FOOD DELIVERY SERVICE AND ITS ASSOCIATION WITH ANTHROPOMETRIC MEASUREMENTS AMONG UNDERGRADUATE FEMALE STUDENTS IN IIUM KUANTAN

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ABSTRACT

Introduction: Food delivery system allows customers to quickly and easily retrieve online menus which customers can search or browse and place and order with just several clicks using their phone or other devices. The accessibility of unhealthy food through this service can further contribute to obesity which is considered as a major health problem. **Aim:** To identify the use of food delivery service among undergraduate female students in International Islamic University Malaysia (IIUM), Kuantan and its association with anthropometric measurements. **Methods:** A cross-sectional study was carried out involving 113 undergraduate female students aged between 18 and 25 years in IIUM, Kuantan campus. Respondents were selected based on convenience sampling. Respondents were required to fill in a set of questionnaires containing 2 parts; demographic characteristics and food delivery service. Body weight, height and waist circumference were measured by the researcher. All data for anthropometric measurements were collected using a stadiometer, portable weight scale and measuring tape. **Results:** The results showed that the main factor of using food delivery service at the *mahallahs* (hostels) was because of ease and convenience. Most of the students (75.2%) bought fast food using food delivery service. Findings showed no significant association between the frequency of food delivery service and body mass index (BMI) (p=0.24). There was a significant association between the frequency of food delivery service and waist circumference (p=0.039). **Conclusions:** Food delivery service is majorly used by the undergraduate female students due to its accessibility and it was associated with waist circumference. For future research, it is recommended to include males as study respondents, as well as frequency of fast food dine-in and delivery service.

KEYWORDS: Obesity, Body mass index, Waist circumference, Food delivery service

INTRODUCTION

Over the past few years, food delivery service has evolved and introduced online which enable customers to search, compare price and order food conveniently (Dang et al., 2018). In simple term, food delivery service provides freshly prepared food which is ordered by customers to be delivered to their address. Food delivery services use an interactive and up-to-date system whereby menu is displayed in an easy option to choose from (Patel, 2015). Thus, both customers and sellers can interact which make the ordering process easier. According to Food logistics (2017), the United States of America (USA) dominated the global online on-demand food delivery services market and accounted for a share of more than 40 percent in 2016. There are a lot of food delivery service providers in Malaysia such as Kentucky Fried Chicken (KFC), McDonald's (McD), Pizza Hut, Domino's Pizza, Foodpanda, Food Valet and others.

Anthropometric measurements are measurements used to assess the size and composition of the human body such as body mass index (BMI), waist circumference (WC), skinfold thickness and body fat. The World Health Organization (WHO, 2018) indicated that a person with a BMI equal to or more than 25 is considered overweight meanwhile BMI of 30 or more is generally considered as obese. In addition, an issue about students being overweight and obese is rising. Statistics showed that in Malaysia, the prevalence of overweight and obesity (>18 years old) has been escalating with 16.6% and 4.4% in 1996, 29.1% and 14.0% in 2006, and 33.6% and 19.5% in 2008, respectively (Yasin, Daher, Nasir et al., 2012). It is well known that BMI is a predictor of the morbidity and mortality especially due to various chronic diseases including obesity, type 2 diabetes, cardiovascular disease and others (Janssen, Katzmarzyk and Ross, 2004). Meanwhile, waist circumference is an established indicator to measure abdominal obesity and predicts obesity-related health risk (Janssen, Katzmarzyk and Ross, 2004). Janssen, Katzmarzyk & Ross (2004) explained that when WC is being assessed together with BMI, these will predict health risk more reliably than measuring BMI alone.

In addition, the incidence of non-communicable diseases (NCDs) like diabetes, cardiovascular disease, renal and cancer are rising globally. Non-communicable diseases are closely related to diet, lifestyle and it can be controlled. Furthermore, consumption of fast food can lead to obesity and cardiovascular disease. A study has shown that those who consumed fast food for at least twice per week met fewer of the dietary recommendations and had a higher risk of abdominal obesity compared to those who rarely consumed fast food (Smith et al., 2009).

The implementation of food delivery service is now spreading rapidly in Malaysia whereby university students these days have no problem to access food as

it is readily available (Zety Shakila, 2016). Food delivery service is becoming more prominent specifically in Kuantan as the students can order food online through different medium such as WhatsApp and food delivery applications through their phone. Therefore, this study was conducted to assess the use of food delivery service and its association with anthropometric measurements among undergraduate female students in IIUM Kuantan.

METHODS

Subjects

In total, 113 female students aged 18 to 25 years from the International Islamic University Malaysia (IIUM) Kuantan campus who were residing in *mahallah* were recruited into this study. The exclusion criteria for this study were males, students aged more than 25 years old, postgraduate students and Centre for Foundation Studies (CFS) students. Informed consent was obtained from the study participants. The students were required to fill in the questionnaire. The questionnaire consisted of two parts; demographic characteristics and food delivery service. In the first part the subjects were required to fill in their personal information. In the second part the subjects were given a list of common fast food and non-fast food that they usually ordered using food delivery services. The protocol of the study was approved by Kuliyyah Post-Graduate Research Committee (KPGRC) and IIUM Research Ethics Committee (IREC ID No. 2019-096).

Anthropometric measurements (BMI and WC classification)

Data was collected at the *usrah* area and cafeteria at the Mahallah Fatimah Az-Zahra because anthropometric measurements like weight, height, body mass index and waist circumference were required. Devices used in this study were a portable weighing scale (SECA 813, Hamburg, Germany) and a stadiometer (SECA 213, Hamburg, Germany). Portable weighing scale was used to measure weight meanwhile stadiometer was used to measure height of the subjects. This information was used to calculate BMI of the subjects. Then, this study used BMI classification according to guideline by the WHO (1998). In addition, measuring tape was used to measure the waist circumference of the subjects. For the anthropometric measurements, the participants must be standing and dressed in the light clothing without shoes. Then, waist circumference was measured over the light clothing at the narrowest point between the lower costal border and the iliac crest, at the end of normal expiration. The abdominal obesity is defined as ≥80 cm for female according to WHO/International Association for the Study of Obesity/International Obesity Task Force for Asian (WHO/IASO/IOTF, 2000).

Statistical analysis

The data were analyzed using SPSS version 20 for Windows. Descriptive statistics were used to analyze demographic characteristics, factors of using food delivery service and the type of food ordered through food delivery services among undergraduate female students. Meanwhile, non-parametric test (Fisher's exact analysis) was used to examine the association between food delivery service and anthropometric measurements. P-value was set at p <0.05.

RESULTS

The use of food delivery service

From the 113 respondents, 75.2% of the respondents have an experience of using food delivery services to order food from *mahallah* (Table 1) while the rest of the respondents did not use food delivery service.

Table 1. The use of food delivery services among undergraduate female students in IIUM Kuantan (n=113)

Variables	N	%
Use of food delivery service		
Yes	85	75.2
No	28	24.8

Among those who did not use food delivery service, 67.9% (n=19) of them were not interested in using food delivery services to order food. Meanwhile, the rest of respondents answered that the services are expensive (28.6%) and poor service (3.6%).

Factors for using food delivery services

Factors for using food delivery service is presented in Table 2.

Table 2**.** Factors of using food delivery service among undergraduate female students in IIUM Kuantan (n=85)

Factors	N	%
Easy and convenient	77	90.6
Cleanliness	1	1.2
Cheap	8	9.4
Limited time to cook	13	15.3
Delivery time	9	10.6

Types of food ordered using food delivery service

There are many types of food that can be ordered using food delivery service which include fast food and non-fast food. Figure 1 showed most of the respondents answered pizza (63.5%) as the most frequent food that they ordered using food delivery services. This is followed by burger which comprised of 34.1%, fried chicken (31.8%) and lastly other types of fast food (4.5%) such as goreng pisang cheese and fried foods.

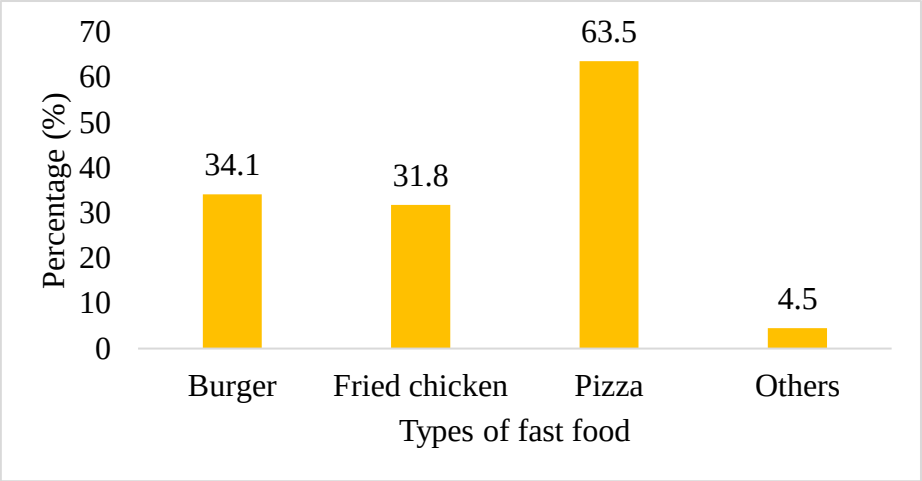

Figure 1. The types of fast food ordered using food delivery services (n=85)

Figure 2 illustrates the types of non-fast food ordered using food delivery service. The most popular non-fast food picked by 54 respondents (63.5%) was other foods such as dessert and *nasi lemak*. Secondly, *masakan panas* was chosen which comprised of 28.2%, and lastly rice set (16.5%).

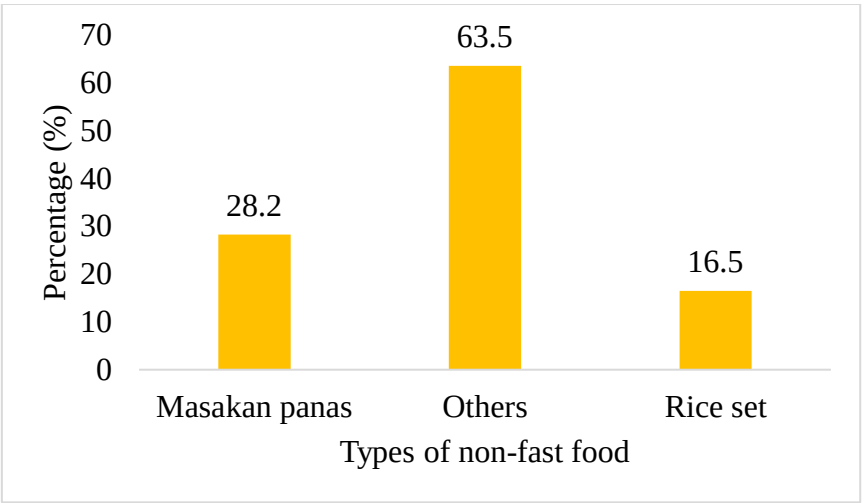

Figure 2. The types of non-fast food ordered using food delivery services (n=85)

The association between frequency of food delivery service and anthropometric measurements

From Table 3, the mean height of the respondents who used food delivery service was 1.56 ± 0.05 m with a range between 1.44 m and 1.70 m. In addition, the mean weight was 55.05 ± 11.75 kg. The range of weight of 19 to 25 years old respondents was from 37.7 kg to 101.1 kg. The mean BMI of the respondents was 22.57 ± 4.55 kg/m^2 with a range from 16.9 kg/m^2 to 40.5 kg/m^2. On the other hand, the WC reading was 68.82 ± 8.90 cm with a range from 50.0 cm to 99.5 cm.

Table 3. Anthropometric data of undergraduate female students in IIUM Kuantan (n = 85)

Variables	Mean (SD)	Range
Height (m)	1.56 (0.05)	1.44-1.70
Weight (kg)	55.05 (11.75)	37.7-101.1
BMI (kg/m^2)	22.57 (4.55)	16.9-40.5
WC (cm)	68.82 (8.90)	50.0-99.5

Based on Figure 3, 11 out of 85 (12.9%) undergraduate students in IIUM Kuantan who used food delivery service were underweight, 57 students (67.1%) were normal weight, 12 students (14.1%) were overweight and 5 students (5.9%) were obese.

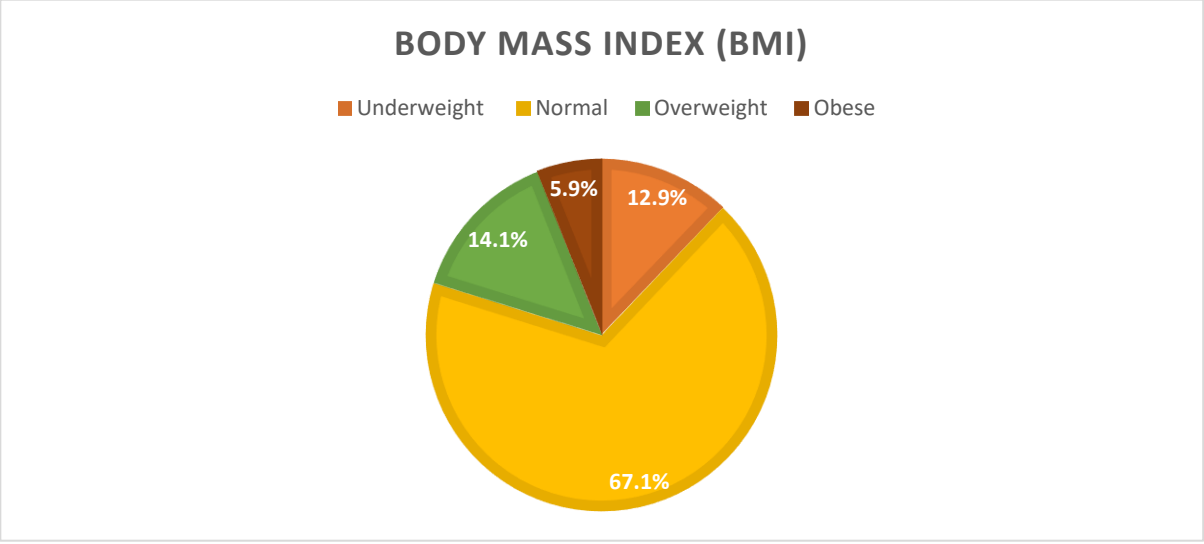

Figure 3. The categories of body mass index (BMI) of undergraduate female students who used food delivery service

Based on waist circumference reading, most participants had low risk (92%) which was 78 out of 85 respondents. Then, followed by 5 respondents who were in

high risk (6%) and lastly 2 respondents from increased risk (2%) as showed in Figure 4.

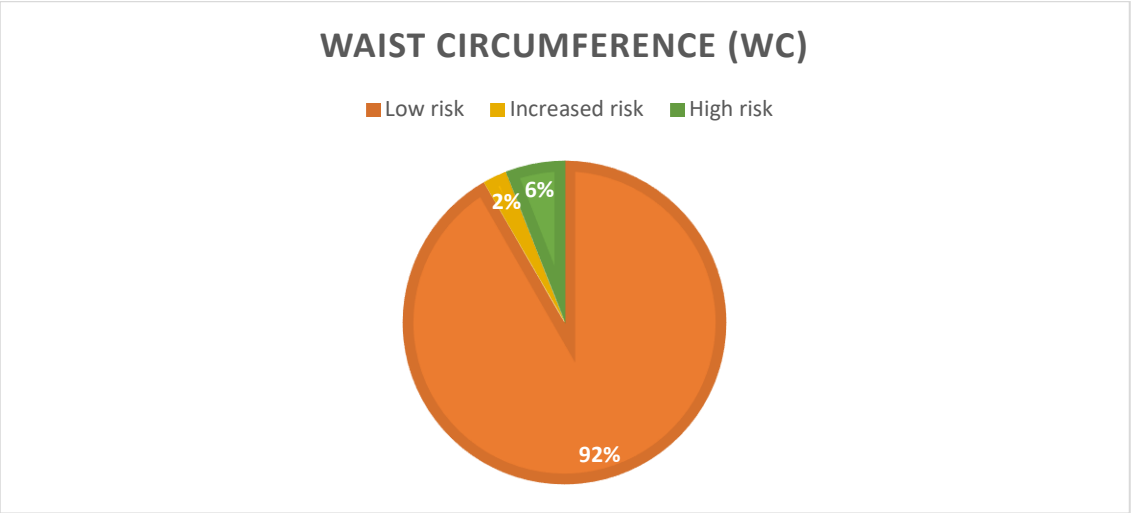

Figure 4. The categories of waist circumference of undergraduate female student who used food delivery service according to health risk

Table 4 shows that the frequency of food delivery service has no significant association (p=0.240) with BMI. It showed that BMI categories have no relationship with frequency of food delivery service. However, the result revealed that there is a significant (p=0.039) association between frequency of food delivery service and waist circumference; which indicated lower frequency of food delivery service was associated with low risk and lower waist circumference values.

Table 4. The association between frequency of food delivery service and anthropometric measurements

Frequency (n=85)	1 per week	2-3 per week	4-5 per week	6-7 per week	*p*-value
BMI (kg/m²)					
Underweight	10	1	0	0	
Normal	54	2	0	1	0.240[a]
Overweight	10	1	1	0	
Obese	4	1	0	0	
WC (cm)					
Low risk	73	4	0	1	
Increased risk	1	0	1	0	0.039[a]
High risk	4	1	0	0	

[a] Chi Square Test (Fisher exact)

DISCUSSION

The use of food delivery service

This study identified that 75.2% of students used food delivery service from the *mahallah*. Meanwhile, 24.8% of the respondents did not use food delivery service due to delivery service charges are expensive, it provides poor service, or the respondents were not interested to use food delivery service.

In 2018, University Putra Malaysia's (UPM) Student Affairs Division and the Student Representative Council introduced the first ever food delivery service inside the campus which called as the "Putra Food Delivery" for UPM students (Zulita Mustafa, 2018). This initiative was aimed to save time for those university students who are busy with daily routines and helping those without transportation. Meanwhile, Mohamed Hatim et al., (2019) conducted a study on food delivery service application inside the UiTM Perak Branch, Tapah campus called eFoodCart that applied the same concepts to the existing online food ordering applications such as Pizza Hut, Just Eat and Foodpanda. This application helps and allows the students of UiTM Perak Branch, Tapah Campus to order their food via mobile devices easily (Mohamed Hatim et al., 2019). On the other hand, in Kuala Lumpur, Wei & Das (2018) developed an online food ordering application to reduce an unhealthy eating habit and ease the process for university students to order their foods by using food delivery service application.

Factors for using food delivery services

The major factor of using food delivery service was due to the service is easy and convenient This was followed by limited time to cook, fast delivery time and cheap due to sales promotion. Punctuality in delivery food ordered by customer is important. This is because the customer will be left waiting and angry if their food are late. For IIUM Kuantan students who reside in *mahallah*, students are forbidden to cook. Thus, they just use food delivery service to order food.

The least popular factor for using food delivery service was cleanliness. These days, lot of food delivery services emerge in Malaysia. Thus, the customers usually raise concerns about the cleanliness of the delivery process. According to Varma (2018), most of delivery providers claimed that keeping delivery process efficient and sanitary is their top priority. To maintain the cleanliness, the companies ensure the bags used by delivery riders are cleaned and wiped with washing liquid or sanitizer to prevent from any bacteria (Varma, 2018).

Most university students prefer to consume fast food compared to non-fast food using food delivery service. Bakar, Anuar, Alias & Mohamad (2017)

demonstrated that 70% of university students chose fast food and meals from local restaurants to fill their stomach. This was supported by Mohamed Hatim et al., (2019) that most university students ordered fast food such as Pizza hut using food delivery service.

The association between frequency of food delivery service and anthropometric measurements

In 2019, a health survey in five different universities in Malaysia conducted by Wan, Salarzadeh, Alanzi et al., found that 57 out of 940 (6.1%) of bachelor degree students were underweight, 53.4% (502 of 940) in the normal range, 23.0% (216 of 940) overweight and 17.6% (165 of 940) were obese. According to Patry-Parisien et al., (2012), WC is divided in three categories for women: low risk (≤79.9 cm), increased risk (≥80 cm) and high risk (≥88 cm). Kamarudin, Tengah, Raysid & Jusoh (2018) stated that BMI prevalence needs WC as complement; whereby obesity predictor for women is 88 cm and 80 cm for overweight. Kamarudin et al., (2018) conducted a study on BMI and WC of University Pendidikan Sultan Idris students and found that among 204 of female students, 71.6% of them was having WC more than 80 which indicated overweight whilst 28.4% was obese.

In this study, the frequency was grouped into four categories which were once a week, 2-3 times per week, 4-5 times per week and 6-7 times per week. The result revealed that there was a significant association between frequency of food delivery service and waist circumference (WC). Our findings showed that lower frequency of food delivery service was associated with lower waist circumference values and lower prevalence of abdominal obesity. Dalvand, Koohpayehzadeh, Karimlou (2015) stated that WC is an indicator of the amount of visceral adipose tissue (VAT). Meanwhile, fat deposition in BMI is calculated all around the body. Hassan, Ahmad et al., (2016) defined that WC is an important measure of abdominal obesity compared to waist-hip ratio (WHR) in which WHR can be low in some obese people due to high hip circumference. Hassan et al., (2016) summarized that overall national prevalence of abdominal obesity using WC was 17.4% among Malaysian adult with 26.0% for women which is higher than men (7.2%).

The strength of this study was the anthropometric measurements were not self-reported by the respondents in the questionnaire. Instead, the anthropometric measurements were performed by single researcher for maintaining the accuracy and consistency of the reading of weight, height and waist circumference. To date, there was no research on association of food delivery service and anthropometric measurements among university students in Kuantan. Identified limitation of this study was recruitment of respondents in a non-probability sample, which was usually

selected based on their accessibility. Thus, this might not represent the whole population of undergraduate female students in IIUM Kuantan.

CONCLUSIONS

This study showed that most of the undergraduate female students in IIUM Kuantan use food delivery service in *mahallah* due to ease and convenience factors. Majority of students who used food delivery service have normal BMI and low risk of getting abdominal obesity. Our study identified significant association between frequency of food delivery service and WC. Lower frequency of fast food consumption using food delivery service was significantly associated with lower prevalence of abdominal obesity.

Future studies should be conducted among male participants. In addition, there is also a need to include the frequency of eating fast food at the restaurants. This is to ensure the overall eating pattern of university students is examined. Moreover, more studies should be conducted to assess the relationship between waist circumference and dietary behavior among university students in Malaysia.

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REFERENCES

Bakar, A.M.F.A., Anuar, J., Alias, M.A.M., & Mohamad, T. (2017). University students' perception on the fast food industry service quality in Terengganu. *Journal of Tourism, Hospitality & Culinary Arts*, 9(2), 551560.

Dalvand, S., Koohpayehzadeh, J., Karimlou, M., Asgari, F., Rafei, A., Seifi, B., … Bakhshi, E. (2015). Assessing Factors Related to Waist Circumference and Obesity: Application of a Latent Variable Model. *Journal of Environmental and Public Health*, 2015, 1-9.

Dang, A. K., Tran, B. X., Nguyen, C. T., Le, H. T., Do, H. T., Nguyen, H. D., … Ho, R. C. M. (2018). Consumer preference and attitude regarding online food products in Hanoi, Vietnam. *International Journal of Environmental Research and Public Health*, *15*(5).

Food logistics. (2017, December 21). Global Online On-Demand Food Delivery Market to Grow 32 Percent by 2021. Retrieved from https://www.foodlogistics.com/technology/press-release/20986811/global-online-ondemand-food-delivery-market-to-grow-32-percent-by-2021

Hassan, M., Ahmad, N., Adam, S. M., Nawi, A., & Ghazi, H. (2016). Abdominal obesity indicators: Waist circumference or waist-to-hip ratio in Malaysian adults population. *International Journal of Preventive Medicin*e, 7(1), 82.

Janssen, I., Katzmarzyk, P. T., & Ross, R. (2004). Waist circumference and not body mass index explains obesity-related health risk. *The American Journal of Clinical Nutrition*, *79*(3), 379-384.

Jessy, A. S. (2017, November 17). We Try To Find Out Why The Food Delivery Service In Malaysia Is So Horrible. Rojak Daily. Retrieved from http://www.rojakdaily.com/lifestyle/article/3846/we-try-to-find-out-why-the-food- delivery-service-in-malaysia-is-so-horrible

Kamarudin, A., Tengah, R., Raysid, N., & Jusoh, N. (2018). Relationship between body mass index, waist circumference, fat mass and fat percentage as a measurement of obesity among Universiti Pendidikan Sultan Idris students. *Journal of Fundamental and Applied Sciences*, *9*(6S), 1161.

Mohamed Hatim, S., Mohamad Zamani, N. A., Abdul Latif, L. M., Ahmad Kardri, M., Ahmad, N., Kamaruddin, N., & Hussain, A. (2019). E-FoodCart: An Online Food Ordering Service. International Journal of Innovative Technology and Exploring Engineering (IJITEE), 8(4). Retrieved from https://www.ijitee.org/wp-content/uploads/papers/v8i4s/DS2861028419.pdf

Patel, M. (2015). Online Food Order System for Restaurants. *School of Computing and Information Systems*, 219. Retrieved from http://scholarworks.gvsu.edu/cistechlib/219

Patry-Parisien J , et al. (2012). Comparison of waist circumference using the World Health Organization and National Institutes of Health protocols. *Health Rep.*, 23(3):53-60.

Smith, K. J., McNaughton, S. A., Gall, S. L., Blizzard, L., Dwyer, T., & Venn, A. J. (2009). Takeaway food consumption and its associations with diet quality and abdominal obesity: A cross-sectional study of young adults. *International Journal of Behavioral Nutrition and Physical Activity*, *6*, 1–13.

Varma, A. (2018, July 29). How food delivery companies keep delivery bags clean. The Straits Times [Singapore]. Retrieved from https://www.straitstimes.com/lifestyle/food- deliveries-come-clean

Wan Mohamed Radzi, C., Salarzadeh Jenatabadi, H., Alanzi, A., Mokhtar, M., Mamat, M., & Abdullah, N. (2019). Analysis of Obesity among Malaysian University Students: A Combination Study with the Application of Bayesian Structural Equation Modelling and Pearson Correlation. *International Journal of Environmental Research and Public Health*, 16(3), 492.

Wei, T. S., & Das, D. (2018). Development of Online Food Ordering System for University Students to Maintain Healthy Eating Habits. *Journal of Applied Technology and Innovation, 2(2*). Retrieved from https://jati.apu.edu.my/files/2018/12/2018_Issue2_Paper3.pdf

World Health Organization. (1998). Obesity: preventing and managing the global epidemic: report of a WHO Consultation on Obesity.

World Health Organization. (2018). WHO | Obesity. Retrieved from http://www.who.int/topics/obesity/en/

WHO., IASO. and IOTF. (2000). The Asia-Pacific perspective: Redefining obesity and its treatment. World Health Organization (WHO)-Western Pacific Region, International Association for the Study of Obesity (IASO), International Obesity Task Force (IOTF), February 2000.

Yasin, M. M., Daher, A. M., Nasir, N. M., Ramli, A. S., Miskan, M., Keat, N. K., … Yusoff, K. (2012). 220 Overweight and Obesity In Malaysia: An Epidemiology Survey. *Journal of Hypertension*, 30, e67.

Zety Shakila Binti Mohd Yusof, Z. (2016). Determinants towards Food Delivery Service through E-Commerce in Pasir Gudang Area. *Journal of Modern Education Review*, *6*(9),622–631.

Zulita Mustafa. (2018). Delivering good food to students on campus. New Straits Times [Serdang]. Retrieved from https://www.nst.com.my/education/2018/03/342347/delivering-good-food-students-campus