

## ORIGINAL ARTICLE

## Plate Wastage Among Hospitalized Cancer Patients

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## ABSTRACT

**Introduction:** Plate wastage in hospital contributes to malnutrition-related complications including longer hospitalization among cancer patients. The objective of this study was to determine the relationship between patients' experiences of access to food hospital and plate wastage among hospitalized cancer patients. **Methods:** Two hundred and thirty-one cancer patients in the National Cancer Institute, Malaysia were recruited for this study. All eligible patients were undergoing cancer treatments and provided with informed consent. Data obtained included socio-demographic characteristics and patients' experiences of access to food hospital which will contribute to plate wastage. Plate wastage was determined by weighing the unwanted food left on the plate. **Results:** Prevalence of plate wastage among cancer patients was high at approximately 54%. The appearance of food served was associated with higher plate wastage ( $p < 0.01$ ). **Conclusion:** This finding shows that the prevalence of plate wastage was high which may inhibit food consumption and affecting nutritional status among cancer patients with oncologic treatment. Effective strategies that address factors associated with plate wastage should be taken among hospitalized cancer patients.

**Keywords:** Food wastage, Cancer, Hospital food, Food appearance, Hospitalized patients

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## INTRODUCTION

Plate wastage refers to the volume or percentage of the served food that is discarded (1). Plate wastage in food service sectors such as restaurants and cafes was found to be less than 15% while hospital food waste used to be two to three times higher (2). According to Mattoso and Schalch (2001), plate wastage can produced up to 50% of the total waste generation in the hospital (3). High level of food wastage is highly associated with malnourished-related complications and impacted financially as well as environmentally (1).

The prevalence of food wastage has increased in hospitalized patients. A plate wastage study that carried out in Australia stated that the median plate wastage in hospitals was approximately 30.0% (range 6 – 65%) (4). The level of plate wastage in the hospital was highly influenced by various parameters such as the setting and environment, diet type, the menu, method of the food distribution system and its flexibility. High plate wastage leads to negative consequences financially and most of the patients are not likely to meet their nutrition requirements (4).

Local study by Norshariza (2016) showed that food wastage among cancer patients was high, regardless via observational method (59.3%) or weighing method (41.9%). The above study also highlighted that the estimated loss of energy and protein values from the discarded food to be approximately from 401 Kcal to 589 Kcal (20-30%) and 17gm to 40gm (21-47%) respectively (5), which has substantial impact on the achievement of dietary requirement of patients.

From a plate wastage study among elderly residents that conducted in Victoria, Australia, it was found that the mean of the whole day energy wastage was 17.0%. The lowest mean energy wastage significantly occurred at breakfast (8.0%), followed by lunch (22.0%) and dinner (25.0%) (6). Furthermore, another study of visual plate wastage in hospitalized patients in the United States stated that 93.4% of the patients accepted the meals served during lunch, 2.0% refused the tray, 2.3% were not in the room and 2.3% had been discharged. Therefore, from the pool, 36.7% ate > 50.0% of the food served, 46.2% ate < 50.0% and 17.1% had nothing into mouth for their lunch (7).

According to a study by Barton and colleagues in 2000, the plate wastage in four different settings, namely geriatric, medical, surgical and orthopedic wards, showed that the mean daily provision of energy for lunch and supper in all wards was 1838 Kcal while protein

was 53.3g, with patients in geriatric ward presented with highest percentage (41.0%) of plate wastage during lunch as compared to other settings (8).

Several reasons were found to contribute to plate wastage which can be either attributed to the side effects of treatments received by the patients or dissatisfaction of hospital foods and foodservice system (9). A study by Stanga et al. (2003) in Switzerland to obtain opinions of hospital food in order to enhance menu planning and food delivery stated that 28.0% of the patients claimed that they finished the food served, 48.0% ate most of the food, with more than one-fifth may only took a small proportion, while 50.0% of the patients claimed to have less appetite in hospital. Patients staying longer in the hospital were stated to have worse appetites and had high plate wastage which presumably due to high severity of illness (9). A study from the United Kingdom stated that 31.5% of all the patients were accounted for experiencing low appetite, 43.0% for quality of meal issues and 25.5% of the patients claimed that the portion sizes of the meal served were too large (10).

Many cancer patients are reliant on adequate food intake, and oral nutrition support (11), which highlights the importance of the quality and nutritional content of hospital foods with respect to treating malnutrition in hospitalized patients. Studies have demonstrated that the provision of a flexible, quality and responsive food service process to deliver the right food to the right patients at the right time can assist in reducing the food wastage (12), which substantially reducing risk of malnutrition while improving patients' care experience (1, 11, 13).

Most studies conducted were on plate wastage and its associated factors in hospitalized patients namely elderly, surgical and medical patients, with limited information on plate wastage among cancer patients. Therefore, this study aimed to determine the presence of plate wastage among hospitalised cancer patients at National Cancer Institute, Putrajaya and its relationship with social demographic and patients' experiences of access to hospital food. This study hopes to provide suggestions on effective strategies to reduce plate wastage among cancer patients.

## **MATERIALS AND METHODS**

### **Participants and Study Design**

This was a cross-sectional study conducted from January to March 2017 at National Cancer Institute, Putrajaya, Malaysia. A total of 231 participants were recruited according to inclusion and exclusion criteria. All participants were Malaysians regardless of the type of cancer diagnosis, aged 18 years old and above, can eat orally, received normal diet and undergoing cancer treatment. The participants included were not

on palliative care, undergoing chemo port insertion and must be admitted at least 48 hours. The reason for selecting participants who had admitted for more than 48 hours was to ensure that the lunch meals were chosen by themselves through their menu cards. Informed consents were obtained from each participant before questionnaires were distributed and measuring their plate after lunch.

### **Structure of the Questionnaire**

A set of structured questionnaire was used to obtain information on socio-demographic factors from the participants. It also consisted participant's eating experience during bedside meal-times, impressions of the standard and acceptability of hospital food and food service, a system for food delivery and arrangements for meal-times and problems of hospital food; it was structured and adapted from an existing validated questionnaire (9). Prior to the study, 10 patients from the National Cancer Institute who met the study criteria had been chosen to pre-test the questionnaire. These patients had the same characteristics as the real study sample. The time needed to complete the questionnaire had been identified as well as the instruction given was clear, direct and easily understood by the patients. After pre-testing, the questionnaire was improvised based on the problems or errors that arose. The feasibility of the questionnaire was also re-assessed after pre-testing so that appropriate information was obtained during the data collection. Patients who had involved in pre-testing were not eligible for study enrolment.

### **Plate wastage**

Lunch was served to all participants from 12.00pm to 1.00pm. The food served would be according to the menu that they had chosen on the menu card given a day before. There were seven types of diet available in National Cancer Institute namely normal diet, diabetic diet, low salt diet, low residue diet, blended diet, soft diet, and a full liquid diet. Normal diet referred to high calories and high protein diet which is different with normal healthy population intake. For this study, only the normal diet menu was used to determine the plate wastage.

To measure plate wastage, weights of each food on the plate were weighed before serving to and after consuming by participants. Digital weighing scale model TANITA KD 400 was used to measure the food of the meal. Firstly, all the empty plates used were weighed. Then, plated meals of each group were weighed before served and recorded. After eating, finished meal plates were collected and each food was weighed again and recorded to obtain the amount of food that was wasted. Weight data for before and after served were input to be analyzed (10). The rate of plate waste in a hospital setting that greater than 30.0% was agreed to be considered as high plate waste (14).

## Statistical Analysis

Categorical variables were presented as frequencies and percentages while continuous variables were presented as means and standard deviations. Independent T-test and One-Way ANOVA were used for comparison between continuous parametric variables. Chi-square test was used to compare the categorical variables. The multivariate linear regression was used to identify factors with age and participants' opinion of hospital food and food service system of plate wastage among cancer patients. All the statistical analysis were performed by using IBM SPSS Statistics 23 with the level of statistical significance set at  $p < 0.05$ .

## RESULTS

### Characteristics of Patients

A total of 231 patients aged from 18 years to 83 years old (median 55.0, IQR 47 – 64) were recruited in the study. There were 89 (38.5%) males and 142 (61.5%) female. About two-thirds of the participants aged < 60 years old (64.1%) as compared to those aged  $\geq$  60 years old (35.9%). Malay (55.8%) was the largest group recruited, followed by non-Malays (44.2%). Almost half of the participants had their education up to secondary level. More than half of participants (64.9%) were reported not having a family history of cancer. The most common tumor location was digestive system (23.4%), followed by breast and gynecology (21.6% respectively), head and neck (21.2%), lung (7.8%) and others (4.3%). Half of the patients were in stage 4 (44.6%). Most patients undergoing chemotherapy (39.4%) (Table I).

Mostly patients ordered the food by themselves (73.6%), followed by food ordered by their family (17.2%), friends (1.8%) and nurses (7.5%). Food ordered was mostly consumed by patients themselves (81.5%) but some were shared with their family (16.7%). There was no statistically significant difference among the patients who ordered the food and consumed the food ordered with plate wastage.

Apart from that, 18.9% of patients reported that the foods served were big in portion size and the appearance of the food served was not attractive (44.5%). Patients also stated that a good garnishing on the food and the attractiveness of the food will enhance their eagerness to try the food even though they have low appetites after the treatments. Besides, 12.3% of the food received by the patients were not the same as the food they ordered and more than half (55.1%) of the patients were given oral nutrition supplements to replenish their energy and protein intake (Table II).

In terms of food temperature, more than half of the patients (55.7%) stated that the food was not served in its optimum temperature. The patients reported that mostly the food served punctually (78.9%) at lunch hour. In overall, 39.2% of the patients were unsatisfied with

**Table I: Socio-demographic characteristics of cancer patients (n=231)**

Characteristics	All partici- pants	Male	Female	*p-value	
	n (%)				
<b>Gender</b>		89 (38.5)	142 (61.5)		
<b>Age categories</b>					
< 60 years old	148 (64.1)	50 (56.2)	98 (69.0)	0.066	
$\geq$ 60 years old	83 (35.9)	39 (43.8)	44 (31.0)		
<b>Ethnicity</b>					
Malay	129 (55.8)	48 (53.9)	81 (57.0)	0.744	
Non-Malay	102 (44.2)	41 (46.1)	61 (43.0)		
<b>Education Level</b>					
Primary	67 (29.0)	22 (24.7)	45 (31.7)	0.257	
Secondary	114 (49.4)	50 (56.2)	64 (45.1)		
Tertiary	50 (21.6)	17 (19.1)	33 (23.2)		
<b>Family History of Cancer</b>					
Yes	81 (35.1)	63 (70.8)	87 (61.3)	0.182	
No	150 (64.9)	26 (29.2)	55 (38.7)		
<b>Location of Tumour</b>					
Breast	50 (21.6)	0 (0.0)	50 (35.2)	-	
Digestive System	54 (23.4)	30 (33.7)	24 (16.9)		
Head and Neck	49 (21.2)	30 (33.7)	19 (13.4)		
Lung	18 (7.8)	12 (13.5)	6 (4.2)		
Gynaecology	50 (21.6)	8 (9.0)	42 (29.6)		
Others	10 (4.3)	9 (10.1)	1 (0.7)		
<b>Cancer Stage</b>					
Stage 1	17 (7.4)	3 (3.4)	14 (9.9)		0.229
Stage 2	33(14.3)	11 (12.4)	22 (15.5)		
Stage 3	78 (33.8)	31 (34.8)	47 (33.1)		
Stage 4	103 (44.6)	44(49.4)	59 (41.5)		
<b>Treatment Undergoing</b>					
Chemotherapy	91 (39.4)	46 (51.7)	45 (31.7)	0.080	
Radiotherapy	77 (33.3)	26 (29.2)	51 (35.9)		
Chemoradiotherapy (CCRT)	37 (16.0)	13 (14.6)	24 (16.9)		
Surgery	25 (11.3)	4 (4.5)	21 (15.5)		

\*p > 0.05 not significantly different with Chi-Square Test

the menu prepared by the institute. This dissatisfaction received by the patients were mostly due to the raw ingredients itself such as the freshness and type of ingredients or the methods of cooking.

The overall percentage of plate wastage among cancer patients in National Cancer Institute, Putrajaya was 53.9%. Table III shows the relationship between patients' opinion of hospital food and food service system with plate wastage. Appearance of food served was correlated with high plate wastage ( $F(2, 220) = 8.361, p < 0.004$ ).

## DISCUSSION

The disposition among males (38.5%) and females (61.5%) were comparable with National cancer registry Malaysia that which reported that 45.2% were in males and 54.8% in females. (15). Basically, there were more females were in the study compared in males which indicated that the common cancers seen were breast and gynecology cancer.

Plate wastage is a globally severe issue, especially

**Table II: Participants’ opinion of hospital food and food service system**

Characteristics	n (%)	p-value
<b>Individual whom order the food</b>		
Patients him or herself	167 (73.6)	0.755
Family members	39 (17.2)	
Friends	4 (1.8)	
Nurses	17 (7.5)	
<b>Individual whom consume the food ordered</b>		
Patients him or herself	185 (81.5)	0.935
Family members	38 (16.7)	
Friends	4 (1.8)	
<b>What do you think of the portion size of the food served?</b>		
Big	43 (18.9)	0.372
Just enough	171 (75.3)	
Small	13 (5.7)	
<b>Does the food received same as the food you ordered?</b>		
Yes	199 (87.7)	0.876
No	28 (12.3)	
<b>Does the appearance of the food served attractive enough?</b>		
Yes	126 (55.5)	0.152
No	101 (44.5)	
<b>Does the food serve at the optimum temperature?</b>		
Yes	96 (42.3)	0.395
No	131 (57.7)	
<b>Does the food serve punctually for lunch?</b>		
Yes	179 (78.9)	0.130
No	48 (21.1)	
<b>Do you like the menu prepared by the Institute?</b>		
Yes	138 (60.8)	0.144
No	89 (39.2)	

*p* > 0.05 not significantly different with Chi-Square Test

in the hospital setting. The rate of plate waste in a hospital setting that greater than 30.0% was agreed to be considered as high plate waste (14). The median reported plate wastage was 30% of the plated food weight in a Meta-analysis of 32 studies, carried out in 29 countries (1). In 2015, the plate waste during lunch in the National Cancer Institute was 41.9% measured by weight (5). However, this study shows that 53.9% of the food served to the cancer patients during lunchtime were discarded by a weighing method which shows that there is an increment in plate wastage. This imposes a great challenge to the hospital especially from the dietitians’ perspective as high plate wastage indicates that cancer patients did not meet their energy and protein requirement.

Food that was ordered by the patients themselves was believed to have the least contribution to plate wastage.

**Table III: Factors related to plate wastage in cancer patients (n=231)**

Variables	Unstandardised coefficient $\beta$	Std. Error	Standardised coefficient $\beta$	Sig
Constant	434.830	33.625		0.0001
Does the appearance of the food served attractive enough?	74.682	35.753	0.137	0.038

Notes: R = 0.191, R<sup>2</sup> = 0.036, Adj. R<sup>2</sup> = 0.032; F = 8.361, *p* < 0.004

When patients ordered the food by themselves, they understood which food may suit their conditions especially in the aspects of the food texture, cooking style as well as their chewing and swallowing ability. Food that ordered by others rather than the patients themselves tended to increase the amount of plate waste as they did not fully know what the patients would prefer to have during their meals. Hence, this would increase plate wastage in the hospital. In fact, some food served were consumed or shared with their family and friends. This shows that the percentage of plate wastage in National Cancer Institute should be more than 53.9% if the food were merely consumed by patients themselves. The sharing of the food with family might delay patients’ nutritional status from achieving their ideal energy and protein requirement. Furthermore, the prescription of oral nutrition supplement did affect plate waste because patients tend to reach their satiety after drinking the supplement and feeling less hungry when the lunch were served.

In this study, less than 20% of the patients commented food served was at big portion and this was majority reported among the geriatric patients. This finding is comparable to other studies (10). The amount given was beyond their eating capacities, so the leftover food would be discarded. To overcome this issue, the portion size should be modified, perhaps with smaller portion size but highly dense energy to meet energy and protein requirement among the geriatric population.

Even though the percentage of food wrongly served was approximately 10%, this could have been avoided in food service management. Therefore, kitchen staffs is strongly advised to be aware of the menu ordered by the patients to prevent any misread or technical error which lead to patients receiving the wrong meals. The food that received differently from the food ordered would increase the tendency of plate wastage. Staffs in-charge have to be alert with the changes in the patients’ status as some patients would have planned to discharge before lunch was served or patients would be taken for procedures during lunchtime. If the food was served when the patients were not around, the food would turn cooler and less appetizing.

Dissatisfaction of the food temperature also an important component in determining plate wastage. In addition,

the temperature of the food somehow determines the amount of food intake. In National Cancer Institute, 57.7% of the hospitalized cancer patients commented that the food was not served hot especially the soup that played a role as an appetizer. When patients were not attracted to the meals, the initiative to pick up the utensils reduced. The food presentation that included cool meals and poor appearance were the reasons for plate wastage in hospitals (1). Food preparation, transport, and serving must assure that all food is presented to the patient in a way, which optimizes its consumption (16).

National Cancer Institute is currently using trolleys to deliver the menu to the patients without the capability to sustain the food temperature. With the plated meal service or centralized system which the food was plated in the kitchen before serving to the patients, would cause meals to be coolly served. In support of today's technology advancement, the transportation of hot and cold meals should be used such as Ready to Serve (RTS) trolley in keeping the hot food hot and cold food cold. The thermo-convection design of RTS ensures the heating and sustained holding of hot food by circulating hot air throughout the compartment. On the cold compartment of the RTS, it was functioned with a forced air circulation system to ensure the food are perfectly refrigerated. Therefore, the usage of RTS in the National Cancer Institute would definitely benefit both patients and dietitians in reducing plate wastage and food resources.

A majority of the patients were satisfied with the serving time (78.9%) (Table II). Punctuality in serving food to the patients is another reason that contributed to plate wastage. Food that was served late would leave the patients hungry, leading them to have their own food instead as some of their caregivers would bring home cook food during lunch and dinner. The family who visited the patients every day would bring a variety of food so that the patients would never go hungry (17). Once they were full, they were not interested to try hospital food when they were served. Mentioning about bringing their own food, some patients would rather prefer to order outside meals or having meals in the hospital cafeteria than eating hospital food. Therefore, the food prepared by the hospital kitchen was just left untouched.

The present study showed that unsatisfied with the appearance of food served is associated with higher plate wastage in the hospital (Table III). It has been shown that meal appearance stated by patients was important for generating or maintaining appetite (18). Odor and appearance of the food seemed to affect patients' appetites than looking at the quantity itself. The presentation of the food is an important component to stimulate patient eagerness to try the food which contribute the major factor in food intake, *ceteris paribus*, nutritional benefit (19-20). To produce appealing cooked food, chef and

staffs must have skillful hand and knowledge along with proper techniques during food preparation. When less appealing foods are presented on the table, participants will tend to ignore them or try eating those that are more appealing such as fruits. The ignorance will indirectly increase the plate wastage in the hospital.

Almost a century ago, people were searching for the strategies to reduce plate wastage in military hospitals, emphasizing on the quality of food and portion size (21). Today, food wastage and food intake are recommended to be monitored closely, with policy modification if necessary (1). Many approaches can be implemented to increase patients' meal consumption and reduce plate wastage. Whereby, in foodservice perspective, the training for the staffs is very important in providing quality foods and services. The quality of service and ways of handling waste issues would directly be affected by the significant training gaps amongst staffs. Some catering staffs must have the knowledge to optimize food quality through adapted instructions and working experience.

In food wise, the menu should be optimally designed for patients needing to be fortified and modified-consistency meals as well as non-traditional eating habits (9). As Malaysia consists of different races and cultures, it is a major challenge to dietitians when it comes into designing a menu. In this matter, they have to be very creative and to consider on age, race, culture, and condition of the patients. For instance, several cultural foods can be included in the new lunch menu to increase patients' satisfaction. Balance is needed to be struck between limiting the range of the menu due to economic factors and making it as broad as possible to fulfill most patients' preferences in order to increase their satisfaction and most importantly their food intakes (9). In overall, food prepared by the National Cancer Institute was almost reaching the standard of satisfaction. Still, there is some space of improvement with enhancement in food service system and food served in order to optimize patients' preferences. With all these potential and effective strategies, it is hoped that plate wastage among hospitalized cancer patients can be minimized as much as possible. Thus, to increase patients nutritional status.

The present study was limited to a single day's meal assessment and so the results provide only a point-in-time assessment rather than an assessment of meal provided over time. Another limitation was that food consumed by their family in the present study, the contribution of plate wastage was expected to be maximized. On the other hand, the limitations in of this study may not represent the actual plate wastage among cancer patients in Malaysia because it was done in only one health center and small numbers of participants. Further research using a larger sample size is recommended. The involvement of only one

researcher in data collection in this study was important to standardize the assessment process and outcomes as well as to minimise the possibility of interrater variation.

## CONCLUSION

In conclusion, the present study shows that plate wastage among cancer patients is high. The appearance of food served has shown a relationship between plate wastage. Effective strategies and interventions should be carried out to reduce plate wastage among cancer patients. The improvement in plate wastage should come with enhancement in food service system and food served itself.

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