preferring fast Food		0.017	0.054	0.412	0	0.169
Fast food influenced by advertisement	0.017		0	0.291	0	0.036
Fast food consumption result in the obesity.	0.054	0		0.303	0	0.087
Fast food is expensive.	0.412	0.291	0.303		0.2	0.266
Fast food trend will increase	0	0	0	0.2		0.131
Fast food offers a variety	0.169	0.036	0.087	0.266	0.131	

Table 3. Total Variance Explained

Component	Initial Eigen Values			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.31	38.506	38.506	2.305	38.408	38.408
2	1.06	17.671	56.177	1.066	17.768	56.177
3	0.897	14.95	71.127			
4	0.886	14.765	85.892			
5	0.464	7.732	93.624			
6	0.383	6.376	100			

Extraction Method : Principal Component Analysis

A binary logistic regression was conducted to predict obesity as the dependent variable. Respondents with a BMI above 25 were coded as 1 (indicating obesity), while those with a BMI of 25 or below were coded as 0 (indicating no obesity). The independent variables considered for prediction were weight and physical activity.

The Omnibus test was used to evaluate the logistic regression model's goodness of fit., which revealed a significant improvement (p value = 0<0.05) in fit compared to the null model. This indicates that the model effectively describes the data after including the independent variables.

The fitting of the model was further evaluated using the Hosmer and Lemeshow test. The obtained p-value for the Hosmer and Lemeshow test (p=0.312 > 0.05) suggests that the model adequately fits the data. This implies that there is no significant difference between the observed and predicted outcomes based on the model. In other words, the model accurately predicts the presence or absence of obesity. A significant value below 0.05 would indicate a poor fit; however, in this case, the model fits well, as indicated by the p-value exceeding 0.05.

The adjusted version of Cox and Snell R^2, also known as Nagelkerke R^2, is 0.654. This indicates that approximately 65.4% of the variance in the criterion variable can be attributed to the predictor variables included in the model.

The classification table demonstrated that the model correctly classified 92.2% of the cases overall. (Table 4)

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Table 4: Classification Table for Binary Logistic

Observed		**Predicted Binary logistic**		**Percentage Correct**
		No Obesity	**Obesity**	
Binary Logistic	No Obesity	81	3	96.4
	Obesity	5	14	73.7
Overall Percentage				92.2

Table 5 indicates that obesity is significantly associated with weight and physical activity.

Table 5: Binary logistic regression model

	B	S.E	Wald	d.f	sig.	Exp(B)
Physical activity	-1.808	0.696	6.755	1	0.009	0.164
Weight	0.198	0.051	14.845	1	0	1.219
Constant	-11.633	3.578	10.569	1	0.001	0

The odds ratio for weight is 1.219, with a 95% confidence interval of (1.098, 1.361). This implies that individuals with higher weight are approximately 1.219 times more likely to be obese compared to those with lower weight.
Furthermore, the odds ratio for physical activity is 0.164, suggesting that respondents with active physical activity are approximately 0.164 times less likely to be obese. The statistical analysis, relatively high sample size, and inclusion of both weight and physical activity as independent factors are strengths of this study. However, few limitations should be acknowledged. Self-reported measures of weight, physical activity, and obesity were used in the study, which are prone to recall and reporting biases. Also the study did not account for any additional potential confounding variables, such as socioeconomic status or genetic features that may have an impact on the relationship between weight, physical activity, and obesity.
The findings suggest that higher weight and less physical exercise independently correlate with higher odds of obesity .This result is in line with past research (Shrestha, 2019). The implications of these findings for public health programs aiming at managing and preventing obesity are important. Further study is required to examine additional potential weight-influencing factors and to create focused interventions aimed at promoting healthy weight management at this population

IV. CONCLUSION:

The survey revealed how common overweight and obesity are among college students. 14.6% of the students were overweight and 3.9% were obese. For young students, the coefficient of determination R^2 revealed that height only accounted for 28.3% of the variation in weight. The study discovered that there is a considerable difference in BMI according to gender. The results show that probabilities of obesity are independently correlated with higher weight and less physical activity. The restrictions of this study must be taken into account. Due to the findings reliance on sample of undergraduate college students, there may be less room for generalization to other demographics. Future research could benefit from using objective measures and incorporating a bigger, more diverse sample.

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