

ORIGINAL

Food Wastage in Hospital among Cancer Inpatients and its Relation with Nutrition Impact Symptoms

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ABSTRACT The objective of the study is to determine the prevalence of food wastage among cancer patient in NCI, Putrajaya. The association between the nutrition impact symptoms resulted from cancer and side effects of cancer treatments with the rate of food wastage was also investigated. This cross sectional study has been conducted from May to June 2015 involving oncology wards in which samples were randomly selected. Weighing method and visual estimation were used to measure weight of leftovers or food waste. Based on observational and weighing method, as high as 59.3% and 41.9% respectively of foods served during lunchtime to the NCI's patient were discarded or wasted which equalled to RM25,259.44 and RM17,847.73 respectively from total expenditure. Based on weighing method, the most food groups being wasted by patient are vegetables, protein main dish, and soft CHO. From visual estimation method, the most wasted food group is main protein group, followed by vegetables group, carbohydrate group, side protein group and the dessert group. Between these two methods, similar food group were reported as being highly wasted. There are also a significant association between nausea, vomiting, loss of appetite and swallowing difficulties with the rate of food wastage. These nutrition impaired symptoms experienced by patients were important to be addressed appropriately to improve their diet intake and indirectly reduces food wastage in hospital..

Keywords: Nutrition, cancer treatments, food wastage, Malaysia.

INTRODUCTION

Food waste or food loss is food that is discarded or lost or uneaten (1). The causes of food waste or loss are numerous, and occur at the stages of production, processing, retailing and consumption (2).

In 2013, half of all food is wasted worldwide, according to the British Institution of Mechanical Engineers (IME) (3). Loss and wastage occurs at all stages of the food supply chain or value chain. In low-income countries, most loss occurs during production, while in developed countries much food – about 100 kilograms per person per year is wasted at the consumption stage (4). The statistic shows that in developing and industrialized countries had dissipated almost the same amount of food which is 630 and 670 million tonnes respectively where fruit, vegetables, root and tubers has the highest rate of food wastage of any food⁵. Global quantitative food losses and waste per year are roughly 30% for cereals, 40-50% for root crops, fruits and vegetables, 20% for oil seeds, meat and dairy plus 35% for fish (5).

High food wastage always being linked to reduced energy and protein intakes and has impact towards malnutrition related complications (6) and indirectly towards the prevalence of malnutrition in hospitalized patients. Malnutrition has been identified as one of related cause in death of cancer patient and many studies find from 25-40% of acute hospital patients are malnourished (7). Standard guidelines and protocol had been developed and practiced by dietitian, and provision of meals has become an essential parts of patient's treatment (8) but somehow the incidence of malnutrition in hospitalized patients especially in cancer patient still occur. In NCI, Putrajaya, a pilot study had been done in June to July 2014, with n=41, where from observation, the rate of food discarded by patient is 19.54% even though the score of Patient Satisfactory Survey is more than 80%. BAPEN 2012 also shows that worrying amount of food waste linked to hospital settings is approximately 40-45 %, coupled with a considerable level of malnutrition among patients which is approximately 20-40% in Denmark.

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In a study done in University hospital with 1200 sample aiming to investigate the cause of continuing weight lost in hospitalized patients, the study conclude that energy and protein intake in patients were low and did not met their recommended intake despite the value of 2000 kcal diet provided by hospital that should met patient's requirement (6). The study reveals that high rates of food wastage more than 40% is a proven evidence of low intake of diet provided among patient resulting in energy and protein received by patient is less than 80% of energy and protein recommended (6). More than enough food is produced or available in hospitals but still for some reason not all patients eat adequately, resulting in malnutrition and food waste (9). Clinical issues involving NIS like poor appetite due to illness or medication, changes in sense of taste or smell, swallowing difficulties, pain, textured modified diet and others issues such as long length of hospital stay had been listed as reasons for food wastage in hospitals (10) and all these condition always occur in cancer patients due to cancer itself or the treatment which can impaired towards patient's nutritional status (11). Therefore, simply planning and providing adequate food is ineffective if it is not eaten by patients regardless of whatever factors that contributed to the lower oral intake. In addition to the nutritional implication of the waste, there are financial concerns as well.

The main objective of this study is to determine the percentage of food wastage in (National Cancer Institute (NCI), Putrajaya and to find if there is significant association between nutritional impaired symptoms or side effects such as nausea, vomiting, diarrhea, stomach discomfort and others with incidence of food wastage in hospitalized cancer patients.

MATERIALS AND METHODS

This cross sectional study has been conducted from Mei to June 2015, during lunch time involving 337 samples from 4 different wards (7A, 7B, 8A and 8D). Sample is randomly selected within these 4 wards and the selected food tray for the selected sample is taken and labelled for data collection.

The food service system in NCI is a centralized plated system with 8 days menu cycle and patient's BOR is 40% from 252 beds. In this study, food wastage has been defined as volume or percentage of the served food that is discarded. There are two measurement methods that have been used: weighing and visual estimation.

Weighing methods had been used to measure weight of leftovers or food waste by each food components or items on each individual tray. Prior to that, few samples of selected tray were weighed before it being served to the patients. The average measurement is used as the baseline weight to be compared with wastage weight.

Second method is a visual estimation. It is used by measuring proportion of leftovers food using semi quantitative 5-point scale (all, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, none) (12). The samples were taken at random date and being recorded using a set of form designed specifically for this study and the data collected by Assistant Catering Officers and

Assistant Clerk as scheduled.

All data will be analysed using Microsoft Excel 2010 and the IBM SPSS Statistic 22.0, IBM Corp. Released 2010. IBM Statistic for windows, version 22.0 (Armonk, NY: IBM Corp). Descriptive statistic including range, means, median, standard deviation, interquartile range and frequency were used to present patient's demographic data, Class of diet and occurrence of NIS, food wastage, One- way Anova test were done to determine if the food wastage were affected with the difference of diet class and Independent T-test were done to present any significant correlation between NIS factors with the rate of food wastage.

RESULTS

Socio-demographic of the study samples are described in Table 1. A total of 337 cancer patients were included: 184 males (54.6%) and 153 females (45.4%). The mean age is 53 ± 13 and 172 samples were from patients in Class 3 (51%), 32.3% and 16.6% from Class 2 and Class 1 respectively. The majority of the samples came from Malay patients (200, 59.3%), Chinese (107, 31.8%) and India (24, 7.1%) respectively and the rest were from other ethnic such as Sarawak Bumiputera.

As shown in Figure 1, all samples for this study were collected representing 8 cycle menu from Menu Day 1 to Menu Day 8 for therapeutic diet. There is no normal diet involve since in NCI, the high calorie high protein diet (therapeutic menu) were set as default diet for all patient admitted to NCI. This therapeutic diet were divided basically to several different types of menu including, spicy, non-spicy, western, vegetarian, soft diet, mixed porridge, minced diet and blended diet. Every type of menu consists of carbohydrate source food, protein source food, vegetables, fruits and water.

From observational method (semi quantitative 5-point scale), overall, the data shows that 59.3% of meal served at lunch time to NCI patients has been discarded. Only 30% of patients finished their lunch meal and another 10.7% had discarded $\frac{1}{4}$ of their meal. Wastage foods were divided into 5 main categories which were carbohydrate group, main protein group, side protein group, vegetables and desserts. As illustrated in Figure 3, the most wasted dish was main protein group (Dish), followed by vegetables group, carbohydrate group (Rice/ ala carte), side protein group (soup/ side dish) and lastly the dessert group.

For second method which was weighing method, the food item were categorised to 10 food groups. There were normal CHO, Soft CHO, Main Protein, Side Dish Protein, Vegetables, Drinks, Ala-Carte, Fruits, Desserts and Soup. Results showed that the total weight of food wastage was 118.69kg (41.9%) from the total meal weight provided to patients. Overall mean of food waste was 488.11 ± 256.61 gram. Mean of food wastage data according to the food groups was illustrated in Table 2.

The 3 tops list of the most food groups being wasted by patient were vegetables (57.9%), protein main dish (55.7%), and soft CHO (51.6%). The independent *t*-test was done to

find if NIS occurs in cancer patients could affect the amount of food wastage. Below was the results produced from collected data as shown in Table 3.

Nausea, vomiting, loss of appetite (LOA) and swallowing difficulties had significant influence in food

wastage. Other symptoms such as abdominal discomfort, vision disorders, chewing difficulties, diarrhoea and sleep disorders were insignificant effects on food wastage among cancer patients.

Table 1. Socio-demographic Characteristic

Characteristic		Frequencies	%
Gender	Male	184	(54.6)
	Female	153	(45.4)
Ethnic	Malay	200	(59.3)
	Chinese	107	(31.8)
	Indian	24	(7.1)
	Others	6	(1.8)
	No formal education	31	(9.2)
Education Level	Primary	79	(23.4)
	Secondary	176	(52.2)
	Universities/ College	50	(14.8)
	Ward Class	Class 1	56
	Class 2	109	(32.3)
	Class 3	172	(51.0)
Group Age (Years)	13-21	9	(2.7)
	22-40	51	(15.1)
	41-59	162	(48.1)
	60>	115	(34.1)

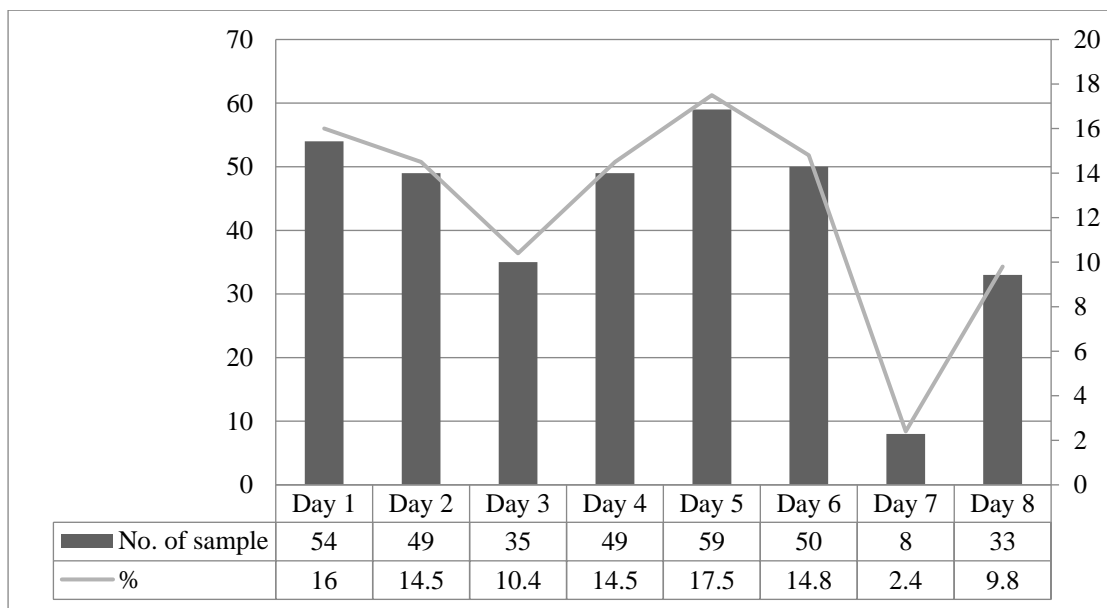


Figure 1. Total samples taken according to the 8 Days Menu Cycle and percentage.

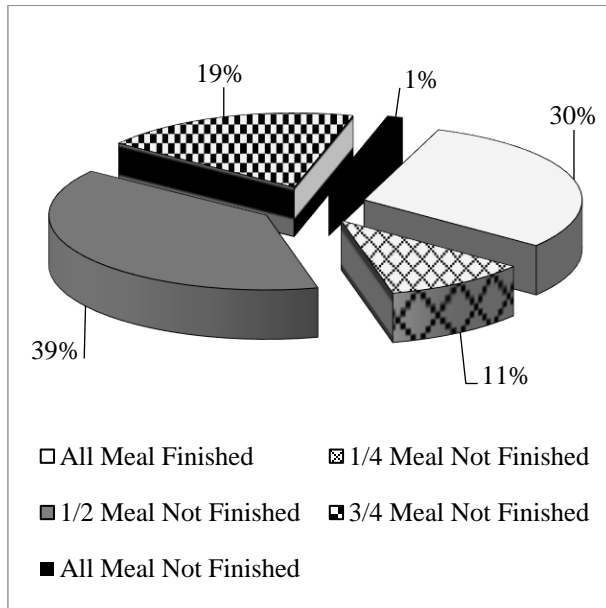


Figure 2. Distribution of food waste by semi quantitative 5 point scale method

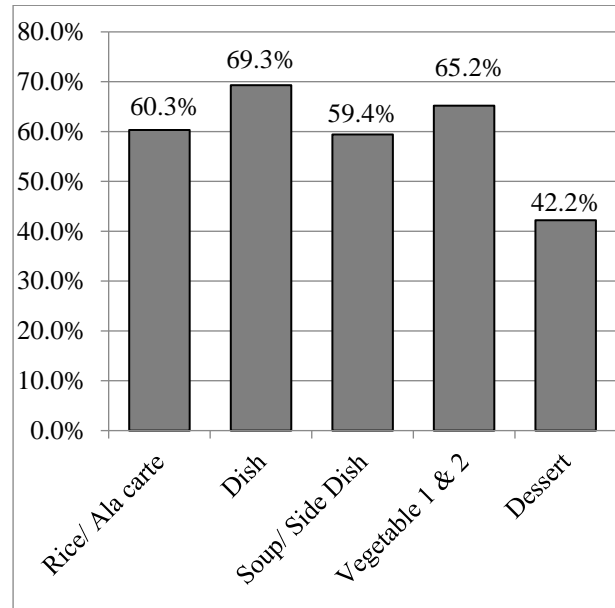


Figure 3. Distribution of most wasted dish

Table 2. Food Waste by Food Groups

Characteristic	Mean (SD)	Estimated Nutritional Value of Total Wasteage	
		Energy (kcal)	Protein (Gram)
Normal CHO	89.09 (81.03)	10.49 – 221.16	0.19 – 4.08
Soft CHO	180.16 (134.12)	18.03 – 123.06	0.33 – 2.27
Main protein	67.83 (53.18)	21.98 – 181.52	2.70 – 22.29
Side dish protein	26.07 (23.68)	3.59 – 74.63	0.44 – 9.16
Vegetables	60.75 (50.79)	2.88 – 32.30	0.21 – 2.32
Fruits	53.40 (69.08)	4.39 – 34.29	0.09 – 0.73
Drinks	36.53 (77.4)	NA- Plain water was provided during lunch time	
Dessert	38.13 (43.65)	10.71 – 158.65	0.10 – 1.55
Soup	141.34 (112.86)	34.46 – 307.58	1.22 – 10.85
Ala carte	86.14 (82.83)	5.73 – 292.32	0.15 – 7.60

* Estimation of nutrient value are calculated based on Atlas of Food Exchange & Portion Sizes; CHO=Carbohydrate

Table 3. NIS influencing food wastage among cancer patients

Symptom		n	Mean (SD)	t statistic	P value ^a
Nausea	Yes	64	410.58 (283.54)	2.001	0.046*
	No	273	338.52 (253.44)		
Vomiting	Yes	52	468.63 (269.71)	3.57	<0.001**
	No	285	330.96 (253.58)		
Abdominal Discomfort	Yes	56	374.59 (247.22)	0.70	0.48
	No	281	347.74 (263.29)		
Loss of appetite	Yes	93	413.44 (278.75)	2.69	0.008**
	No	244	328.86 (249.89)		
Vision Disorder	Yes	46	328.5 (291.66)	-0.66	0.51
	No	291	355.95 (255.6)		
Chewing Difficulties	Yes	42	319.21 (250.34)	-0.88	0.38
	No	295	356.90 (262.01)		
Swallowing Difficulties	Yes	30	458.17 (294.71)	2.35	0.019**
	No	307	341.85 (255.12)		
Diarrhoea	Yes	23	383.22 (318.16)	0.59	0.56
	No	314	349.93 (256.26)		
Sleep Disorders	Yes	77	376.30 (271.69)	0.92	0.36
	No	260	345.07 (257.22)		

^aIndependent t-test; *significant at 0.05; **significant at 0.01

DISCUSSION

This study showed that based on observational and weighing method, as high as 59.3% and 41.9% respectively of foods served during lunchtime to the NCI's patient were discarded or wasted which equalled to RM25,259.44 and RM17,847.73 respectively from total expenditure. All patients in NCI, Putrajaya were given standardised therapeutic diet of High Calorie High Protein diet to meet the increased needs of nutrition in cancer patients. The standard calorie and protein provided for High Calorie High Protein Diet was 2000 kcal, 85gram protein. From this study, it showed that estimated loss of energy and protein value that can be provided towards cancer patients from discarded food were between 401.24 kcal until 589.07 kcal (20.1 – 29.5%) and 17.4 gram until 39.9 gram (20.5 – 46.9%) of protein from the standard requirement.

The top 3 most wasted food groups from observational method (semi quantitative 5-point scale) were protein group (Lauk), vegetables group and carbohydrate group (Nasi/ala carte) whereas based on weighing method, vegetables (57.9%), Protein Main Dish (55.7%), and Soft CHO (51.6%) were among the top food wasted. Between these two methods, similar food group were reported as being highly wasted.

There was also significant association between nausea, vomiting, loss of appetite and swallowing difficulties with the rate of food wastage. These nutrition impaired symptoms experienced by patients were important to be

addressed appropriately to improve their diet intake and indirectly reduces food wastage in hospital. Food presentation could be improved further to enhance patients' appetite and encourage patient to eat more. Diet texture modification is also important to assist patients with swallowing difficulties.

In NCI, all inpatients will be provided with a menu card daily. Different menu will be provided for duration of 8 days. Patients have the right to choose their own preferred menu. However, dietitian in charge will provide suggestion to change the menu to cater the need of patients. For example, patients with swallowing difficulty may be prescribed with soft diet, liquid diet or blenderised diet. These adjustments helped to improve patients' food intake and subsequently reduce food wastage.

Limitation of this study was whether the total food wastage actually as stipulated. This was because there was no way to tell that the meal provided were actually consumed by the patient or not. Thus, the actual rate of wastage could be much higher than the results attained since there were possibilities that patient's meal actually being consumed by patient's next of kin or caregiver instead of patient himself.

In the near future, if similar study to be conducted, a simple interview should be done on all patients involved to obtain a more accurate information regarding actual diet intake.

CONCLUSION

Food wastage issue among hospitalized patients is a worldwide problem that needs to be addressed appropriately. Insufficient calorie intake directly affects nutritional status of patients and will result in malnutrition especially if the patients stay longer in ward. Apart from implication towards patient's nutritional status, food wastage also affects the hospital financially. A large sum of money equivalent to the wasted foods can be used for other aspect of patient's care. Thus, effective measures need to be taken to reduce total wastage. Besides nutrition impact symptoms being part of the reason patients not finishing meals provided, further study need to be done to identify causes of specific food groups being wasted.

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