Journal of Mathematics and Computing Science, ** (*): **-**, 202*

eISSN: 0128-0767

Determinants of Overweight and Obesity Among University Students: A Logistic Regression Analysis of Knowledge, Lifestyle, and Psychological Factors

Nur Niswah Naslina Azid @ Maarof [1]*, Siti Zakiah Hanim Mohd Aminuddin[2], Siti Nurani Zulkifli [3], Norafefah Mohamad Sobri[4], Nor Azima Ismail[5], and Wan Faizah Wan Yaacob[6]

[1,2.3.4.5,6]Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA Kelantan, Bukit Ilmu, Machang, Kelantan, Malaysia
Authors' email: niswah@uitm.edu.my*, ctzakiah.aminuddin@gmail.com, nurani08@uitm.edu.my, noraf378@uitm.edu.my, norazima@uitm.edu.my, and wfaizah98@uitm.edu.my

*Corresponding author

Received **; Received in revised **; Accepted ***
Available online ***
DOI: https://doi.org/10.24191/jmcs.*******

Abstract: Overweight and obesity remain escalating public health concerns in Malaysia, with young adults representing a critical population for early intervention. This study examined the association between health-related knowledge, lifestyle behaviors, and psychological factors with body mass index (BMI) status among university students. A cross-sectional survey was conducted among 316 students from two faculties at Universiti Teknologi MARA (UiTM) Kota Bharu using validated questionnaires. BMI was classified according to WHO criteria, and multivariable logistic regression was used to identify factors associated with overweight and obesity. The prevalence of overweight and obesity was 23.4% and 11.4%, respectively. Higher lifestyle risk scores were associated with increased odds of being overweight or obese (adjusted OR = 1.337, 95% CI 1.131–1.582), whereas greater health knowledge was associated with lower odds (adjusted OR = 0.759, 95% CI 0.623–0.926). Psychological factors were not significantly associated with BMI status after adjustment. These findings suggest that modifiable knowledge and lifestyle-related behaviors are important correlates of BMI among university students and may serve as priority targets for campus-based health promotion initiatives.

Keywords: Body mass index (BMI), Health knowledge, Lifestyle behaviors, Overweight and obesity, Psychological determinants, University students

1 Introduction

Obesity is a global public health concern, defined by the World Health Organization (WHO) as an abnormal or excessive accumulation of body fat that poses significant health risks. It is associated with cardiovascular diseases, type 2 diabetes, hypertension, dyslipidaemia, osteoarthritis, stroke, and various cancers (Scully et al., 2021). BMI is commonly used to classify weight status, with values of 25.0–29.9 kg/m² considered overweight and ≥30 kg/m² classified as obese (WHO, 2022). Globally, more than one billion individuals are affected, including 650 million adults, and the prevalence has nearly tripled since 1975, with up to 40% of adults projected to be overweight or obese by 2030 (WHO, 2022). In Malaysia, the prevalence of overweight and obesity has continued to rise, increasing from 50.1% in 2019 to 54.4% in 2023 (Chong et al., 2023; Ministry of Health Malaysia, 2023). Among university students, overweight rates range from 14.3% to 21.2% and obesity rates from 10.1% to 16.3% (Pitil & Ghazali, 2022; Radzi et al., 2019).

The transition to university life often involves major lifestyle changes, increased independence, academic pressure, and psychological stress, all of which may contribute to unhealthy weight-related behaviours. University students are particularly vulnerable to changes in dietary habits, reduced physical activity, irregular sleep, and emotional eating, making them an important population to study in relation to BMI and its determinants.

The selection of knowledge, lifestyle, and psychological factors as determinants is grounded in empirical evidence. Nutritional knowledge influences food choices, portion control, and weight-related behaviors (Yahia et al., 2016). Lifestyle behaviors that including dietary habits, physical inactivity, sedentary time, and sleep patterns are consistently associated with BMI among young adults (Pengpid & Peltzer, 2015). Psychological factors such as stress, anxiety, and emotional eating have also been identified as strong predictors of weight gain in university populations (Jang et al., 2020; Choi, 2020). Furthermore, unhealthy dietary patterns, stress, and social media use are consistently associated with higher BMI among university students (Caso et al., 2020).

Despite growing evidence, existing studies in Malaysia often examine these predictors in isolation, rely on simple correlations, or include limited sample diversity. As a result, there is a lack of multivariable analyses exploring how knowledge, lifestyle, and psychological factors collectively predict BMI among Malaysian university students. Moreover, findings remain inconsistent regarding whether knowledge or lifestyle behaviors exert a stronger influence on BMI (Pengpid & Peltzer, 2015). These gaps highlight the need for further research using more robust analytical approaches.

Therefore, this study aims to address these gaps by examining the relationships between knowledge, lifestyle, and psychological factors and BMI using multivariable analysis. Specifically, the study seeks to determine the extent to which these predictors collectively explain variations in BMI and to assess whether BMI differs across faculties within the university.

2 Literature Review

A Review on Obesity among University Students Globally

Obesity among university students is a growing public health concern worldwide, with prevalence and contributing factors varying by region. In the Western Balkans, medical students exhibited high rates of overweight and obesity, primarily attributed to sedentary lifestyles, academic stress, and poor dietary habits (Ilić et al., 2024). In Indonesia, stress, emotional eating, and lack of physical activity were identified as major contributors to obesity among adolescents and young adults, including university students (Agustina et al., 2021). Similar trends were reported in the Middle East, where Syrian students consuming diets high in carbohydrates, fats, and meat demonstrated elevated obesity risk influenced by socio-demographic and psychological factors (Alolabi et al., 2022). Nutritional knowledge also plays a crucial role; even healthcare students in Saudi Arabia displayed gaps in awareness of healthy eating, potentially contributing to obesity prevalence (Bawazir et al., 2022). Collectively, these findings indicate that obesity in university populations is multifactorial, influenced by lifestyle behaviors, psychological factors, and knowledge deficits.

B Review on Obesity among University Students in Malaysia

In Malaysia, obesity among university students has emerged as a significant public health issue. Studies have reported prevalence rates ranging from 24% to 40% across different universities. Key contributing factors include sedentary behavior, unhealthy dietary patterns, and limited physical activity (Shamsudin et al., 2019; Ahmad et al., 2023; Azhan et al., 2024; Pitil & Ghazali, 2022). For instance, Radzi et al. (2019) identified dietary habits, physical inactivity, and psychological stress as primary risk factors, with stress correlating strongly with emotional eating and elevated BMI. These studies collectively highlight the urgent need for interventions that promote nutrition education, active lifestyles, and mental health support among Malaysian university students.

C Review on Obesity Factors among University Students

i. Knowledge

Knowledge about obesity is a critical determinant of health behavior. Studies show that while many students recognize obesity as a disease, there is a gap between awareness and practice. Higher levels of nutritional knowledge are associated with healthier eating and lower BMI, whereas insufficient awareness contributes to poor dietary choices and sedentary behavior (Xue et al., 2021; Bawazir et al., 2022; Haq et al., 2018; Reethesh et al., 2019). Educational interventions targeting knowledge improvement are therefore essential to empower students to prevent obesity.

ii. Lifestyle

Lifestyle behaviors, particularly dietary habits and physical activity, strongly influence obesity risk. University students commonly consume high-calorie, energy-dense foods such as fast food and sugary drinks, skip meals, and maintain irregular eating schedules (Varma et al., 2024; Pitil & Ghazali, 2022; Rusli & Harith, 2020). Sedentary behaviors, including prolonged screen time, exacerbate the risk of obesity, while stress and emotional eating further reinforce unhealthy eating patterns (Radzi et al., 2019; Xue et al., 2021; Mansoury, 2024). Promoting balanced diets and active lifestyles is critical for obesity prevention in university populations.

iii. Psychological Factors

Psychological factors, including stress, anxiety, depression, and body image dissatisfaction, contribute significantly to obesity among university students. Academic pressures often lead to emotional eating, late-night snacking, and preference for high-calorie foods (Agustina et al., 2021; Joma et al., 2024; Radzi et al., 2019). Emotional eating, used as a coping mechanism, is driven by negative emotions and can result in overconsumption of nutrient-poor foods (Jividen, 2024; Constant et al., 2023). These findings underscore the importance of addressing mental health alongside dietary and lifestyle interventions to mitigate obesity risk in university settings.

3 Methodology

A Research Design

This study employed a quantitative cross-sectional research design to examine the relationship between knowledge, lifestyle, and psychological factors with Body Mass Index (BMI) levels among university students at UiTM Kota Bharu. Ethical clearance was granted by the UiTM Research Ethics Committee (Ref. No: BERC/MR/UG/2025/027). Primary data were collected using a self-administered online questionnaire developed via Google Forms and distributed through WhatsApp, ensuring convenient access and efficient data collection from participants. This approach allowed the researcher to gather reliable and accurate responses directly from the target population.

B Population and Sampling

The target population comprised 1,120 full-time undergraduate students from two faculties: the Faculty of Business Management (831 students) and the Faculty of Computer and Mathematical Sciences (289 students). The sample size was determined using the Raosoft calculator, yielding a total of 316

respondents after accounting for a 10% buffer to address potential non-responses. A proportionate stratified random sampling technique was applied to ensure representation from both faculties. Prior to the main survey, a pilot study involving 30 students was conducted to test and refine the research instrument for clarity, validity, and reliability.

C Data Collection Instrument

The research instrument consisted of four main sections: demographic information, knowledge, lifestyle, and psychological factors. Knowledge, lifestyle, and psychological constructs were measured using a 10-point Likert scale, with items adapted from validated instruments in previous studies. BMI was computed based on participants' self-reported height and weight, and categorized into two groups—Underweight and Normal (UWN) and Overweight and Obese (OWOB)—to align with established health classifications and to enhance statistical reliability.

D Data Analysis

All analyses were performed using SPSS. Data were first cleaned to remove outliers identified through Tukey's method and Cook's Distance. Reliability of the scales was tested using Cronbach's alpha, with values above 0.70 considered acceptable.

Descriptive statistics (frequency and percentage) were used to describe demographic profiles and BMI distribution. The chi-square test was applied to examine the relationship between faculty and BMI level. Finally, binary logistic regression was conducted to identify the significant predictors of BMI (UWN = 0; OWOB = 1) based on knowledge, lifestyle, and psychological factors.

Model adequacy was assessed using the Omnibus Test, Hosmer-Lemeshow Goodness-of-Fit Test, and Cox & Snell and Nagelkerke R^2 statistics. These tests evaluated the significance, fit, and explanatory power of the logistic regression model.

4 Findings

A Reliability Analysis

The reliability of the questionnaire was assessed through a pilot study involving 30 participants. As shown in Table 1, the Cronbach's Alpha values for all three variables—knowledge on BMI, lifestyle, and psychological factors—were above 0.7 in both the pilot and actual studies. This indicates that all variables demonstrated acceptable internal consistency and the instrument was considered reliable for data collection.

Table 1: Cronbach's Alpha for Pilot and Actual Study

Variable	Number of Item	Cronbach's Alpha for Pilot Study	Cronbach's Alpha for Actual Study
Knowledge	5	0.799	0.798
Lifestyle	5	0.928	0.809
Psychological	5	0.916	0.798

B Demographics of Respondents

Table 2 presents the demographic profile of the respondents. The majority of participants were female (52.2%), while males comprised 47.8%. Most respondents were aged between 22 and 25 years (73.7%), with the smallest group being students aged 26 and above. In terms of academic programs, the largest

group came from the Bachelor of Science (Hons.) Statistics (CDCS241/CS241) program with 185 students (58.5%), followed by the Bachelor of Business Administration (Hons.) Marketing (BA240) program with 39 students (12.3%). The smallest group consisted of 9 students (4.3%) enrolled in the Bachelor of Science (Hons.) Statistics and Bachelor of Entrepreneurship (Logistics and Distributive Trade) (CS291) program. Semester-wise, most respondents were in Semester 6 (35.1%), while only 5.1% were in Semester 2. Faculty-wise, 61.4% of respondents were from the Faculty of Computer and Mathematical Sciences (FSKM), and 38.6% were from the Faculty of Business Management (FPP).

The higher proportion of FSKM respondents was influenced by the researcher's accessibility and established trust within the faculty, which enhanced participation rates. This distribution was intentional, allowing for a more focused exploration of FSKM students' specific lifestyle and health challenges, such as sedentary behavior, irregular eating patterns, and academic stress linked to technical coursework. Although the sample was not perfectly balanced between faculties, appropriate statistical techniques were applied to ensure valid comparisons. These findings provide valuable insights for developing faculty-specific health interventions, such as encouraging movement breaks for FSKM students and promoting healthier food options during events for FPP students.

Table 2: Summary of Descriptive Analysis

Variable	Class Variable	Frequency (n)	Percentage (%)
Gender	Male	151	47.8
	Female	165	52.2
Age	18-21 years old	82	25.9
	22-25 years old	233	73.7
	26 years old and above	1	0.3
Course	BA240 / BA270	39	12.3
	BA242 / BA272	30	9.5
	BA249 / BA279	30	9.5
	BA250 / BA280	23	7.3
	CS241 / CDCS241	185	58.5
	CS291 / CDCS291	9	2.8
Faculty	Faculty of Business Management	122	38.6
	Faculty of Computer and Mathematical Sciences	194	61.4
Semester	Semester 2	16	5.1
	Semester 3	52	16.5
	Semester 4	61	19.3
	Semester 5	46	14.6
	Semester 6	111	35.1
	Semester 7 and above	30	9.5

C Chi-Square Test

Table 3 indicates a notable difference in BMI distribution between faculties, with 42.6% of Faculty of Business Management (FPP) students classified as overweight or obese (OWOB), compared to only 29.9% of Faculty of Computer and Mathematical Sciences (FSKM) students. This suggests that FPP students have a higher prevalence of weight-related issues than their FSKM counterparts.

Several factors may contribute to this trend among FPP students. The nature of business programs often involves frequent networking events, club activities, and social gatherings where high-calorie foods and snacks are commonly served, leading to greater caloric intake. Additionally, the demanding and irregular schedules of business students may result in poor eating habits, such as skipping meals or consuming unhealthy foods, further contributing to higher OWOB rates.

Table 3: Crosstabulation Faculty * BMI

Faculty	BMI Level	Total

	UWN	OWOB	
Faculty of Business Management	70.1%	29.9%	100%
	136	58	194
Faculty of Computer and Mathematical Sciences	57.4%	42.6%	100%
	70	52	122
Total	65.2%	34.8%	100%
	206	110	316

Table 4 shows a p-value of 0.021, which is below the 0.05 significance level. This result indicates a statistically significant relationship between faculty and students' BMI, suggesting that a student's faculty affiliation may influence their BMI levels.

Table 4: Chi-Square Test

	Value	Sig.
Pearson Chi-Square	5.345	0.021
Likelihood Ratio	5.301	0.021

D Logistic Regression

Logistic regression analysis was conducted to identify factors influencing the relationship between the independent and dependent variables. A stepwise backward method was used to reduce the number of predictors by removing the least significant ones. The analysis began with a full model and eliminated variables one by one until the optimal model was obtained. The variable psychological was removed, while knowledge and lifestyle remained significant. Table 5 presents the significant variables that influence university students' BMI levels.

Table 5: Variable in the Equation

Variable	Coefficient, B	Sig.	Odds Ratio, e^B
Knowledge	- 0.275	0.006	0.759
Lifestyle	0.291	< 0.001	1.337
Constant	- 0.820	0.002	0.440

The results indicated that knowledge and lifestyle were significant factors influencing overweight and obesity (OWOB) among university students ($p < 0.05$). Students with better knowledge were 0.759 times less likely to have OWOB, while those with unhealthy lifestyles were 1.337 times more likely to have OWOB.

Probability (p);

$$p = \frac{e^B}{1 - e^B} \quad (1)$$

Where;

p = probability of a university student having OWOB

B = coefficient

The final logistic regression equation predicting the probability of a university student having OWOB was:

$$log\left(\frac{p}{1-p}\right) = -0.820 - 0.275\ Knowledge + 0.291\ Lifestyles \quad (2)$$

Table 6: Final Model

Variable	Coefficient, B	Odds Ratio, e^B	$e^B - 1$	% Change
Knowledge	- 0.275	0.759	-0.241	-24.1%
Lifestyle	0.291	1.337	0.337	33.7%

The negative coefficient for knowledge ($\beta = -0.275$) indicates an inverse association between knowledge and the likelihood of being overweight or obese (OWOB). Specifically, a one-unit increase in knowledge is associated with a 24.1% reduction in the odds of OWOB. This suggests that higher levels of knowledge are linked to a lower risk of overweight and obesity among university students. Conversely, the positive coefficient for lifestyle ($\beta = 0.291$) demonstrates a direct association between lifestyle and OWOB. A one-unit increase in lifestyle risk (reflecting less healthy lifestyle behaviors) corresponds to a 33.7% increase in the odds of OWOB. These findings imply that while greater knowledge contributes to lowering the risk of OWOB, unhealthy lifestyle practices substantially elevate that risk among university students.

As shown in Table 7, the p-value of the final model is 0.002, which is below the significance level of 0.05. Therefore, the model can be considered statistically significant.

Table 7: Stepwise Backward Omnibus Test Analysis

	Chi-square	df	Sig.
Model	12.117	2	0.002

As presented in Table 8, the p-value of the final model is 0.624, which exceeds the 0.05 significance level. This suggests that the logistic regression model provides a good fit to the data.

Table 8: Stepwise Backward Hosmer and Lemeshow Test Analysis

	Chi-square	df	Sig.
Model	6.211	8	0.624

According to Table 9, the Cox & Snell and Nagelkerke R Square values indicate that knowledge and lifestyle factors account for approximately 3.8% to 5.2% of the variability in BMI levels.

Table 9: Stepwise Backward Cox & Snell and Nagelkerke R Square Analysis

Cox & Snell	Nagelkerke R Square
0.038	0.052

Based on the results presented in the Classification Table, the model's performance measures were computed as follows:

Sensitivity = 17 / (17 + 93) × 100 = 15.45%,
Specificity = 188 / (188 + 18) × 100 = 91.26%, and
Overall Accuracy = (188 + 17) / (188 + 18 + 93 + 17) × 100 = 64.87%.

According to Table 10 , the model's sensitivity was 15.45%, reflecting limited ability to identify overweight or obese (OWOB) students. However, its specificity of 91.26% suggests strong performance in correctly classifying students with underweight or normal weight (UWN).

Table 10: Stepwise Backward Classification Analysis

Observed		Predicted		
		Category of BMI Level		Percentage Correct
		UWN (0)	OWOB (1)	
Category of BMI Level	UWN (0)	188	18	91.3
	OWOB (1)	93	17	15.5
Overall Percentage				64.9

Table 11 presents the results of the stepwise backward logistic regression analysis predicting the likelihood of being overweight or obese (OWOB) among UiTM Kota Bharu students. The analysis revealed that knowledge was a significant negative predictor of OWOB (p = 0.006, OR = 0.759), indicating that higher knowledge levels were associated with 24.1% lower odds of reporting OWOB status. In contrast, lifestyle showed a highly significant positive association with OWOB (p < 0.001, OR = 1.337), suggesting that certain lifestyle factors increased the odds of being OWOB by 33.7%.

Table 11: Stepwise Backward Logistic Regression Results for Predictors of having OWOB

Variable	Odds Ratio, e^B	95% CI[a]	Wald (df)	p-value
Knowledge	0.759	0.623,0.926	7.412(1)	0.006
Lifestyle	1.337	1.131,1.582	11.559(1)	<0.001

5 Conclusion

This study investigated the factors influencing Body Mass Index (BMI) levels among university students at UiTM Kota Bharu, Kelantan, focusing on the roles of knowledge, lifestyle, and psychological factors. The results showed that 65.2% of students were classified as underweight or normal weight (UWN), while 34.8% were overweight or obese (OWOB). This suggests that although most students maintained a normal BMI, a substantial proportion were at risk of excess weight.

Among the variables examined, only knowledge and lifestyle were statistically significant predictors of BMI. Higher levels of knowledge were associated with a lower likelihood of being overweight or obese, indicating that awareness and understanding of health and nutrition serve a protective function. In contrast, unhealthy lifestyle behaviors were positively linked to OWOB status, highlighting the significant impact of lifestyle choices on BMI outcomes. The psychological factor did not show a significant association with BMI among the students.

The study acknowledges several limitations and provides recommendations for future research. As the sample was limited to UiTM Kota Bharu, future studies should include more diverse populations to improve generalizability. Alternative sampling methods, such as cluster sampling, and refined questionnaires with additional relevant variables are recommended to enhance data accuracy and comprehensiveness. Moreover, initiatives to promote healthy lifestyle behaviors and increase obesity-related knowledge among students are warranted. Employing face-to-face interviews is also suggested to reduce response bias and improve the reliability and precision of future research.

Acknowledgements

This study did not receive any specific funding from public, commercial, or not-for-profit organizations. Ethical approval for the study was obtained from the UiTM Research Ethics Committee.

Conflict of Interest Statement

The authors declare that they have no actual or potential conflicts of interest related to this article.

Author Contributions

All authors contributed to this work. Siti Zakiah Hanim Mohd Aminuddin conducted the data collection and analysis. Niswah Naslina Azid@Maarof drafted and finalized the manuscript. Siti Nurani Zulkifli and Norafefah Mohamad Sobri, revised the manuscript to comply with the formatting requirements of JMCS. Nor Azima Ismail and Wan Faizah Wan Yaacob proofread the manuscript and handled its submission to JMCS.

References

[1] A. Constant, A. Fortier, Y. Serrand, E. Bannier, R. Moirand, R. Thibault, N. Coquery, A. Godet, and D. Val-Laillet, “Emotional overeating affected nine in ten female students during the COVID-19 university closure: A cross-sectional study in France,” *PLoS ONE*, vol. 18, no. 8, e0286439, 2023, doi: 10.1371/journal.pone.0286439.

[2] A. Joma, S. Abuzerr, and S. Alsoudi, “Variables associated with the relationship between obesity and mental health among university students in the Gulf Cooperation Council countries: a systematic review,” *Front. Public Health*, vol. 12, 2024, doi: 10.3389/fpubh.2024.1411229.

[3] B. Xue, X. Zhang, T. Li, Y. Gu, R. Wang, W. Chen, X. Ren, X. Liu, G. Chen, Y. Lin, C. Pan, W. Zhao, T. Li, L. He, and C. Han, "Knowledge, attitude, and practice of obesity among university students," *Ann. Palliat. Med.*, vol. 10, no. 4, 2021, doi: 10.21037/apm-21-573.

[4] C. T. Chong, W. K. Lai, S. M. Sallehuddin, and S. S. Ganapathy, "Prevalence of overweight and its associated factors among Malaysian adults: Findings from a nationally representative survey," *PLoS ONE*, vol. 18, no. 8, 2023, doi: 10.1371/journal.pone.0283270.

[5] C. W. J. W. M. Radzi, H. S. Jenatabadi, A. R. A. Alanzi, M. I. Mokhtar, M. Z. Mamat, and N. A. Abdullah, "Analysis of obesity among Malaysian university students: A combination study with the application of Bayesian structural equation modelling and Pearson correlation," *Int. J. Environ. Res. Public Health*, vol. 16, no. 3, p. 492, 2019, doi: 10.3390/ijerph16030492.

[6] D. Caso, C. Miriam, F. Rosa, and C. Mark, "Unhealthy eating and academic stress: The moderating effect of eating style and BMI," *Health Psychol. Open*, vol. 7, no. 2, p. 2055102920975274, Nov. 2020, doi: 10.1177/2055102920975274.

[7] H. Alolabi, M. O. Alchallah, F. Mohsen, M. Marrawi, and Z. Alourfi, "Social and psychosocial factors affecting eating habits among students studying at the Syrian Private University: A questionnaire based cross-sectional study," *Heliyon*, vol. 8, no. 5, e09451, 2022, doi: 10.1016/j.heliyon.2022.e09451.

[8] H. J. Jang, B. S. Kim, C. W. Won, S. Y. Kim, and M. W. Seo, "The relationship between psychological factors and weight gain," *Korean J. Fam. Med.*, vol. 41, no. 6, pp. 381–368, Nov. 2020, doi: 10.4082/kjfm.19.0049.

[9] I. ul Haq, Z. Mariyam, M. Li, X. Huang, P. Jiang, F. Zeb, X. Wu, Q. Feng, and Z. Ming, "A comparative study of nutritional status, knowledge attitude and practices (KAP) and dietary intake between international and Chinese students in Nanjing, China," *Int. J. Environ. Res. Public Health*, vol. 15, no. 9, 2018, doi: 10.3390/ijerph15091910.

[10] J. Choi, "Impact of stress levels on eating behaviors among college students," *Nutrients*, vol. 12, no. 5, p. 1241, Apr. 2020, doi: 10.3390/nu12051241.

[11] K. Peltzer, S. Pengpid, T. A. Samuels, N. K. Özcan, C. Mantilla, O. H. Rahamefy, M. L. Wong, and A. Gasparishvili, "Prevalence of overweight/obesity and its associated factors among university students from 22 countries," *Int. J. Environ. Res. Public Health*, vol. 11, no. 7, pp. 7425–7441, Jul. 2014, doi: 10.3390/ijerph110707425.

[12] K. Varma, K. Muthusamy, Y. C. Rou, G. Kavinga, and T. W. Naing, "Cross sectional study on the dietary habits and lifestyle practices among university students in Malaysia," *Int. J. Multidiscip. Res.*, vol. 6, no. 1, 2024, doi: 10.36948/ijfmr.2024.v06i01.8194.

[13] M. Ilić, H. Pang, T. Vlaški, M. Grujičić, and B. Novaković, "Prevalence and associated factors of overweight and obesity among medical students from the Western Balkans (South-East Europe Region)," *BMC Public Health*, vol. 24, no. 1, 2024, doi: 10.1186/s12889-023-17389-7.

[14] M. M. Mansoury, "The degree of emotional eating among female university students and its impact on their pattern of eating behaviors," *J. Pioneering Med. Sci.*, vol. 13, no. 3, pp. 51–60, 2024, doi: 10.61091/jpms202413309.

[15] M. Yahia, L. M. Karam, and D. R. Abou-Zeid, "The impact of nutritional knowledge on dietary habits among university students," *J. Food Sci. Nutr.*, vol. 67, no. 4, pp. 195–203, 2016.

[16] N. S. Rusli and S. Harith, "Body mass index, eating habits and physical activity among dietetics students in Universiti Sultan Zainal Abidin," *J. Nutr. Sci.*, vol. 1, no. 2, 2020, doi: 10.35308/jns.v1i2.2757.

[17] Nationthailand, "More than half of Malaysia's children at risk of obesity," *Nationthailand*, May 4, 2024. [Online]. Available: https://www.nationthailand.com/blogs/news/asean/40037765?utm_source=chatgpt.com.

[18] P. P. Pitil and S. R. Ghazali, "Overweight and obesity: a study among university students in Sarawak, Malaysia," *Int. J. Health Promot. Educ.*, pp. 1–13, 2022, doi: 10.1080/14635240.2022.2040380.

[19] R. Agustina, N. Meilianawati, N. Fenny, N. Atmarita, N. Suparmi, K. A. Susiloretni, W. Lestari, K. Pritasari, and A. H. Shankar, "Psychosocial, eating behavior, and lifestyle factors influencing overweight and obesity in adolescents," *Food Nutr. Bull.*, vol. 42, no. 1, pp. S72–S91, 2021, doi: 10.1177/0379572121992750.

[20] S. Jividen, RN, "Emotional eating: Factors behind motivations," *Verywell Health*, Aug. 12, 2024. [Online]. Available: https://www.verywellhealth.com/emotional-eating-8670472.
[21] S. N. F. F. Ahmad, N. S. Salehuddin, S. K. A. Sharoni, R. Fauzi, S. S. Buhari, and N. M. Nor, "Weight management behaviors among students in a public university," *Malays. J. Nurs.*, vol. 14, no. 03, pp. 67–75, 2023, doi: 10.31674/mjn.2023.v14i03.008.
[22] S. R. Reethesh, P. Ranjan, C. Arora, G. Kaloiya, N. K. Vikram, S. N. Dwivedi, V. P. Jyotsna, and M. Soneja, "Development and validation of a questionnaire assessing knowledge, attitude, and practices about obesity among obese individuals," *Indian J. Endocrinol. Metab.*, vol. 23, no. 1, pp. 102–110, 2019, doi: 10.4103/ijem.IJEM_487_18.
[23] T. Lobstein and K. Cooper, "Obesity: a Ghost at the Feast of the Sustainable Development Goals," *Curr. Obes. Rep.*, vol. 9, no. 4, pp. 470–478, 2020, doi: 10.1007/s13679-020-00405-x.
[24] T. Scully, A. Ettela, D. LeRoith, and E. J. Gallagher, "Obesity, type 2 diabetes, and cancer risk," *Front. Oncol.*, vol. 10, 2021, doi: 10.3389/fonc.2020.615375.
[25] Z. Bawazir, A. A. Alrasheedi, and B. Aljehany, "Nutritional knowledge and attitudes among physician interns graduated from King Abdul-Aziz University, Jeddah, Saudi Arabia," *Healthcare*, vol. 10, no. 9, 2022, doi: 10.3390/healthcare10091788.