ASSOCIATION BETWEEN DIET QUALITY AND MALNUTRITION AMONG CANCER PATIENTS IN HOSPITAL PAKAR UNIVERSITI SAINS MALAYSIA (HPUSM)

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by

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DECLARATION

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

Nurul Najwa Binti Noorli

Date: 1 July 2025

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LIST OF ABBREVIATIONS

AHEI-2010: Alternative Healthy Eating Index-2010

aMED: Alternate Mediterranean diet score

DASH: Dietary Approaches to Stop Hypertension

EVOO: Extra Virgin Olive Oil

HPUSM: Hospital Pakar Universiti Sains Malaysia

MUST: Malnutrition Universal Screening Tool

NIH: National Institutes of Health

NHLBI: National Heart, Lung, and Blood Institute

RCT: Randomized Clinical Trial

S-MHEI: Standardized Malaysian Healthy Eating Index

SGA: Subjective Global Assessment

HUBUNGAN KUALITI PEMAKANAN DENGAN MALNUTRISI DALAM KALANGAN PESAKIT KANSER DI HOSPITAL PAKAR UNIVERSITI SAINS MALAYSIA (HPUSM)

ABSTRAK

Kualiti diet yang lemah dan status kekurangan zat makanan dikaitkan dengan kesan yang lebih buruk selepas rawatan kanser. Kajian ini dijalankan untuk menentukan hubungan antara kualiti diet dan status kekurangan zat makanan dalam kalangan pesakit kanser di Hospital Pakar Universiti Sains Malaysia (HPUSM). Kajian keratan rentas ini melibatkan 91 pesakit kanser yang menerima rawatan sebagai pesakit luar dan pesakit dalam, dipilih melalui persampelan mudah. Satu set soal selidik yang sah telah digunakan merangkumi maklumat sosiodemografi, Borang Ingatan Diet 3 Hari, dan Penilaian Subjektif Global (SGA). Status kualiti diet dinilai menggunakan Indeks Pemakanan Sihat Malaysia Piawaian Baharu (S-MHEI). Majoriti peserta ialah wanita (70.3%), berbangsa Melayu (95.6%), sudah berkahwin (84.6%), berpendidikan sehingga sekolah menengah (60.4%), tidak bekerja (61.5%), dan mempunyai pendapatan bulanan kurang daripada RM2,500 (78%). Seramai 70.3% peserta melaporkan sejarah keluarga dengan kanser. Jenis kanser yang paling lazim ialah kanser reproduktif (27.5%), dan didiagnosis pada Tahap 3 (35.6%). Lebih separuh daripada peserta (53.8%) menerima kemoterapi sebagai rawatan utama. Min skor kualiti diet dalam kalangan pesakit kanser ialah 56.43 ± 13.12. Skor minimum ialah 25 dan maksimum ialah 85. Ini menunjukkan bahawa kualiti diet keseluruhan sampel memerlukan penambahbaikan. Berdasarkan pembahagian tiga kategori, 58.2% pesakit diklasifikasikan sebagai berstatus nutrisi yang baik (SGA A), 27.5% pesakit diklasifikasikan sebagai berstatus kekurangan zat makanan sederhana atau berisiko (SGA B), manakala 14.3% diklasifikasikan sebagai kekurangan zat makanan

yang teruk (SGA C). Ini menunjukkan prevalens kekurangan zat makanan yang tinggi dalam kajian ini. Tiada perbezaan min yang signifikan secara statistik antara skor kualiti diet pesakit berstatus pemakanan baik dan pesakit kekurangan zat makanan ($p = 0.228$). Dapatan ini mencadangkan bahawa faktor lain selain kualiti diet seperti pengetahuan pemakanan, kesejahteraan psikologi, had fungsi fizikal, beban rawatan, akses kepada makanan, serta sokongan sosial atau penjaga mungkin memainkan peranan yang lebih besar dalam menentukan status kekurangan zat makanan dalam kalangan pesakit kanser.

ASSOCIATION BETWEEN DIET QUALITY AND MALNUTRITION AMONG CANCER PATIENTS IN HOSPITAL PAKAR UNIVERSITI SAINS MALAYSIA (HPUSM)

ABSTRACT

Poor diet quality and malnutrition are linked with poorer outcomes following cancer treatment. This study determined the association between diet quality and malnutrition status among cancer patients in Hospital Pakar Universiti Sains Malaysia (HPUSM). This cross-sectional study involving 91 cancer patients receiving both outpatient and inpatient cancer treatment, selected using convenience sampling. A set of validated questionnaires were used which consists information of socio-demography, 3-days diet recalls and Subjective Global Assessment (SGA). Diet quality status was assessed using the new standardized Malaysian Healthy Eating Index (S-MHEI). Majority of the participants were women (70.3%), identified as Malay (95.6%), married (84.6%), had a secondary school level of education (60.4%), unemployed (61.5%), and reported a monthly income of less than RM2,500 per month (78%). Among the participants, 70.3% reported a family history of cancer. Most participants did not have major comorbidities, with 63.7% without hypertension, 69.2% without type 2 diabetes mellitus, 74.7% without hyperlipidaemia, 92.3% without heart disease, and 93.4% without kidney disease. The most common cancer type was reproductive cancers (27.5%), while the majority were diagnosed at Stage 3 (35.6%). More than half of the participants (53.8%) were receiving chemotherapy as their primary treatment. The mean diet quality score among cancer patients was 56.43 ± 13.12. The minimum and maximum scores were 25 and 85, respectively. This indicated that the overall diet quality of the sample needs an improvement. Based on the three-category classification, 58.2% of patients were classified as well-nourished (SGA A),

27.5% of patients were classified as moderately malnourished or at risk (SGA B), while 14.3% were classified as severely malnourished (SGA C). This indicated a high prevalence of malnutrition among cancer patients in this study. There was no statistically significant mean difference of diet quality between well-nourished (SGA A) and malnourished (SGA B+C) patients ($p = 0.228$). This suggests that other factors beyond diet quality such as nutrition knowledge, psychological well-being, functional limitations, treatment burden, food accessibility, and the level of social or caregiver support may play a more significant factor in malnutrition status among cancer patients.

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Cancer is defined as the rapid formation of abnormal cells that grow beyond their usual boundaries, can invade adjoining parts of the body and spread to other organs. The latter process is referred to as metastasis and is the major cause of death in cancer (Brown et al., 2023). Cancer is the second leading cause of mortality in the world (Nagai & Kim, 2017). There are almost 20 million new cases and 9.7 million cancer-related deaths worldwide reported by National Cancer Institute (2024) in 2022. Cancer is Malaysia's fourth highest cause of mortality, accounting for 12.6% of all deaths in public hospitals and 26.7% in private hospitals (National Cancer Registry, National Cancer Institute, Ministry of Health Malaysia, 2018). According to Global Cancer Observatory (GLOBOCAN) (2022), Malaysia reported 51,650 number of new cancer cases in 2022, with age-standardized incidence rate (ASR) of 142.1 per 100,000 population. The top 3 leading cancers among both sexes are breast cancer, accounting for 16.2%, colorectum cancer, accounting for 13.8%, and lung cancer, accounting for 10.7% of all cancer cases. These followed by liver and prostate cancer which common among male population with 4.6% for both, and other cancer sites with 50.2% of all cancer cases. By 2040, the number of new cancer cases is expected to double.

Malnutrition is defined as deficiencies, excesses or imbalances in individual's intake of energy and/or nutrients (World Health Organization, 2024). It mainly covers two broad groups of conditions. The first group is undernutrition which includes stunting as for low height for age, wasting as for low weight for height, underweight as for low weight for age, and micronutrient deficiencies or insufficiencies as for a lack of important vitamins and minerals. The second group is overweight, obesity and diet-related noncommunicable diseases such as heart disease, stroke, diabetes, and cancer (World Health Organization, 2024). In this research, 'malnutrition' refers specifically to undernutrition.

Malnutrition, anorexia, and weight loss typically occur among cancer patients, even on their initial visit to a medical oncology centre (Muscaritoli et al., 2017). A study conducted in Brazil among 60 cancer patients on chemotherapy treatment reported prevalence of malnutrition was 77% (Ferigollo et al., 2018). Another study by Nitichai et al. (2019) in Thailand reported 39% of 195 cancer patients were well nourished, 27% were moderately malnourished and 34% of patients were severely malnourished. However, the prevalence of malnutrition among cancer patients in Malaysia remains less explored, despite its critical implications. According to Sing and Danoh (2022), who ran a study among 82 cancer patients receiving both outpatient and inpatient cancer treatment in Hospital Pakar Universiti Sains Malaysia (HPUSM), the prevalence of malnutrition is 69.5%. Another study conducted in the Peninsular Malaysia's East Coast among 70 newly diagnosed adult patients with cancer, Menon et al. (2014) discovered that almost one-third of cancer patients were undernourished when they were diagnosed.

Malnutrition among cancer patients is caused by various factors. It can be the type of cancer, and the body part affected such as cancer in the head, neck or esophagus because it can affect individual's ability to swallow food (NIH, 2017). Second, the type of cancer treatment such surgery, chemotherapy and radiotherapy can increase body's energy and

protein needs. Even before starting anti-cancer treatment, patients with cancer have high nutrient requirements due to increased metabolic rate (Planas et al., 2011). Tumor-induced pathophysiological changes alter the macronutrient metabolic pathways leading to increased protein catabolism, muscle protein degradation and elevated lipid oxidation (Ströhle, 2010). Third, side effects from cancer treatment such as nausea, vomiting and diarrhea because it can make difficulty in eating, and the food eaten might not be absorbed as well as usual (Milliron et al., 2022).

Cancer patients develop dysgeusia and a weak appetite which then limit their food consumption (Palmier et al., 2024). Cancer cachexia can be caused by reduced oral intake, combined with altered metabolic alterations, which then can manifests as wasting, anorexia, and systemic inflammation (Donohoe et al., 2011). As a result, many cancer survivors have unintentional weight loss which is a marker of undernutrition and associate their weight loss with negative outcomes (Sing and Danoh, 2022). These profoundly increasing the risk of adverse outcomes, including impairment of immune functions, performance status, muscle function, decreased quality of life (QOL), and various medical complications (Van Cutsem & Arends, 2005). Also, there may be decreasing in responses to chemotherapy, chemotherapy-induced toxicity, more frequent and severe complications, and shortening the survival times (Nguyen et al., 2022). As well as depression, fatigue and malaise which can also significantly impact on patients' well-being (Van Cutsem & Arends, 2005).

These factors including dysgeusia, weak appetite, cancer cachexia, unintentional weight loss, adverse outcomes, reduced response to chemotherapy, and psychological effects such as depression and fatigue contributed significantly towards poor diet quality among cancer patients. According to Zhang et al. (2015) who studied on diet quality among 1533 adult cancer survivors in the United States using 2010 Healthy Eating Index

(HEI-2010), this study identified that cancer survivors tend to have poor dietary patterns. Specifically, they consume higher intakes of calories from solid fats, sugars, and alcohol, while their intake of essential nutrients such as fiber, vitamins D and E, potassium, and calcium is often inadequate as compared to recommended levels. Additionally, they exceed recommended intakes for saturated fats and sodium. On the contrary, healthy diets characterized by recommended amount of vegetables, fruits, legumes, nuts, whole grains, unsaturated vegetable oils, and fish, lean meat or poultry when meat was included, are associated with decreased risk of all-cause mortality, can enhance recovery and reduce the risk of recurrence (Cena & Calder, 2020). These findings highlight the need for improved dietary interventions among cancer survivors to promote better health outcomes and reduce the risk of recurrence. Poor dietary patterns may exacerbate these morbidities in cancer patients, while healthy dietary patterns may serve a protective function, better health outcomes, including lower morbidity rates among cancer survivors (Zhang et al., 2015).

Indeed, focusing on diet quality rather than just nutrient intake is important because it covers the overall dietary pattern, which includes a variety of food groups that can contribute to health. A good quality diet can be defined as a diversified and balanced diet that provides adequate energy and essential nutrients to meet the requirements of a living being (Palma-Morales et al., 2022). Overall diet quality can be measured using New-Standardized Malaysia Healthy Eating Index (S-MHEI) which is developed through a study conducted by using main references such as The Malaysian Dietary Guidelines (MDG) 2010 and MDG for Children and Adolescents (MDCGA) 2013 (Jailani et al., 2021). Instead of focusing solely on individual nutrients, this thorough approach can help to identify dietary patterns that may influence health outcomes in cancer survivors. Diet quality can be assessed using some traditional methods of dietary assessment including

dietary records, food frequency questionnaires, diet history, 24-hour dietary recalls or screener (Thompson & Subar, 2017). Is this research, 3-day diet recalls will be used as it was selected as the method of assessment for the NHLBI Growth and Health Study.

The association between diet quality and malnutrition in cancer patients is important to understand on ways of thorough nutritional assessments and interventions can enhance treatment outcomes. Poor diet quality not only can increase the risk of malnutrition but also interrupts recovery and increases susceptibility to treatment side effects. Hence, this research aims to identify the association between diet quality and malnutrition among cancer patients at Hospital Pakar Universiti Sains Malaysia (HPUSM). The final outcome of this research will inform on some valuable insights into the importance of healthy diet quality, nutritional strategies and lifestyle modifications that can be used to inform public health strategies and clinical guidelines in reducing malnutrition risk, as well as improving the cancer patients' care and outcomes. In addition, this research hopes to contribute to the growing body of evidence on the prevention of malnutrition, as well as improve nutritional health and quality of life of cancer patients in Kelantan and beyond via identifying key modifiable risk factors.

1.2 PROBLEM STATEMENT

Cancer is Malaysia's fourth highest cause of mortality, accounting for 12.6% of all deaths in public hospitals and 26.7% in private hospitals (National Cancer Registry, National Cancer Institute, Ministry of Health Malaysia, 2018). By 2040, the number of new cancer cases is expected to double. Adults with cancer are at a high risk for malnutrition and is a very concerning issue in Malaysia and worldwide, usually due to suffering from the side effects of cancer and its treatments. The high prevalence of cancer-related malnutrition and its negative consequences are taken too lightly in most oncology

units. Farrah et al. (2017) have reported that the prevalence of malnutrition among hospitalized adult cancer patients at the National Cancer Institute, Putrajaya, Malaysia, assessed using SGA, was 43.5%. Another finding by Menon et al. (2014), among 70 newly diagnosed adult patients with cancer from the East Coast of Peninsular Malaysia, greater than one-third were undernourished and two-thirds were anaemic. The same research reported the proportion of energy derived from the macronutrients of young adult patients' diets were within the normal ranges, but was lower than their energy requirements, whereas the older women with cancer had poor energy, macro and micronutrient intakes. In general, both young and older cancer patients' micronutrient intakes were inadequate, increasing their risk of malnutrition. Indeed, people with cancer are among the most malnourished of all patient groups. According to Farrah et al. (2017), we can determine that the four most common cancer patients who developed mildly to moderately malnourished status or at risk of malnutrition or had a low serum albumin level were NPC, lung cancer, breast cancer and colorectal cancer. Further, some studies have estimated that about 20% of head and neck and gastrointestinal patients with cancer die due to malnutrition than from cancer per se (Ottery, 1994; Leuenberger, Kurmann & Stanga, 2010). Paccagnella, Morassutti, and Rosti (2011) found that weight loss of 50% was commonly found in patients with aggressive forms of lymphoma, as well as colon, prostate, and lung cancers. Higher incidence with 85% of weight loss was found in patients with upper gastrointestinal cancers. According to Carrier et al. (2019), individuals who have better diet quality were more likely to have a well-nourished body or not at risk of malnourished.

One of the main factors of malnutrition is inadequate dietary intake. Cancer patients often experience a decline in oral intake due to multiple causes and serious consequences of disease-associated malnutrition in cancer include anorexia, cachexia ranging from pre-

cachexia to cachexia, sarcopenia, appetite loss resulting from altered appetite signals, physical restrictions that reduce food intake and nutrient absorption such as mouth ulcers, diarrhea, vomiting, pain, intestinal obstructions, or malabsorption (Muscaritoli et al., 2017). These problems will contribute to poor diet quality, which can also be characterized by insufficient intake of fruits, vegetables, and essential nutrients such as Vitamin D, Iron, Vitamin B9, Vitamin B12, Vitamin B1, Calcium, Magnesium, and Vitamin A, will lead to malnutrition and negatively influences the efficacy of treatment (World Health Organization, 2023; Haskins et al., 2020).

Despite the risks associated with malnutrition are known, there is still a lack of thorough research focusing on the association between diet quality and malnutrition among cancer patients in Malaysia, particularly at Hospital Pakar Universiti Sains Malaysia (HPUSM). Lack of knowledge on the association between diet quality and the risk of malnutrition is the main problem being addressed. In order to overcome this concerning issue, it is important to conduct research that clarify the association between diet quality and malnutrition among cancer patients at HPUSM to help in guiding future dietary recommendations and health interventions that could lower the risk of malnutrition in this vulnerable population.

1.3 RESEARCH QUESTIONS

1. What is the diet quality score among cancer patients at HPUSM?
2. What is the prevalence of malnutrition among cancer patients at HPUSM?
3. Is there a mean difference in diet quality scores between well-nourished and malnourished cancer patients at HPUSM?

1.4 RESEARCH OBJECTIVES

General Objective

To identify the association between diet quality and malnutrition in cancer patients at Hospital Pakar Universiti Sains Malaysia (HPUSM), Kubang Kerian, Kelantan.

Specific Objectives

i. To determine the diet quality status using the New Standardized Malaysia Healthy Eating Index (S-MEI) score among cancer patients at HPUSM.

ii. To determine the prevalence of malnutrition among cancer patients at HPUSM.

iii. To compare the mean difference in diet quality scores between malnourished and well-malnourished cancer patients at HPUSM.

1.5 RESEARCH HYPOTHESIS

1. Null Hypothesis (H_o): There is no mean difference in diet quality scores between well-nourished and malnourished cancer patients at HPUSM.
2. Alternative Hypothesis (H_A): There is a mean difference in diet quality scores between well-nourished and malnourished cancer patients at HPUSM.

1.6 SIGNIFICANCE OF STUDY

Adequate nutrition is an essential part in cancer patient care, not only for overall well-being, health, and help to recover faster from illness, but also to prevent malnutrition (Hiatt et al., 2023). According to Arends et al. (2016), it is really crucial to prevent malnutrition for cancer medical therapy. A well-balanced diet that is rich in nutrients won't cure cancer, however it can help supply the patients the current energy they need more than ever. All nutrients are necessary to keep the metabolic processes running smoothly. It is proven that malnutrition has a severe impact on quality of life, treatment toxicities, and is estimated that up to 10 to 20% of cancer patients die as a result of malnutrition rather than from the cancer itself (Muscaritoli et al., 2021). Therefore, a deep understanding of the importance of healthy diet quality practice is important in multimodal cancer care. Multimodal cancer care combines medical treatments, nutritional support, and lifestyle interventions to meet cancer patients' complex, with evidence showing that proper nutrition reduces treatment toxicities, improves quality of life, and increases survival rates (Arends et al., 2016; Muscaritoli et al., 2021).

There had been two studies conducted in HPUSM, which have successfully established the significant association between nutritional status and psychological distress (Shamsudin, J., & Lee Mei Ling., 2020) and, between malnutrition and social support (Swee Sing, L., & Vanoh,D., 2022). While these studies identified who is at risk of malnutrition, a key question remains unanswered which is the specific role of dietary intake in this equation. This study addresses this fundamental gap by introducing diet quality as the control variable. The key distinctions of this study are moving from examining the consequences and correlates of malnutrition such as distress to investigating a primary contributing factor which is the patient's actual diet. This is an important step towards developing effective nutritional interventions. Furthermore, this