



## Determinant Factors of Hospital Food Waste in Surgical and Medical Wards at the Teaching Hospital, Kuliypitiya

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### Abstract

Food waste is a global health issue challenging sustainable development. The Ministry of Health has reported that the monthly wasted food amount in Teaching Hospital Kuliypitiya as six thousand kilograms per month and 30% of that food is provided by the hospital. Hospital food waste has significant social, economic, and nutritional impacts. This study aimed to determine the factors affecting hospital-supplied food waste among in-patients of medical and surgical wards at Teaching Hospital Kuliypitiya (THK). This was a quantitative descriptive study. The patients of age in between 20 to 60 years admitted to medical and surgical wards at THK who were having hospital diet as the meal, was selected as the sample for this study. Data were collected using a self-administered questionnaire. Descriptive statistics were computed to analyse data using SPSS version 23. The results showed that 48.5% of the participants were dissatisfied with Lunch and 57.8% of the participants were dissatisfied with chewing status of the food. The findings of the study concluded that the most common factors for hospital food waste as; timing of dinner serving, courtesy of the staff who serve food, dissatisfaction with the dining places, poor ventilation of dining places and the dissatisfaction of the hygienic condition of serving food. Moreover, inappropriate temperature of serving food and dissatisfied taste of the food

were also reported as the most common factors for food waste.

**Keywords:** Hospital Food; food waste; determinant factors

### Introduction

United Nations in 2015, mentioned sustainable development Goals (SDGs) with reference to zero hunger (SDG 2) and responsible consumption and production of foods (SDG1 2) by 2020, Nevertheless, each year more than 1.3 billion tons of food are thrown away along with the entire food supply chain worldwide equal to roughly one – third of the global food production for human consumption (FAO – 2013). Hospitals are one of the focal points of food waste among leading food waste places and the food waste in hospitals is a significant problem all over the world.

The hospital food service is a fundamental element in patient care (Gomes et al., 2020). Food provides essential nutrients to generate energy, grow cell production and set up the immunity of a person. Therefore, meals served during the length of hospital stay are an extremely important requirement for hospital treatment and for the patient's recovery. The provision of an adequate diet to the patient should be the responsibility of the food and nutrition service of

each hospital and the hospital diet must generate an adequate supply of nutrients to hospitalized patients allowing it to preserve and/or recover its nutritional status through its co-therapeutic role in chronic and acute disease (Gomes et al., 2020).

Food waste has become an object of discussion in the hospital food service since it's seen as the cause of many negative effects including health, economic, social and environmental issues (Gomes et al., 2020).

According to the statistics of rapid assessment on healthcare waste management in Ministry of Health, Sri Lanka, (2021), the total food waste in Teaching Hospital, Kuliypitiya is six thousand kilograms per month and thirty per cent of it is provided by the hospital. This survey was done by the hospital's infection prevention and control unit.

Food loss and food waste represent global health, social and environmental concerns, imposing several challenges in turns of sustainable development (Amicarelli & Bux, 2021).

Food waste has become an object of discussion of hospital food waste, since it is seen as the cause of the many negative effects, including health, economic, social and environmental issues (Gomes et al., 2020). Up to 50% of overall waste is comprised of food waste in some healthcare settings (Cook et al., 2022).

In the world context, there are several studies that investigate the factors related to hospital food waste, but the Sri Lankan or South Asian studies are non-existent. Food waste in hospitals is a significant problem all over the world. The main consequences of food waste are unsatisfying nutritional needs of the patients, financial losses, and a problem in waste management (Amicarelli & Bux, 2021).

Even though there are successful research studies demonstrating a decrease in food waste, their settings specific problems are complex to solve due to the obligation and duty of care hospitals, food service and dietitians have to provide patients with abundant opportunities to consume adequate

nutrition that can support their recovery from illness (Cook et al., 2022).

“Food waste in the food service industry has been called an “unsustainable hot spot”. The critical concerns of this issue also include climate changes, food security, monetary loss (Rinninella et al., 2023), and include health impact (Gomes et al., 2020).

According to the data of the rapid assessment of Healthcare Waste Management in the Ministry of Health (2021), the monthly wasted food amount in the Teaching Hospital Kuliypitiya is six thousand kilograms per month. According to a survey conducted in the hospital by the infection prevention and control unit mentioned that 30% of it is the food provided by the hospital. It is clear that 30% is a significant financial loss of the hospital budget.

Most hospitalized adult patients are treated in general surgical and medical wards. The bed occupancy rate of these wards is higher than other wards in the hospital all over the year.

The majority of the patients admitted to these wards consume a full portion of the hospital diet. The population of these wards is cohered to the selected demographic data of this research study.

Considering all above-mentioned reasons, the surgical and medical wards of THK were selected to this study, as suitable for this research study. This research study's goal is to give suggestions for improving hospital food facilities, quality and service and reducing unnecessary financial loss.

Hospital food supply plays a vital role in caring for patients, but food waste is a significant burden in hospitals all over the world and it has social, economic, and health-related impacts. Food plays a vital role for the person in any disease condition. Therefore, hospital food service is a very important aspect in caring for patients. Even though, up to 50% of overall waste is comprised of food waste in some healthcare facilities (Cook et al., 2022). In Sri Lanka, the situation is the same. Food waste is taking first

place in the total hospital food amount (UNDP, 2021) and 30% of wasted food is provided by the hospital kitchen.

The annual estimate of raw food of the hospital is roughly thirty- three million of rupees and 30% of it is wasted purposelessly due to this waste. Roughly it is nine million and nine hundred thousand rupees.

Therefore, it is important to determine factors affecting hospital-supplied food waste in the teaching hospital Kuliyaipitiya, Sri Lanka.

The findings of this study will redound to benefit of the healthcare setting. There will be a greater demand for healthcare workers to arrange a proper food service for the patients. Thus, hospital administrators will apply this strategy to implement better food service in their institutions. From this result, researchers will cover critical areas in their educational process. Thus, in-detailed and scientific reveal regarding the Determination of Factors affecting Hospital supplied food waste will fill the gap in the body of knowledge.

The main aim of this study is to determine the factors affecting hospital-supplied food waste among in-patients of medical and surgical wards at Teaching Hospital Kuliyaipitiya.

The specific objectives are as follows.

(1) To determine the patient-related factors for hospital-supplied food waste of medical and surgical wards at, Teaching Hospital, Kuliyaipitiya.

(2) To determine the institutional-related factors for hospital-supplied food waste of medical and surgical wards at, Teaching Hospital, Kuliyaipitiya.

## **Materials and Methods**

### **Research Approach and Design**

A quantitative descriptive design was used in this study to determine the factors affecting hospital supplied food waste in surgical and medical wards at Teaching Hospital, Kuliyaipitiya.

For the study a self-administered questionnaire was used as the data collecting tool to generate numerical data and statistical analyse to organize data.

Descriptive design was suitable for this study as the descriptive design helped to identify various characteristics of community, institution and problems ( Basavanthappa, 2007).

### **Study Setting**

This study was conducted at the T.H.K., which is the second largest hospital in Northwestern Province in Sri Lanka. The bed strength of the hospital is Six Hundred Sixty-Three. The bed capacity of surgical and medical ward (wards 1, 3, 5 and 12) is Two Hundred Twenty-Two two hundred or four hundred in both wards? The bed occupancy rate of the above ward is 76. According to the feasibility of the study team, surgical and medical wards in the T.H.K. were selected as the study setting of this research.

### **Study Population**

The population of this research is four hundred and twenty-two patients. All the patients were above twenty and were on hospital diet in medical and surgical wards at T.H.K. Normally adult patients admitted for medical and surgical conditions consume a full portion of hospital diet. Therefore, this population is selected as the study population.

### **Inclusive criteria**

The patients who admitted to medical and surgical wards and who have requested the food supplied by the hospital and having a sound mind to give consent for this research were included until the desired number is achieved.

### **Exclusive criteria**

The patients who kept nil by mouth during the hospital stay were excluded.

### **Sampling Procedure**

Convenience sampling method was selected as the

sampling technique.

### Sample Size Calculation

(Lwanga and Lameshow equation, 1991)

$$N = Z^2 P(1-P)$$

d<sup>2</sup>

N=Required minimal Sample size

Z=1.96; critical value of confidence, at 95% confidence interval.

P=Probable estimate of the proportion of given characteristic.

D = Degree of accuracy desired sat as 0.05

$$N = (1.96)^2 * 0.5 * (1 - 0.5)$$

$$(0.06)^2 N = 384$$

As the anticipated none responding rate is 10%, the target minimum sample size will be, N = 422

Sample size (N) was rounded into 500.

### Ethical Consideration

The ethical approval was obtained from the Ethical Review Committee of Wayamba University of Sri Lanka.

Written informed consent was taken from each participant before collecting data.

### Data Collection

Quantitative method was applied. A self-administered questionnaire was prepared based on a validated questionnaire (Trinca et al., 2021) as close ended and pretested. The questionnaire is changed and developed according to Sri Lankan setting. The questionnaire was used as one of the most popular measures of satisfaction, the items of the developed questionnaire were responded to using a five-point Likert scale which was ranging from “strongly dissatisfied”, “Dissatisfied”, “Neither Satisfied

nor Dissatisfied”, “Satisfied”, “Strongly Satisfied”. Numerical rating to the responses obtained by using values ranging from two points of “strongly dissatisfied” and “Dissatisfied”.

### Development and description of the tool

Questionnaire was consisted of three sections as part A, Part B and Part C.

The part A was consisted of socio demographic data such as Gender, Age, Nationality, Education Level, Period of hospital stay, and Number of meals taken.

Part B was consisted with patient related factors such as appearance, smell, taste, quantity of the food and chewable and easy to swallow, variety and temperature of the food, method of your meal preparation and the way of serving food.

Part C was consisted of institution related factors such as, availability of washing facilities of the dining area, affection of the chemical otter for having foods, affection of the timing schedule of food serving and affection of dining place, courtesy of the staff, hygienic conditions, cleanliness of utensils and the daily routines of the hospital.

### Reliability and Validity of the Instrument

The questionnaire was translated into all three main languages used in Sri Lanka for a better understanding of the questions. Prior to administering the questionnaire necessary information were provided through an informed consent letter. Institutional permission is taken from the Director of the Teaching Hospital, Kuliyaipitiya. The questionnaire was prepared based on a validated questionnaire (Trinca et al., 2021) by getting advice from medical expert and the service experience of the investigators. The questionnaire was changed and developed according to the Sri Lankan Setting.

Reliability was assessed with 10 patients avoiding contaminating with the actual sample using test - rest method.

## Data Collection

The patients in between the age 20 years and 60 years who were having hospital diet as the meal in surgical and medical wards of Teaching Hospital, Kuliyaipitiya is the sample of this study. Initially they were informed individually to answer this questionnaire after taking the informed consent. Staff cooperation was affirmed through obtaining permission of the hospital directors and the personal communication with the ward staff by researchers.

During each day of data collection, giving instructions for investigators, distributing information letters to participants and getting informed consent were assured prior to data collection. All the questionnaires were filled with patients' willingness.

Data collection was undertaken by the researchers from 15<sup>th</sup> July to 30<sup>th</sup> July according to the time frame. Four Hundred Twenty-Two questionnaires were completed and returned.

Confidentiality and privacy of all participants maintained in this study during the period of collecting data by maintaining coding system for numbering questionnaires without putting their personal identifications. Answered questionnaires were collected from provided boxes kept in front of the wards to maintain confidentiality of each participant.

## Data Analysis

Prior to data analysis, variables were identified. Data were analysed by using descriptive statistics. Quantitative analysis involved labelling and coding all the data so that explanations can be recognized. Questionnaire part A included demographic and personal data of patients who were admitted to surgical and medical wards with 6 statements to assess relationship with the objectives. Questionnaire part B included patient related factors questionnaire was included 10 statements. That is for each item, decide whether they have experience of food waste or whether their experience is "satisfied", "strong

satisfied", "strong dissatisfied" or "dissatisfied" as mark respectively. Questionnaire part C included institutional related factors and contained 10 statements. In that there were four responses were coded by giving mark for "no" and "yes",

Statistical analysis was carried out with Statistical Package for the Social Sciences version (SPSS) 23. In this study Frequencies and percentages of the levels of the categorical variables are calculated. Sample were used to determine whether there are significant differences among the percentages of the level of the categorical variables. Manual test was used to determine the association between selected demographic factors and institutional and patient related factors. Data was illustrated by using tables.

There were few analysis techniques used to test the significance of different variables. In individual analysis, different individual analysis methods are applied to each of the variables individually. By using this test, we could find whether at least there is a significant difference among percentages or counts of the patient related factors. By using this test, we could find whether there is significant difference among percentages or counts of the institutional factors.

## Results

Demographic characteristics of patients who were admitted in surgical and medical wards in THK are shown in the Table 1 of the total (n=422), patient related factors (n=422) have participated to this study giving a response rate of 90.1%. Most of the participants were between 31-40 years of age and it was 28%.

There were considerable respondents of 28% in between 41-50 years of age and 29% in between 31-40 years of age. According to their educational level of the patients 30%, (n=128) with Ordinary Level education (O/L), 29%, (n=117) are below O/L, 29%, (n=123) with Advanced Level (A/L) and 13% (n=54) with above A/L.



ward, 30% (n=127) on day 2, 30%(n=128) on day 3 and 21%(n=89) on day 4 stay in the wards.

waste,75% (n=319) Sinhala, 17% (n=70) Muslims and 8% (n=33) Tamils.

Among 422 patients indicated regarding food

The questionnaire respondents regarding hospital food waste of meal duration 32%, (n=134) patients who had taken 1 to 3 meals,36%, (n=150) 3 to 6 meals,24%(n=103) 6-9 meals and 8% (n=33) 9-12 meals.

The questionnaire indicates regarding food waste of hospital stay 18% (n=76) on day 1 stay in the

**Table 1.** Demographic Data

	Category	Total	Percentage %
<b>Sex</b>	Male	245	58.05
	Female	177	41.9
<b>Age</b>	20 - 30	68	16.11
	31 - 40	120	28.4
	41 - 50	119	28.19
	51 - 60	115	27.25
<b>Nationality</b>	Sinhala	319	75.5
	Tamil	33	7.8
	Muslim	70	16.58
<b>Educational Level</b>	Below OL	117	27.7
	OL	128	30.33
	AL	123	29.14
	Above AL	54	12.8
<b>Hospital Stay</b>	Day1	76	18.01
	Day2	127	30.09
	Day3	128	30.33
	Day4	89	21.09
<b>Number of meals</b>	1 – 3 Meals	134	31.75
	3 – 6 Meals	150	35.5
	6 – 9 Meals	103	24.4
	9 – 12 Meals	33	7.81

16% (n=68) 20-30 age group and 27% (115) 51-60 age group.

The responses regarding hospital food waste were, 75% (n=319) Sinhala patients and few 17%(N=70) Muslim patients, and 8% (N=33) Tamil patients.

H0: there is no any significant difference among proportions/ counts / percentages of above categories. According to one sample chi-square test,

there was a significant difference ( $P < 0.05$ ) among different Educational Status in counts/ percentages. Same as before, 13%, which is highest percentage of patients have educated up to high school level. But 30% of patients are low educated upper than high school level.

**Table 2.** Patient Related Factors

Variables		Strongly Dissatisfied	Dissatisfied	Neither nor Satisfied Or Dissatisfied	Satisfied	Strongly Satisfied
<b>Appearance</b>	Frequency	17	69	151	142	43
	Percentage	4%	16.4%	35.8%	33.6%	10.1%
<b>Type</b>	Frequency	13	60	181	139	29
	Percentage	3.1%	14.2%	43%	33%	6.7%
<b>Smell</b>	Frequency	16	88	157	142	19
	Percentage	3.8%	20.9%	37.2%	33.6%	4.5%
<b>Taste</b>	Frequency	23	110	176	91	22
	Percentage	5.5%	26%	42%	21.6%	4.6%
<b>Quantity</b>	Frequency	23	94	178	85	42
	Percentage	5.5%	22.3%	42.2%	20.1%	9.9%
<b>Chewing</b>	Frequency	6	33	140	196	47
	Percentage	1.4%	7.8%	33.1%	46.1%	11.7%
<b>Swallowing</b>	Frequency	20	66	119	178	39
	Percentage	4.7%	15.6%	28.2%	42.2%	9.3%
<b>Variety</b>	Frequency	25	77	162	135	23
	Percentage	5.9%	18.2%	38.4%	32%	5.5%
<b>Temperature</b>	Frequency	76	152	111	57	27
	Percentage	18%	36%	26%	13.5%	6.5%
<b>Cooking Methods</b>	Frequency	14	114	165	108	22
	Percentage	3.1%	27%	39.1%	25.6%	5.2%

**Table 3.** Institutional Related Factors of hospital food waste

<b>Variables</b>		<b>Strongly Dissatisfied</b>	<b>Dissatisfied</b>	<b>Neither Nor Satisfied Or Dissatisfied</b>	<b>Satisfied</b>	<b>Strongly Satisfied</b>
<b>Breakfast</b>	Frequency	23	81	141	138	40
	Percentage	5.5%	19.2%	33.4%	32.8%	9.1%
<b>Lunch</b>	Frequency	19	53	145	154	53
	Percentage	4.6%	12.5%	34.4%	36.5%	12%
<b>Dinner</b>	Frequency	159	106	52	69	36
	Percentage	37.6%	25.1%	12.3%	16.4%	8.6%
<b>Place</b>	Frequency	56	131	109	101	26
	Percentage	13.3%	31%	25.8%	24%	5.6%
<b>Courtesy</b>	Frequency	60	88	109	136	29
	Percentage	14.2%	32.2%	25.8%	20.8%	7%
<b>Ventilation</b>	Frequency	45	137	108	113	9
	Percentage	10.7%	32.5%	25.6%	26.8%	4.4%
<b>Hygiene</b>	Frequency	35	85	192	81	28
	Percentage	8.3%	20.1%	45.5%	19.2%	6.9%
<b>Daily Routine</b>	Frequency	40	78	154	116	35
	Percentage	9.5%	18.5%	36.5%	27.5%	8%
<b>Cleaning Equipment</b>	Frequency	19	70	181	115	37
	Percentage	4.5%	16.6%	43%	27.2%	8.7%
<b>Cleaning Equipment</b>	Frequency	40	78	154	116	35
	Percentage	9.5%	18.5%	36.5%	27.5%	8%
<b>Cleaning Equipment</b>	Frequency	19	70	181	115	37
	Percentage	4.5%	16.6%	43%	27.2%	8.7%



**Table 4.** Comparison of The Patient Related Causes

<b>Variables</b>	<b>Strongly Satisfied/Satisfied</b>	<b>Strongly Dissatisfied/ Dissatisfied</b>
<b>Appearance</b>	20.4%	43.7%
<b>Type</b>	17.3%	39.7%
<b>Smell</b>	24.7%	38.1%
<b>Taste</b>	31.5%	26.5%
<b>Quantity</b>	27.8%	30%
<b>Chewing Easy</b>	9.2%	57.8%
<b>Swallowing Easy</b>	20.3%	51.5%
<b>Variety</b>	24.1%	37.5%
<b>Temperature</b>	54.2%	20%
<b>Cooking Method</b>	30.1%	30.8%

**Table 5.** Comparison of The Institutional Related Causes

<b>Variables</b>	<b>Strongly Satisfied/Satisfied</b>	<b>Strongly Dissatisfied/Dissatisfied</b>
<b>Breakfast</b>	24.7%	41.9%
<b>Lunch</b>	12.5%	48.5%
<b>Dinner</b>	62.7%	25%
<b>Place</b>	44.3%	29.6%
<b>Courtesy</b>	34.5%	36.6%
<b>Ventilation</b>	43.2%	31.2%
<b>Hygiene</b>	28.4%	26.1%
<b>Daily Routing</b>	28%	35.5%
<b>Cleaning Equipment</b>	21.1%	35.9%

## **Discussion**

This study focused on identifying factors affecting hospital supplied food waste in surgical and medical wards at Teaching Hospital, Kuliyaipitiya.

### **Institutional affecting Factors for Hospital Food waste of Medical and Surgical wards at T.H.K.**

It was noticed that institutional factors were more responsible for hospital supplied food waste in medical and surgical wards at Teaching Hospital, Kuliyaipitiya. This result is partially similar to that of two studies done separately in Sweden and Italy (Eriksson et al., 2020).

In this study, five most common factors were found that affect hospital supplied food waste in medical and surgical wards at Teaching Hospital, Kuliyaipitiya. They are timing of food serving, dining places provided at the ward, courtesy of the staff, ventilation of the dining place and hygienic condition of serving food.

Eriksson et al. ( 2020) conducted a qualitative descriptive study using one hundred and two hospitals and units in Sweden to investigate food waste quantification practices in Swedish Hospital. They found poor appetite and medication, food and menu issues, such as complex ordering systems,

eating environmental issues, such as the meal being interrupted by ward rounds and tests and inappropriate mealtimes affect hospital food waste.

Rinninella et al., (2023) in Italy, demonstrate that monitoring and improving hospital service could improve food intake and reduce food waste, applying changes in the service system, menus, serving times, patients' needs, training staff, communication, quality of food and meal condition can lead to increased compliance with patients' meal and a reduction in food waste.

Most of the patients (n = 265) reported that the timing of dinner served should be rescheduled. This study revealed the study population had bad experiences with dining places provided at the ward (n = 187) and ventilation of the dining place (n = 182). Courtesy of the staff and hygienic condition of serving food was also found as the other factors affecting food waste in medical and surgical wards at Teaching Hospital, Kuliypitiya.

Patient affecting Factors for hospital food waste of medical and surgical Wards at T.H.K.

In accordance with previous studies, one study revealed that most participants' experiences patients, conditions, food and menu, service system, developing important categories whereby food waste can be reduced (Alshqaqeeq et al., 2018).

A cross-sectional analytical study was conducted by (Schivone et al., 2019) in Southern Italy by using Seven Hundred Sixty-Two participants to find subjects of food waste in three hospitals. They found the primary reasons for food waste related to the characteristics of the food served, poor quality, different eating habits, the feeling of safety, and poor appetite of patients.

In this study we found three most common factors that affect hospital supplied food waste in medical and surgical wards at Teaching Hospital, Kuliypitiya. They are temperature of served food, tastiness of food and method of meal preparation.

In our study 20.8% of patients said that the temperature of served food is not satisfied and 26.5(%) participants said that the taste of food is not adequate and 30.8 (%) of participants said that they were not satisfied with the method of preparing meals.

## Conclusions

In this research study researchers noted that the most common factors for food waste in hospital were bad timing of dinner serving, courtesy of the staff who are serving food, dissatisfaction of the dining places, poor ventilation of dining places and the dissatisfaction of hygienic condition of serving food. Moreover, inappropriate temperature of serving food and dissatisfied taste of the food were also the most common factors for food waste.

An understanding of the factors affecting food waste is important to plan how to reduce food waste in hospitals.

All the hospital staff, especially nurses, have an important role in the hospital food service system. Hence, it is necessary to plan educational programs for hospital staff, especially for nurses to improve knowledge and attitude regarding food service system because courtesy is very important when serving food for patients.

Hospital administrators and nursing leaders need to consider improving the quality of food service system and dining room facilities because those facts directly affect food waste.

As the findings of current study, researchers would like to recommend some facts for the betterment of hospital food service; Establish a personalized, flexible meal reservation procedure based on unique requirements tastes and dietary restrictions, enhance food quality based on user satisfaction surveys, patient feedback is crucial for outcomes research and quality improvement projects because it gives patients a formal forum for feedback and shows them the nurses and other medical professionals

appreciate what they have to say, health care administrators and auditors always look for patient-reported outcomes to get a sense of the structure and quality of care.

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