



**UNIVERSITI PUTRA MALAYSIA**

***FACTORS ASSOCIATED WITH PATIENT'S DIETARY INTAKE IN  
PATIENTS RECEIVING NORMAL AND THERAPEUTIC DIET AT  
HOSPITAL SERDANG***

**TAN KIAN SIANG**

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**BY**

**TAN KIAN SIANG**

A project submitted as a partial fulfillment of the requirement for the degree of  
Bachelor of Science (Dietetics) from the Faculty of Medicine and Health Sciences,  
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## ABSTRACT

### FACTORS ASSOCIATED WITH PATIENT'S DIETARY INTAKE IN PATIENTS RECEIVING NORMAL AND THERAPEUTIC DIET AT HOSPITAL SERDANG

**Tan Kian Siang**

Optimal hospital foodservice and adequate nutrient consumption are essential for patient's recovery. The purpose of this study was to determine factors associated with patient's dietary intake and compare the hospital food intake among normal diet group (ND) and therapeutic diet group (TD). There were 70 patients recruited in the study, 35 from each diet group. Dietary intake was assessed through estimated food intake by observation for hospital food and food record for outside food. Socio-demographic factors, contextual variables, and patient's hospital foodservice satisfaction was determined using an interview based questionnaire. The mean age of the respondents for ND and TD were  $35.09 \pm 11.89$  and  $46.94 \pm 14.61$  years respectively. There were 85.8% (n=30) of patients in ND and 85.7% (n=30) in TD being satisfied or very satisfied with the hospital foodservice provided. Food quality and staff issues dimension had the lowest and highest rating for both diet groups. The mean hospital energy and protein intake for ND and TD was  $936 \pm 605$  and  $969 \pm 602$  kcal/day and  $23.15 \pm 14.78$  and  $42.56 \pm 26.18$ g/day. The mean outside energy and protein intake for ND and TD was  $395 \pm 406$  and  $250 \pm 203$  kcal/day and  $12.41 \pm 12.50$  and  $7.97 \pm 8.47$ g/day. Most of the patients from both diet groups did not meet energy and protein requirements and consumed half or less of hospital food. There was significant correlation between reliability and consistency score and food quality and total satisfaction score with hospital energy and protein intake ( $p < 0.05$ ;  $p < 0.01$ ) in TD. There was no significant difference between hospital energy intake between ND and TD ( $p > 0.05$ ) but there was significant difference in hospital protein intake between ND and TD ( $p < 0.01$ ). In this study, it was found that hospital foodservice satisfaction particularly food quality and also reliability and consistency dimension was correlated with patient's dietary intake in both diet groups.

## ABSTRAK

### FAKTOR-FAKTOR YANG BERKAITAN DENGAN PENGAMBILAN MAKANAN PESAKIT DALAM PESAKIT MENERIMA DIET NORMAL DAN TERAPEUTIK DI HOSPITAL SERDANG

Tan Kian Siang

Perkhidmatan makanan hospital yang optimum dan pengambilan nutrien yang mencukupi adalah penting untuk pemulihan pesakit. Tujuan kajian ini adalah untuk menentukan faktor-faktor yang berkaitan dengan pengambilan pemakanan pesakit dan membandingkan pengambilan makanan hospital antara kumpulan diet normal (ND) dan kumpulan diet terapeutik (TD). Terdapat 70 pesakit dalam kajian ini, 35 daripada setiap kumpulan diet. Pengambilan makanan dinilai melalui anggaran pengambilan makanan dengan kaedah pemerhatian bagi makanan hospital dan rekod makanan sehari bagi makanan luar. Faktor-faktor sosio-demografi, kontekstual, dan kepuasan perkhidmatan makanan hospital pesakit ditentukan dengan menggunakan soal selidik secara temuduga. Min umur responden untuk ND dan TD adalah  $35.09 \pm 11.89$  dan  $46.94 \pm 14.61$  tahun. Terdapat 85.8 % (n = 30) pesakit dalam ND dan 85.7 % (n = 30) dalam TD berpuas hati atau sangat berpuas hati dengan perkhidmatan makanan hospital. Dimensi kualiti makanan dan isu kakitangan mempunyai peratusan paling rendah dan paling tinggi masing-masing bagi kedua-dua kumpulan diet. Min tenaga dan protein pengambilan makanan hospital bagi ND dan TD adalah  $936 \pm 605$  dan  $969 \pm 602$  kcal/hari dan  $23.15 \pm 14.78$  dan  $42.56 \pm 26.18$ g/hari. Min tenaga dan protein pengambilan makanan luar ND dan TD adalah  $395 \pm 406$  dan  $250 \pm 203$  kcal/hari dan  $12.41 \pm 12.50$  dan  $7.97 \pm 8.47$ g/hari. Kebanyakan pesakit dari kedua-dua kumpulan diet tidak memenuhi tenaga dan protein keperluan dan mengambil separuh atau kurang daripada makanan hospital. Terdapat hubungan yang signifikan antara skor reliabiliti dan konsistensi dan skor kualiti makanan dan jumlah skor kepuasan dengan pengambilan tenaga dan protein hospital ( $p < 0.05$ ;  $p < 0.01$ ) dalam TD. Tidak terdapat perbezaan yang signifikan di antara pengambilan tenaga hospital antara ND dan TD ( $p > 0.05$ ) tetapi terdapat perbezaan yang signifikan dalam pengambilan protein hospital antara ND dan TD ( $p < 0.01$ ). Dalam kajian ini, adalah didapati bahawa kepuasan perkhidmatan makanan hospital terutamanya dimensi kualiti makanan dan juga reliabiliti dan konsistensi dimensi mempunyai hubungan dengan pengambilan makanan pesakit dalam kedua-dua kumpulan diet.

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Background**

Healthcare consumers at the present time are expecting a high quality in medical services for better clinical outcomes (Mayer & Cates, 2004) as patient now are more educated compared to the past. In customer-oriented service, it is important to be able to create an environment or quality service that achieves or exceeds patients' expectation (Somesh, 2011). Quality service is determined by the degree it is able to meet customer's needs and expectations (Hudak, McKeever, & Wright, 2003). With quality service, patient will be more satisfied with the hospital service.

Hospital foodservice is one of the important aspects that will be in contact with every patient during hospitalization and it is important for recovery and well-being of the patient. There are about 75% of patients depending only on hospital food for their nutrition (Allison, 2003). In hospital healthcare, there are no other services

but only food services that are being delivered to the patient on everyday basis which will affect their health being significantly (Mustafa, Rashid, Singh, & Qadri, 2008). Thus, eating in hospital is not just a sense of comfort to patients but a vital need during hospitalization.

Optimal hospital foodservice is one of the ways to improve clinical outcomes among patients. It is found that good nutritional care and food provided in the hospital have beneficial impact on patient's recovery process and quality of life (Kondrup, 2004). By providing early nutrition intervention, patients' nutritional status can be improved and assist patients to maintain body weight and lean body mass, tolerate treatment better and improve quality of life (Bauer, Capra, Battistutta, Davidson, & Ash, 2005). Besides, using quality hospital foodservice to promote optimal nutrition among patients can also result in faster recovery and reduced length of hospital stays which will have a large effect on hospital costs (Johansen et al., 2004).

Every single hospital foodservice operation is unique and treatment should be specialized and suitable to the specific patient group's requirements and perceptions (Wright, Connelly, & Capra, 2006). Hospital team must provide the patients with desired food in order to ensure therapy given is successful (Sheehan-Smith, 2006). In hospital setting, patient will always able to identify food quality easily but they usually cannot tell the quality of treatment (Mustafa et al., 2008). Thus, for high quality hospital foodservice, the provision of foodservice should not only meet but far beyond than the patients' expectations (Fallon, Gurr, Hannan-Jones, & Bauer, 2008).

According to Dupertuis et al. (2003), most hospitalized patients did not have sufficient energy consumption to meet their nutritional needs although there is adequate food provision. Adequate nutrient consumption is essential for recovery of hospital patient. Sufficient meal consumption to achieve patient nutritional needs is essential and helps in recovery process (Edwards & Hartwell, 2006).

The prevalence of malnutrition in acute hospital setting found from previous studies ranged from 20 to 50% (Banks, Ash, Bauer, & Gaskill, 2007 ; Pirlich et al., 2006). Poor nutritional status, weight loss and malnutrition among patients will result in reduced quality of life, reduced functional status, increased complication rates and treatment disruptions (Marin Caro, Laviano, & Pichard, 2007). Besides, malnutrition state may cause weakness, fatigue, decreased life quality, inability to tolerate treatment and increased mortality (Marin Caro et al., 2007). Undernutrition state will result in loss in muscle strength and reduced immune function which in next will increase complication, infection and mortality rates (Johansen et al., 2004). Insufficient food consumption during hospitalization may worsen the malnutrition problem and eventually increase morbidity, length of stay and mortality. Previous study showed that malnutrition has been associated with increased length of hospital stay (Kruizenga et al., 2005). Foodservice satisfaction acts as a way or strategy to control malnutrition in hospital as low satisfaction is associated with low nutritional intake.

In order to measure the effectiveness of hospital service, patients' satisfaction need to be determined (Thind, 2010). Patients' satisfaction level is defined as the measure on how satisfied the patients feel about the medical care they received in healthcare organization (Mohd Nor, 2010). In a study of 1.8 million patients, hospital food quality had been ranked the lowest of 10 items measured on a scale of

satisfaction (Press Ganey, 2003). In order to have better understanding on patients' expectations and promote good nutritional state of patient, a thorough and detailed knowledge of several dimensions of foodservice satisfaction is required (Wright et al., 2006). Besides attracting market share and increasing profit, the data of patient satisfaction is also a valuable tool to the hospital management to use as guideline for strategy development and improvement in the future (Schirg, 2007).

Patient hospital foodservice satisfaction need to be identified as it serves as a way to prevent malnutrition, as study shows that when patients' satisfaction declines, malnutrition risk increases (Wright et al., 2006). Patient satisfaction is found to have significant correlation with the quality of hospital food service given (Sheehan-Smith, 2004). There are several dimensions of hospital food service satisfaction to be understood in order to determine patient expectations and promote good health and nutritional state (Somesh, 2011). Patient satisfaction is needed to be identified in evaluation of quality of healthcare services and important for determining patient's behavioural patterns after receiving the healthcare (Teng, Esah, & Teng, 2003). In addition, there is also study showing that patient is concerned about meal choices, meal presentation, and overall satisfaction during hospital stay (Schirg, 2007).

## **1.2 Problem Statement**

Now, the healthcare industries are having stiff competition, several ways had been thought by hospital foodservice operation in order to improve patient's dietary intake and also hospital foodservice satisfaction. By placing inpatient hospital experience and patient satisfaction into concern, it will result in higher patient care quality, less employee turnover, and increased financial and competitive performance

(Barsamian, Gregoire, Sowa, Lafferty & Stone, 2010). There is significant correlation between foodservice quality and overall patient satisfaction (Sheehan-Smith, 2006).

Therapeutic diet is the normal diet modified in terms of nutrients in order to improve certain or specific health conditions (Ministry of Health, 2006). It is normally planned by registered dietitian to the patients. This type of diet is different in nutrients, caloric content and texture from the normal diet. The modifications made may not be palatable and patient may be dissatisfied with it, consequently affect patient's dietary intake. In the hospital, patients' food intake is often affected by disease state, poor appetite, gastrointestinal intolerance, fatigue, early satiety and taste alterations (Somesh, 2011). This may worsen the patients' dietary intake and also hospital foodservice satisfaction level. In addition, the modifications made in the therapeutic diet may affect the appearance, texture and taste of the meal, which in next might affect patients' dietary intake and satisfaction level as well.

Thus, the purpose of this study is to identify association of factors (socio-demographic variables, body mass index and patient's hospital foodservice satisfaction) with patient's dietary intake. Comparison of patients' dietary intake between normal diet group and therapeutic diet group will be done as therapeutic diet has different consistency, texture, taste and nutrient content compared to normal diet. Thus, it is important to examine the difference in patient's dietary intake between normal diet group and therapeutic diet group.

In addition, there are not many studies done on patients' satisfaction with food services in the healthcare industry (Sahin, Demir, Celik, & Teke, 2006). Hence, more data and information regarding patient's dietary intake and hospital foodservice

satisfaction are required in order to have a better understanding and develop effective strategy to improve patient's dietary intake and also satisfaction especially in hospital foodservice.

### **1.3 Research Questions**

1. What is the association between socio-demographic variables (age and household income), body mass index, patient's hospital foodservice satisfaction with patient's dietary intake for normal diet group and therapeutic diet group?
2. What is the difference in the patient's dietary intake between normal diet group and therapeutic diet group?

### **1.4 Significance of the Study**

By carrying out this study, association between socio-demographic variables (age and household income), body mass index and patients' hospital foodservice satisfaction with patient's dietary intake can be determined. Besides, presence of difference in patients' dietary intake data between normal diet group and therapeutic diet group will be determined. The data generated from this study can also be used by the Ministry of Health to improve the current health policy. Besides, the patients' dietary intake and hospital foodservice satisfaction data obtained can be used by the hospital authorities in order to plan suitable intervention or strategy that can improve patients' dietary intake and hospital foodservice satisfaction. The data obtained is also useful for the dietetics management to plan the comprehensive and suitable menu for the patients. In addition, this study will also provide baseline data which can be used in future research.

## **1.5 Objectives**

### **1.5.1 General Objective**

To determine factors associated with patients' dietary intake and to compare patients' dietary intake between normal diet group and therapeutic diet group in Hospital Serdang.

### **1.5.2 Specific Objectives**

- a. To determine socio-demographic variables (age, gender, ethnicity, educational level, household income, number of hospitalization), contextual variables (length of stay and appetite status), body mass index, patients' hospital foodservice satisfaction and patient's dietary intake for normal diet group and therapeutic diet group.
- b. To determine associations between socio-demographic variables (age and household income), body mass index and patients' hospital foodservice satisfaction with patient's dietary intake for normal diet group and therapeutic diet group.
- c. To compare patients' dietary intake between normal and therapeutic diet groups.

## **1.6 Hypotheses-Null Hypotheses**

- a. There are no significant associations between patients' dietary intake (normal diet group and therapeutic diet group) with:

- Socio-demographic variables (age and household income)
- Body mass index
- Patients' hospital foodservice satisfaction

b. There is no significant difference in patient's dietary intake for normal diet group and therapeutic diet group.

### 1.7 Conceptual Framework

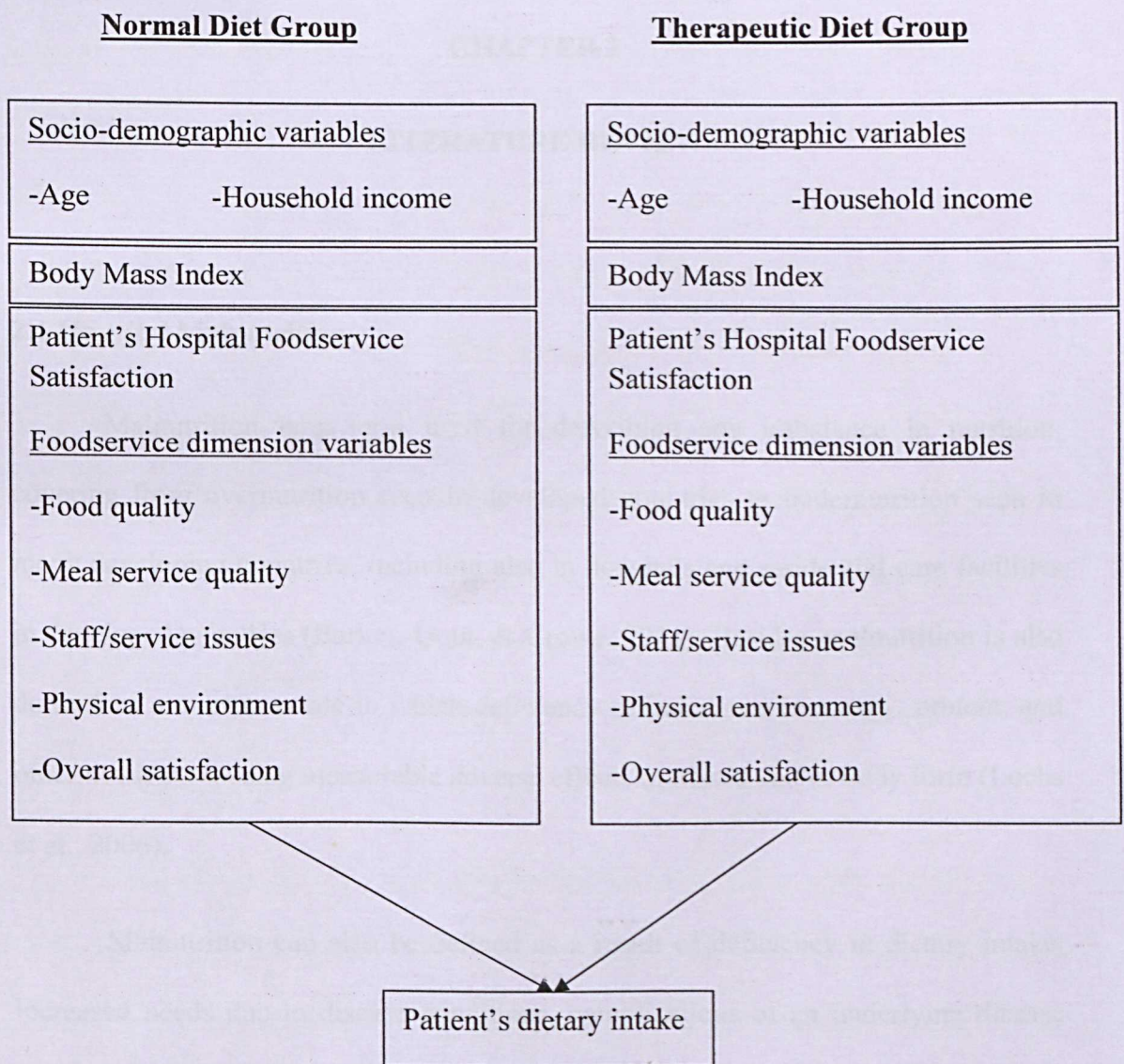


Figure 1.1: Conceptual framework

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Hospital Malnutrition

Malnutrition is a term used for describing any imbalance in nutrition, covering from overnutrition seen in developed countries to undernutrition seen in many developing countries, including also in hospitals and residential care facilities in developed countries (Barker, Gout, & Crowe, 2011). Besides, malnutrition is also defined as a nutrition state in which deficiency or imbalance in energy, protein, and other nutrients causing measurable adverse effects on tissue and/or body form (Lochs et al., 2006).

Malnutrition can also be defined as a result of deficiency in dietary intake, increased needs due to disease conditions, complications of an underlying disease such as poor absorption and excessive nutrient losses, or a combination of the above factors (Soeters et al., 2008). Cachexia is characterized by the presence of

multifactorial syndrome of severe loss of body weight, fat and muscle and also increased protein catabolism due to underlying diseases (Muscaritoli et al., 2010). In hospitalized patients, malnutrition seen is usually a combination of cachexia (disease-related) and malnutrition (inadequate nutrients intake) (Muscaritoli et al., 2010).

The prevalence of malnutrition in acute hospital setting found from previous studies ranged from 20 to 50% (Banks et al., 2007 ; Pirlich et al., 2006). Patients from oncology, gastrointestinal and lung disease discipline are associated with highest prevalence of undernutrition (Planas et al., 2003). Among hospitalized older patients, the prevalence of undernutrition was shown to be between 30% and 60% (Gazzotti, Arnaud-Battandier, & Parello, 2003). Kyle et al. (2005) states that there is unacceptable number of undernourished patients and this led to prolonged hospital stays, extended rehabilitation and unnecessary healthcare costs.

Other than only reporting malnutrition rates, previous studies also consider other aspects of patient care affected by malnutrition including length of stay, medication use, infection rates, dietetic referrals, documentation of malnutrition and mortality (Soeters et al., 2008). Malnutrition problem is always referred as the 'skeleton in the hospital closet' because it is often overlooked, undiagnosed and untreated (McKee, 2006).

Two causes of malnutrition in inpatients are previous malnutrition (due to subjacent illness: anorexia, feeding difficulties and increased nutritional needs) and 'ex novo' malnutrition during hospital stay (inadequate hospital diets, fasting periods due to diagnostic or therapeutic procedures and metabolic stress related to disease)

(Martínez Olmos, Martínez Vázquez, Martínez-Puga López, & del Campo Pérez, 2005).

Consequences of malnutrition are causing impairment at a cellular, physical and psychological level. These impairments are actually depending on many factors such as patient's age, gender, type, duration of diseases and current nutrient intake (Holmes, 2007; Kubrack & Jensen, 2007). For cellular level, the body's ability to induce an effective immune response to counter infection is impaired, causing infection harder to be detected and treated. This result in increased risk of pressure ulcers, delayed wound healing, increased infection risk, decreased nutrient intestinal absorption, altered thermoregulation and compromised renal function (Holmes, 2007; Kubrack & Jensen, 2007).

Due to malnutrition, in aspects of physical level, there will be loss of muscle and fat mass, reduced respiratory muscle and cardiac function and atrophy of visceral organs (Holmes, 2007; Kubrack & Jensen, 2007). At psychological level, malnutrition will cause fatigue and apathy, which in next delaying recovery, worsening anorexia and increasing convalescence time (Kubrack & Jensen, 2007). Malnutrition problems also pose an additional stress on acute health care organizations due to increased hospital costs used for treating patient (Barker et al., 2011).

Malnutrition is an independent risk factor in many diseases progression, and treatment on malnutrition problem can actually improve patients' prognosis (Lochs & Dervenis, 2003). Besides, malnutrition is associated with longer hospital stay reported in literature (Kruizenga et al., 2005). Malnourished patients are also having higher risk for infectious and non-infectious complications (Kuzu et al., 2006).

Nutritional screening is essential to detect individual requiring treatment because malnutrition is usually under recognized and under treated (Rasmussen et al., 2004).

Studies showed that nutritional intervention is effective to reduce complications, length of hospital stay, improve wound healing, improve well-being and also lower mortality rates among malnourished patients (Kruizenga et al., 2005; van Bokhorst-de van Schueren, Klinkenberg, & Thijs, 2005).

Patients who received high quality nutritional care (early intervention added with frequent use of nutrition services) had a 2.2 day shorter period of hospitalization than those receiving medium quality nutritional care (early intervention or frequent use of nutrition services). There is longest average period of hospitalization recorded among those receiving low quality nutritional care (late or no intervention and/or infrequent or no use of nutrition services) (Barker et al., 2011). Thus, early detection and treatment of malnutrition is beneficial for patients as well as health care facilities.

## **2.2 Inadequate Energy Intake in Hospital**

Nutritional intake is sufficient for body needs when it is actually providing energy sources for current body metabolism needs and restores catabolized endogenous proteins and increase the low glycogen content in muscles (Aquilani et al., 2003).

There are two types of energy depletion which are chronic protein-energy deficiency and acute undernutrition. Chronic protein-energy deficiency is defined as a prolonged period of insufficient energy intake due to starvation or health conditions such as cardiac disease, cancer, chronic respiratory or gastrointestinal (GI) disorders.

It is characterized by significant reduction in skinfold thickness and arm muscle circumference caused by loss of subcutaneous fat, and associated muscle wasting caused by protein loss from skeletal muscles in which such wasting also affects internal organs including heart, kidneys and liver (Holmes, 2003). Acute undernutrition is related with acute and life-threatening conditions, causing hypermetabolism and increased requirement for protein and energy at a time when intake is normally reduced (Holmes, 2003).

Insufficient energy consumption is common during disease conditions and this might cause undernutrition (Holmes, 2003). It is shown that prescription of modified or 'nothing by mouth' (NPO) diets before clinical examinations may cause inadequate food intake (Dupertuis et al., 2003). There are studies showing that nutritional factors, both related and unrelated to the leading diseases are affecting length of hospital stay and overall health care costs (Darmon, Lochs, & Pichard, 2008).

Hospital malnutrition and poor food intake may be caused by poor hospital meal service, low quality and flexibility of hospital catering and also insufficient assistance were given by hospital staff (Dupertuis et al., 2003). One of the factors causing malnutrition is inadequate food intake during hospitalization (Dupertuis et al., 2003; Hiesmayr et al., 2009; Meier & Stratton, 2008). To fight hospital malnutrition, steps must be taken are optimizing menu design, adapting menus and improving mealtime atmosphere (Iff et al., 2008).

There were over one-third of the patients consuming less than 50% of energy provided in a standard hospital diet (Kowanko, Simon, & Wood, 2001). Bauer et al. (2011) also found that there were nearly 50% of the patients consuming only half or

less of the hospital meal and these patients were four times more likely to be malnourished compared to who consume more than half of the hospital diet. Patients who took less than 50% of the hospital food served were 2.4 times more likely to be malnourished (Agarwal, Ferguson, Banks, Bauer, Capra, & Isenring, 2012).

Another study by Dupertuis et al. (2003), 43% or 600 out of 1707 hospitalised patients had total food intake below their minimum nutritional requirements. In a study by Almdal, Viggers, Beck and Jensen (2003); it was found that energy intake of both malnourished and non-malnourished patients did not have significant difference, but only 60-70% of TEE was covered by both groups. 97% or 947 out of 975 patients whose recommended requirements were not met did not consume all the food served. Same findings found in the study by Kondrup (2001) highlighting that about half of the hospital adult patients were underfed.

Study by Munirah (2008) showed that hospital energy intake contributing 83% of total energy intake whereas outside food intake contributing only 17%. 52.9% of patients did not achieve energy requirement. The mean hospital energy intake was  $1518.80 \pm 373.49$  kcal/day and outside energy intake was  $269.06 \pm 266.37$  kcal/day. It was seen that in study by Rosita et al. (2010) showing that hospital energy intake was higher than outside energy intake consumed by patients. Only 36% or 25 out of 70 patients achieve energy requirement. The mean hospital energy intake was  $1036.70 \pm 316.10$  kcal/day and outside energy intake was  $354.91 \pm 329.68$  kcal/day. Past studies were showing that most hospitalized depends on hospital diet for their energy intake but yet most of them did not able to achieve energy requirement.

### **2.3 Socio-demographic factors**

There was a study showing that older patients have insufficient food intake at mealtimes in hospital (Schenker, 2003). This is consistent with another study whereby for elderly patients with mean age 80 years, only 41% of them achieved estimated resting energy requirements (Mudge, Ross, Young, Isenring, & Banks, 2011). But study by Dupertuis et al. (2003) stated that age is not correlated with the hospital dietary intake. All of these showing that age may have an effect on patient's energy intake, but more evidence need to be gathered. Compare to women, men had more risk of being underfed (Dupertuis et al., 2003).

Study by Munirah (2008) showed that there was no correlation between age, gender, ethnicity and household income with hospital foodservice satisfaction. It was consistent with study by Rosita et al. (2010) which also stated there was no significant correlation between patient's age, gender, ethnicity and household income with hospital foodservice satisfaction (Rosita et al., 2010). Inadequate meal service, quality and flexibility of hospital foodservice can cause malnutrition and also insufficient food intake (Kondrup, 2001). There was interrelationship between hospital foodservice satisfaction with the patient's dietary intake. Thus, more data regarding association between socio-demographic factors and patient's dietary intake need to be collected.

### **2.4 Contextual variables**

There was increase in both length of hospital stay and chance of re-admission with poor nutrition in hospital (Department of Health, 2001). Patients with longer hospital stay (>8days) had less risk of being underfed compared to patients assessed

in early phase of hospital stay (Dupertuis et al., 2003). Studies showed that nutritional intervention is effective to reduce complications, length of hospital stay, improve wound healing, improve well-being and also lower mortality rates among malnourished patients (Kruizenga et al., 2005; van Bokhorst-de van Schueren, Klinkenberg, & Thijs, 2005).

Patients who received high quality nutritional care (early intervention added with frequent use of nutrition services) had a 2.2 day shorter period of hospitalization than those receiving medium quality nutritional care (early intervention or frequent use of nutrition services). There is longest average period of hospitalization recorded among those receiving low quality nutritional care (late or no intervention and/or infrequent or no use of nutrition services) (Barker et al., 2011). Past studies showing that there was association between nutritional care and length of hospital stay whereby it might affect patient's dietary intake as well.

In the hospital, patients' food intake is often affected by disease state, poor appetite, gastrointestinal intolerance, fatigue, early satiety and taste alterations (Somesh, 2011). There was association between inadequate energy intake with poor appetite (Mudge, Ross, Young, Isenring, & Banks, 2011). Patients who stay longer in hospital are expected to be more likely have severe condition, loss appetite and consume less food (Stanga et al., 2006). In other words, patient's dietary intake was determined by their appetite status.

## **2.5 Body mass index**

Patients who were underweight were prone or at risk of malnutrition (O' Flynn et al., 2005). But malnutrition was also associated with other factors whereby

studies had shown that malnutrition is associated with longer hospital stay (Kruizenga et al., 2005). In a previous study by Almdal et al. (2003), it stated that patients who were at risk of malnutrition had three criteria which were BMI of less than  $18.5\text{kg/m}^2$ , almost 5% of weight loss in one month or 10% of weight loss in 6 months and food intake was less than 1/3 of normal dietary intake for 2 weeks.

Both overweight and obese patients were having higher risk of getting chronic disease and complications. It was shown that the risk of diabetes was increased with the presence of weight gain and also up to 65% of type 2 diabetes mellitus cases was caused by overweight (Bray, 2004). Besides, obesity was also resulting in hypertension, heart failure, coronary heart disease (CHD) and also stroke (Finer, 2006). Hence, overweight and obese patients were also needed to taken with care in order to prevent complications associated with obesity. Previous study showed that increased BMI was correlated with increased risk of not covering the nutritional needs (Dupertuis et al. 2003). But Mudge et al. (2011) reported that obesity was not a significant predictor of poor intake.

## **2.6 Customer-Oriented Healthcare**

Nowadays, patients are no longer treated as merely patients but also customers. This is because patients nowadays are more educated and have higher expectations compared to the past. To become a customer-oriented healthcare institution, patient expectations should be thoroughly studied. Expectations are usually subjective, changing over time and sometimes difficult to convey. Bostan, Acuner, and Yilmaz (2007) defined patient expectations as the demand of patients in

terms of features of medical and management service that certain health institutions should bear.

Patients' expectations on hospital foodservice are no longer what they used to be. Patients today expect the hospital food experience to mimic the feeling that they have with room service at a hotel or at a full-service restaurant. In other words, patients are expecting abundance of food choices, great meal presentation and service-focused mindset (HBG Health, 2009). Bostan et al. (2007) suggests that to effectively achieve the return rate of patients, customer needs have to be understood first then fulfill the customer's needs.

Without customers or patients, a health institution cannot survive. Thus, patients' needs are taken into accounts during implementation of medical services. Institute of Medicine (2001) defines patient-centered care as the health care that establishes a partnership among practitioners, patients, and their families (when appropriate) to ensure that decisions respect patients' wants, needs, and preferences and that patients have the education and support they need to make decisions and participate in their own care.

## **2.7 Quality Healthcare and Patients' Satisfaction**

Bostan et al. (2007) suggests that patient expectations are the core determiner of quality and customer satisfaction. The word 'Quality' and 'Patient Satisfaction' becomes important nowadays due to increasing rivalry generally in the institutions, especially in the health institutions (Bostan et al., 2007).

In healthcare service, quality can be said to satisfy the institution, community, or patients which demand service and continuously added with technological and medical facilities development by understanding the importance of patient's needs, expectations and desires. Usually the quality expectations on rural hospital is lower than urban hospitals, but now due to medical knowledge and patient rights, patients are expecting better medical hospital service quality (Bostan et al., 2007).

Patients' satisfaction is the main product of the healthcare service. Customer satisfaction is defined as a condition in which customers obtain more benefits than their cost (Liu & Yen, 2010). Besides, Bostan et al. (2007) defined customers' satisfaction as the concept in which the service experienced by the customers was compared with the customers' needs and expectations.

In addition, patients' feedback acts as an important indicator in health care policy decisions. Patient satisfaction is widely used as the measure of the health care quality which can be linked to other outcome measures and to patients' behavioral intentions (Jaipaul & Rosentahal, 2003). In order to measure the success of a health care organization, customers' perception and satisfaction is important to be monitored (Akoijam, Konjengbam, Bishwalata, & Singh, 2007).

## **2.8 The Role of Hospital Foodservice**

In hospital therapeutic care, the provision of good quality food, fluids and nutritional care is very important as meeting patients' nutritional needs helping them to recover (Iff et al., 2008). In a hospital, food service plays an important role in treatment process as it will affect the length of recovery and life quality (Sahin et al., 2006). Hospital nutritional intake is one of the important elements in patients'

recovery process making foodservice having great value (Schirg, 2007). Monitoring of various aspects of foodservice including portion control, presentation, flavor and texture, temperature, timing of service and patient satisfaction should be done regularly (Iff et al., 2008).

Hospital foodservice can act as an educational tool which stimulates patients to maintain healthy eating habits after have been discharged from the hospital, making the recurrence or worsening of malnutrition problem caused by overeating or undereating less likely (Dupertuis et al., 2003).

In addition, the hospital foodservice management should be able to offer a balanced menu that meets the patients' nutritional requirements (Iff et al., 2008). During menu planning, disease or therapy related feeding problems such as loss of appetite, changes in taste perception, or difficulty in chewing and swallowing should be taken into considerations (Iff et al., 2008).

Hospital catering systems can affect the nutritional intake of hospitalized patients and potentiate malnutrition (Mowe et al., 2006). Better hospital foodservice systems can help to reduce malnutrition problems (O' Flynn, Peake, Hickson, Foster, & Frost, 2005).

In Malaysia, there are three types of hospitals comprising of government (n=135), private (n=112) and university teaching hospitals (n=3) (Ministry of Health, 2011). In general, public hospitals are subsidized by the Malaysian government in which hospital charges are based on class system and minimal charge (Chee & Barrachough, 2007). As part of Medical and Hospital Enactment 1957, hospital food provision is governed by the class system and still being used today. There are 3 classes which are 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup>, the charge for 1<sup>st</sup> class is the highest and charge for

3<sup>rd</sup> class is the lowest. All food provision to the patients is subsidized by the government but the amount subsidized depends on the classes. The food preparation is also being carried out according to different classes.

## **2.9 Patients' Hospital Foodservice Satisfaction**

In the evaluation of quality of health care services, patient satisfaction is always a key criterion to be investigated. But foodservice satisfaction sometimes was neglected when looking at the overall hospital patient satisfaction because the quality of nursing, physician and technical medical care are more commonly identified in the research (Tranter, Gregoire, Fullam, & Lafferty, 2009). Compared to scores obtained by other hospital services and departments, hospital foodservice systems traditionally achieved low patient satisfaction scores (Schirg, 2007).

Patient satisfaction is a complex phenomenon which is influenced by many determinants and yet is a vital component in foodservice continuous management and improvement. Patients' foodservice satisfaction cannot be truly measured by using a patient satisfaction questionnaire that only includes a simple "yes/no" answer (Fallon et al., 2008). The patients' responses and the foodservice satisfaction analysis can be influenced by the methods used to carry out the survey (e.g. who asks the questions, who records the responses) and the objective of the survey (e.g. intent to improve foodservice or for business matter) (Fallon et al., 2008).

Generally, patient has "institutionalized stereotyping" in which having perspective that the hospital food quality is poor (Hartwell, Edwards, & Beavis, 2007). The patients' expectations were even lowered down by the poor hospital foodservice quality. In other words, patients usually have negative view about

hospital food, thus expectations were usually compromised without trying the food (Naithan, Jane, Martin, Gulliford, & Myfanwy, 2008). In the hospital setting, the main factor causing consumers' negative perception and view over food are food presentation, food variety and physical setting.

There are several factors associated with patient satisfaction with hospital food service. Factors associated with patient satisfaction including food quality, on time food supply and maintenance of food hygiene and safety (Aljaziri, 2011). During hospital stay, patients take meal choices, meal times, meal presentation and overall satisfaction into consideration (Schirg, 2007). Delay in meal distribution may lead to rejection of diet and increase in patient dissatisfaction (Aljaziri, 2011). In addition, temperature of food is found to be one of the factors causing patient dissatisfaction (Tranter et al., 2009; Stanga et al., 2003).

In the world, food quality was found to be a wide problem around most hospitals as it was found that food-quality ratings is significantly correlated with patients who stayed for long periods and typically very sick (Jessri et al., 2011; Tranter et al., 2009). In patient's hospital foodservice satisfaction, food quality plays an important role (Hwang, Eves, & Desombre, 2003; Tranter et al., 2009; Wright et al., 2006). Study showed that food quality in the patient's view means freshness, taste, temperature, variety and aroma (Tranter et al., 2009). Definition of food quality also encompasses the following attributes which are meal taste, variety, flavor, texture of meat and vegetables and the perception to choose a healthy meal (Wright et al., 2006). In patients' perspective, food quality is equivalent to care quality or the overall perception that the hospital cares for them (HBG Health, 2009). According to Kim, Kim and Lee (2010), patient intake can be enhanced by improving food quality. Most of older patients claimed that the meal portion size was

too big compared to their small appetites (Xia & McCutcheon, 2005). Limitation in food selection in hospital foodservice system will also influence patient's dietary intake (Dupertuis et al., 2003).

There is also study showing that there are powerful effects of personalized care service on overall patient satisfaction in hospital foodservice (Tranter et al., 2009). Personal contact between medical staff and patient showed beneficial effect as patient feel that they receive emotional support from the staff (Watters, Sorensen, Fiala, & Wismer, 2003). Moreover, patients who stay longer in hospital are expected to be more likely have severe condition, loss appetite and consume less food (Stanga et al., 2006). When patients eating, they were interrupted by medical staff ward rounds, nurses and other visitors (Xia & McCutcheon, 2005). This showing that physical environment or atmosphere in hospital will also affect the patient's dietary intake as well.

Perceived foodservice quality will affect patient recovery and overall satisfaction during hospital stay (McLymont, Sharon, & Stell, 2003). To improve patient satisfaction and control costs, many hospital foodservice departments start to change to be more centered on patient care (Buzalka, 2008).

## **2.10 Relationship between hospital foodservice with patient's dietary intake**

Inadequate meal service, quality and flexibility of hospital foodservice can cause malnutrition and also insufficient food intake (Kondrup, 2001). Patient's food intake and achievement of individual energy requirement can be improved by modifying hospital menus and mealtime environment to meet patients' expectations (Kondrup, 2001). For patients who did not consume all of the food served, the most

commonly reason were inadequate taste and absence of choice (Dupertuis et al., 2003). Inadequate meal service was found to be reason of at least 572 (59%) of the underfed patients did not achieve their nutritional requirements (Dupertuis et al., 2003). In acute care setting, the meal timing of lunch and supper too early causing patients are underfed (Dupertuis et al., 2003).

Study by Munirah (2008) showing that there was no significant correlation between energy intake with total satisfaction score for hospital foodservice. Another study by Aina (2008) also supported there was no significant correlation between patient's energy intake with total score of foodservices dimension ( $p>0.05$ ).

### **2.11 Differences of patient's dietary intake between normal diet group and therapeutic diet group**

There are few studies focusing on the differences of energy intake between normal diet and therapeutic diet. In a study by Wright, Cotter, Hickson and Frost (2005), a comparison of energy and protein intakes among older people consuming a texture modified diet with a normal hospital diet was done. Texture modified diet is one of the therapeutic diet used in the hospital. Results showed that energy intake was significantly lower in texture-modified diet group compared to normal diet group. In addition, there was no one of the patients in texture-modified group met their energy needs if compared to almost half of the patients on normal diet achieving energy requirements.

Another study by Dupertuis et al. (2003) showed that the percentage of underfed patients was higher in the 207 (15%) of patients receiving modified/therapeutic diets than in patients receiving normal diet. It was found that



## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 Study Design**

The cross sectional study was conducted to determine the associations between socio-demographic information (age and household income), body mass index and patients' hospital foodservice satisfaction with patient's dietary intake and to identify differences of patients' dietary intake data between normal diet group and therapeutic diet group.

#### **3.2 Study Location**

This study was conducted in Hospital Serdang, Selangor, Malaysia. It is a multi-specialty hospital funded by the government which is located in the district of Sepang in Selangor state, Malaysia. Its location is in the east of the South Klang Valley Expressway (SKVE) and in the west of the Faculty of Medicine and Health

Sciences of Universiti Putra Malaysia. It has a total area of 129,000 square meters and there are a total of 20 operating theatres, 19 wards and 620 beds in Hospital Serdang. It is specially designed as a reference center for cardiology, cardiothoracic, urology and nephrology surgery. Hospital Serdang is running on plated foodservice system.

### 3.3 Sample Size Determination

In order to determine the sample size needed, the formula by Daniel (2005) was used:

$$n1 = n2 = \frac{2[Z(\alpha/2) + Z(1-\beta)]^2}{\Delta^2}$$

$Z(\alpha/2) = 1.96$  with  $\alpha=0.05$  (confidence level=95%)

$Z(1-\beta) = 0.84$  with statistical power (80%)

Mean score for hospital food service satisfaction:

Group 1=79.66±16.47 (Munirah, 2008); Group 2=83.63±11.15 (Rosita et al., 2010)

$$n1 = n2 = \frac{2[1.96 + 0.84]^2}{\frac{(83.63 - 79.66)^2}{(11.15 - 16.47)^2}}$$

$$= 2 \frac{(2.8)^2}{(0.746)^2}$$

=28 adding 20% non-response/missing data

=35 respondents for each group

Total respondents=70

### 3.4 Sampling Design

Purposive sampling is used to select the hospital and patients for data collection. Thirty five inpatients who taking normal diet and therapeutic diet in medical wards were included, giving a total of 70 respondents. All the respondents who met the criteria were invited to participate in the study.

### 3.5 Subjects

The subjects for this study were patients taking normal diet and therapeutic diet for both genders. Some of the inclusion and exclusion criteria were:

Table 3.1 Subject's selection criteria

Inclusion Criteria	Exclusion Criteria
Malaysian	Pediatric and psychiatric patients
>18 years old	Patients with NPO diet order or receiving enteral and parenteral nutrition
On oral normal or therapeutic diet	Critically ill patient
Had taken more than 2 meals in the hospital	

Energy and protein content for normal and therapeutic diet included in this study was as follow:

Table 3.2 Energy and protein content of hospital diet

Type of diet	Energy (kcal)	Protein (g)
Normal Diet	2000	91
<b>Therapeutic Diet</b>		
Diabetic Diet	1800	101
Diabetic High Protein Diet	2300	121
High Protein Diet	2300	121
Soft Diet	1800	85
Low Salt Diet	2000	91

### 3.6 Measures

In this study, socio-demographic variables (age, gender, ethnicity, educational level, household income and number of hospitalization), contextual variables (length of stay and appetite status), patients' hospital foodservice satisfaction and patient's dietary intake were measured using self-administered questionnaire (guidance was given when needed).

#### 3.6.1 Socio-demographic and contextual variables

Self-administered questionnaire was used to obtain socio-demographic variables (age, gender, ethnicity, educational level, household income, number of hospitalization) and contextual variables (length of stay and appetite status). Questionnaire for both socio-demographic and contextual variables was adapted

from Acute Care Hospital Foodservice Patient Satisfaction Questionnaire (ACHFPSQ) (Capra, Wright, & Sardie, 2005).

### 3.6.2 Anthropometry measurement

#### **Height measurement**

##### **For ambulatory patients**

Anthropometry measurement was used to measure the height of the patient based on the standard. The patient's height was measured using SECA Body Meter. During the height measuring process, patient was needed to stand straight, foot sealed, back of the body and buttocks should in vertical position and patient must look in front and in Frankurt's horizontal position. The value of height was measured to the nearest of 0.1cm. To have more accurate measurement, the patient's height was being measured two times in order to obtain the mean measurement.

##### **For bedridden patients**

For bedridden patient, the measurement of height was estimated using arm span. Measuring tape was used to obtain the arm span length. Calculation for estimated height using arm span for bedridden patient was as follows (Suzana & Ng, 2003):

$$\text{Male: Ht} = [0.681 \times \text{arm span (cm)}] + 47.56$$

$$\text{Female: Ht} = [0.851 \times \text{arm span (cm)}] + 18.78$$

## **Weight measurement**

### **For ambulatory patients**

Anthropometry measurement was used to measure patient's weight based on the standard. The patient's weight was measured using TANITA electronic weighing scale. During the measuring process, the weighing scale was put on a smooth and flat surface in order to ease patient standing on it and increase the accuracy of the measurement. Patient had to stand straight on the weighing scale, look in front and in stand in a relaxed position. The value of weight was measured to the nearest of 0.1kg. In order to have more accurate measurement, the patient's weight was measured two times to obtain the mean measurement.

### **For bedridden patients**

For bedridden patient, the weight was estimated using the following formula (Chumlea, Rochea, & Mukherjee, 1984):

$$\text{Male} = (0.98 \times \text{CC}) + (1.16 \times \text{KH}) + (1.73 \times \text{MUAC}) + (0.37 \times \text{subscap}) - 81.69$$

$$\text{Female} = (1.27 \times \text{CC}) + (0.87 \times \text{KH}) + (0.98 \times \text{MUAC}) + (0.40 \times \text{subscap}) - 62.35$$

Patient's body mass index (BMI) was calculated using following formula

$$\text{BMI} = \text{Wt (kg)} / [\text{Ht(m)}]^2$$

Body mass index measurement was set by World Health Organization (WHO) in year 1999 for international standard and suitable for population aged more than 18 years old. Body mass index acts as an important indicator in patient's nutritional status assessment.

Table 3.3 Body Mass Index (BMI) used by World Health Organization (WHO) 1999

BMI Classification	BMI (kg/m <sup>2</sup> )
Underweight	< 18.50
Normal	18.50 – 24.99
Overweight	25.00 – 29.99
Obese Class I	30.00 – 34.99
Obese Class II	35.00 – 39.99
Obese Class III	≥ 40.00

### 3.6.3 Patients' hospital foodservice satisfaction

A validated questionnaire entitled Acute Care Hospital Foodservice Patient Satisfaction Questionnaire (ACHFPSQ) (Capra, Wright, & Sardie, 2005) that was modified was used to obtain data about patient's hospital foodservice satisfaction. The questionnaire was modified and validated by Nurul (2013). The questionnaire was self-reported by the patients who were able to answer on their own. If the patients were unable to fill in the questionnaire, a structured interview will be carried out by the researcher in order to obtain the data.

*Acute Care Hospital Foodservice Patient Satisfaction Questionnaire* (ACHFPSQ) is designed following a six-year study which included 2347 acute care hospital patients from two public hospitals and one hospital. It acts as an accurate and reliable measure of patients' hospital foodservice satisfaction. In general, it is divided into four main dimensions of hospital foodservice which are food quality, meal service quality, staff/service issues, and physical environment. For food quality dimension, 11 items are included which measures the satisfaction with taste, temperature, texture, portion size and also smell. There are a total of 6 items in meal

service quality dimension measuring the appropriateness of meal timing and duration. Next, staff issues dimension is also measured using 3 items about the staff's manners and cleanliness. The last dimension will be physical environment asking patient's satisfaction about the noise level and smell in the ward.

For all four foodservice dimensions, hospital foodservice satisfaction level was measured using five-point Likert scale (from 1 = very dissatisfied, to 5 = very satisfied). The maximum total score for hospital foodservice satisfaction computed was 110. There is also an item to assess patient's overall satisfaction with the hospital foodservice with the rating from 1 = very dissatisfied to 10 = very satisfied. Table 3.4 shows the number of items and total marks for the patient's hospital foodservice satisfaction.

Table 3.4 Total items and marks for patient's hospital foodservice satisfaction

<b>Foodservice dimension</b>	<b>No. of items</b>	<b>Total marks</b>
Dimension 1: Food quality	11	55
Dimension 2: Reliability and Consistency	6	30
Dimension 3: Staff issues	3	15
Dimension 4: Physical Environment	2	10
Total satisfaction score	22	110
Overall satisfaction	1	10

**Percentage of score for each dimension**

= Mean score/total score for each dimension X 100%

Total satisfaction score for all dimensions was categorized as following: very dissatisfied=0-21 marks, dissatisfied=22-43 marks, moderate= 44-65 marks, satisfied= 66-87 marks, very satisfied= 88-110 marks.

#### 3.6.4 Patient's dietary intake

A one-day food intake was recorded for each patient using hospital food intake and outside food intake. The hospital provided 3 main meals (breakfast, lunch and dinner) and one snack (afternoon tea). The menu provided was non-selective.

Hospital food intake was assessed by observing the amount of food consumed by patient. However, during observation, they were asked that who actually consumed the food. In the process, a sample of the hospital food was weighed first, then followed by estimation of unfinished food in order to determine the exact hospital food intake using five categories (consume 100% of the meal, 75% of the meal, 50% of the meal, 25% of the meal and 0% of the meal). Energy and protein intake were estimated based on the percentage of the meal consumed in the hospital diet. Outside food intake data was assessed from the patient using one day food record, the same day the hospital food intake was assessed. Energy and protein for outside food intake were analyzed using Nutritionist Pro Version 2.4.1.

Patient's hospital dietary intake was analyzed and compared to each patient's individual requirement using the Harris and Benedict equation (1919) for energy requirement as shown in the following. Table 3.5 showed the values for activity and injury factors used in Harris-Benedict equation.

For men,  $BMR = 66.47 + 13.75W + 5.0H - 6.76A$

For women,  $BMR = 665.10 + 9.56W + 1.85H - 4.68A$

where W = weight in kg, H = height in cm, A = age in years

Total energy intake = BMR X activity factor X injury correction factor

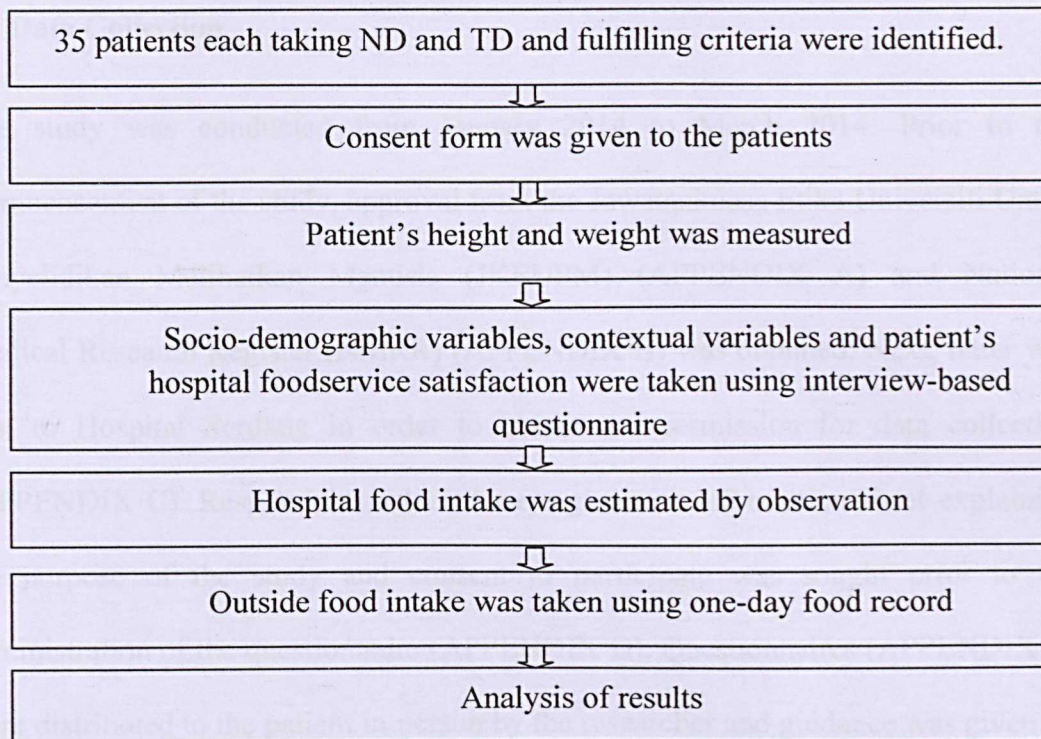
Table 3.5 Values for activity factor and injury correction factor

Values	Activity factor	Injury correction factor
1.2	Confined to bed	For non-stressed, nutritionally sound patients
1.3	Out of bed/ ambulatory	For minimally stressed patients; inflammatory bowel disease, cancer, elective surgery and moderate skeletal trauma  For moderately stressed patients; orthopaedic surgery, sepsis, burns, and major skeletal trauma  For severely stressed patients; multiple trauma, sepsis, and multi-system surgery  For the extremely stressed patients; severe head injury, acute respiratory distress syndrome, thermal burns, and sepsis  Major thermal injury

For protein requirement estimation was as follows (Gracie et al., 2000):

For healthy adults: 0.8g/kg/day

Under stress: 1.0-1.5g/kg/day



\*ND=Normal diet; TD=Therapeutic diet

Figure 3.1 Flowchart of data collection process

### 3.7 Pre-testing

The questionnaire was pretested on 5 subjects each from normal diet group and therapeutic diet group in December 2013 in Hospital Serdang. Pre test was being done in order to find out the duration of time required to answer the questionnaire and determine any error in the questionnaire which is needed to be modified. After the pre test, errors and problems found in pre-testing were corrected so that the questionnaire can be used to obtain appropriate and relevant information in the study later.

### **3.8 Data Collection**

The study was conducted from January 2014 to March 2014. Prior to the commencement of the study, approval from the Jawatankuasa Etika Universiti Untuk Penyelidikan Melibatkan Manusia (JKEUPM) (APPENDIX A) and National Medical Research Register (NMRR) (APPENDIX B) was obtained. Next, letter was sent to Hospital Serdang in order to obtain the permission for data collection (APPENDIX C). Respondents selected were given an information sheet explaining the purpose of the study and consent to participate was sought prior to the administration of the questionnaire (APPENDIX D). Questionnaires (APPENDIX E) were distributed to the patient in-person by the researcher and guidance was given by the researcher when needed.

### **3.9 Data Analysis**

All the statistical analysis was performed by using IBM SPSS Statistics 21. Continuous variables, (age, household income and body mass index) which are normally distributed were presented as means (standard deviations) and categorical variables (gender, ethnicity, educational level, number of hospitalization, length of stay and appetite status) were presented as counts (percentages). Pearson product-moment correlation analysis was used to determine the correlation between age, household income, body mass index and patient's hospital foodservice satisfaction with patient's dietary intake. Independent sample t-test was used to determine differences in patient's dietary intake between gender for each diet group and between normal diet group and therapeutic diet group. Statistical significance level is set at  $p < 0.05$ .

## CHAPTER 4

### RESULT AND DISCUSSION

#### 4.1 Socio-demographic characteristics

Table 4.1 shows the socio-demographic characteristics of the subjects involved in the study. There were a total of 70 patients recruited in the study, in which 35 patients received hospital normal diet and another 35 patients received hospital therapeutic diet. For normal diet group, the mean age in years was  $35.09 \pm 11.89$  and for therapeutic diet group, the mean age was  $46.94 \pm 14.61$  years. There were 48.6% (n=17) of male patients and 51.4% (n=18) of female patients in both normal diet group and therapeutic diet group.

Majority of the patients were Malay constituting 82.9% and 68.6% in normal and therapeutic diet groups respectively. Most of the patients in normal diet group (45.7% and 42.9%) and therapeutic diet group (37.1% and 45.7%) had secondary and tertiary education respectively.

The mean household income for normal diet group and therapeutic diet group was RM2647.97±1656.26 and RM1737.14±1919.57 respectively. In normal diet group, majority of the patients (51.4%) was admitted to hospital for the first time. Then for therapeutic diet group, most of the patients (42.9%) had been admitted to the hospital more than four times.

Table 4.1 Socio-demographic characteristics of subjects

Variables	Mean ± SD	n (%)	Mean ± SD	n (%)
	ND (n=35)		TD (n=35)	
Age (yrs)	35.09±11.89		46.94±14.61	
Gender				
Male		17 (48.6)		17 (48.6)
Female		18 (51.4)		18 (51.4)
Ethnicity				
Malay		29 (82.9)		24 (68.6)
Chinese		2 (5.7)		7 (20.0)
Indian		2 (5.7)		3 (8.6)
Others		2 (5.7)		1 (2.9)
Educational level				
No education		1 (2.9)		2 (5.7)
Primary education		3 (8.6)		4 (11.4)
Secondary education		16 (45.7)		13 (37.1)
Tertiary education		15 (42.9)		16 (45.7)
Household income (RM)	2647.97±1656.26		1480.00±1297.46	
Number of hospitalization				
1 <sup>st</sup> time		18 (51.4)		10 (28.6)
2 <sup>nd</sup> time		8 (22.9)		7 (20.0)
3 <sup>rd</sup> time		6 (17.1)		3 (8.6)
≥4 <sup>th</sup> time		3 (8.6)		15 (42.9)

\*ND=Normal diet; TD=Therapeutic diet

\*3 outliers for household income in therapeutic diet group were removed as the SD value was higher than the mean value

## 4.2 Contextual variables

Table 4.2 shows the contextual variables of subjects involved in the study. Regarding length of hospital stay, most of the patients (88.6% and 91.4%) had stayed in hospital less than 1 week for normal and therapeutic diet groups respectively. Majority of the patients (54.3% and 57.1%) in normal and therapeutic diet groups claimed that their appetite was less than usual.

Table 4.2 Contextual variables of subjects

Variables	n (%)	
	ND (n=35)	TD (n=35)
Length of stay		
<1 week	31 (88.6)	32 (91.4)
1-2 weeks	1 (2.9)	3 (8.6)
2-4 weeks	2 (5.7)	0 (0.0)
1-2 months	1 (2.9)	0 (0.0)
>2months	0 (0.0)	0 (0.0)
Appetite status		
Unchanged	12 (34.3)	12 (34.3)
More than usual	4 (11.4)	3 (8.6)
Less than usual	19 (54.3)	20 (57.1)

\*ND=Normal diet; TD=Therapeutic diet

## 4.3 Anthropometry data of subjects

Table 4.3 shows the anthropometry data of the patients. Regarding Body Mass Index (BMI) of the patients, BMI of both male and female patients within normal diet group was almost similar with mean BMI of  $25.78 \pm 6.70$  and  $25.70 \pm 5.57$

kg/m<sup>2</sup> respectively. But in therapeutic diet group, female subjects had higher mean BMI of 27.52±7.99 compared to male's mean BMI of 23.85±4.52. The mean BMI of male and female patients in normal diet group and also female patients in therapeutic diet group was considered in overweight category whereas the mean BMI of male patients in therapeutic was categorized as normal weight.

Table 4.3 Anthropometry data of subjects

Variables	Mean ± SD	
	ND (n=35)	TD (n=35)
Height (cm)		
Male	167.59±4.74	170.65±8.70
Female	155.33±5.46	152.11±7.38
Weight (kg)		
Male	72.59±19.70	68.79±9.83
Female	62.00±13.52	63.78±19.75
BMI (kg/m <sup>2</sup> )		
Male	25.78±6.70	23.85±4.52
Female	25.70±5.57	27.52±7.99

\*ND=Normal diet; TD=Therapeutic diet

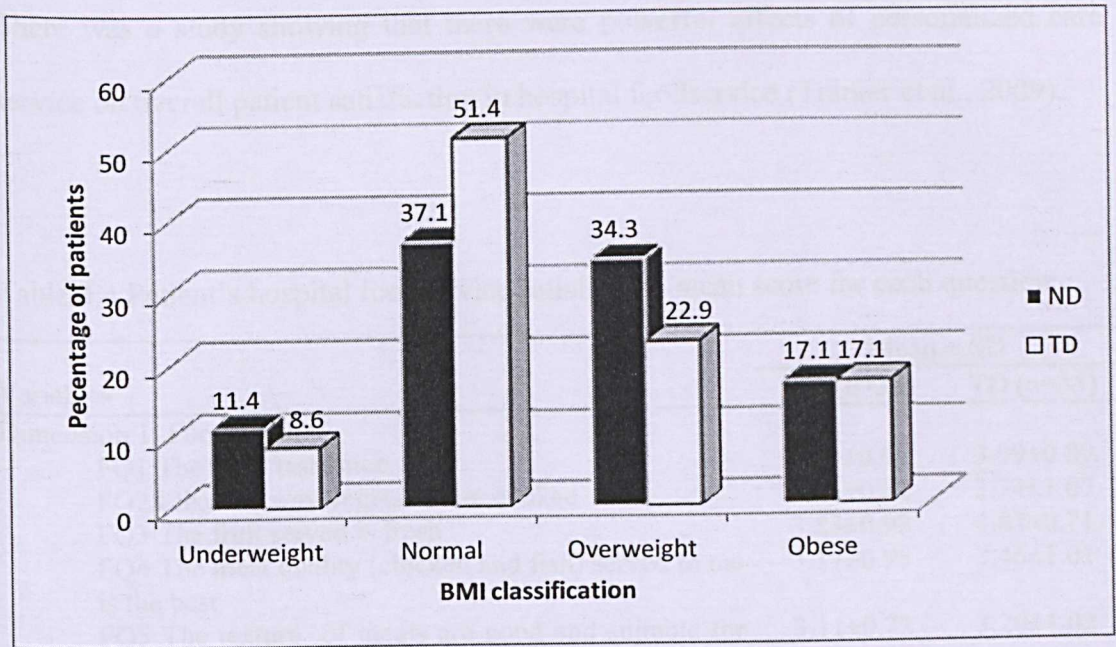
Figure 4.1 shows the prevalence of underweight, normal weight, overweight and also obesity among subjects in both normal diet group and therapeutic diet group based on BMI classification (WHO, 1999). Although the mean BMI of both diet groups was categorized as normal weight and overweight, but there was still 11.4% and 8.6% of patients who were underweight. Patients who were underweight were prone or at risk of malnutrition (O' Flynn et al., 2005). But malnutrition was also associated with other factors whereby studies had shown that malnutrition is

associated with longer hospital stay (Kruizenga et al., 2005). In a previous study by Almdal et al. (2003), it stated that patients who were at risk of malnutrition had three criteria which were BMI of less than  $18.5\text{kg/m}^2$ , almost 5% of weight loss in one month or 10% of weight loss in 6 months and food intake was less than 1/3 of normal dietary intake for 2 weeks.

There were 37.1% and 51.4% of patients in both normal diet group and therapeutic diet group respectively in normal weight classification. But there were also 34.3% and 22.9% of patients from normal diet group and therapeutic diet group who were overweight. For obese category, the percentage of patients in both normal diet group and therapeutic diet group was the same which was 17.1%. Both overweight and obese patients were having higher risk of getting chronic disease and complications. It was shown that the risk of diabetes was increased with the presence of weight gain and also up to 65% of type 2 diabetes mellitus cases was caused by overweight (Bray, 2004). Besides, obesity was also resulting in hypertension, heart failure, coronary heart disease (CHD) and also stroke (Finer, 2006). Hence, overweight and obese patients were also needed to taken with care in order to prevent complications associated with obesity.

#### **4.4 Patient's hospital foodservice satisfaction**

Table 4.4 shows the patient's hospital foodservice satisfaction mean score for each question. From the result, for the normal diet group, it was found that the question with highest mean score of  $4.23\pm 0.65$  was SI 1 from staff issues dimension and question with the lowest mean score of  $2.91\pm 0.95$  and  $2.91\pm 1.01$  was FQ1 and FQ7 from food quality dimension. Then for therapeutic diet group, the highest mean



\*ND=Normal diet; TD=Therapeutic diet

Figure 4.1 BMI categorization of patients based on WHO classification (1999) based on diet groups

score of  $4.26 \pm 0.66$  was found in SI 2 which was also from staff issues dimension whereas the question with lowest mean score of  $2.71 \pm 1.02$  was FQ10 from food quality dimension also. For question on overall satisfaction, normal diet group has higher mean score of  $6.83 \pm 1.87$  compared to therapeutic diet group with a mean score of  $6.11 \pm 2.18$ .

Questions on food quality dimension had the lowest rating, which shows that patients were not satisfied enough with it. In patients' perspective, food quality is equivalent to care quality or the overall perception that the hospital cares for them (HBG Health, 2009). Thus, food quality was actually playing an important role in patients' hospital foodservice satisfaction.

The questions with the highest rating were from the staff issues dimension which also signifies that patients were satisfied with the services given by the staffs.

There was a study showing that there were powerful effects of personalized care service on overall patient satisfaction in hospital foodservice (Tranter et al., 2009).

Table 4.4 Patient's hospital foodservice satisfaction mean score for each question

Variables	Mean $\pm$ SD	
	ND (n=35)	TD (n=35)
Dimension 1: Food Quality		
FQ1 The meal taste nice	2.91 $\pm$ 0.95	3.09 $\pm$ 0.89
FQ2 I like the way vegetable are cooked	2.86 $\pm$ 0.81	2.74 $\pm$ 1.07
FQ3 The fruit served is fresh	3.83 $\pm$ 0.92	4.03 $\pm$ 0.71
FQ4 The meat quality (chicken and fish) served to me is the best	3.17 $\pm$ 0.95	3.46 $\pm$ 1.01
FQ5 The texture of meals are good and suitable for my condition	3.11 $\pm$ 0.72	3.20 $\pm$ 1.02
FQ6 Portion size of my meals are suitable and enough for me	3.91 $\pm$ 0.98	3.80 $\pm$ 0.87
FQ7 The meals have excellent and distinct flavour	2.91 $\pm$ 1.01	2.94 $\pm$ 0.91
FQ8 The drinks served are just at the right temperature	3.40 $\pm$ 0.98	3.43 $\pm$ 0.88
FQ9 The hot foods are just at the right temperature	3.29 $\pm$ 1.05	3.29 $\pm$ 0.93
FQ10 The smell of my meals are nice and good	2.94 $\pm$ 0.87	2.71 $\pm$ 1.02
FQ11 The colour of my meals are attractive	2.94 $\pm$ 0.91	2.89 $\pm$ 1.02
Dimension 2: Reliability and Consistency		
TR1 The mealtime for breakfast is suitable	4.09 $\pm$ 0.89	3.86 $\pm$ 1.14
TR2 The mealtime for lunch is suitable	4.11 $\pm$ 0.83	3.94 $\pm$ 1.11
TR3 The mealtime for afternoon tea is suitable	4.11 $\pm$ 0.83	3.97 $\pm$ 1.07
TR4 The mealtime for dinner is suitable	4.03 $\pm$ 0.89	3.89 $\pm$ 1.21
TR5 The meals served punctually according to schedule	4.09 $\pm$ 0.89	3.91 $\pm$ 0.85
TR6 The duration given to finish the meal is enough	4.03 $\pm$ 0.75	4.03 $\pm$ 0.89
Dimension 3: Staff Issues		
SI1 The staff who deliver and collect my meal are friendly and polite	4.23 $\pm$ 0.65	4.03 $\pm$ 0.95
SI2 The staff who deliver and collect my meals are neat and clean	4.20 $\pm$ 0.90	4.26 $\pm$ 0.66
SI3 The staff are taking away my tray only after I finish eating	3.80 $\pm$ 1.08	4.03 $\pm$ 0.79
Dimension 4: Physical Environment		
PE1 The hospital or ward scent stops me from enjoying my meals	3.43 $\pm$ 1.09	3.80 $\pm$ 0.93
PE 2 The noise at hospital or ward disturb me to enjoying my meals	3.60 $\pm$ 1.06	3.86 $\pm$ 0.88
Overall Satisfaction		
I am satisfied with the overall foodservice in this hospital	6.83 $\pm$ 1.87	6.11 $\pm$ 2.18

\*ND=Normal diet; TD=Therapeutic diet

Table 4.5 shows the total mean score for each foodservice dimension and also total mean satisfaction score for all dimensions. For normal diet group, the mean score for food quality, reliability and consistency, staff issues and physical environment was  $35.29 \pm 7.64$ ,  $24.46 \pm 4.54$ ,  $12.23 \pm 2.28$ , and  $7.03 \pm 2.08$  respectively. Among therapeutic diet group, the mean score for food quality, reliability and consistency, staff issues and physical environment was  $35.57 \pm 7.11$ ,  $23.60 \pm 5.64$ ,  $12.31 \pm 2.04$ , and  $7.66 \pm 1.63$  respectively. For total satisfaction score, therapeutic diet group has a comparable mean score of  $79.14 \pm 13.63$  to normal diet group having mean score of  $79.00 \pm 13.52$ .

Based on the percentage of patient's satisfaction according to dimension as shown in Figure 4.2, the food quality dimension had the lowest percentage of 64.16% and 64.67% for normal diet group and therapeutic diet group respectively. Then staff issues dimension had the highest percentage of 81.53% and 82.67% for normal diet group and therapeutic diet group respectively.

Results obtained in this study was consistent with the study by Munirah (2008) whereby the food quality dimension had the lowest percentage of 65.4% and the staff issues dimension was having the highest percentage of 80.4%. In a study by Fallon et al. (2008), results also showed that food quality dimension had the lowest factor score of 4.3 compared to the highest factor score of 4.8 in staff issues dimension. In addition, about 60% of negative comments made by the respondents were related to food quality dimension. Thus, this confirmed that food quality plays an important role in patient's hospital foodservice satisfaction (Hwang, Eves, & Desombre, 2003; Tranter et al., 2009; Wright et al., 2006).

Table 4.5 Patient's hospital foodservice satisfaction mean total score for each dimension

Variables	Mean $\pm$ SD	
	ND (n=35)	TD (n=35)
Food Quality (55 marks)	35.29 $\pm$ 7.64	35.57 $\pm$ 7.11
Reliability and Consistency (30 marks)	24.46 $\pm$ 4.54	23.60 $\pm$ 5.64
Staff Issues (15 marks)	12.23 $\pm$ 2.28	12.31 $\pm$ 2.04
Physical Environment (10 marks)	7.03 $\pm$ 2.08	7.66 $\pm$ 1.63
Total Satisfaction Score (110 marks)	79.00 $\pm$ 13.52	79.14 $\pm$ 13.63

\*ND=Normal diet; TD=Therapeutic diet

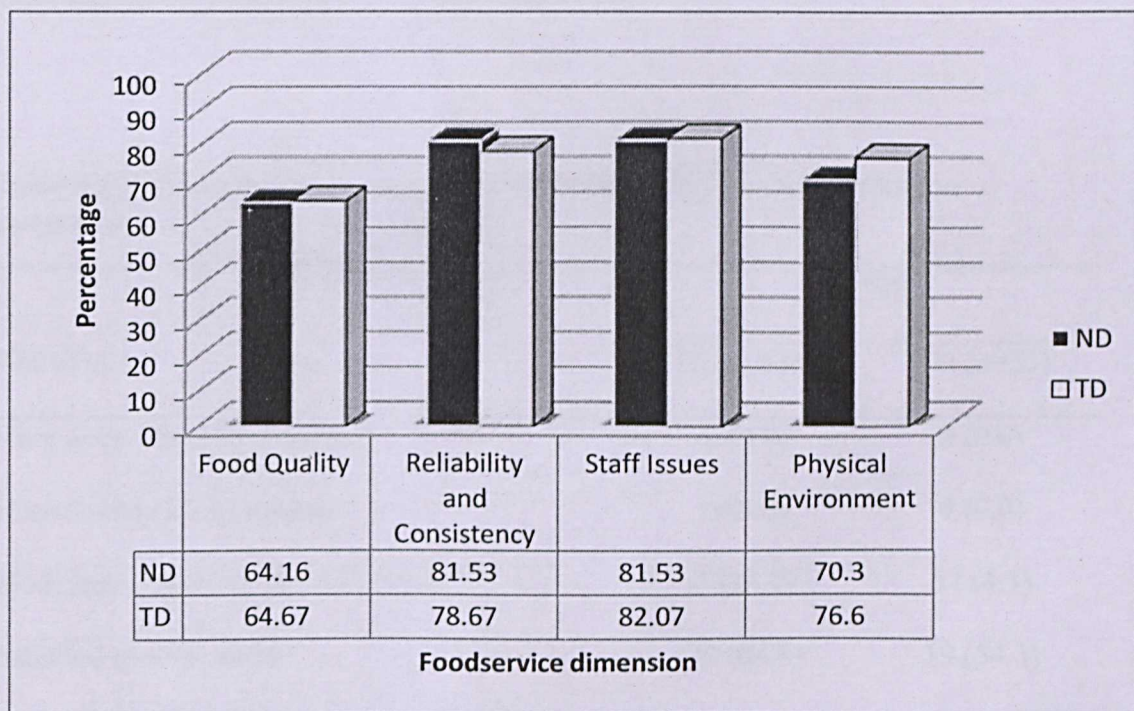


Figure 4.2 Percentage of marks for each foodservice dimension based on diet groups

Table 4.6 shows the categories for patient's hospital foodservice satisfaction and it was found that 14.3%, 62.9% and 22.9% of the patients in the normal diet group were moderately satisfied, satisfied and very satisfied respectively. Among

therapeutic diet group, 14.3%, 54.3% and 31.4% of patients reported as moderately satisfied, satisfied and very satisfied respectively. Both diet groups did not have much difference in terms of hospital foodservice satisfaction in which there was no dissatisfaction seen among the patients.

A study by Teng et al. (2003) reported that 93.7% of the patients said that hospital food was satisfactory or good. Another study by Abdelhafez, Al Qurashi, Al Ziyadi, Kuwair, Shobki, & Mograbi (2012) showed that 78.8% of the patients were satisfied with the quality of hospital foodservices provided. Mustafa et al. (2008) found that there were 69.85% of respondents who rated foodservices as good. Compared with past studies, hospital foodservice satisfaction level might vary according to different hospital catering and setting.

Table 4.6 Patient's hospital foodservice satisfaction total score according to categories

Variables	n (%)	
	ND (n=35)	TD (n=35)
Very dissatisfied (0-21marks)	0 (0.0)	0 (0.0)
Dissatisfied (22-43 marks)	0 (0.0)	0 (0.0)
Moderately satisfied (44-65 marks)	5 (14.3)	5 (14.3)
Satisfied (66-87 marks)	22 (62.9)	19 (54.3)
Very satisfied (88-110 marks)	8 (22.9)	11 (31.4)

\*ND=Normal diet; TD=Therapeutic diet

#### 4.5 Patient's dietary intake

Table 4.7 shows the types of therapeutic diet and also number of patients received it. It was observed that majority of the patients had received high protein diet (31.4%) and also diabetic high protein diet (25.7%). Only a small percentage of patients received soft diet (8.6%) and also low salt diet (5.7%).

Table 4.7 Number of patients according to therapeutic diet received

Types of therapeutic diet	n (%)
	TD (n=35)
Diabetic Diet	10 (28.6)
Diabetic High Protein Diet	9 (25.7)
High Protein Diet	11 (31.4)
Soft Diet	3 (8.6)
Low Salt Diet	2 (5.7)

\* TD=Therapeutic diet

Table 4.8 shows the mean patient's dietary intake. For hospital food intake, the mean energy intake for normal diet group and therapeutic diet group was  $936\pm605$  and  $969\pm602$  kcal/day respectively whereas the mean protein intake for normal diet group and therapeutic diet group was  $23.15\pm14.78$  and  $42.56\pm26.18$  g/day respectively. It was observed that mean hospital protein intake was higher for therapeutic diet compared to normal diet, this was due to higher protein content in therapeutic diet as shown in Table 3.2. For outside food intake, the mean energy intake for normal diet group and therapeutic diet group was  $395\pm406$  and

250±203kcal/day whereas the mean protein intake was 12.41±12.50 and 7.97±8.47g/day for normal diet group and therapeutic group respectively.

Figure 4.3 shows the mean contribution of energy (%) for hospital and outside food intake towards total food intake. For normal diet group, hospital food and outside food intake contributed 68.49% and 31.51% respectively in total food intake in a day. In therapeutic diet group, 72.76% and 27.24% of energy were contributed by hospital food and outside food. Results showed that hospital energy intake in both diet groups were higher compared to outside energy intake.

This was consistent with the study by Munirah (2008) whereby hospital energy intake contributed 83% of total energy intake whereas outside energy contributed only 17%. Similar finding was found by Rosita et al. (2010) showing that hospital energy intake was higher than outside energy intake consumed by patients.

Figure 4.4 shows the mean contribution of protein (%) for hospital and outside food intake towards total food intake. In the normal diet group, the percentage over total food intake in a day contributed by hospital protein intake and outside protein intake was 64.75% and 35.25% respectively. In the therapeutic diet group, 72.76% and 27.24% of hospital protein intake and outside protein intake contributed to the total food intake in a day. Thus, it could be concluded that hospital protein intake was higher in both diet groups compared to outside protein intake.

The study by Rosita et al. (2010) showed that protein intake from hospital food (36.68±14.14 g) were higher than outside food (11.04±10.73 g). Consistent results were also found in the study by Munirah (2008) whereby hospital food protein intake (51.42±17.72 g) was higher than outside food protein intake (10.49±14.94 g).

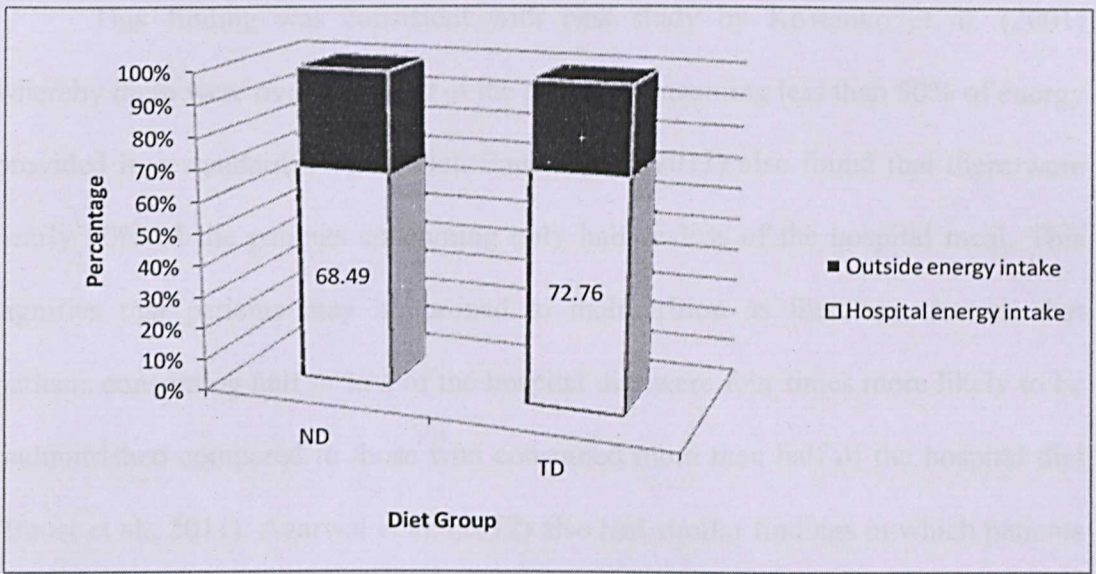
All of these implied that patient depended more on hospital food for their daily nutrition and also highlighted that patient can accept the food provided by the hospital. Past studies also showed that about 75% of patients depended only on hospital food for their nutrition (Allison, 2003).

Table 4.8 Patient's dietary intake

Variables	Mean $\pm$ SD	
	ND (n=35)	TD (n=35)
Hospital food intake		
Energy (kcal/day)	936 $\pm$ 605	969 $\pm$ 602
Protein (g/day)	23.15 $\pm$ 14.78	42.56 $\pm$ 26.18
Outside food intake		
Energy (kcal/day)	395 $\pm$ 406	250 $\pm$ 203
Protein (g/day)	12.41 $\pm$ 12.50	7.97 $\pm$ 8.47
Total food intake in a day		
Energy (kcal/day)	1331 $\pm$ 767	1219 $\pm$ 598
Protein (g/day)	35.56 $\pm$ 19.58	50.53 $\pm$ 26.08

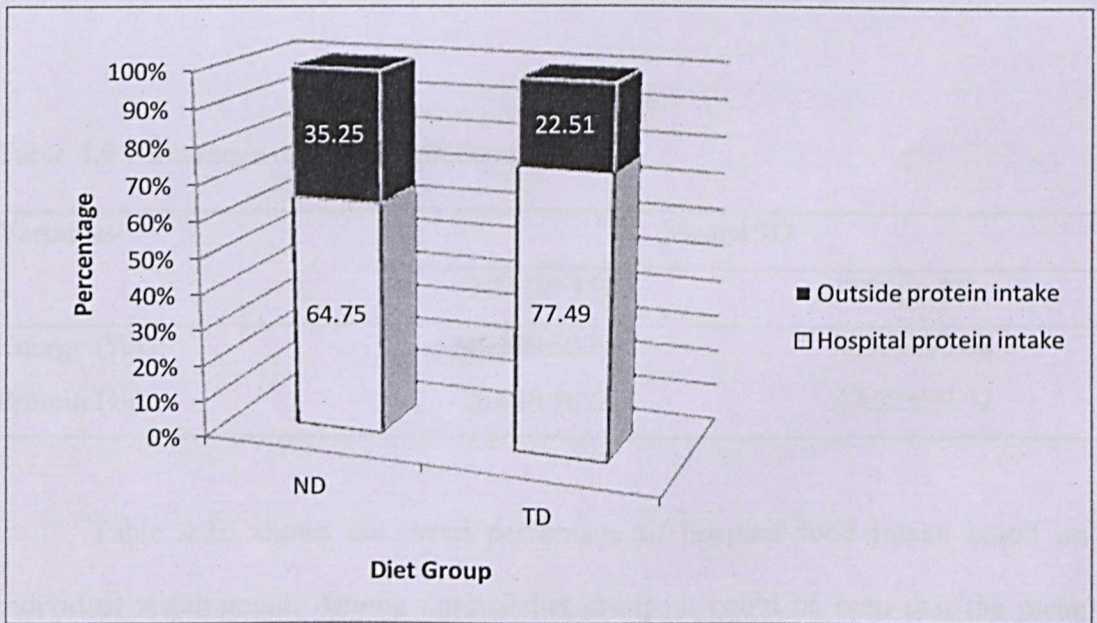
\*ND=Normal diet; TD=Therapeutic diet

Table 4.9 shows the percentage of hospital diet consumed by the patients. In the normal diet group, the mean percentage of energy and protein consumed was 46.80 $\pm$ 30.26% and 26.01 $\pm$ 16.60% respectively. For therapeutic diet group, it was found that mean percentage of energy and protein consumed was 48.45 $\pm$ 30.08% and 47.82 $\pm$ 29.42% respectively. Both diet groups showed that the mean percentage of hospital diet consumed for both energy and protein was below 50%.



\*ND=Normal diet; TD=Therapeutic diet

Figure 4.3 Mean contribution of energy (%) for hospital and outside food intake towards total food intake based on diet groups



\*ND=Normal diet; TD=Therapeutic diet

Figure 4.4 Mean contribution of protein (%) for hospital and outside food intake towards total food intake based on diet groups

This finding was consistent with past study by Kowanko et al. (2001) whereby there were over one-third of the patients consuming less than 50% of energy provided in a standard hospital diet. Bauer et al. (2011) also found that there were nearly 50% of the patients consuming only half or less of the hospital meal. This signifies that patients may be prone to malnutrition as literature showed that patients consuming half or less of the hospital diet were four times more likely to be malnourished compared to those who consumed more than half of the hospital diet (Bauer et al., 2011). Agarwal et al. (2012) also had similar findings in which patients who took less than 50% of the hospital food served were 2.4 times more likely to be malnourished. In other words, hospital foodservice system should be improved as better hospital foodservice systems can help to reduce malnutrition problems (O' Flynn et al., 2005).

Table 4.9 Percentage of hospital diet consumed

Variables	Mean±SD	
	ND (n=35)	TD (n=35)
Energy (%)	46.80±30.26	48.45±30.08
Protein (%)	26.01±16.60	47.82±29.42

Table 4.10 shows the mean percentage of hospital food intake based on individual requirement. Among normal diet group, it could be seen that the mean percentage of hospital energy and protein intake over individual requirement was 52.25±33.92% and 36.26±24.37% respectively. In therapeutic diet group, over the individual requirement, the mean percentage of hospital energy and protein intake was 56.32±34.20% and 55.32±35.69% respectively. Both diet groups showed that the hospital food intake was below their nutritional requirement.

Figure 4.5 shows the percentage of subjects on the achievement of individual energy requirement with hospital food intake. There were 14.3% and 85.7% of patients achieve and did not achieve energy requirement for normal diet group whereas there were only 8.6% and 91.4% of patients achieve and did not achieve energy requirement in therapeutic diet groups. In both diet groups, most of the patients did not achieve their daily energy requirement.

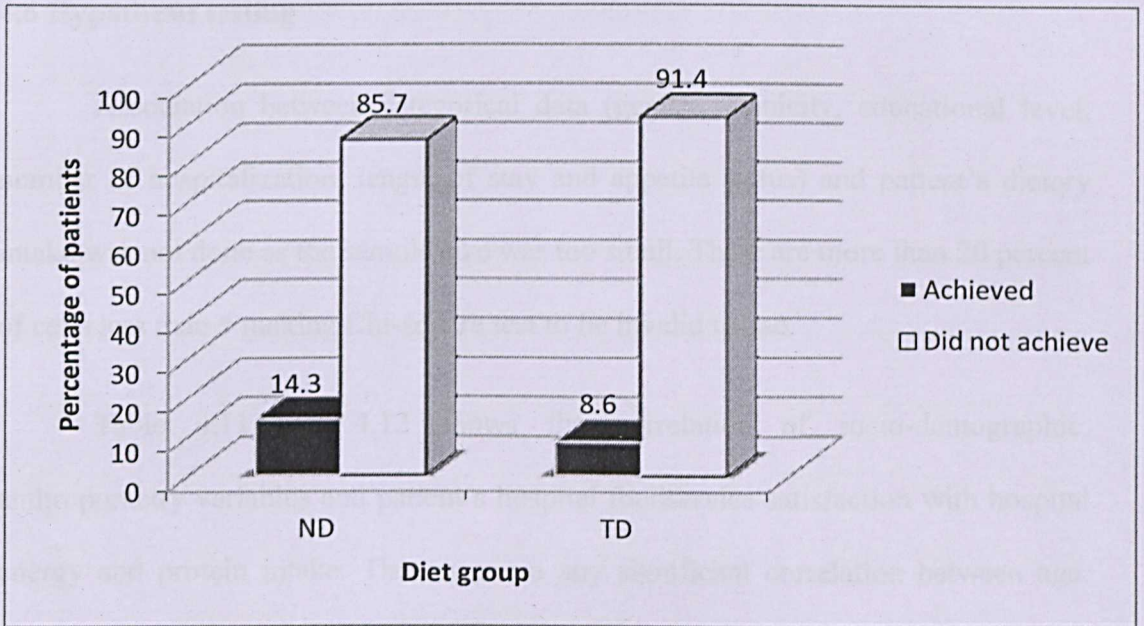
Figure 4.6 showed the percentage of subjects on the achievement of individual protein requirement with hospital food intake. For normal diet group, there were none of the patients achieve the protein requirement. Among therapeutic diet group, there were 14.3% and 85.7% of patients achieve and did not achieve protein requirement respectively. Most of the patients in both diet groups did not achieve their daily protein requirement.

Past study by Dupertuis et al. (2003) showed that 43% or 600 out of 1707 hospitalized patients had total food intake below their minimum nutritional requirements. Kondrup (2001) also reported that about half of the hospital adult patients were underfed. In a study by Rosita et al. (2010), most of the patients did not fulfill or achieve their energy and protein requirement. There were some differences seen in a study by Munirah (2008) whereby 53% of patients did not achieve energy requirement but majority of the patients met the protein requirement.

Table 4.10 Mean percentage of hospital food intake over individual requirement

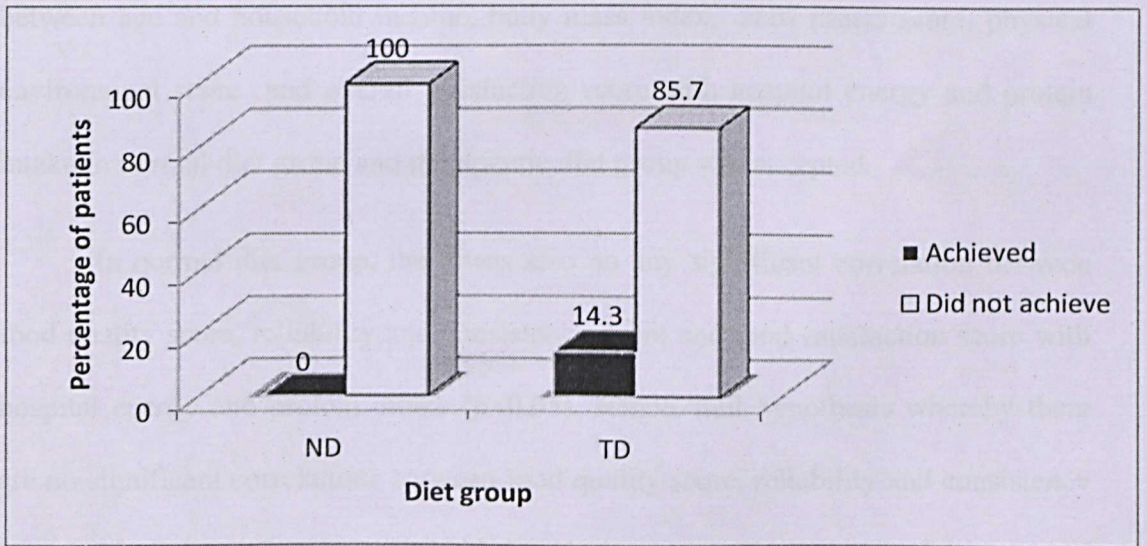
Variables	Mean $\pm$ SD	
	ND (n=35)	TD (n=35)
Hospital food intake (%)		
Energy	52.25 $\pm$ 33.92	56.32 $\pm$ 34.20
Protein	36.26 $\pm$ 24.37	55.32 $\pm$ 35.69

\*ND=Normal diet; TD=Therapeutic diet



\*ND=Normal diet; TD=Therapeutic diet

Figure 4.5 Achievement of hospital energy intake over individual energy requirement among subjects based on diet groups



\*ND=Normal diet; TD=Therapeutic diet

Figure 4.6 Achievement of hospital protein intake over individual protein requirement among subjects based on diet groups

## 4.6 Hypothesis testing

Association between categorical data (gender, ethnicity, educational level, number of hospitalization, length of stay and appetite status) and patient's dietary intake was not done as the sample size was too small. There are more than 20 percent of cells less than 5 making Chi-square test to be invalid to use.

Table 4.11 and 4.12 shows the correlation of socio-demographic, anthropometry variables and patient's hospital foodservice satisfaction with hospital energy and protein intake. There was no any significant correlation between age, household income, body mass index, staff issues score, physical environment score and overall satisfaction score with hospital energy and protein intake in both diet groups ( $p>0.05$ ). Thus, null hypothesis whereby there are no significant correlations between age and household income, body mass index, staff issues score, physical environment score and overall satisfaction score with hospital energy and protein intake in normal diet group and therapeutic diet group was accepted.

In normal diet group, there was also no any significant correlation between food quality score, reliability and consistency score and total satisfaction score with hospital energy and protein intake ( $p>0.05$ ). Hence, null hypothesis whereby there are no significant correlations between food quality score, reliability and consistency score and total satisfaction score with hospital energy and protein intake in normal diet group was accepted. It was found to have significant correlation between reliability and consistency score with hospital energy and protein intake ( $p<0.05$ ) in therapeutic diet group. There was also significant correlation between food quality score and total satisfaction score with hospital energy and protein intake ( $p<0.01$ ) in therapeutic diet group. Thus, null hypothesis whereby there are no significant

correlations between food quality score, reliability and consistency score and total satisfaction score with hospital energy and protein intake in therapeutic diet group was rejected.

In both diet groups, there was negative correlation between age and hospital energy and protein intake indicating that older patients had lower hospital energy and protein intake. It was supported by previous study showing that older patients have insufficient food intake at mealtimes in hospital (Schenker, 2003). Another study also supports this finding whereby subjects with inadequate energy intake were found to be older (Mudge et al., 2011). But study by Dupertuis et al. (2003) stated that age is not correlated with the hospital dietary intake.

In this study, there was positive correlation between body mass index (BMI) with hospital energy and protein intake in both diet groups highlighting that patients with higher BMI had higher hospital energy and protein intake. But previous study showed that increased BMI was correlated with increased risk of not covering the nutritional needs (Dupertuis et al. 2003). But Mudge et al. (2011) reported that obesity was not a significant predictor of poor intake.

Food quality dimension was found to be positively correlated with patient's hospital energy and protein intake in both diet groups. Food quality included the following attributes which are meal taste, variety, flavor, texture of meat and vegetables and the perception to choose a healthy meal (Wright et al., 2006). For patients who did not consume all of the food served, the most commonly reason were inadequate taste and absence of choice (Dupertuis et al., 2003). Most of older patients claimed that the meal portion size was too big compared to their small appetites (Xia & McCutcheon, 2005). Limitation in food selection in hospital

foodservice system will also influence patient's dietary intake (Dupertuis et al., 2003). According to Kim, Kim and Lee (2010), patient intake can be enhanced by improving food quality. All of these were implying that food quality in hospital diet is one of the determinants of hospital dietary intake.

In normal diet group, there was negative correlation between reliability and consistency score, staff issues score and physical environment score with hospital energy and protein intake indicating that although they were satisfied with these dimensions, but their hospital energy and protein intake was found to be lower. This might be due to patient's condition as patients' food intake in hospital is often affected by disease state, poor appetite, gastrointestinal intolerance, fatigue, early satiety and taste alterations (Somesh, 2011). But in therapeutic diet group, reliability and consistency score, staff issues score and physical environment score was found to be positively correlated with hospital energy and protein intake. Previous study showed that inadequate meal service, quality and flexibility of hospital foodservice can cause malnutrition and also insufficient food intake (Kondrup, 2001). Besides, inadequate meal service was found to be reason of at least 572 (59%) of the underfed patients did not achieve their nutritional requirements (Dupertuis et al., 2003). In acute care setting, the meal timing of lunch and supper too early causing patients are underfed (Dupertuis et al., 2003). This showed that patients were concerned about the meal timing and meal service reliability during hospital stay which will influence their hospital food intake as well.

Previous study showed that staff issues dimension was playing role on patient's hospital foodservice satisfaction in determining hospital food intake whereby there are powerful effects of personalized care service on overall patient satisfaction in hospital foodservice (Tranter et al., 2009). Besides, personal contact

between medical staff and patient showed beneficial effect as patient feel that they receive emotional support from the staff (Watters, Sorensen, Fiala, & Wismer, 2003). Hence, better staff contacts can actually help to improve patient's hospital food intake.

Hospital environment was also a determinant in patient's dietary intake. It was supported by previous study showing that when patients eating, they were interrupted by medical staffs ward rounds, nurses and other visitors (Xia & McCutcheon, 2005). This showed that physical environment or atmosphere in hospital will also affect the patient's dietary intake as well.

Study by Munirah (2008) showing that there was no significant correlation between energy intake with total satisfaction score for hospital foodservice. Another study by Rosita et al. (2010) also supported there was no significant correlation between patient's energy intake with total score of foodservices dimension ( $p > 0.05$ ). But in this study, there was significant correlation between total satisfaction score with hospital food intake. This might be due to different hospital catering and population being studied.

Table 4.11 Correlation of variables with hospital energy intake

Variables	Hospital energy intake					
	ND (n=35)			TD (n=35)		
	Mean±SD	r	p-value	Mean±SD	r	p-value
<b>Socio-demographic variables</b>						
Age	35.09±11.89	-0.261	0.130	46.94±14.61	-0.202	0.245
Household income	2647.97±1656.2	0.019	0.913	1480.00±1297.46	0.167	0.337
<b>Anthropometry variable</b>						
Body Mass Index	25.74±6.05	0.142	0.417	25.74±6.71	-0.125	0.475
<b>Patient's hospital foodservice satisfaction</b>						
Food quality score	35.29±7.64	0.253	0.143	35.57±7.11	0.442	0.008**
Reliability and consistency score	24.46±4.54	-0.069	0.692	23.60±5.64	0.366	0.031*
Staff issues score	12.23±2.28	-0.142	0.415	12.31±2.04	0.152	0.383
Physical environment score	7.03±2.08	-0.158	0.365	7.66±1.63	0.220	0.203
Overall satisfaction score	6.83±1.87	-0.003	0.984	6.11±2.18	0.244	0.158
Total satisfaction score	79.00±13.52	0.071	0.684	79.14±13.63	0.431	0.010**

\*ND=Normal diet; TD=Therapeutic diet

\*\*Statistically significant at p <0.05; \* \*p <0.01.

Table 4.12 Correlation of variables with hospital protein intake

Variables	Hospital protein intake			
	Mean±SD	r	p-value	p-value
		ND (n=35)		TD (n=35)
Socio-demographic variables				
Age	35.09±11.89	-0.288	0.094	0.296
Household income	2647.97±1656.2	0.032	0.857	0.364
6				
Anthropometry variable				
Body Mass Index	25.74±6.05	0.112	0.520	0.479
Patient's hospital foodservice satisfaction				
Food quality score	35.29±7.64	0.273	0.113	0.006**
Reliability and consistency score	24.46±4.54	-0.079	0.653	0.025*
Staff issues score	12.23±2.28	-0.127	0.468	0.354
Physical environment score	7.03±2.08	-0.149	0.391	0.188
Overall satisfaction score	6.83±1.87	0.029	0.870	0.156
Total satisfaction score	79.00±13.52	0.083	0.634	0.007**

\*ND=Normal diet; TD=Therapeutic diet

\*\*Statistically significant at  $p < 0.05$ ; \*  $p < 0.01$ .

Table 4.13 shows the mean differences of patient's hospital food intake, outside food intake and total food intake in a day between normal diet group and therapeutic diet group. It was found that there were no significant difference between normal diet group and therapeutic group in terms of hospital energy intake. Hence, null hypothesis whereby there was no significant difference in hospital energy intake between normal and therapeutic diet groups was accepted. However, there was significant difference between normal diet group and therapeutic diet group for hospital protein intake ( $p < 0.01$ ). Thus, null hypothesis whereby there was no significant difference in hospital protein intake between normal and therapeutic diet groups was rejected.

In a study by Wright, Cotter, Hickson and Frost (2005), results showed that energy intake was significantly lower in texture-modified diet group compared to normal diet group. Another study by Dupertuis et al. (2003) showed that the percentage of underfed patients was higher in the 207 (15%) of patients receiving modified/therapeutic diets than in patients receiving normal diet. The highest percentage of patients taking half or less of the hospital meal was among patients taking texture modified diets  $\pm$  ONS (50%), compared to high energy-high protein diets (43%), standard diets  $\pm$  ONS (35%) and special (normal texture) diets  $\pm$  ONS (34%) (Agarwal, Ferguson, Banks, Bauer, Capra, & Isenring, 2012). But results in this study were showing that there was no significant difference in hospital energy intake between two diet groups and also there was significantly higher hospital protein intake for therapeutic diet group. This might be due to higher protein content in hospital diet given for therapeutic diet group as shown in Table 3.2.

Table 4.13 Mean differences in hospital food intake between normal diet group and therapeutic diet group

Variables	Mean±SD		t-value	p-value
	ND (n=35)	TD (n=35)		
Energy (kcal/day)	936 ±605	969±602	-0.228	0.820
Protein (g/day)	23.15±14.78	42.56±26.18	-3.819	0.0001**

\* Statistically significant at p <0.05; \* \*p <0.01.

## **CHAPTER 5**

### **CONCLUSION AND RECOMMENDATION**

#### **5.1 Conclusion**

This cross sectional study involved a total of 70 patients, 35 patients each from normal diet group and therapeutic diet group respectively in order to identify the factors associated with hospital food intake for both diet groups. Majority of the patients in both diet groups were satisfied with hospital foodservice but there were few were moderately satisfied. Food quality dimension had the lowest rating while staff issues dimension had the highest rating. This indicated that food quality was a very important predictor in hospital foodservice satisfaction which might influence patient's dietary intake as well. Although there was high hospital foodservice satisfaction among patients, but most of the patients from both diet groups consumed half or less of the hospital food and did not meet their energy and protein requirement. Majority of the patients depended on hospital food for their daily nutrition during hospital stay compared to outside food. This was a good indicator

that patients can still accepting hospital food. Thus, hospital foodservice management should have some useful strategies in terms of menu planning in order to be able to meet or exceed patient's expectation on food which might help to improve their hospital food intake and prevent malnutrition.

In this study, older patients in both diet groups were found to have lower hospital food intake. Besides, patients with higher BMI tend to have higher hospital food intake. Food quality dimension was found to be positively correlated with patient's hospital energy and protein intake in both diet groups. It was found that there was significant correlation between food quality dimension, reliability and consistency dimension and also total satisfaction score with hospital energy and protein intake in therapeutic diet group. In normal diet group, there was negative correlation between reliability and consistency score, staff issues score and physical environment score with hospital food intake. This might be due to patient's condition as patients' food intake in hospital is often affected by disease state, poor appetite, gastrointestinal intolerance, fatigue, early satiety and taste alterations (Somesh, 2011). But in therapeutic diet group, reliability and consistency score, staff issues score and physical environment score was found to be positively correlated with food intake. Hence, we can say that hospital foodservice satisfaction was actually important in determining patient's hospital food intake. There was no significant difference between hospital energy intake between normal diet group and therapeutic diet group but there was significant difference in hospital protein intake between normal diet group and therapeutic diet group. Hence, all factors should be taken into consideration in hospital foodservice management especially menu planning in order to promote optimal nutrition and food intake among patients.

The most important element that hospital needed to improve was food quality as it had the lowest rating in this study. During menu planning, criteria that needed to be taken into account including disease- or therapy-related feeding issues such as loss of appetite, alteration in taste perception, or chewing and swallowing difficulties. Hospital foodservice department should be able to create menu that is balanced which can cater patient's needs and also meets patient's nutritional requirement (Iff, Leuenberger, Rösch, Knecht, Tanner, & Stanga, 2008). Besides, hospital foodservice management should be more creative in terms of menu planning and adding more variety as limitation in food variety and selection will affect patient's hospital food intake as well.

## **5.2 Limitations**

It was a complicated and sophisticated process in determining patient's food intake and patient's hospital foodservice satisfaction as this process was influenced by many other hospital-related factors such as hospital setting, disease state and patient's condition.

This study was only able to determine correlation but could not describe causal relationship. Only one day food record was being taken due to time constraint. Besides, there was limited number of patients which was only 70 patients being studied due to time and resource constraint. The results of each hospital might not be generalized to other hospitals. In addition, the patient's response might be affected by other hospital service as well such as medical or nursing services as all of the hospital services were interrelated.

### 5.3 Recommendations

More studies regarding patient's hospital dietary intake and also hospital foodservice satisfaction should be done from time to time as this would help to identify factors that will influence the hospital food intake and also patient's satisfaction. In future studies, bigger sample size should be recruited so that it could represent the general population of the hospital. Besides, more detailed information about hospital foodservice satisfaction needed to be obtained such as written comments by patients especially in food quality context. With these comments, hospital foodservice management could plan or think of strategy that could solve the issues raised by the patients. Plate waste could also be conducted in future study as it would reflect the hospital cost and also patient's satisfaction as well.

Hospital management should put in more effort in strategy planning and carry out survey from time to time especially in terms of foodservice because perceived foodservice quality will affect patient's recovery and overall satisfaction during hospital stay (McLymont et al., 2003). In addition, hospital malnutrition rates and cost would also be reduced. Plate waste in hospital would also be indirectly reduced when the patient's hospital food intake was improved.

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Reference No.

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**FAKULTI PERUBATAN DAN SAINS KESIHATAN**  
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**JABATAN PEMAKANAN DAN DIETETIK**  
*DEPARTMENT OF NUTRITION AND DIETETICS*

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**BORANG SOAL SELIDIK**

*QUESTIONNAIRE*

**“SULIT”**

*“CONFIDENTIAL”*

**Faktor-faktor yang berkaitan dengan pengambilan makanan pesakit dalam pesakit menerima diet normal and terapeutik di Hospital Serdang**

*Factors associated with patient's dietary intake in patients receiving normal and therapeutic diet at Hospital Serdang*

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**PENYELIDIK/RESEARCHER** : TAN KIAN SIANG

**PROGRAM/PROGRAMME** : B. SC. (DIETETICS)

**PENYELIA/SUPERVISOR** : PROF MADYA DR ROSITA JAMALUDDIN

**Semua maklumat yang diberikan akan dikekalkan rahsia dan hanya digunakan untuk tujuan kajian sahaja. Segala kerjasama yang tuan/puan berikan saya dahului dengan ribuan terima kasih.**

*Your personal information given is for research purpose only. It will be kept strictly confidential. Your co-operation is very much appreciated.*

**Part A/ Bahagian A: Socio-demographic information/ Maklumat sosiodemografi**

1. Age/ *Umur* : \_\_\_\_\_
2. Gender/ *Jantina* : Male/ *Lelaki* ( )  
Female/ *Wanita* ( )
3. Ethnicity/ *Bangsa* : Malay/ *Melayu* ( )  
Chinese/ *Cina* ( )  
India/ *India* ( )  
Others/ *Lain-lain* \_\_\_\_\_
4. Educational level/ *Tahap pendidikan*: Primary school/ *Sekolah rendah* ( )  
Secondary school/ *Sekolah menengah*( )  
STPM/Diploma ( )  
Degree/ *Ijazah* ( )  
Master/PHD ( )  
Others/ *Lain-lain* \_\_\_\_\_
5. Household income/ *Pendapatan* : RM \_\_\_\_\_

*isi rumah*

6. Number of hospitalization/ *Bilangan kemasukan ke hospital* : 1<sup>st</sup> time/ *kali pertama* ( )  
2<sup>nd</sup> time/ *kali kedua* ( )  
3<sup>rd</sup> time/ *kali ketiga* ( )  
>4<sup>th</sup> time/ *>kali keempat* ( )

**Part B/ Bahagian B: Contextual information/ Maklumat konteks**

1. How long have you been in hospital (this time)?

*Sudah berapa lamakah anda berada dalam hospital (kali ini)?*

- <1 week/ *<1 minggu* ( )      1-2 weeks/ *1-2 minggu* ( )  
2-4 weeks/ *2-4 minggu* ( )      1-2 months/ *1-2 bulan* ( )  
>2 months/ *>2 bulan* ( )

2. As compared to your normal food intake, how would you rate your food intake for the majority of your hospital stay (this time)?

*Berbanding dengan pengambilan makanan biasa, macam manakah anda mengangarkan pengambilan makanan sepanjang berada di hospital (kali ini)?*

- unchanged/ *tiada perubahan* ( )  
 More than usual/ *lebih daripada biasa* ( )  
 Less than usual/ *kurang daripada biasa* ( )

**Part C/ Bahagian C: Body mass index/ Indeks Jisim Tubuh**

Height/Tinggi (cm): Reading/Bacaan 1: \_\_\_\_\_ 2: \_\_\_\_\_

Weight/Berat (kg): Reading/Bacaan 1: \_\_\_\_\_ 2: \_\_\_\_\_

BMI/IJT (kg/m<sup>2</sup>): \_\_\_\_\_

**Part D/ Bahagian D: Patient hospital foodservice satisfaction/ Kepuasan pesakit terhadap perkhidmatan makanan di hospital**

1	Very dissatisfied/ <i>Sangat tidak memuaskan</i>
2	Dissatisfied/ <i>Tidak memuaskan</i>
3	Sederhana
4	Satisfied/ <i>Memuaskan</i>
5	Very satisfied/ <i>Sangat memuaskan</i>

**Dimension 1/ Dimensi 1: Food Quality/ Kualiti Makanan**

Code/ Kod	Statement/ Pernyataan	Score/ Skor				
		1	2	3	4	5
FQ1	The meal taste nice <i>Rasa hidangan adalah baik</i>					
FQ2	I like the way vegetable are cooked <i>Saya suka cara sayuran dimasak</i>					
FQ3	The fruit served is fresh <i>Buah-buahan yang dihidang kepada saya adalah segar</i>					
FQ4	The meat quality (chicken and fish) served to me is the best <i>Kualiti daging (ikan atau ayam) yang dihidang kepada saya adalah terbaik dan segar</i>					
FQ5	The texture of meals are good and suitable for my condition <i>Tekstur makanan yang dihidang kepada saya adalah bersesuaian dengan keadaan saya</i>					
FQ6	Portion size of my meals are suitable and enough					

	for me <i>Saiz hidangan yang dihidangkan adalah sesuai dan mencukupi untuk saya</i>					
<b>FQ7</b>	The meals have excellent and distinct flavour <i>Makanan yang dihidang adalah terbaik dan mempunyai rasa yang berbeza</i>					
<b>FQ8</b>	The drinks served are just at the right temperature <i>Suhu minuman yang dihidang adalah pada tahap yang sesuai</i>					
<b>FQ9</b>	The hot foods are just at the right temperature <i>Makanan panas dihidangkan pada suhu yang sesuai</i>					
<b>FQ10</b>	The smell of my meals are nice and good <i>Aroma hidangan sangat sedap</i>					
<b>FQ11</b>	The colour of my meals are attractive <i>Warna hidangan sangat menarik</i>					

**Dimension 2/ Dimensi 2: Reliability and consistency/ Ketepatan dan konsistensi**

Code/ Kod	Statement/ Pernyataan	Score/ Skor				
		1	2	3	4	5
<b>TR1</b>	The mealtime for breakfast is suitable <i>Waktu sarapan adalah sesuai</i>					
<b>TR2</b>	The mealtime for lunch is suitable <i>Waktu makan tengah hari adalah sesuai</i>					
<b>TR3</b>	The mealtime for afternoon tea is suitable <i>Waktu minum petang adalah sesuai</i>					
<b>TR4</b>	The mealtime for dinner is suitable <i>Waktu makan malam adalah sesuai</i>					
<b>TR5</b>	The meals served punctually according to schedule <i>Makanan dihidangkan tepat pada waktunya</i>					
<b>TR6</b>	The duration given to finish the meal is enough <i>Masa yang peruntukkan adalah cukup untuk menghabiskan makanan</i>					

**Dimension 3/ Dimensi 3: Staff Issues/ Isu Kakitangan**

Code/ Kod	Statement/ Pernyataan	Score/ Skor				
		1	2	3	4	5
SI1	The staff who deliver and collect my meal are friendly and polite <i>Kakitangan yang menghantar dan mengambil hidangan saya adalah mesra dan sopan</i>					
SI2	The staff who deliver and collect my meals are neat and clean <i>Kakitangan yang menghantar dan mengambil hidangan saya adalah kemas dan bersih</i>					
SI3	The staff are taking away my tray only after I finish eating <i>Kakitangan hanya mengambil dulang hidangan setelah saya menghabiskan makanan</i>					

**Dimension 4/ Dimensi 4: Physical Environment/ Persekitaran fizikal**

Code/ Kod	Statement/ Pernyataan	Score/ Skor				
		1	2	3	4	5
PE1	The hospital or ward scent stops me from enjoying my meals <i>Bau hospital/wad menghalang saya untuk menikmati makanan</i>					
PE2	The noise at hospital or ward disturb me to enjoying my meals <i>Bunyi bising di hospital/wad mengganggu saya untuk menikmati makanan</i>					

**Overall Satisfaction/ Kepuasan keseluruhan**

Code/ Kod	Statement/ Pernyataan
OVERALL/ KESELURUHAN	I am satisfied with the overall foodservice in this hospital <i>Saya berpuas hati dengan keseluruhan khidmat penyediaan makanan di hospital ini</i>

**SCORE/ SKOR**

1	2	3	4	5	6	7	8	9	10
Very dissatisfied/ <i>Sangat tidak memuaskan</i>		→						Very satisfied/ <i>Sangat memuaskan</i>	

**Part E1/ Bahagian E1: 24 hour Hospital Food Record (Estimated)/ *Rekod Makanan Hospital 24 jam (Anggaran)***

<b>Meal Time/ <i>Masa Makan</i></b>	<b>Estimated Food Consumed/ <i>Anggaran Pengambilan Makanan (%)</i></b>
<b>Breakfast/ <i>Sarapan</i></b>	
<b>Lunch/ <i>Makan Tengah Hari</i></b>	
<b>Afternoon Tea/ <i>Minum Petang</i></b>	
<b>Dinner/ <i>Makan Malam</i></b>	

**Part E2/ Bahagian E2: Dietary Recall (Outside Food)/ *Ingatan diet 24 jam (Makanan Luar)***

<b>No.</b>	<b>Time/ <i>Masa</i></b>	<b>Menu/ <i>Menu</i></b>	<b>Portion Size/ <i>Saiz Porsi</i></b>