PROVISION OF ENTERAL FEEDING ADEQUACY AND REASON FOR UNDERFEEDING IN INTENSIVE CARE UNIT PATIENTS IN HUSM

by

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Dissertation submitted in partial of the requirement for the degree of Bachelor of Health Sciences (Honours) (Dietetics)

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CERTIFICATE

This is to certify that dissertation entitled Provision of Enteral Feeding Adequacy and Reason for Underfeeding in Intensive Care Unit patients in HUSM is the bona fide record of research work done by Mr Mohamad Safwan bin Abd Shokor during the period of February 2018 to June 2018 under my supervision. I have read this dissertation and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation to be submitted in partial fulfilment for the degree of Bachelor of Health Sciences (Dietetics).

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DECLARATION

I hereby that this dissertation is the result of my own effort and investigation, except where otherwise stated and duly acknowledged. I also declared that it has not been previously or concurrently submitted as whole for any other degrees at Universiti Sains Malaysia or other institution. I grant Universiti Sains Malaysia the right to use the dissertation for teaching, research and promotional purposes.

(MOHAMAD SAFWAN BIN ABD SHOKOR)

Date: 10/6/2018

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Contents

LIST OF TABLES

LIST OF FIGURES

Pemberian Pemakanan Enteral Dan Sebab Ketidakcukupan Penerimaan Makan Di Dalam Unit Rawatan Rapi Di HUSM

ABSTRAK

Pesakit yang dimasukkan ke unit rawatan rapi ICU memerlukan jumlah terapi pemakanan yang optimum untuk hasil klinikal yang lebih baik. Objektif kajian ini adalah untuk menyiasat kecukupan penerimaan pemakanan enteral dalam kalangan pesakit kritikal , untuk menetukan perkaitan data biokimia dengan status pemakanan enteral pesakit dan mengenal pasti sebab berlakunya ketidakcukupan dalam pemakanan enteral. Kajian keratan rentas dilakukan di wad Trauma ICU, Medical ICU dan 2 Delima, Hospital USM. Kriteria responden adalah pesakit dewasa (≥ 18 tahun) yang dijangka tinggal sekurang-kurangnya 24 jam di ICU dan menerima pemakanan enteral semasa kemasukan. Pesakit yang layak akan dipantau 7 hari , sehingga discaj atau berlakunya kematian. Sebanyak 55 orang pesakit terlibat dalam kajian. Purata umur 50.4 ± 17.2 tahun dan min BMI 25.7 ± 6.9 kg / m^2., Seramai 34 (61.8%) pesakit tidak menerima keperluan pemakanan yang disyorkan (≥ 80 keperluan tenaga dan protein). Perubahan dalam jumlah protein, albumin dan hemoglobin selama 7 hari antara makanan yang tidak diberi cukup makan dan cukup makan tidak signifikan secara statistik kecuali untuk albumin ($p \leq 0.05$) pada hari pertama pemakanan EN. Sebab yang paling kerap untuk gangguan pemakanan adalah prosedur pernafasan (38%), prosedur bilik operasi (12%) dan GRV tinggi (>500ml) (11%). Sebab ketidakcukupan pemberian EN di kalangan pesakit kritikal dibuktikan oleh 61.8% pesakit kritikal yang tidak menerima protein dan protein yang disyorkan. Gangguan pemakanan enteral dalam kalangan pesakit kritikal perlu di atasi dengan protokol klinikal yang piawai supaya status nutrisi pesakit tidak terjejas.

Provision of Enteral Feeding Adequacy and Reason For Underfeeding In Intensive Care Unit Patients In HUSM

ABSTRACT

Patient who admitted in the ICU require optimal amount of nutrition therapy for a better clinical outcome. The objectives of this study was to investigate the prevalence of enteral nutrition (EN) feeding adequacy, mean differences between feeding adequacy and biochemical indicator among patient and to identify the causes of under feeding. A cross sectional study was carried out at Trauma ICU, Medical ICU and 2 Delima, Hospital USM. Adult patients (≥ 18 years old) who were, expected to stay for at least 24 hours in ICU and received enteral feeding during admission were included. Eligible patient was followed in ICU ward for maximum of 7 days or until death or discharge from ICU. A total of 55 patient were involved. Mean age 50.4 ± 17.2 years and mean BMI 25.7 ±6.9 kg/m^2 (overweight). Among 55 patients, 34 (61.8%)did not received the recommended nutrition requirement (≥ 80 of calculated energy and protein requirement). Changes in total protein , albumin and haemoglobin for 7 days between underfed and adequately fed were not statistically significant except for albumin for the first day of EN feeding. The most frequent reason for the feeding interruption were respiratory procedure (38%), operating room procedure (12%) and high GRV (> 500ml) (11%). EN feeding was inadequate among critically ill patient as evidenced by majority (61.8%) of critically ill patient not receiving the recommended energy and protein. The causes feeding interruption should be improved via standard clinical protocol to avoid nutrition deterioration among critically ill patient.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Critical care is the complex and comprehensive management that is monitor by highly trained staff on patient that is seriously injured or ill (Mahan & Raymond, 2016). The provision of nutrition on critically patient can be provided via enteral or parenteral route to prevent malnutrition (Weimann *et. al*, 2017). A state resulting from lack of nutrition intake leading to altered body composition (decreased fat free mass) and body cell mass leading to diminished physical and mental function and impaired clinical outcome from disease is definition of malnutrition that cause by starvation, ageing or disease (Cederholm *et al*, 2015). Based on ASPEN, malnutrition indicate inflammation as a biomarker for inflammation which is the root of preventing malnutrition to be resolve although patient consuming adequate food or nutrients (Skipper, 2012).

Obtaining optimal nutritional support or nutrition therapy on critically ill patient is necessary due to the catabolic state during critical illness (Lee, Nisak, & Airini, 2016). American Society for Parenteral and Enteral Nutrition (ASPEN) defined nutrition therapy as provision of either enteral nutrition (EN) by enteral access device and/or parenteral nutrition (PN) by central venous access. The overall aim of nutrition support is to try to ensure that total nutrient intake including food with nutrition support, provides adequate energy, protein, fluid and micronutrients to meet all the patient's requirements (National Collaborating Centre for Acute Care, 2006). In additional, due to one of the benefit on preserve mucosal structure and reduction of inflammation, EN was shown to be superior than PN (Lee, Nisak, & Airini, 2016).

It has proved that early initiation of enteral feeding would be beneficial, with significant positive effects on septic complications, and has been shown to improve the outcome when compared with parenteral nutrition (Binnekade, J. M., *et al.*,2005). Enteral nutrition has been able to maintain gut integrity, control stress and the systemic immune response, and reduce disease severity (Kang, and Kudak, 2007, McClave *et al.*, 2016).

The optimal amount of calories and protein caloric targets are often not achieved in critically ill patients (Kuslapuu, Jogela, Starkopf & Reintam Blaser, 2015). Underfeeding in the ICU, with a subsequent accumulation of an energy debt, has been associated with increased rates of nosocomial infection, prolonged dependence on mechanical ventilation, possibly depletion is associated with the loss of lean body mass, including cardiac and respiratory muscles, and mortality (White et al., 2012). Furthermore, patient who received underfeeding energy requirements leads to tissue catabolism that can cause poor wound healing, impaired immune response, and physiologic exhaustion contributing to total body failure. Undernutrition have been frequently reported in the ICU, related to lack of knowledge or prioritization on the part of physicians, difficulties with the determination of energy and protein goals in the impaired gastrointestinal (GI) function, and feeding interruptions for procedures or ventilator weaning trials (Cresci, 2015).

In a study conducted by Kuslapuu *et al* (2015) showed that the greatest risk for an inadequate provision of protein and calories requirement during enteral feeding appears to be related with those patients with exacerbated acute-phase reactions because these patients took longer to reach the nutritional goal and had more negative energy and protein balances. In addition, the causes of non-compliance included the interruption of the enteral feeding due to extubation and gastrointestinal complications, and these causes accounted for more than 50% of the interruptions (Ribeiro *et al.*, 2014). Inadequate

nutrition delivery, through poor oral intake, withhold nutrition support unnecessarily, delayed feeding initiation of feeding and disease complication that effect nutrition support supply can impact outcome in critical illness (Skillman and Mahta, 2012)

In this study, adequate EN intake in this study is defined as total energy intake more than 80% of energy requirement (McClave et al., 2016). The formula used in critically ill adult patient include polymeric formula, modular formula, elemental formula and disease-specific formula. The requirement volume of formula is determined by dietitian in-charge based on a patient's individually nutrition needs. A recent study showed that more than 80% of patient in selected hospital in Malaysia received inadequate enteral feeding. Effort should made in order to supply adequate enteral feeding provision to critically ill patient

1.2 Problem statement

Critically ill patients are difficult to consume food and their health status can be detrimental when they received inadequate nutrition. Various study have been reported that critically ill patient were under feeding (Hoffer & Bistrian, 2016 ; Bear, *et al.*, 2017 ; Villet *et al.*, 2005). The prevalence of iatrogenic underfeeding worldwide was 74%. Iatrogenic underfeeding is defined as patient who received energy and protein intake less than 80% compare to requirement (Heyland, Dhaliwali,Wang & Day, 2014). In Malaysia, a study on feeding adequacy among critically ill patient in selected Public Hospital has shown that 88.2% of critically patient not received adequate energy and protein intake (Lee, Nisak, & Airini, 2016). Calories and protein deficit can be somewhat reduced with the involvement of a dietitian and supplemental parenteral nutrition but dietitian not always available and the safety use of the latter has been question (Kuslapuu *et al.*, 2015). Various factor including lack of knowledge or prioritization on the part of physicians,

difficulties with the determination of energy and protein goals in the impaired gastrointestinal (GI) function, and feeding interruptions for procedures or ventilator weaning trials were found associated with underfeeding. The aim of this study to identify feeding adequacy of critically ill patient and provide evidenced based data to healthcare professional in HUSM to improves patient enteral feeding adequacy and nutritional status.

1.3 Definition of Term

2. Critical care patient is defined as patient having or at risk of developing, acute, life threatening organ dysfunction (Teitelbaum, 2005)
3. Enteral nutrition is defined as nutrition that is provide through gastrointestinal tract via tube that delivers nutrients distal to oral cavity (MDA, 2017)
4. Underfeeding is defined as total energy intake less than 80% of energy requirement (MDA, 2017)

1.4 Research Question

1. What is the prevalence of underfeeding among critically ill patient in critical care of HUSM?
2. What is the causes of patient with underfeeding.
3. Are there any differences of biochemical indicator with feeding adequacy?

1.5 Research Objective

A) General Objective

To evaluate the provision of adequacy of enteral feeding among critical care patient.

B) Specific Objective

1. To investigate the prevalence of underfeeding and full feeding among critical care patient.
2. To determine mean differences between feeding adequacy and biochemical indicator among patient
3. To identify feeding adequacy and causes of feeding interruption.

1.6 Hypothesis

Hypothesis 1

A) Null Hypothesis (H_0)

i. There is no significance mean difference between adequacy energy and protein intake and biochemical indicator.

B) Alternative Hypothesis (H_A)

i. There is significance mean difference between adequacy energy and protein intake and biochemical indicator

1.7 Significance on study

The significance of this study will identify feeding adequacy of critically ill patient and reason of underfeeding among patient. Thus, provide evidenced based data to healthcare professional in HUSM to improves patient enteral feeding adequacy and overall clinical outcomes such as recovery time, length of stay, infection, mortality and morbidity.

1.8 Conceptual framework

This conceptual model (Figure 1) represents the change in nutritional status of critically ill patients who underfed and adequately-fed over 7 days in the ICU. The path is affected by factors increase or decrease patients' energy intake. These factors are, and not limited to energy prescription, time of feeding initiation, patient's age and feeding interruption. These factors have an influence on the adequacy of energy intake of critically ill patients that may lead to the change in nutritional status.

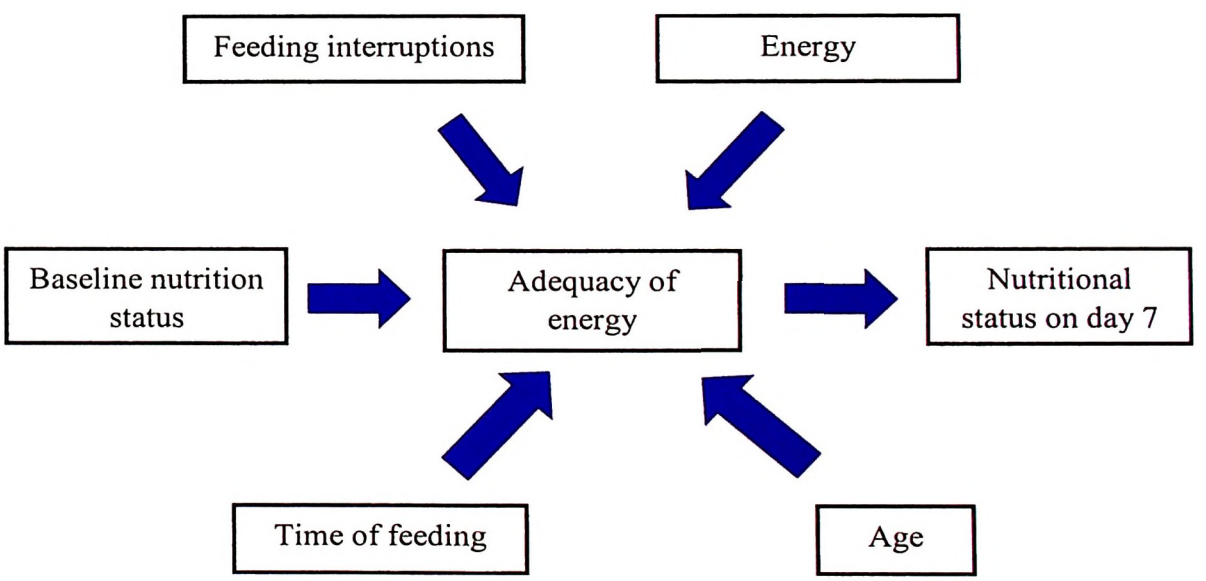

Figure 1.1: Conceptual framework

CHAPTER 2

LITERATURE REVIEW

2.1 Metabolic Changes in The Critically Ill

Critical illness and injury results in profound metabolic alteration, it starts at the time of injury and continuing until the process of wound healing and recovery is complete. Furthermore, critically ill patient usually admits to intensive care unit (ICU) because of burn injury, postoperative complication or multiple trauma (Mahan & Raymond, 2016). Almost all organ is affected during critical illness and it depend on the severity of disease at that time. Thus, hypercatabolism and following unsuitable nutritional supplementation can be detrimental to different organ system function in the body (Reid, 2006).

Cuthbertson (1942), the first physician studying the metabolic response to injury, had described organic response to stress as the metabolic response to trauma which is a physiological event secondary to any insult to the body. He also introduced the term s *ebb* and *flow* to defined as hypo- and hypermetabolic phases that follow traumatic injury (Correia and Trancoso de Almeida, 2005). The metabolic response to stress also involves a neuroendocrine and an inflammatory or immune factor. Recent data suggest that hormones released from the adipose tissue and from the gastrointestinal tract can play an important role as well (Preiser *et al.*, 2014).

Stress can be defined as any stimulus that cause disequilibrium to the body's internal balance that include physiological or homeostasis (Breckor, 2013). The stressor might be result of physical injury, chemical changes or emotional influence. In the central nervous system (CNS), hypothalamus secretes corticotropin-releasing hormone (CRH) in response from the stress stimulation and activate hypothalamic-pituitary-adrenal axis

(HPA). CRH stimulates the production of adrenocorticotropic hormone (ACTH) which also known as corticotropin, that stimulate adrenal cortex to activates secretion of glucocorticoids such as cortisol.

A state that hypercortisolism acutely change carbohydrate, fat and protein metabolism, so the energy can be supply instantly to vital organ such as brain, and anabolism is thus delayed. Catecholamines receives response from inotropic and vasopressor and intravascular fluid retention (Cresci, 2015). . Moreover, hemodynamic advantages are offer by angiotensin II in the fight and flight response. The best way to overcome this situation is by providing a multidisciplinary intervention, which encompass better nutrition status, intraoperative body temperature control, adequate fluid administration, pain control and early oral or enteral nutrition (Correia and Trancoso de Almeida, 2005).

2.2 Malnutrition in ICU

Malnutrition is well-defined as any imbalance in the normal nutrition status (Escott-Stump, 2015) and generally seen as a chronic condition due to lack of food or nutrients secondary to environmental, social, or psychological etiologies (Powers and Samaan, 2014). In acute-care setting, 30% to 50% of malnutrition occur on hospitalized patient. It is related with negative clinical outcomes such as increased risk of infection and pressure ulcers, reduction of wound healing, extend hospital length of stay, high risk of morbidity, and mortality as well as increased cost of hospitalized care (Barker *et al.*, 2011). The risk of malnutrition increased in critically patients through contribution of combination of increased resting energy expenditure and inadequate nutritional delivery (Kim *et al.*, 2012).

In 2009, an International Guideline Committee, including the American Society for Parenteral and Enteral Nutrition (ASPEN.) and European Society for Clinical Nutrition and Metabolics had developed and published an etiology-based approach to the diagnosis of adult malnutrition in acutely ill patients (Powers and Samaan, 2014). It is including the assessment of the presence of inflammation and describes whether malnutrition is related to starvation, chronic disease, acute illness, or injury (Powers and Samaan, 2014).

In 2012, Academy of Nutrition and Dietetics and the ASPEN. made a consensus on these recommendations recommending standardized characteristics for the identification and documentation of adult malnutrition (Codner, 2012; White *et al.*, 2012). Although the statement emphasized on undernutrition, the investigators specified that overweight and obese patients who are also undergoing critical illness or injury are at risk for malnutrition and receive same benefit from the same nutrition intervention as other critically ill patients (Powers and Samaan, 2014). Undernutrition was used synonymously with malnutrition and was defined as a inadequate calories, protein, or other nutrients needed for tissue preservation and repair occurring along a continuum of inadequate intake, impaired absorption, and altered utilization and transport of nutrients (Malone and Hamilton, 2013). Adequate nutritional support is crucial to the prevention and treatment of malnutrition (Kim et al., 2012).

2.3 Prescription of Energy and Protein

Determination of energy requirements is a fundamental of all nutrition support prescriptions. Resting metabolic rate, diet-induced thermogenesis, and physical activity are component that comprises in daily energy expenditure. The resting metabolic rate is sometimes increased in sick individuals but decreasing in physical activity. Hypermetabolism may cause increment of resting metabolic rate and the change in physical activity can be highly variable (Frankenfield and Ashcraft, 2011). The American Dietetic Association has recognized by using indirect calorimetry (IC) for measuring energy expenditure to determine the most accurate method to measure an individual's resting metabolic rate (RMR) (Compher *et al.*, 2006). Besides that, simplistic formulas and published predictive equation can be used to calculated (McClave *et al.*, 2016).

In addition, there are more 200 predictive equation that have been published in the literature, with accuracy rates ranging from 40% - 75% when compared to IC. Thus, no single equation emerges as being more accurate in an ICU (McClave *et al.*, 2016). Equation derived from testing hospital patients such as Penn State and Ireton-Jones, are less accurate than equation derived from testing normal volunteers such as Harris-Benedict and Mifflin St Jeor. Still, the most accurate predictive equation (Harris-Benedict) did not accurately predict measured energy requirement in 39% of patients, and the error was high. (Boullata *et al.*, 2007).

Calculation energy requirement through simplistic formulas (25-30 kcal/kg/d) can be used which its advantage is due to its simplicity compared to other predictive equation. In critical care setting, dry or usual body weight should use by clinicians in weight-based equation on patient where volume resuscitation or in presence of edema are take account (McClave *et al.*, 2016). Contribution of obligatory calories provided by dextrose-

containing fluids and lipid-based medication such IV Dextrose and Propofol should accounted to meet the energy goal. Energy expenditure should be recalculate more than once per week, whether it is measured through IC or predictive equation. Thus, optimizing energy and protein should be plan (Frankenfield and Ashcraft, 2012).

In critical illness, protein requirements are increasing due to elevated protein loss related with the stress response. Consensus statement issued jointly by the society of Critical Care Medicine (SCCM) and ASPEN guideline in 2009 and recommendation for patients who is metabolically stressed with body mass index (BMI) less than 30, protein requirement is suggested in the range of 1.2 to 2.0 g/kg of actual body weight per day (McClave *et al.*, 2009). Current studies suggest that provision of protein in critical care setting shows more positives outcome that provision of total energy (McClave *et al.*, 2016). A prospective study was done in mechanically ventilated patients was associated with 50% decrease in mortality rate when both protein (1.3g/kgBW/day protein provided) and energy requirement were achieved, whereas provision of 0.8g/kg/d of protein was noted that no decrease of mortality (Weijs *et al.*, 2012).

Additional protein need can be added through protein losses via open and drainage wound which it is depend on the amount of drainage and protein content that can be estimated approximately 2.9g protein of exudate (Wade *et al.*, 2010). Failure to account for these additional protein losses may lead to underfeeding and inadequate nutrition support that cause direct effect to the patient (Cheatham *et al.*, 2007). Most clinicians using simplistic weight-based equations (1.2 -2.0 g /kg/d) due to determination of protein requirement in critically ill patient remains difficult (McClave et al., 2016).

2.4. Implication of underfeeding

Hospital malnutrition is associated with a significant increase in length of stay, especially in patients who are well nourished at admission and become malnourished during hospitalization; this also results in an incremental cost of care per patient (Álvarez-Hernández *et al.*, 2012). Negative nutrition scenario in hospitals results from patients receiving incomplete, inadequate, or obsolete diets that do not provide them with an optimal amount and variety of nutrients for their recovery such as clear liquid, low-sodium, low-fat, or low-cholesterol diets (Arenas Moya *et al.*, 2016). Underfeeding scenarios can result in nutrition deterioration of the patient and an increased number of complications, especially when combined with disease or inflammation during hospital stays (Dijkink *et al.*, 2016).

2.5 Feeding interruption

Underfeeding remains a main challenge in the ICU, where 30%–50% of patients do not meet their daily protein and energy requirements (Heyland *et al.*, 2016). Patient in critically ill with an good condition gastrointestinal (GI) tract should receive enteral nutrtion (EN) if in haemodynamically stable and unable to eat (McClave et al., 2009). Patient in critical care, interruption of feeding may cause inadequate of energy and protein provision due to feeding intolerance, and the conduct of diagnostic and therapeutic procedures (Alberda *et al.*, 2009). In a study conducted by Soguel et al., 2012 demonstrated that increasing energy deficit accumulation up to 6000 kcal may occur during the first week in ICU although nutrition aspect was given attention (Soguel *et al.*, 2012). Involvement of dietetian and supplemenantal parentaral nutrition (PN) can

somewhat reduced this energy deficit problem , the first is not always available while PN method has been questioned (Casaer *et al.*, 2011).

Feeding interruption is more common in enteral nutrition (EN). A single-centre, prospective, observational study conducted by Kuslapuu *et al* (2015) showed that 56.7% of study subject does not receive adequate enteral nutrtion. The reasons of insufficient was documented which attributed to withholding, discontinuing, decreasing or not increasing insufficient EN. The primary reason for insufficient EN in ICU include GI surgery, shock and large gastric residual.

In the context of Malaysia study, a cross sectional prospective study showed that 66% of patients receive adequate energy requirement within 3 days whereas procedure (45.1%) was the most dominant reason for feeding interruption followed by high gastric residual volume (38.0%), diarrhea, difficulty in nasogastric tube placement and vomitting (Yip *et al.*, 2014). Thus, feeding adequacy in critical care setting are high specifically in Malaysia which is 88.2% (Lee, Nisak, & Airini, 2016)

CHAPTER 3

METHODOLOGY

3.1 Ethics

Ethical consent was obtained from Jawatankuasa Etika Penyelidikan Manusia (JEPeM) with protocol code USM/JEPeM/17100479. An approval from the Director of the Hospital USM had given. An approval to conduct this study at selected wad in Hospital USM also obtained.

3.2 Research Design

This a cross sectional study is conducted to evaluate the provision of adequacy enteral feeding among critical care patient in Hospital Universiti Sains Malaysia. Specifically, to identify feeding adequacy and causes of inadequate enteral feeding.

3.3 Study Area

This study was conducted at 1 mutiara, 1 kristal, 2 delima and trauma ICU, Hospital Universiti Sains Malaysia (HUSM), Kubang Kerian, Kelantan.

3.4 Study population

Subject for this study was patient who received enteral feeding in intensive care unit of HUSM.

3.5 Study period

The study took 2 months. It started in February 2018 and completed in March 2018.

3.6 Subject Criteria

3.6.1 Inclusion

i. Above 18 years old.

ii. Expected stay for at least 24 hours in ICU

iii. Received enteral feeding during admission in the ICU

iv. Consent to participate

3.6.1 Exclusion

i. Patient who received parenteral feeding.

ii. Patient who received energy both oral and enteral tube feeding

3.7 Sample Size Estimation

The following simple formula (Daniel, 1999) is used. The prevalence for underfeeding is 82% population (Heyland, Dhaliwal, Wang, & Day, 2014).

$$n = \frac{Z^2 P(1 - P)}{d^2}$$

n = sample size,

Z = value for a 90% level of confidence

P = expected prevalence or proportion

d = precision (8 %)

$$n = \frac{1.645^2\ 0.82(1 - 0.82)}{(0.08)^2} = 62 \text{ subject} + 10\% \text{ of drop out compensation}$$

$$= 68 \text{ subject}$$

3.7 Sampling method

The non-probability purposive sampling is used because it does not involve any random selection of participants.

3.8 Data collection and tool

3.8.1 Data collection tool (Appendix A)

This tool contains all the information need to be taken from subject medical record which include sociodemographic information, clinical information, biochemical indicator, route of feeding, time feeding initiation, type of enteral product, energy and protein requirement. The tool was created in English and the data was recorded by the researcher. The tool was developed specifically for this study to collect applicable data from medical record.

3.8.2 Medical Record Review

Medical record of critically ill patient admit to the ICU during data collection period are reviewed for documentation of provision of enteral feeding. If there was no documentation of provision of enteral feeding, no review take place. If provision of enteral feeding is documented in medical record, ICU admission date, patient sociodemographic, diagnosis, biochemical indicator, route of feeding, time feeding initiation, type of enteral product, energy and protein requirement were collected.

3.8.3 Data collection

Glasgow Coma Scale (GCS), blood sugar level, creatinine, albumin, total protein, energy and protein intake were recorded until enteral feeding was discontinued, patient is transfer, or

until 7 days of admission. Subjects feeding adequacy was recorded and determined within 72 hours from time of initiation of feeding.

3.9 Variables

3.8.1 Independent Variable(s)

Independent variable in this study was energy and protein prescribed. Their energy and protein prescribed will be determined by dietitians. Study is not purposely to determine the energy and protein requirement for patient.

3.8.2. Dependent Variables(s)

The dependent variables in this study was patient feeding adequacy and biochemical indicator (Haemoglobin, albumin and total protein). Both dependent variables will be determined through observation on medical record and ICU chart.

Study flowchart

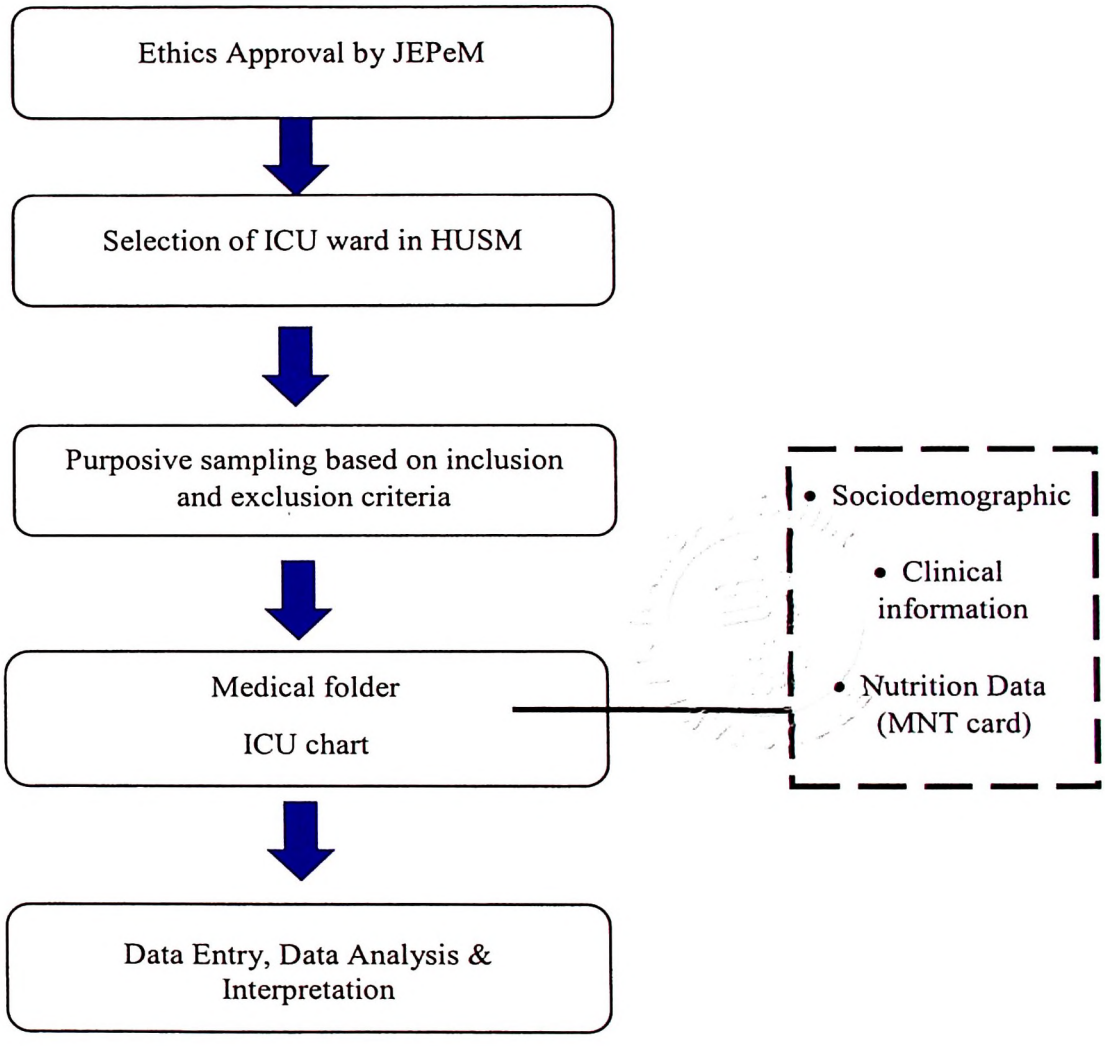

Figure 3.1 : Flowchart study

3.10 Data Analysis

Data were entered and analysed using SPSS version 22. Descriptive statistics were used to summarise the socio-demographic characteristics of subjects, caloric intake and reason for feeding interruption. Categorical data was presented as frequency (percentage). Data normality was checked by using Histogram. The differences between feeding adequacy and biochemical indicator among patient were determined by using Independent T-test or Mann-Whitney for normally distribute and non-normally distribute continuous data, respectively. The significance level was $p \leq 0.05$ to reject the null hypothesis.

CHAPTER 4

RESULTS

4.1 General Characteristics

A total of 55 patients were involved in the study with consent of patient's caregiver. The number of subject according to study area ward Trauma ICU 5 (9%), 1 Mutiara 27 (49%) and 2 Delima 23(42%). 57 patients were eligible for this study but 2 of them were not give consent due to fear of being treated as subject (Figure 4.1). The average age was 50 ± 17.2 years old, and 32 (58.2%) were male whereas 23 (41.8%) were female. Among ethnic groups, 52 (94.5%) were Malay and 3 (5.5%) were Chinese. The mean body mass index (BMI) was 25.7± 6.9 kg/m2. The primary ICU diagnosis for ICU admission were mainly trauma 16 (29.1%), followed by neurologic 14(25.5%), respiratory 11 (20%), sepsis 10 (18.2%), nephrology 3 (5.5%) and hematologic 1 (1.8%). 49 (89%) of critically ill patient had length of stay in ICU more than 7 days. In addition, the types of formula was used in the ICU were specialized formula 27 (45%), polymeric formula 25 (41.7%), elemental formula 5 (8.3%) and modular formula 3 (5%)

Table 4.1: Baseline characteristic of patient

BASELINE CHARACTEREISTIC	N = 55
Age, years	
• Mean (SD)	50.4 (17.2)
Sex, n (%)	
• Male	32 (58.2)
• Female	23 (41 .8)
Race, n (%)	
• Malay	52 (94.5)
• Chinese	3 (5.5)
BMI, kg/m^2	
• Mean (SD)	25.7 (6.9)
ICU Admission Diagnosis, n (%)	
• Trauma	16 (29.1)
• Neurologic	14 (25.5)
• Respiratory	11 (20)
• Sepsis	10 (18.2)
• Nephrology	3 (5.5)
• Hematologic	1 (1.8)
Length of ICU stay, n (%)	
• ≤ 7 days	6 (11)
• > 7 days	49 (89)
Ward , n (%)	
• Trauma ICU	5 (9)
• 1 Mutriara (Medical ICU)	27 (49)
• 2 Delima	23 (42)
Types of formula, n (%)	
• Specialized	27 (45)
• Polymeric	25 (41.7)
• Elemental	5 (8.3)
• Modular	3 (5)

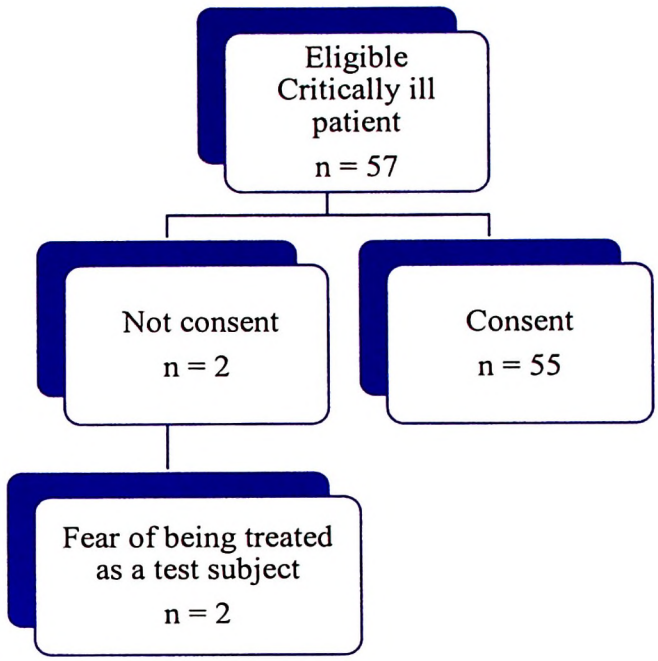

Figure 4.1: Sample of study

4.3 Nutrition characteristic

Mean energy and protein requirement among patients was about 1623 kcal ± 140.1 kcal and 71.1 g ± 13 g per day respectively. The mean of energy intake and protein intake were 73.5% ± 13.0% and 69.5% ± 12.7% respectively. In addition, 27 (49.1%) of patients received bolus feeding and 28 (50.9%) patient received pump feeding. Furthermore, 48 (87.3%) haemodynamically stable patients was initiated on enteral nutrition of ICU admission.

Table 4.2: Nutritional Characteristic

Mean Energy and Protein Requirement	
• Mean ER, kcal/d	1623 (140.1)
• Mean PR, g/d	71.1 (13.0)
Nutrition received within 3 days	
• % of ER	73.5 (11.4)
• % of PR	69.5 (12.7)
Energy and Protein Intake Adequacy, n (%)	
• <80 %	34 (61.8)
• ≥80 %	21 (38.2)
EN Feeding Mode, n (%)	
• Pump	28 (50.9)
• Bolus	27 (49.1)
Feeding Initiation, n (%)	
• 24 – 48 Hours	48 (87.3)
• > 24- 48 Hours	7 (12.7)

ER – Energy requirement, PR – Protein Requirement, EN – Enteral nutrition

4.4 Prevalence of underfeeding

Based on Table 4.2, In addition, 34 (61.8%) of patients received <80% of energy requirement while 21 (38.2 %) of patients received adequate energy and protein intake.