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Online Food Delivery Practices and Association with Body Mass Index among University Students

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Abstract

This study aims to investigate the utilisation of online food delivery among 150 undergraduate students. 71.3% of participants used the online food delivery (OFD) services. Fast food was the top type of meal bought online. Participants pay more attention to the price of the food than the nutritional value. Participants perceived unhealthy foods online because they were high in salt, sugar and oil. A Pearson chi-square test revealed a statistically significant association between body mass index and OFD. In conclusion, the present study shows that participants place less emphasis on the nutritional value of food when ordering online.

Keywords: body mass index; online food delivery; undergraduate students

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1.0 Introduction

Lifestyle behaviours have gained public attention as a crucial factor affecting overall health and well-being. The public recognises a healthy diet and regular physical activity as the most significant indicators of general health and well-being. However, online food delivery services have introduced a new aspect to people's eating habits and physical well-being. Online food delivery (OFD) has been mostly associated with unhealthy dietary patterns and reduced physical activity levels (Stephens et al., 2020). University students are precious assets for any nation. As such, students who experience low levels of well-being and quality of life can enormously impact the country's social, economic, and other factors. Neglecting to address these issues can result in their manifestation in the next generation of working adults. Nowadays, it has become increasingly common for undergraduate students to use food delivery apps to buy high-calorie and unhealthy meals, which may negatively impact their health and well-being (Buettner et al., 2023). The use of OFD by students can negatively impact their dietary patterns. Students tend to consume unhealthy food, have an uncontrolled portion size, and lack consistency in their mealtimes. Continuation of such unhealthy habits for a prolonged period can put their health at risk and make them more susceptible to being diagnosed with non-communicable illnesses at a younger age. Although it is crucial to understand the impact of OFD on health, there is a scarcity of research investigating the perspective of students who use OFD and how it is associated with

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their body mass index (BMI). Therefore, this study aims to investigate the utilisation of OFD among university students. The primary objectives of this study are to assess the utilisation and perceptions of online food delivery services among university students and to examine the association between the frequency of using online meal delivery and the BMI of university students. The findings of this study could help in developing effective interventions and strategies to enhance the overall well-being of students at universities.

2.0 Literature Review

2.1 Online Food Delivery

Termed as "platform-to-consumer delivery operations" for ready-to-consume meals, OFDS facilitate the direct delivery of a diverse array of takeout foods and beverages from kitchens to doorsteps. The global usage of online food delivery (OFD) services has experienced a substantial surge, especially during the COVID-19 pandemic. The outbreak of the pandemic caused an extraordinary escalation in the prevalence of food delivery services, with a remarkable 47% global growth in restaurant food delivery during 2020. In 2021, over 1.6 billion people utilised some online food delivery service (Li et al., 2022). In Asia, specifically China, the adoption rate for online food delivery has surged to 52.7% by December 2021, marking a remarkable increase of 36.20% since 2015 when it was only 16.5%. In Malaysia, there has been consistent growth in the online food delivery sector, evidenced by the rising number of companies providing this service (Tarmazi et al., 2021). Many factors contribute to the use of OFD (Mohamad et al., 2023). According to Pitchay et al. (2021), social influence, information quality, price-saving orientation, and time-saving orientation positively and significantly impact the attitude towards online food delivery services, augmenting the intention to utilise the application.

2.2 The use of OFD among university students

Exploration into the connection between online food delivery usage and the health of Malaysian university students remains relatively scarce. A prior investigation in Terengganu, Malaysia, delved into the motivations behind the utilisation of online food delivery services among university students hailing from rural areas. The study identified that flexible payment emerged as the most influential factor predicting the intention to use online food delivery services, followed by considerations of convenience, price savings, and time savings (Sahidi et al., 2022). Another study aimed to explore the satisfaction levels of university students in Malaysia regarding the use of OFD. The findings of this study revealed that satisfaction was significantly associated with factors such as delivery service, time, security/privacy, and price. Among these, delivery services exhibited the most pronounced and significant relationship (Azman et al., 2021). On the other hand, a previous study was conducted to evaluate the influence of food delivery applications on perceived customer value within the context of university students in Malaysia. The results of this study indicated that a majority of students rated the satisfaction level and quality of online food delivery apps as positive (Ganatra et al., 2021). However, these studies did not examine the perception of OFD and the relationship between OFD use and health. Additionally, the studies did not establish a connection between customer satisfaction and health outcomes after using OFD.

2.3 Health effects of using OFD

Although online food delivery services provide convenience, additional research is necessary to investigate the potential impact of these services on diet and health (Keeble et al., 2020). Recent research has focused on the health impacts associated with online food delivery services. The prevalence of online food delivery services among university students has raised concerns about potential health consequences. A study of 1220 university students in Beijing, China, found that a significant proportion of online food delivery consumption was associated with non-medical majors, a preference for high-fat and high-sugar foods, lack of physical activity, and high BMI among university students (Li et al., 2020). The influence of online food delivery services on dining-out habits and the potential interference with the World Health Organisation's (WHO) sustainable development goals (SDG) for optimal health (Jia et al., 2022).

3.0 Methodology

This study was designed as a cross-sectional analysis. It involved 150 students at the Universiti Teknologi MARA, Puncak Alam Campus, Selangor, Malaysia. Convenient sampling was used to select the participants. The study targeted individuals 21 years of age or older who can communicate in English or Malay. However, pregnant or breastfeeding students were excluded from the study. To collect data, the students were instructed to complete two separate assessments. These assessments included taking anthropometric measurements and filling out self-administered questionnaires. The goal of these assessments was to achieve the objectives of the study.

3.1 Anthropometric measurements

The students' BMI status was determined by measuring their weight and height. The formula (weight (kg)/ height (m²)) was utilised to calculate the body mass index (BMI) based on the measured height and weight. The BMI status for Malaysians was categorised based on Clinical Practice Guidelines (Management of Obesity 2nd Edition, 2023).

Table 3.1. The BMI classification for Malaysian

Classification	BMI (kg/m2)
Underweight	Less than 18.5

Normal	18.5 – 22.9
Overweight	23.0 – 27.4
Obese class I	27.5 – 32.4
Obese class II	32.5 – 37.4
Obese class III	More than 37.5

3.2 Self-administered questionnaires

A set of questionnaires consisting of two sections, including demographic data and an Online Food Delivery Questionnaire (OFDQ) was distributed to each participant. The OFD questionnaire was adopted from a previous study (Dai et al., 2022). The questionnaire serves the objectives of assessing the utilisation patterns of online food delivery services, gauging consumers' perspectives on the nutritional quality of online food delivery and understanding its impact on consumers' health. This self-administered survey comprises eight items designed to evaluate participants based on the frequency of OFD usage, how participants make OFD food choices and their perception of OFD food.

3.3 Data analysis

The demographic data was analysed using descriptive methods, and the Pearson chi-square test was utilised to assess the association between OFD and BMI. The Cramer's V is employed to assess the strength of the data's association after obtaining a statistically significant Chi-square result. The strength of association was determined according to McHugh (2013).

4.0 Findings

The demographic and body mass index data are shown in Table 1. As this study was conducted in one centre and limited students volunteered, only 150 students were enrolled. The mean (SD) age of students was 22.0 (1.2) years old, and the majority of students were female (75.3%). Most students have a normal BMI (46%), followed by overweight and obese (38%).

Table 4.1. Demographic and body mass index (BMI) data among students in UiTM Puncak Alam (n=150)

Variables	Frequency (%)	Mean (SD)
Age (years old)		22.0 (1.2)
Gender		
• Male	37 (24.7)	
• Female	113 (75.3)	
Body Mass Index (kg/m ²)		
• Underweight	24 (16.0)	
• Normal	69 (46.0)	
• Overweight	38 (25.3)	
• Obese	19 (12.7)	

Table 4.2 identifies the usage and frequency of online food delivery among students in UiTM Puncak Alam. Based on the table, most of the students, 71.3% (n=107), have used online food delivery services, while 28.7% (n=43) of the participants have never used them. For the frequency, 44% of the participants reported using OFD 1 time per week (n=66), while 14.0% reported using the services 2 times per week (n=21). Other than that, 11.3% (n=17) and 2.0% (n=3) of the participants have used OFD 3 times per week and 4 times per week, respectively. Lastly, 28.7% of the participants reported never using OFD (n=43).

Table 4.2. Usage of Online Food Delivery among Students (n=150)

Variables	Frequency (%)
Usage of Online Food Delivery	
• Yes	107 (71.3)
• No	43 (28.7)
Frequency of usage	
• 1 time per week	66 (61.7)
• 2 times per week	21 (19.6)
• 3 times per week	17 (15.9)
• 4 times per week	3 (2.8)

Table 4.3 presents the Practices of online food delivery among students. The first variable contains types of online food delivery meals purchased by the participants. Many of the participants, 56% reported purchasing fast foods (n=84), followed by rice meals with 42.0% (n=63). Salads and fruits had the lowest purchase frequency, with 2.0% (n=3) and 0% (n=0), respectively. Other than that, consumers' concerns while using online food delivery were also identified. Price has shown the highest concern among the participants,

with 83.2% (n=89), followed by taste, 11.2% (n=12). However, 9.3% of the participants have 'not at all' paid attention to the nutrition knowledge (n=10), while 8.4% often give attention to the nutrition knowledge of OFD foods (n=9).

Table 4.3. Practices of online food delivery among students (n=150)

Variables	Frequency (%)
Types of online food delivery meals purchased	
• Rice meals	63 (42.0)
• Fast foods	84 (56.0)
• Noodles	21 (14.0)
• Dessert, snacks, and confectionary	16 (10.7)
• Salads	3 (2.0)
• Coffee/ tea (without sugar)	22 (14.7)
• Fruits	0 (0)
• Sugar-sweetened beverages	25 (16.7)
Consumers' concerns while on Online food delivery apps.	
• Price	89 (83.2)
• Delivery speed	5 (4.7)
• Taste	12 (11.2)
• Nutritional value	1 (0.9)
Attention towards nutrition knowledge	
• Not at all	10 (9.3)
• Rarely	47 (43.9)
• Occasionally	41 (38.3)
• Often	9 (8.4)

Next, participants' perceptions of health after ordering food online were recognised (Table 4.4). Most participants answered, 'No changes' (62.6%), while 35.5% acknowledged it to be 'unhealthier'. Most participants responded with 'weight gain' (46.5%), followed by 'No changes' with 15.3% (n=24). The percentage of participants who answered 'malnutrition' and 'high blood pressure' was at par, with 8.3% each. Lastly, the reasons for consumers' perception of unhealthy food on online food delivery were also determined. From the result, 'high salt content' has the highest pick, with 28.9%, followed by 'high oil content' with 28.5%.

Table 4.4. Perception towards online food delivery (n=107)

Perceptions	Frequency (%)
Perception towards health after ordering food online	
• Healthier	2 (1.9)
• Unhealthier	38 (35.5)
• No changes	67 (62.6)
Perception of body changes after consumption of food on online food delivery	
• Weight gain	73 (46.5)
• Increased blood lipids	15 (9.6)
• Gastrointestinal discomfort	19 (12.1)
• Malnutrition	13 (8.3)
• High blood pressure	13 (8.3)
• No changes	24 (15.3)
Reasons for consumers' perception of unhealthy food on online food delivery	
• Improper food combination	44 (17.7)
• High oil content	71 (28.5)
• High salt content	72 (28.9)
• High sugar content	61 (24.5)
• Other	1 (0.4)

A two-way contingency table analysis was conducted to evaluate whether BMI was associated with the frequency of use of OFD. The two variables were BMI categories with two levels (underweight to normal and overweight to obese) and frequency of OFD with three levels (Never, 1-2 times per week and ≥ 3 times per week). A chi-square test of independence conducted between BMI and OFD showed a statistically significant association between frequency use of OFD and BMI, $X^2 (2, N=150) = 6.21, p=0.045$. The association was moderate (Cohen, 1988; Green & Salkind, 2017), with Cramer's $V = 0.203$, as shown in Table 4.5.

Table 4.5. Association of frequency use of online food delivery with body mass index among university students (n=150)

Frequency of use	BMI category		X ² statistic (df)	Cramer's V	p-value
	Underweight to normal (%)	Overweight to obese (%)			
• Never	23 (24.7)	20 (35.1)	6.21 (2)	0.203	0.045
• 1-2 times per week	61 (65.6)	26 (45.6)			
• ≥3 times per week	9 (9.7)	11 (19.3)			

5.0 Discussion

This study offers valuable insights into the use, perception, and association between online meal delivery and its impact on health. Females constitute the majority of participants in the study, as they display a higher level of interest in taking part as compared to males. Nearly half of the participants in this study are classified as having a high BMI. The results of this study were consistent with a recent study conducted among undergraduate students at a health campus in Malaysia, which reported that about 15% of students were classified as obese and overweight (Muhamad Azhar et al., 2023). Another study by Athirah Sorfina et al. (2024) found almost 30% of the students are categorized as overweight. Elevated BMI is associated with an increased likelihood of developing insulin resistance and visceral fat, making individuals more vulnerable to chronic diseases such as diabetes, cardiovascular disease, hypertension, and other non-communicable diseases.

Consuming an unhealthy diet high in calories, fats, and sugars significantly contributes to a high BMI. This unhealthy dietary pattern is often linked to an increase in ultra-processed food consumption among consumers, which reduces the focus on the nutritional value and quality of the food. This study found that fast food was the primary choice among participants, with no one opting for fruits and only a limited selection of vegetables. This indicates that individuals tend to adopt an unhealthy dietary pattern when ordering food online. Another study revealed that consumers' most frequently requested dishes were cheeseburgers and fries, pizzas, and nachos (Stephens et al., 2020). This suggests that high-calorie choices are among the preferred options for delivery. A UK National Diet and Nutrition Survey study found that obese individuals tend to consume more food from fast food restaurants (Penney et al., 2017). The study also revealed that people do not pay much attention to dietary information. However, when it comes to purchasing food through online food delivery, the primary concern of most people is the price. This finding is consistent with prior research suggesting that price promotions play a role in purchasing unhealthy food (Keeble et al., 2022). In a study by Eu and Sameeha (2021), 290 Malaysian public university students reported that they perceived a lack of diverse, high-quality, and reasonably priced healthy food options while using online food delivery (OFD) applications. These findings indicate that online meal delivery services may hinder progress towards the sustainable development goal (SDG) by affecting people's dietary habits. Additionally, the investigation revealed that many participants used online meal delivery services every week, consistent with the results of another study by Keeble et al. (2020).

In terms of perception, participants reported no health changes after using the OFD. However, a significant number of individuals have observed weight gain and consider these services to be high in oil, salt, and sugar. Participants recognise that the food choices offered by these services are generally unhealthy and may increase their risk of acquiring diseases. Previous studies have found that online food delivery platforms provide a wide range of nutritionally inadequate menu options (Jia et al., 2022). Another study was conducted on 680 well-known restaurants in Sydney, Australia, that are affiliated with Online Food Delivery Services. The study found that 37.6% of these restaurants were fast-food franchises. Of the 2,463 most popular menu items, 2,358 were identified as "discretionary foods". These discretionary foods have high levels of saturated fat, sodium, and sugar, which are unhealthy and unnecessary for maintaining good health (Partridge et al., 2020). Moreover, an investigation conducted in Canada analysed the complete menus of vendors who partner with a major online food delivery service found that these vendors received notably low scores on the Healthy Eating Index-2015, with scores ranging from 19.95 to 50.78 out of 100 (where a score of 100 indicates the highest level of healthiness) (Brar & Minaker, 2021).

The relationship between online meal delivery and health is a complex issue with advantages and disadvantages. A chi-square test of independence showed a significant connection between BMI and OFD. This finding aligns with a previous study by Jiang et al. (2019). They researched 1220 university students in Beijing, China, which revealed a significant connection between frequent use of online meal delivery and a high BMI. This suggests that there may be a link between online food delivery and BMI. The high BMI could be due to the participants' fast food consumption, as it was the most ordered food in this study. On the contrary, Keeble et al. (2020) discovered no correlation between online food delivery services and an individual's weight status.

6.0 Conclusion and Recommendation

In conclusion, the findings of this study demonstrate a significant link between the BMI status of university students and their use of online food delivery services. The study also shows that individuals are less aware of the nutritional value of online food choices and prefer fast food. The study has a few limitations due to its exclusive focus on a single facility for participant recruitment. Therefore, the

findings cannot be considered representative of Malaysia's entire population of university students. However, the findings suggest that the online food environment in Malaysia is potentially harmful to health.

It is recommended that future research investigates the reasons why university students use online food delivery services and strategies to encourage healthy online food shopping among these consumers. Analysing the potential motives for utilising online meal delivery services could aid in formulating future public health initiatives if deemed necessary.

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Paper Contribution to Related Field of Study

These studies offer valuable insights into the factors influencing the use of online food delivery services among university students, including their perceptions. A comprehensive understanding of the usage of OFD among university students can be obtained by combining the results of prior and present studies.

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