ORIGINAL ARTICLE

# The Prevalence, Characteristics and Dietary Intake of Warded Patients Consuming Out-of-hospital Food in Hospital Universiti Sains Malaysia

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## ABSTRACT

**Introduction:** Hospital food is planned carefully by dietitians to meet patient's medical and nutrition needs. Consumption of out-of-hospital food (OHF) could negatively impact recovery due to its potentially unfavorable nutritional content. There was lack of recent study on the consumption of OHF in Malaysia. This study determines the prevalence and characteristics of OHF consumption among inpatients in Hospital Universiti Sains Malaysia (HUSM). **Materials and methods:** This cross-sectional study involved 156 ambulatory inpatients aged 18 to 65 admitted to HUSM for at least 24 hours, selected via convenience sampling. Excluded patients who were cancer, pregnant, fasting, on Ryles tube feeding, parenteral nutrition, or oral nutrition supplements. Dietary intake was recorded through a 24-hour recall questionnaire. OHF was defined as food not prepared by the hospital kitchen while patients consuming OHF for at least one meal were classified as the out-of-hospital-food group (OFG). Nutrient intake was analysed using Nutritionist Pro™ Diet Analysis Software. Weight and height were measured, status was classified according to WHO standards. **Results:** 90% of respondents were classified as OFG, showing significantly higher energy, carbohydrates and fibre intake than those classified as hospital food group (HFG). Common OHFs included fried local *kuih-muih*, banana fritters, fried chicken, fish and chicken cooked in coconut gravy (*gulai*), fried rice and *mee-hoon* soup. Sex ($p<0.001$) and educational level ($p=0.016$) were associated with the OHF consumption. **Conclusion:** Majority of patients consumed OHF during admission, resulting to higher energy, carbohydrates and fibre intake. Interventions promoting adherence to hospital diets are necessary to ensure optimal nutrition during hospitalization.
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**Keywords:** Out-of-hospital food, Warded patients, Hospital food, Nutrients, Energy intake

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## INTRODUCTION

In this modern society, there are many people taking away-from-home food probably due to their busy schedules and the convenience. Study revealed that there were about 84% of adult respondents consumed away-from-home food which prepared outside the home in Malaysia (1). This indicated that away-from-home food has become a frequent practice in the country.

In hospital setting, hospital meals are prepared for patients who are admitted for one or more night stay to receive medical care. These patients are known as inpatients, hospitalised patients, or warded patients. Most of the patients are hospitalised due to severe or life-threatening condition such as stroke, cancers, and coronary heart diseases. Patients may also be hospitalised for less severe medical conditions that could not be sufficiently managed elsewhere such as at home or at outpatient surgery centre (2). According to Williams (2009), hospital meals are regarded as medicine-centred meals. The provision of hospital meal is a part of treatment for sick patients who admitted to hospital and are aimed to meet patients' specific nutrition needs (3).

In most of the hospital, warded patients will be provided with hospital meals which are carefully planned by dietitians or nutritionists who in charge for hospital nutrition department after several nutrition assessments and nutrition diagnosis in addition with medical diagnosis from physician. Therefore, hospital meals should be the first and priority choice for warded patients as this could prevent malnutrition in either undernutrition or overnutrition among them. However, in Malaysia, according to Teng et.al (2003), about 62% of warded patients supplemented hospital

food with out-of-hospital food, a total of 53.8% of them were reported as not satisfied with hospital food for some specific reasons such as adequacy, variety, attractiveness and serving time (4). A study done by Tran et al. (2019) in Vietnam showed there was only 1.1% from 887 patients consumed only food prepared by hospital nutrition department, might be due to limited resources for hospital meals in selected hospital (5). The food sources for patients during admission other than hospital food included home-cooked meal, food from hospital canteen, food from outside and charity meal (5). However, another study indicated that most of the warded patients in tertiary hospital in Nigeria consumed hospital food at 73.1% with only 10% of them bought additional out-of-hospital food while 16.9% never eat hospital food during admission (6). Patients who ate additional out-of-hospital food and who never consume hospital food may have higher chance for worsen clinical outcome, such as increases severity of disease, recovery period and length of stay in hospital.

As there is lack of research on out-of-hospital food consumption in warded patients, the most relevant population is adult. In non-hospitalised adult context, away-from-home meal is the outside food, where the food eaten is not prepared from home. Several studies indicated that people from high socioeconomic status (SES) who were with higher or tertiary education level, higher household income and with professional occupation were associated with higher prevalence of eating away-from-home food than each comparison group (7,8). Besides, a study in Malaysia found that respondents who worked in government and semi-government sectors were associated with eating-out (1). From most of the studies, energy and macronutrients intake were found to be higher in people who consumed away-from-home food (1,9). Meanwhile, there was a difference in result finding for dietary fibre and sugar intake (9,10). Different studies showed different findings on association of BMI and eating away-from-home food (8,11,12). Furthermore, people with high frequency of eating-away-from-home meals have poorer food choice such as lower intake of vegetables and higher intake of fats and oils than low or moderate frequency (12) Higher intake of away-from-home food per week was associated with an increased intake of trans fatty acids, and the increase of trans fatty acid consumption was associated with increase in BMI (13). There was a two-way relationship found between body-mass index (BMI) and dietary intake. Respondents who were overweight and obese were found lacking healthy diet compared to those normal weight (NW) respondents with significantly lower intake of whole grains, vegetables, fruits and drinking water but higher intake of refined grains, salts and oils than NW respondents (14).

Therefore, this study aimed to determine the prevalence of out-of-hospital food consumption among warded patients in HUSM, to assess the association between socioeconomic status (SES) and out-of-hospital food consumption in warded patients in HUSM, to investigate the mean differences of energy and nutrients intakes between out-of-hospital food group (OFG) and hospital food group (HFG) warded patients in HUSM, and to determine the association between body mass index (BMI) and out-of-hospital food consumption in warded patients in HUSM.

## MATERIALS AND METHODS

### Operational Definition

In this study, out-of-hospital food (OHF) was defined as any food that was not prepared by hospital kitchen, which included canteen food, take-away food, restaurant food, fast food, and home-cooked food. Besides, quantitative definition of out-of-hospital food consumption was included. Respondents were classified as Out-of-Hospital Food group (OFG) for consuming out-of-hospital food for at least one meal assessed from single 24-hr diet recall. Respondents who did not meet the above definitions were classified as Hospital Food group (HFG).

### Study Design

This cross-sectional study was conducted among warded patients who registered and stayed at HUSM ward. The types of hospital ward included in this study were general ward, medical ward, surgery ward, obstetrics & gynaecology (O&G) ward and orthopaedic ward. The sample size was calculated using single proportion estimation with an expected proportion of 0.10 and precision of 0.05 (6). The estimated sample size with 10% dropout was 153 respondents.

Respondents were recruited via convenience sampling method. The inclusion criteria included warded patients who registered and stayed in HUSM for at least 24 hours since admission, patients aged between 18 to 65 years old, both male and female patients, and ambulatory patients who able to stand and walk. Meanwhile, this study excluded patients who were unconscious, critically ill, bedridden, cancer or pregnant, patients who were required to fast, patients who were on Ryles tube feeding or parenteral nutrition and patients who received oral nutrition supplement orally. The study procedure was reviewed and approved by Human Research Ethics Committee USM (USM/JEPeM/KK/23060486). Informed consent was obtained from respondents before joining the study.

### Data Collection

This study was done using questionnaire comprised of three sections to collect data from warded patients in HUSM. The questionnaire included sociodemographic questionnaire, BMI measurement and 24-hour diet recall.

The sociodemographic data included ages, gender,

ethnicity, medical diagnosis, level of education, monthly household income, occupation and type of hospital diet. Level of education, monthly household income and occupation were used to assess socioeconomic status.

Dietary data was assessed via 24-hour dietary recall. Interview session using semi-structured and open-ended question was carried out to assess the dietary intake for the preceding 24 hours. 24-hour diet recall captures meal taken, with food description, household amount, preparation method and ingredients (Food and Agriculture Organization of United Nations, 2018). Nutritionist ProTM Diet Analysis Software was used to analyse the energy and nutrient intake of respondents. Recipes and food were selected from the reference list of Nutrient Composition of Malaysian Foods in the software. Portion size was calculated based on standardised hospital menu recipe for hospital food. Other food and recipes that were not listed in the reference list were added to the database. Weight of foods or ingredients to make the recipes were referred from Malaysian Food Composition Database (MyFCD) and FoodData Central from U.S Department of Agriculture (USDA).

Weight and height of participants was measured using weighing scale and stadiometer respectively. Besides, weight and height of respondents were also obtained from medical folder. Body mass index (BMI) was calculated by mass (kg) divided by square of height (meter) in kg/m$^2$. Weight status of respondents was determined based on WHO BMI (2000) classification for general population, categorise respondents into underweight (BMI< 18.50 kg/m$^2$), normal weight (BMI 18.50- 24.99 kg/m$^2$), overweight ((BMI 25.00- 29.99 kg/m$^2$), and obese (BMI> 29.99 kg/m$^2$) (15).

### Data Analysis

The data collected were analysed using IBM Statistical Package for the Social Sciences (SPSS) version 27.0. Descriptive analysis was used to summarise the sociodemographic characteristics of participants for age, ethnicity, level of education, household income and occupation. Categorical data was presented as frequency and percentages. Continuous data with a normal distribution was presented as mean and standard deviation (SD) while skewed data was presented as median and interquartile range (IQR). Association between two groups were analysed using Pearson's Chi Square test or Fisher's Exact test. Contribution of energy and nutrients from hospital food (HF) and out-of-hospital food (OHF) among out-of-hospital food group (OFG) who consumed both food sources were analysed using Paired t-test or Wilcoxon Signed Rank test. Comparison of energy and nutrient intake between two groups was analysed for each nutrients using independent t-test or Mann-Whitney test.

## RESULTS

Table I showed the sociodemographic characteristics of the study population. A total of 156 respondents (69 male and 87 female) participated in the study. Most of the respondents were 36 years old and above (58%), Malay (94%), had a monthly household income not more than RM3030 (69%), had secondary level education (56%) and were not working (49%). Besides, majority of the respondents (59%) had normal standard diet. Majority of the respondents (44%) admitted due to non-communicable diseases and/or its complication. The prevalence of overweight and obesity was 55%, with the mean body mass index (BMI) at 26.03 kg/m$^2$ with 95% confidence interval (25.19, 26.87).

**Table I: Characteristics of Respondents (n=156)** [†]

| Characteristics | | Male (n =69) | Female (n =87) | Overall n (%) |
|---|---|---|---|---|
| Age (years) | 18 – 35 | 28 | 37 | 65 (42) |
| | ≥ 36 | 41 | 50 | 91 (58) |
| Ethnicity | Malay | 65 | 81 | 146 (94) |
| | Chinese | 2 | 3 | 5 (3) |
| | Indian | 1 | 1 | 2 (1) |
| | Other | 1 | 2 | 3 (2) |
| Reason of Admission | Accident | 16 | 10 | 26 (17) |
| | Infectious disease | 14 | 14 | 28 (18) |
| | Non-communicable disease | 30 | 39 | 69 (44) |
| | Obstetrics & Gynecology | 0 | 7 | 7 (4) |
| | Other reason | 9 | 17 | 26 (17) |
| Household Income Category | B40 | 46 | 61 | 107 (69) |
| | M40 | 13 | 11 | 24 (15) |
| | T20 | 10 | 14 | 24 (15) |
| Educational Level | Primary education | 4 | 5 | 9 (5) |
| | Secondary education | 36 | 51 | 87 (57) |
| | Tertiary education | 28 | 32 | 60 (38) |
| Occupation | Professional | 21 | 23 | 44 (28) |
| | Labour job | 21 | 14 | 35 (22) |
| | Not working | 27 | 50 | 77 (49) |
| Type of Hospital Diet | Normal diet | 44 | 48 | 92 (59) |
| | Therapeutic diet | 25 | 39 | 64 (41) |
| BMI (kg/m$^2$) | <18.5 | 6 | 3 | 9 (6) |
| | 18.5 – 24.9 | 26 | 35 | 61 (39) |
| | 25.0 – 29.9 | 28 | 23 | 51 (33) |
| | ≥ 30.0 | 9 | 26 | 35 (22) |

[†] Sample size was not always n=156 due to missing values.
[‡] Based on Kelantan household income statistics by Department of Statistics Malaysia 2019. (B40: < RM3030; M40: RM3030 -RM6620; T20: > RM6620).

Table II showed the association between food consumption and sociodemographic variables: age, gender and ethnicity, and socioeconomic status (SES) parameter: household income, educational level and

occupation. The prevalence of out-of-hospital food consumption among warded patients was 90%. The consumption of out-of-hospital food and hospital-food was significantly associated with age (p<0.001). For socioeconomic status parameter, educational level was found to be significantly associated with out-of-hospital consumption (p=0.016).

**Table II: Association between Food Consumption during Hospitalisation and Socioeconomic Status (SES) Parameter: Household Income, Educational Level and Occupation (n=156).**

| Variables | | HFG n (%) | OFG n (%) | p-value |
|---|---|---|---|---|
| **Prevalence** | | 16 (10) | 140 (90) | |
| **Age (years)** | 18 – 35 | 0 (0) | 65 (46) | **<0.001[a]*** |
| | ≥ 36 | 16 (100) | 75 (54) | |
| **Sex** | Male | 6 (38) | 63 (45) | 0.607[a] |
| | Female | 10 (62) | 77 (55) | |
| **Ethnicity** | Malay | 13 (81) | 133 (95) | 0.086[b] |
| | Chinese | 2 (13) | 2 (1.5) | |
| | Indian | 0 (0) | 2 (1.5) | |
| | Other | 1 (6) | 2 (1.5) | |
| **Household Income** [†] | B40: < RM3030 | 11 (69) | 96 (69) | 0.426[b] |
| | M40: RM3030 -RM6620 | 4 (25) | 20 (14) | |
| | T20: >RM6620 | 1 (6) | 23 (17) | |
| **Household Income (RM)** | | 2150 (3550) | 2000 (2700) | 0.782[c] |
| **Educational Level** | Primary education | 1 (6) | 8 (6) | **0.016[b]*** |
| | Secondary education | 14 (88) | 73 (52) | |
| | Tertiary education | 1 (6) | 59 (42) | |
| **Occupation** | Working | 6 (38) | 41 (29) | 0.199[a] |
| | Not Working | 10 (62) | 99 (71) | |

[†] Based on Kelantan household income statistics by Department of Statistics Malaysia 2019.
[‡] Sample size was not always n=156 due to missing values.
[a] Chi-square test.
[b] Fisher's exact test.
[c] Mann-Whitney test, median ± interquartile range was reported.
* p <0.05.

Table III showed the contribution of energy, macronutrients, dietary fibre and total sugar for hospital food (HF) and out-of-hospital food (OHF) in respondents who consumed both food source in a daily diet. The contribution of energy (p<0.001), protein (p<0.001), carbohydrates (p<0.001), fat (p=0.001), dietary fibre (p=0.004) and sugar (p<0.001) were found to be significantly higher from hospital food (HF) than out-of-hospital food (OHF) in warded patients who consumed both food sources during hospitalisation.

**Table III: Contribution of Energy, Macronutrients, Dietary Fibre and Total Sugar from Hospital Food and Out-of-Hospital Food in a day (n=127)[a].**

| Nutrient | Total Intake Median (IQR) n=127 | HF Median (IQR) n=127 | OHF Median (IQR) n=127 | p value[†] |
|---|---|---|---|---|
| **Calories (kcal)** | 1108.78 (625.62) | 678.5 (619.87) | 348.7 (450.03) | <0.001* |
| **Protein (g)** | 44.01 (25.58) | 26.98 (30.96) | 11.14 (17.92) | <0.001* |
| **CHO (g)** | 164.05 (94.48) | 100.10 (89.73) | 53.64 (69.41) | <0.001* |
| **Fats (g)** | 30.32 (20.99) | 17.58 (18.33) | 9.46 (15.89) | 0.001* |
| **Dietary Fibre (g)** | 3.27 (3.10) | 1.88 (1.81) | 1.08 (1.89) | 0.004* |
| **Sugar (g)** | 34.54 (21.15) | 17.25 (28.51) | 9.00 (17.92) | <0.001* |

[a] Sample size was based on respondents who consumed both hospital food and out-of-hospital food.
[†] p value was based on Wilcoxon signed-rank test, unless otherwise indicated.
Paired-t test, mean ± standard deviation was reported.
* p< 0.05.

Table IV showed the comparison between energy and nutrients provided by hospital diet and the energy and nutrients intake of hospital-food group (HFG) and out-of-hospital food group (OFG). The consumption of energy and most of the nutrients was low in both HFG and OFG warded patients compared to provision of hospital diet. Figure 1 and 2 showed the comparison of energy and macronutrient intake (protein and carbohydrate) between hospital-food group (HFG) and out-of-hospital food group (OFG) respectively. Table V showed the comparison of other nutrients intake between HFG and OFG. Overall, the intake of energy (1113.47 vs. 898.68; p=0.002), carbohydrates (166.79 vs. 133.46; p<0.001) and dietary fibre (3.22 vs. 1.98; p=0.015) were significantly higher in OFG than HFG. Furthermore, there was no significant association between BMI and food consumption among warded patients.

**Table IV: Comparison of Energy and Nutrients between Hospital Diet and Food Intake of Warded Patients.**

| Nutrients | Standard Diet[ax] | Therapeutic Diet[a*x] | Soft Diet[ax] | HFG | OFG |
|---|---|---|---|---|---|
| **Calories (kcal)** | 1487.87 | 1349.00 | 1180.76 | 898.68 | 1113.47 |
| **Protein (g)** | 53.03 | 56.95 | 37.17 | 37.06 | 42.98 |
| **Carbohydrates (g)** | 224.31 | 184.23 | 186.87 | 133.46 | 166.79 |
| **Fat(g)** | 41.69 | 42.66 | 31.55 | 21.91 | 30.22 |
| **Cholesterol (mg)** | 205.48 | 232.569 | 163.55 | 104.71 | 103.26 |

CONTINUE

**Table IV: Comparison of Energy and Nutrients between Hospital Diet and Food Intake of Warded Patients. (CONT.)**

| Nutrients | Standard Diet[ax] | Therapeutic Diet[a*x] | Soft Diet[ax] | HFG | OFG |
|---|---|---|---|---|---|
| Sodium (mg) | 1673.82 | 1585.91 | 1721.54 | 1130.33 | 1330.45 |
| Potassium (mg) | 1321.98 | 1110.35 | 583.85 | 768. 47 | 839.55 |
| Vitamin C (mg) | 77.70 | 73.08 | 12.06 | 52.51 | 48.74 |
| Calcium (mg) | 178.24 | 180.68 | 80.18 | 168.82 | 199.78 |
| Iron (mg) | 6.18 | 7.77 | 5.72 | 6.93 | 6.91 |
| Phosphorus (mg) | 657.89 | 654.87 | 473.49 | 478.92 | 521.26 |
| Dietary Fibre (g) | 4.38 | 4.31 | 3.36 | 1.98 | 3.22 |
| Total sugar (g) | 64.04 | 19.09 | 63.18 | 16.03 | 30.13 |

[a] Standard diet, therapeutic diet and soft diet are the hospital diet.
[*]Diabetic diet was included as an example of therapeutic diet.
[x] According to standardised hospital menu recipe of Hospital Universiti Sains Malaysia.

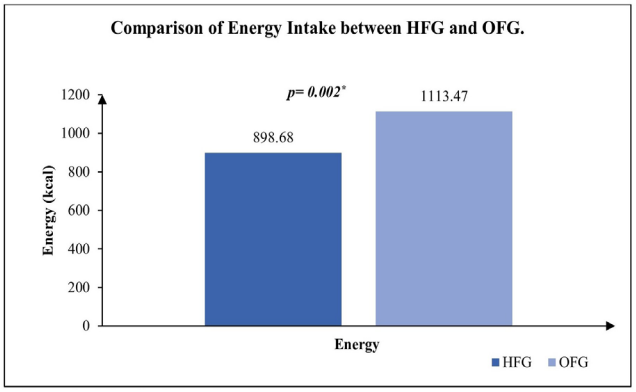


**Figure 1: Comparison of energy intake between HFG and OFG.**

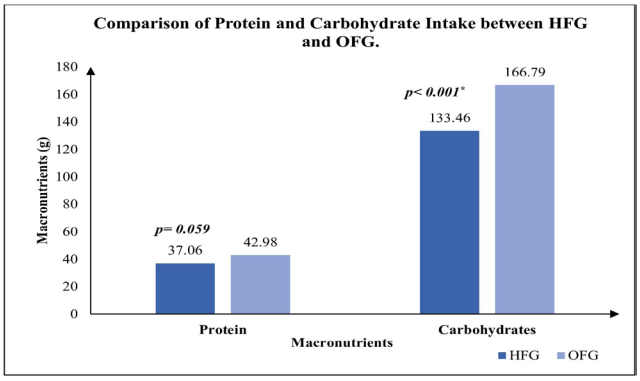


**Figure 2: Comparison of protein and carnohydrate intake between HFG and OFG.**

**Table V: Comparison of Nutrient Intake Between Out-of-Hospital Food Group (OFG) and Hospital Food Group (HFG) Warded Patients.**

| Variables | HFG Median (IQR) | OFG Median (IQR) | p-value[a] |
|---|---|---|---|
| Fat(g) | 21.91 (16.67) | 30.22 (21.66) | 0.091 |
| Cholesterol (mg) | 104.71 (29.50) | 103.26 (116.00) | 0.573 |
| Sodium (mg) | 1130.33 (691.37) | 1330.45 (929.03) | 0.183 |
| Potassium (mg) | 768. 47 (480.67) | 839.55 (645.04) | 0.513 |
| Vitamin C (mg) | 52.51 (38.96) | 48.74 (54.38) | 0.972 |
| Calcium (mg) | 168.82 (93.89) | 199.78 (168.85) | 0.181 |
| Iron (mg) | 6.93 (3.04) | 6.91 (5.06) | 0.775 |
| Phosphorus (mg)[b] | 478.92 (116.57) | 521.26 (231.07) | 0.24 |
| Dietary Fibre (g) | 1.98 (2.13) | 3.22 (3.11) | 0.015* |
| Total sugar (g) | 16.03 (36.93) | 30.13 (31.48) | 0.067 |

[a] p value was based on Mann-Whitney test, unless otherwise indicated.
[b] Independent-t test, mean ± standard deviation was reported.
[*] p< 0.05.

## DISCUSSION

### Prevalence of Out-of-Hospital Food Consumption

A standardised seven-day cycle menu was utilised in HUSM. Every warded patient would be given the hospital diet based on their medical conditions, patients would obtain either normal diet or therapeutic diet. The types of therapeutic diets provided in HUSM included diabetic diet, low salt diet, low fat diet, soft diet or combination of two or more therapeutic diets.

Based on the result, almost all (90%) warded patients consumed out-of-hospital food and were classified as out-of-hospital food group (OFG). This result was inverse with previous study done in Nigeria in 2021. Faremi et al (2021) found that majority of the patients (73.1%) consumed only hospital food during admission and only 26.9% of patients took either additional foods outside or never eat hospital foods (6). The high prevalence of OFG in this study could be due to the accessibility of out-of-hospital food for the warded patients. In HUSM, the cafeteria, food store and convenience shop were available, patients or their visitors would buy food from the store during admission, thus, most of the OFG patients took out-of-hospital food from cafeteria and store in hospital area. There was also food vendors sold food in the hospital ward. Therefore, most of patients consumed kuih, nasi berlauk, fried mee-hoon, bread and biscuits as the out-of-hospital food during hospital stay. Besides, there were also visitors or caregivers brought

home-cooked food or fruits from home during visiting patients. Thus, patients replaced the hospital food with food brought by visitors. Several non-hospital offered food consumed by patients during hospital stay included fresh fruits, cakes and biscuits, fruit juice, sweets, dairy products and their favourite dish (16).

Furthermore, the possible reason of high OFG proportion could be due to small portion size of hospital food. As hospital provided standardized portion food to all patients regardless the age, gender and their medical condition, the portion might be too small and not enough for some patients and they consumed additional out-of-hospital food when they feel hungry between meals (17). Furthermore, organisational factors such as serving time could be one of the reasons that patients did not consume hospital food (18). According to previous study, patients had missed meal due to hospital procedure, examination, surgery, and test, resulting in patients did not manage to take hospital food as the food was served during their treatment, causing patients took out-of-hospital food when feeling hungry after treatment (19). The fixed serving time for each meal might not be consistent with patient's normal dietary habits causing them not feeling hungry during the food served. Moreover, the causes of high out-of-hospital food intake could be due to the lack of variety of food in hospital meal probably due to patient were not given chance to choose their favourite food and the same cycle menu was served which led to boredom especially for those patients with long hospital stay (6).

**Association Between Socioeconomic Status (SES) and Out-of-Hospital Food Consumption**

As there is lack of study of the food consumption among inpatients, the next relevant population, adults, and the intake of away-from-home food were included in the discussion. Based on the result, the food consumption during hospitalisation were associated with age. Although there was higher proportion of OFG contributed from respondents aged 36 years old and above, 100% of the respondents aged between 18 to 35 years old were classified as OFG. This result was consistent to previous study with 95% of young adults with mean age of 25.3 years old reported to have out-of-home food consumption at least one time per week (20). The exact reasons were unclear; however, it could be due to the increased household income and therefore increased the purchasing power of food in younger generations due to the economic and social development (21). Besides, young adults were also exposed to social media more frequently than those elder, thus they had easier accessibility to various food through media. For example, several warded patients reported that the OF were ordered from online food delivery services such as Food Panda and Grab. Furthermore, most of the young-aged respondents were working adult, the consumption of out-of-hospital food might be their habit and lifestyle during working (22).

In this study, the overall association between socioeconomic status (SES) and food consumption was unable to conclude as inconsistent results were obtained from each SES parameter. The overall SES from the respondents was found to be low and moderate SES as more than half of the respondents were classified as B40 for household income, completed secondary education and were not working. Educational level was shown to have significant association with food consumption during hospitalisation. Based on the result, all three educational level showed to have higher proportion of OFG than HFG. When compare HFG and OFG proportion among each educational level, the respondents with tertiary education level had the biggest difference of OFG (98%) and HFG (2%) than primary and secondary education level. This result was in line with previous study in Shang Hai, where respondents with higher education status were more likely to eat out of home. This could be due to people with tertiary education level often secure a fixed job and fixed salary as they obtained specific skill and knowledge for certain field upon completing diploma, undergraduate and postgraduate. The probability of dining out was high could be due to the convenience and time saving than practicing home-cooked (8). However, another research showed that people with higher educational level tended to be taken care of their diet by following the recommended guidelines (23). According to the previous study, higher levels of education were linked to higher consumption of foods that were components of healthy diet such as fruits and vegetables, lean meat, and whole-grain food choices in combination with high-fat and high-sugar-containing food and drinks. This research finding conflicted with the previous research finding, where majority of the patients with higher education level did not follow the recommended intake in hospital and consumed out-of-hospital food during their stay. Despite only focused on education level, nutrition literacy was a crucial component in influencing food choice. Several studies showed that people with high nutrition literacy were linked with low frequency of take-out food consumption and demonstrated an eating habit consistent with the nutrition knowledge as they tended to adhere with the nutrition knowledge learnt in daily diet (24,25). In this study, since none of the respondents was from nutrition-related background, thus, this could be one of the possible reasons of high out-of-hospital food intake across all levels of education.

**Differences of Energy and Nutrients Intakes Out-Of-Hospital Food Group (OFG) and Hospital Food Group (HFG)**

Among 140 respondents who were classified as OFG, 127 (91%) of them which was 81.4% of total respondents consumed both hospital food and out-of-hospital food in a day during hospitalisation. Based on the findings, respondents consumed mainly hospital food and supplemented hospital food with out-of-hospital food as they had significant higher intake of energy, protein,

carbohydrates, fats, dietary fibre and sugar from hospital food which were about double than the out-of-hospital food. This finding shown a similar result from a previous study by Teng et al. (2003). Based on previous study, 62% of the respondents supplemented hospital food with out-of-hospital food with the reasons of feeling hungry between meals, for added variety and inadequate of hospital food (4).

The overall energy and nutrient intake among the warded patients were low compared to the recommended intake for adults. According to Recommended Nutrition Intake (2017), the energy requirements for low active adult's males and females aged 19 to 29 years old was 1960 kcal/day and 1610 kcal/day respectively, aged 30 to 59 years old was 1920 kcal/day and 1660kcal/day respectively and 60 years old and above was 1780 kcal/day and 1550kcal/day respectively. However, the mean intake of energy in HFG and OFG was only 898.68 kcal/day and 1113.47 kcal/day respectively. Besides, the energy and most of the nutrient's intake among patients was also low compared to the provision of hospital diet. This indicated that most of the patients did not finish the food provided by hospital. The food consumption during hospital admission was influenced mainly by patients' physical and clinical condition leading to reduced food intake. The effects of illness that lead to decreased in food intake during hospitalisation included loss of appetite, sickness and lethargy and tired (26). Meanwhile, other reasons of reduced food consumption were patients not feeling hungry, disliked food's taste, experienced nausea and vomiting and required assistance to eat (16).

The comparison of energy and nutrients Intake in this study was found to be in line with previous study with OFG showing a higher of energy and most of the nutrient's intake than HFG (1). A significantly higher energy and carbohydrates intake was observed among respondents consumed out-of-hospital food than respondents consumed only hospital food. This could be due to the consumption of out-of-hospital food that were more energy-dense food than hospital food such as fried delicacies such as fried kuih-muih, banana fritters, processed snacks (kerepek), and high-sugar content food and beverages such as chocolate spread in waffle and rolls, filled biscuits, cream bread, 3-in-1 drinks and juices. In comparison, hospital food was prepared using healthy cooking method such as baking using combi oven and omit high-fat cooking method such as deep-frying. Besides, despite the fibre intake in both groups was low compared to the provision of hospital diet, a significant higher fibre intake was found in OFG than HFG in this study which was inconsistent with the previous study (9) might be due to OFG respondents consumed vegetables from vegetable soup, fried rice with vegetables such as carrot and mustard leaves. Some of the OFG respondents also consumed fruits brought from home and thus ensuring fibre intake. On the other hand, some of the HFG respondents reported that dislike the fruits and vegetables provided and not finish the dishes, leading to lower fibre intake.

Surprisingly, this study found that most of the nutrients' intake such as proteins, fats, sodium, potassium, calcium, dietary fibre, and total sugar were comparable higher in OFG than HFG although there was no significant association. This could be due to small sample size of HFG. Despite that, the results showed a slightly higher intake of these nutrients when respondents consumed out-of-hospital food. The possible reasons of high protein and fat intakes in OFG might be due to consumption of high-fat cooking method meat-based food such as chicken and fish cooked in coconut gravy (*gulai*), fried chicken and fried fish were more common than using low-fat cooking method like steaming and boiling, led to increase proportion of energy intake from protein and fat. The higher sodium intake in OFG than HFG was in line with the previous study where greater sodium intake was associated with having at least one meal outside the home (27). The common out-of-hospital main dishes taken by respondents included fried noodles, noodles soup, fried rice, *nasi kerabu* and chicken porridge while other snacks was burger, pizza, fried chicken and *kerepek*. The mentioned food had medium sodium content (between 120 and 600mg/100g food) and high sodium content (>600mg/ 100g food) due to the adding of high amount salt, sauces and flavouring in cooking and processing to increase palatability of food (28).

The higher calcium intake in OFG than HFG could be due to some of the respondents who claimed to be loss of appetite substituted main meal with milk in either powdered milk or carton milk. Meanwhile, the sugar intake in OFG was about double from HFG. This could be due to respondents complained of bland taste of beverages provided by hospital such as *Teh O* and *Kopi O* as less sugar was added compared to commercial food store and no sugar added for those with diabetes mellitus. Therefore, the respondents consumed beverages such as juices made from cordial, *teh tarik* and iced lemon tea from food store around HUSM. Other than that, some respondents also took snacks especially sweet *kuih-muih* such as *kuih cek mek molek*, *akok* and *pulut pagi*, waffle, crepe and churros dipped with condensed milk due to the easy accessibility in HUSM.

**Association between Body Mass Index (BMI) and Out-of-Hospital Food Consumption**

There was no significant association found between weight status and food consumption during hospitalisation probably due to small sample size. Besides, in-hospital weight variation which included weight gain, weight maintenance and weight loss might be happened during hospitalisation. The assessment of body-mass-index (BMI) was only taken consideration to the current condition of patients without considering weight variation during admission. Based on previous study, 45.5% of patients experienced weight loss during

their stay probably due to reduced energy intake, increased energy requirement and reduced digestion and absorption of nutrients (29). Thus, weight loss might be a confounding factor of the association between BMI and food consumption during hospitalisation.

In this study, the assumption was made at the consumption of out-of-hospital food was the usual practice of eating habits during normal non-hospitalised day for warded patients. Therefore, studies of out-of-home food and weight status were included in the discussion. Even though there was no association found between weight status and food consumption during hospitalisation, based on the result, OFG respondents had higher intake of energy, macronutrients and most of the micronutrients than HFG. In this study, OFG respondents consumed higher amounts of energy-dense food such as high-fat and high-sugar content food compared to HFG respondents. Frequent consumption of high-fat food was positively associated with body weight, BMI and thus the risk of overweight and obesity (30). Furthermore, previous study also found that respondents who consumed food far away from home (FAFH) had higher average adjusted weight gain per year and significantly associated with higher BMI than those consumed food from home (31).

**Strengths and Limitations**

The strength of this research was it investigated the prevalence and characteristics of food intake in warded patients, focusing on hospital food and out-of-hospital food consumption. This study provided some understandings on food consumption in warded patients on the food source, energy and nutrient intake during hospitalisation. Besides, the data obtained from this study could be references for future study. This research could be useful for hospital authorities to carry out survey and educational activities to create a healthy-eating lifestyle among warded patients.

This study had its limitations. Firstly, it was a cross-sectional study design with questionnaire-based methodology, mainly focusing on dietary recall but did not explore the factors associated with out-of-hospital food. Therefore, in future study, a mixed method of qualitative and quantitative method is suggested to explore the reasons. Next, the use of BMI might not be suitable for warded patients as it could not detect weight loss and malnutrition status among warded patients. Instead of using BMI, other anthropometry assessment methods such as nutrition-focused physical examination (NFPE) and subjective global assessment (SGA) are recommended to be used in future research. Besides, recall bias might be drawback as patients might not remember their food intake. Thus, a multiple-day dietary recall could be performed instead of only taking single-day dietary recall. Furthermore, due to the time constraints, the sample size was small and might not be representative of the whole population. For nutrients analysis, there were incomplete nutrition information in Malaysia Food Composition Database (MyFCD) and brand food products. Some food products only labels with energy and macronutrients without information of micronutrients and dietary fibre which might lead to misinterpretation and not significant result between both groups. Lastly, there was lack of similar study of outside food consumption in hospital setting, thus results might be differed due to different setting.

## CONCLUSION

In conclusion, the prevalence of out-of-hospital food consumption was 90% in warded patients who stayed at Hospital Universiti Sains Malaysia. Out-of-hospital food consumption was associated with age and education level. Besides, no association was found between out-of-hospital food consumption and body mass index (BMI). The dietary composition of respondents who were classified as out-of-hospital food group (OFG) was significantly higher in energy, carbohydrates, and fibre than hospital food group (HFG) respondents. The trends of other nutrients also showed a higher intake of OFG than HFG. Therefore, the promotion of healthy diet during hospitalisation should be carried out to ensure patients received adequate and balanced nutrition during hospital stay.

Hospital diet is important to support the nutritional requirement for warded patients as it is complete balanced in terms of nutrition. Patients did not take food provided by hospital due to several factors. Therefore, a hospital food service satisfaction survey could be carried out for hospital authorities to improve the menu, portion size and organisational factors and thus to ensure the consumption of hospital food in warded patients. Besides, promotion of healthy diet during hospitalisation should be carried out to ensure patients obtained adequate and balanced nutrition during hospital stay. For example, hospital authorities could also prepare poster and pamphlet about healthy food choices and healthy cooking methods as well as nutrition information of commonly consumed out-of-hospital food could be prepared and compared with the hospital food to patients and caregivers. Besides, hospital authorities should inspect the food menu in food store periodically and develop a healthier menu thus creating a healthy food environment to warded patients. It is hoped that patients could choose the good food with good nutrition during hospitalisation.

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