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COMPARATIVE STUDY ON NUTRIENT CONTENTS BETWEEN VARIETY BRANDS OF COW'S MILK AND PLANT BASED MILK MARKETED IN KOTA BHARU, KELANTAN.

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VARIETY BRANDS OF COW'S MILK AND PLANT BASED MILK
MARKETED IN KOTA BHARU, KELANTAN.

by

VERONICA ANGGEL ANAK HOLIES GRA

Dissertation submitted in partial fulfillment
of the requirements for the degree of
Bachelor in Nutrition with Honours

January 2025

CERTIFICATE

This is to certify that the dissertation entitled “*Comparative Study on Nutrient Contents Between Variety Brands of Cow’s Milk and Plant Based Milk Marketed in Kota Bharu, Kelantan*” is the bona fide record of research work done by Miss *Veronica Anggel Anak Holies Gra* during the period from April 2024 to Jan 2025 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 fulfillment for the degree of Bachelor in Nutrition with Honours.

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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.

Veronica

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VERONICA ANGEL ANAK HOLIES GRA

Date: 10 January 2025

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List of Symbols, Abbreviations and Acronyms

WHO	World Health Organizations
DV	Daily Value
RNI	Recommended Nutrient Intake
CVD	Cardiovascular Disease
SPSS	Statistical Package for The Social Sciences
<	Less Than
>	More Than
p	Significance Level

**KAJIAN PERBANDINGAN KANDUNGAN NUTRIEN ANTARA PELBAGAI
JENAMA SUSU LEMBU DAN SUSU BERASASKAN TUMBUHAN YANG
DIPASARKAN DI KOTA BHARU, KELANTAN.**

ABSTRAK

Kajian ini membandingkan kandungan nutrisi susu lembu dan alternatif susu berasaskan tumbuhan (susu badam, soya, dan oat) yang terdapat di pasar raya di Kota Bharu, Kelantan. Analisis ini memfokuskan pada makronutrien (protein, karbohidrat, lemak), serta kalsium, vitamin D, vitamin B12, kandungan serat, dan sumbangannya kepada Nilai Harian (DV). Ujian Kruskal-Wallis digunakan untuk menilai perbezaan yang signifikan. Perbezaan signifikan ditemui dalam kandungan makronutrien. Susu lembu mempunyai tahap protein dan lemak yang lebih tinggi, manakala susu oat mempunyai kandungan karbohidrat tertinggi. Susu soya menunjukkan profil pemakanan yang seimbang. Penemuan ini membawa kepada penolakan hipotesis nol untuk makronutrien. Bagi vitamin D, terdapat perbezaan signifikan di mana susu lembu mengandungi tahap yang lebih tinggi berbanding susu berasaskan tumbuhan. Walau bagaimanapun, kandungan kalsium dan vitamin B12 tidak menunjukkan perbezaan yang signifikan, menyebabkan penolakan sebahagian hipotesis nol. Kandungan serat tidak menunjukkan perbezaan signifikan antara jenis susu. Selain itu, perbezaan yang signifikan diperhatikan dalam peratusan nilai harian untuk kalsium dan vitamin D3 antara jenis susu yang berbeza, manakala tiada perbezaan signifikan ditemui untuk vitamin B12, yang membawa kepada penolakan separa hipotesis nol. Kajian ini memperincikan perbezaan nutrisi penting antara susu lembu dan alternatif berasaskan tumbuhan, memberikan pengguna di Kota Bharu maklumat berguna untuk membuat keputusan pemakanan yang lebih bijak.

**COMPARATIVE STUDY ON NUTRIENT CONTENTS BETWEEN VARIETY
BRANDS OF COW'S MILK AND PLANT BASED MILK MARKETED IN KOTA
BHARU, KELANTAN.**

ABSTRACT

This study compared the nutritional content of cow's milk and plant-based milk alternatives (almond, soy, and oat milk) available in supermarkets in Kota Bharu, Kelantan. The analysis focused on macronutrients (protein, carbohydrates, fat), as well as calcium, vitamin D, vitamin B12, fiber content, and their contributions to Daily Values (DV). The Kruskal-Wallis test was used to assess significant differences. Significant differences were found in macronutrient content. Cow's milk had higher protein and fat levels, while oat milk had the highest carbohydrate content. Soy milk provided a balanced nutritional profile. These findings led to the rejection of the null hypothesis for macronutrients. For vitamin D, significant differences were observed, with cow's milk containing higher levels than plant-based milks. However, calcium and vitamin B12 content showed no significant differences, resulting in partial rejection of the null hypothesis. Fiber content showed no significant differences across milk types. Furthermore, significant differences observed in the percentage of the daily value for calcium and vitamin D3 among different milk types, while no significant difference was found for vitamin B12, leading to the partial rejection of the null hypothesis. This study highlights important nutritional differences between cow's milk and plant-based alternatives, offering consumers in Kota Bharu valuable insights for making informed dietary decisions.

CHAPTER 1: INTRODUCTION

1.1 Background of the study

Milk production starts when a mammal, such as a cow or a human, delivers birth. Hormonal stimulation causes the mammary glands to begin producing milk shortly after delivery. Alveoli, which are tiny sacs that generate milk, are found in these glands. Milk is released from these alveoli through ducts and out of the nipples as a result of a reflex that is triggered when the infant sucks. This process lasts as long as there is a need for milk, and it usually ends when the infant is ready to be weaned. (Milk, 2023b)

Milk serves as a vital first food for newborn babies, providing a complete nutritional package essential for their rapid growth and development. It has an abundance of protein for tissue growth and repair, lipids for energy storage, and carbohydrates for immediate energy. Vitamins like iron essential to produce red blood cells, while minerals like calcium are essential for the development of strong teeth and bones. (Willett & Ludwig, 2020). Breast milk, in particular, provides an additional layer of protection for newborn babies. It functions as a barrier against infections and illnesses because it is loaded with antibodies known as immunoglobulins, especially secretory IgA (SIgA). Infants' respiratory and digestive tract linings are coated with SIgA, which neutralises dangerous germs before they can cause sickness. (Pietrzak et al., 2020). This passive immunity is especially crucial in the early months of life when the baby's immune system is still developing.

One of the most popular forms of milk consumed globally is cow's milk, which is generated by the mammary glands of female cows. There are various types of milk available, that have distinct fat contents, such as whole milk, low-fat milk, and skim milk. (Rd, 2023). Whole milk includes the full fat content found in cow's milk, resulting in a rich and creamy texture. Low-fat milk is reduced in calories while maintaining the majority of its nutrients by eliminating some fat, usually leaving behind 1% to 2% of fat. Skim milk is a lower fat option that yet has the same nutritional value because almost all of the fat has been removed, leaving it at a very low level—typically less than 0.5%.

However, lactose intolerance causes some people to be unable to digest the sugar called lactose contained in milk. (Sethi et al., 2016). Moreover, some people decide not to eat dairy for a variety of reasons, such as being allergic to nuts or seeds, adopting a vegan diet, or having

environmental concerns regarding dairy farming. There is a growing trend towards plant-based milk, which can be an affordable option for the underprivileged in developing nations and in areas with limited access to cow's milk. Plant-based milk, made from a variety of plant sources such as nuts (almond milk, cashew milk), seeds (soy milk, hemp milk), grains (oat milk, rice milk), and even legumes (pea milk), provides a dairy-free option.

1.2 Problem statement

Both cow's milk and plant-based milk are becoming more and more popular in Kelantan, Malaysia. Despite this growing popularity, there is a significant gap in knowledge for a comprehensive comparison of the nutrient profiles of cow's milk and plant-based milk. The lack of complete information makes it difficult for consumers to make informed decisions on these important food sources, which provide essential nutrients such as protein, fat, carbohydrates, vitamins, and minerals. As a result, consumers are unsure about the relative benefits and drawbacks of cow's milk versus plant-based milk because there is no clear guidance on the nutritional content difference between them. Consequently, customers find it challenging to assess the nutritional advantages and disadvantages of each option based on their specific dietary needs due to this uncertainty. Therefore, the decision to focus the study on the Kota Bharu market is rooted in the desire to capture local consumption patterns. In Kota Bharu, milk consumption patterns are influenced by socioeconomic status. Lower income groups typically opting for affordable cow's milk, while those with higher income are more likely to explore plant-based alternatives.

1.3 Objective

1.3.1 General objective

To compare the macronutrients and specific micronutrients of cow's milk and plant-based milk available marketed in Kota Bharu, Kelantan.

1.3.2 Specific objectives

- i. To compare the content of macronutrients (protein, carbohydrates, fat) in various brands of cow's milk and plant-based milk readily available in Kota Bharu, Kelantan supermarkets.
- ii. To compare the content of calcium, vitamin D and vitamin B12 in various brands of cow's milk and plant-based milk readily available in Kota Bharu, Kelantan supermarkets.

- iii. To assess the presence of fiber in different brands of cow's milk and plant-based milk that can be purchased in Kota Bharu, Kelantan supermarkets.
- iv. To compare Daily Values (DV) for calcium, vitamin D and vitamin B12 between various brands of cow's milk and plant-based milk readily available in Kota Bharu, Kelantan supermarkets.

1.4 Study Hypothesis

Hypothesis 1

H₀: There is no significant difference in the macronutrients and specific micronutrients of cow's milk and plant-based milk available marketed in Kota Bharu, Kelantan.

H₁: There is a significant difference in the macronutrients and specific micronutrients of cow's milk and plant-based milk available marketed in Kota Bharu, Kelantan.

Hypothesis 2

H₀: There is no significant difference in the presence of fiber among different brands of cow's milk and plant-based milk available in Kota Bharu, Kelantan supermarkets.

H₁: There is a significant difference in the presence of fiber among different brands of cow's milk and plant-based milk available in Kota Bharu, Kelantan supermarkets.

Hypothesis 3

H₀: There is no significant difference in the Daily Values (DV) for calcium, vitamin D and vitamin B12 between various brands of cow's milk and plant-based milk readily available in Kota Bharu, Kelantan supermarkets.

H₁: There is a significant difference in the Daily Values (DV) for calcium, vitamin D and vitamin B12 between various brands of cow's milk and plant-based milk readily available in Kota Bharu, Kelantan supermarkets.

1.5 Research Questions

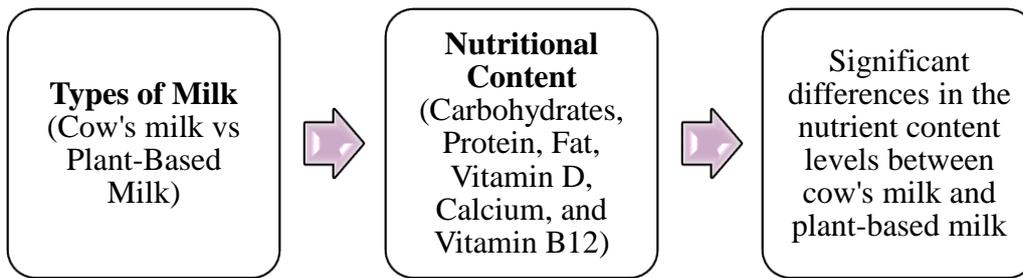
- i. Are there significant differences in the macronutrients (protein, carbohydrate, fat) between cow's milk and plant-based milk readily available in Kota Bharu, Kelantan supermarkets?

- ii. Are there significant differences in the calcium, vitamin D and vitamin B12 between cow's milk and plant-based milk readily available in Kota Bharu, Kelantan supermarkets?
- iii. Which brands of cow's milk and plant-based milk that can be purchased in Kota Bharu, Kelantan supermarkets have the highest amount of fiber?
- iv. Are there significant differences in the Daily Values (DV) for calcium, vitamin D and vitamin B12 between various brands of cow's milk and plant-based milk readily available in Kota Bharu, Kelantan supermarkets?

1.6 Significance of Study

This study on the nutrient content of cow's milk in comparison to plant-based milk has substantial implications for boosting public health through a variety of strategies. First of all, it gives customers more power by supplying insightful details on the specific nutritional characteristics of each brand of milk, addressing the fact that many consumers are unaware of the nutritional differences between cow's milk and plant-based milks. Moreover, the study may serve as an incentive for the advancement of dietary variety, as differences in nutrient profiles can significantly impact individuals with specific dietary requirements, such as children, pregnant women, elderly or athletes. The study encourages consumers to include a greater variety of these beverages in their diets by showcasing the unique range of nutrients provided by both cow's milk and plant-based milk. This dietary diversification serves an important function in maintaining a balanced intake of essential nutrients, potentially lowering the risk of deficiencies, and boosting overall health and well-being. This study's significance goes beyond individual choices, with the potential to influence policy and regulatory decisions. In Malaysia, this research could support nutrition promotion program by helping health authorities recommend the best options for specific groups. The results of this study can help policymaker create more precise dietary guidelines and labelling standards that clearly explain the distinctions between cow's milk and plant-based milk. With the right information, customers may make decisions that benefit their health and possibly even a more sustainable food system.

1.7 Conceptual Framework



CHAPTER 2: LITERATURE REVIEW

2.1 Carbohydrates content in Milk

Both cow's milk and plant-based milk include considerable amounts of carbohydrates, albeit the types of carbohydrates present vary significantly. Cow's milk is defined by its high lactose content, which is a disaccharide sugar made up of glucose and galactose. Approximately 4.8–5.2% of cow's milk is lactose, which is an important source of energy for growing children. (Huppertz & Kelly, 2013). Conversely, plant-based milk provides a greater range of sources of carbohydrates. For instance, the majority of the carbohydrates in soy milk come from sucrose, a disaccharide sugar that is frequently found in table sugar. (Vanga & Raghavan, 2018). Almond milk, which is naturally low in carbohydrates, can be sweetened with additional sugar to improve its taste. (Nevin & Rajamohan, 2010). Almond milk is naturally lower in carbohydrates than cow's milk. Nonetheless, additional sugars may be present in some commercial almond milk products in order to improve flavour. While sweetened almond milk can have a higher carbohydrate level, unsweetened almond milk typically has 1-2 grammes of carbohydrates per serving. (Drewnowski & Rehm, 2018). When cow's milk and plant-based milk are compared, it can be seen that the milk from cows usually has higher lactose content. On the other hand, plant-based milks frequently have a lower total carbohydrate content, which means that they could be a good choice for people who are lactose intolerant or who are trying to limit their carbohydrate intake. It is important to remember, though, that the amount of carbohydrates in plant-based milks can vary greatly based on the particular base component and any additional sugars or starches added for texture or flavour. Thus, it is advised to carefully read the nutrition label before choosing a plant-based milk.

2.2 Protein content in Milk

Protein is a vital macronutrient found in both cow's milk and plant-based milk. It provides the essential amino acids required for the development, maintenance, and repair of bodily tissues. (Lacroix & Bos, 2014). Casein and whey proteins make up the majority of the two main fractions of protein found in cow's milk, which has a high protein concentration of about 3.2 grammes per 100 millilitres. (Park & Haenlein, 2010). About 80% of the total protein in cow's milk is made up of casein, with the remaining 20% being made up of whey proteins. (Farrell Jr et al., 2006). Meanwhile, the protein level of plant-based milk varies according to the source. One of the most popular plant-based, soy milk, for instance, normally has a protein level of 2.5 to 4 grammes per 100 millilitres, which is similar to that of cow's milk. (Phillips & Van Loon, 2011). On the other hand, the protein level of other plant-based, like rice milk,

coconut milk, and almond milk, is usually lower and ranges from 0 to 1 gramme per 100 millilitres. (Weaver & Heaney, 2017).

2.3 Fat content in Milk

Fat is an important component of both cow's milk and plant-based milk, as it provides vital fatty acids and fat-soluble vitamins that are required for overall health. The average fat content of cow's milk is approximately 3.25%, although this can vary from 1% in skim milk to over 8% in whole milk. (Park & Haenlein, 2010). However, the lipid content of plant-based milk varies greatly from source to source. Almond milk and rice milk, for example, have a lower fat content, ranging around 1-2 grammes per serving, due mostly to additional oils or naturally occurring lipids in nuts or grains. (Shurtleff & Aoyagi, 2014). According to Haenlein (2014), soy milk can include 1-4 grammes of fat per serving, which is comparable to low-fat cow's milk, depending on the brand and processing technique. Although plant-based milk have a lower fat level than full cow's milk, they nevertheless add to total fat intake. Nevertheless, they can be a good choice for people who are trying to avoid dairy products or who have dietary limitations.

2.4 Calcium in Milk

Milk is a great source of calcium, a mineral that is necessary for many bodily physiological processes. One of its main functions is to maintain healthy bones. Specifically, during early infancy and adolescence, when bones are growing and developing, calcium helps to increase bone density and strength. (Weaver, 2014). In order for these physiological processes to function properly, calcium is also essential for blood coagulation, neuron transmission, and muscle contraction. Furthermore, according to NIH Osteoporosis and Related Bone Diseases National Resource Center, a sufficient calcium consumption has been linked to a decreased likelihood of osteoporosis, a medical condition defined by porous and weak bones especially in elderly. Since milk is one of the foods highest in calcium, it should be a part of a well-balanced diet to maintain healthy bones and general wellbeing.

2.5 Vitamin D in Milk

Milk is an important dietary source of vitamin D, providing both naturally occurring and fortified forms of this essential nutrient. The natural vitamin D found in milk is derived from the skin's production of provitamin D (vitamins D2 and D3) when exposed to sunshine. However, the amount of sunshine that the skin receives can vary depending on a number of factors, including location and seasonal variations, which might restrict the skin's ability to synthesise vitamin D. In order to counter this, more vitamin D usually in the form of vitamin

D2 or D3 is added to fortified milk to provide a steady intake of this essential mineral. (Weaver, 2014). This technique of fortification is especially important in areas where exposure to sunlight is restricted or in periods when UV radiation is not enough to produce enough vitamin D. Since vitamin D helps the body absorb calcium and encourages its deposition in teeth and bones, it is essential for maintaining bone health (Zittermann & Gummert, 2010). In milk, vitamin D is found in small amounts. According to the NIH Osteoporosis and Related Bone Diseases National Resource Centre, vitamin D lowers the incidence of bone-related illnesses such as osteomalacia in adults and rickets in children by improving calcium utilisation, which enhances bone density and strength. In a nutshell milk is an important medium for delivering vitamin D, including both natural and fortified forms of this vital nutrient. The importance of milk in achieving optimal health outcomes is highlighted by its role in boosting bone health and treating deficiencies, especially in groups that are susceptible to vitamin D insufficiency.

2.6 Vitamin B12 in Milk

Vitamin B12, commonly known as cobalamin, is an important water-soluble vitamin that is required for several physiological processes in the body. Vitamin B12 is mostly found in animal-derived foods, such as milk, and is essential for red blood cell development, brain function, and the synthesis of DNA. (Park & Haenlein, 2010). Vitamin B12 deficiency can cause neurological conditions such as peripheral neuropathy, mood swings, and cognitive decline, as well as megaloblastic anaemia. Megaloblastic anaemia is a condition marked by oversized, immature red blood cells that are unable to carry oxygen to body tissues efficiently. This condition is caused by a deficiency of vitamin B12, which impairs the process of red blood cell development. (Green et al., 2017). Vitamin B12 is essential for supporting neurological function as well as red blood cell development. According to Park and Haenlein (2010), vitamin B12 has a role in the synthesis of myelin, a fatty material that coats and insulates nerve fibres to promote effective neuronal transmission and communication. Vitamin B12 deficiency can cause the myelin sheath to be damaged, which can lead to neurological symptoms including peripheral neuropathy, which is characterised by tingling, numbness, and weakness in the extremities, as well as mood swings and cognitive decline (Green et al., 2017). Moreover, vitamin B12 is necessary for the production of DNA, especially in cells that have a high turnover rate, such as the lining of the gastrointestinal tract and the bone marrow cells that produce red blood cells. (Park & Haenlein, 2010). Sustaining the integrity and functionality of these quickly proliferating cells, as well as promoting maximum health and vigour, requires adequate quantities of vitamin B12. Although animal products naturally contain a lot of vitamins B12,

those who eat a vegetarian or vegan diet may not get enough of it since their dietary sources are limited. In order to achieve dietary needs for this crucial nutrient, it becomes imperative to incorporate fortified foods, for instance milk, especially plant-based milk.

2.7 Health Benefits of Cow's Milk

Cow's milk has a wealth of health benefits because of its high nutrient profile, which includes calcium, protein, vitamin B12, and vitamin D, all of which are necessary for strong bones, muscle development, and overall well-being. Calcium works with vitamin D to promote calcium absorption. Calcium is essential for mineralization of bones and muscle contraction. Furthermore, cow's milk is a complete protein source, containing all of the essential amino acids necessary for muscle growth, repair, and immunological function. Cow's milk is a powerful source of nutrients when compared to certain plant-based alternatives because its nutrients, particularly calcium, have high bioavailability, which guarantees effective absorption and utilisation by the body (Thorning et al., 2017). Furthermore, cow's milk provides an important source of iodine, which is necessary for thyroid function and regulation of metabolic processes and essential for growth, development, and metabolism.

2.8 Drawbacks of Cow's Milk

However, even with these advantages, there are disadvantages to cow's milk that should be taken into account. The presence of lactose can cause discomfort in those who are lactose intolerant, and cow's milk protein, especially casein and whey, can cause allergic reactions that can range from mild skin reactions to life-threatening anaphylaxis, especially in infants and young children (Michaëlsson et al., 2014). Other than that, conventional cow's milk production uses antibiotics and hormones to increase milk yield and prevent disease, which raises questions about their possible effects on human health even if regulations are in place to guarantee the safety of milk (Melnik, 2012). Consequently, even if cow's milk has many nutritional advantages, its disadvantages highlight how crucial it is to consider personal health circumstances and legal requirements while consuming it.

2.9 Health Benefits of Plant-Based Milk

Plant-based milk provide a number of advantages that address a wide range of nutritional demands and environmental issues. Due to their inherent lactose-free nature, they offer a viable substitute for those who are lactose intolerant, relieving any upset stomach that may arise from consuming dairy products (Michaëlsson et al., 2014). Furthermore, customers can choose from a wide range of plant-based milk, including soy, almond, oat, and coconut milk, depending on their dietary needs and taste preferences. This increases dietary flexibility

and diversity (Vanga & Raghavan, 2016). According to Pfeuffer and Schrezenmeir (2000), a number of plant-based milk have lower saturated fat content than cow's milk, which may improve heart health by lowering the risk of cardiovascular illnesses linked to excessive saturated fat intake. Additionally, to match the nutritional profile of cow's milk, certain plant-based milks are fortified with vital elements including calcium, vitamin D, and vitamin B12. This helps to rectify any inadequacies in a plant-based diet and promotes general health (Messina & Messina, 2014). When compared to cow's milk, plant-based milk typically has a smaller environmental impact because they require less land and water for production, which lowers greenhouse gas emissions and lessens the strain on natural ecosystems (Thorning et al., 2017).

2.10 Drawbacks of Plant-Based Milk

When making dietary decisions, it's critical to balance the benefits and drawbacks of plant-based milk. While there are many advantages to plant-based milk, there are also essential aspects to keep in mind. According to research by Vanga and Raghavan (2016), although many plant-based milk are fortified with vital nutrients, the nutritional composition can change among various brands and types, which could result in nutrient variability and inadequate intake of nutrients if not closely monitored. Furthermore, some plant-based milk, like soy or almonds, can cause allergies in those who are sensitive, emphasising the significance of allergy awareness and ingredient inspection (Michaëlsson et al., 2014). In addition, certain consumers who prefer minimal food chemicals may be concerned about plant-based milk because they may contain additives like sugars, stabilisers, or flavourings to improve taste, texture, or prolonged shelf life (Vanga & Raghavan, 2016). Concerns about the environment also stem from the large-scale cultivation of some crops for plant-based milks, including almond milk, which uses a lot of water and may cause soil erosion and a decline in biodiversity due to monoculture farming methods (Thorning et al., 2017). Therefore, even though plant-based milk has many advantages, making informed dietary decisions requires careful evaluation of the nutritional value, allergies, chemicals, and impact on the environment.

CHAPTER 3: METHODOLOGY

3.1 Study Design

A comparative study is a method of research where two or more distinct components are examined and contrasted in order to identify commonalities, differences, strengths, and weaknesses (Smith, 2010). According to Jones and Brown (2015), it provides a systematic approach to acquiring understanding of many facets of these entities, such as policies, phenomena, and goods and actions. Fundamentally, a comparative study includes choosing which entities to compare, defining evaluation factors or criteria, gathering, and analysing data, interpreting results, and drawing conclusions and recommendations (Garcia et al., 2018). According to Johnson (2017), researchers can conduct a systematic evaluation of things under investigation, such as products in a market, regulations in different jurisdictions, or phenomena across cultures, by defining particular criteria for comparison. By using this approach, researchers aim to illuminate the subtle differences and similarities between the entities, enabling a more thorough comprehension of their features and functions (Robinson & Smith, 2019). In the end, comparative studies help researchers reach well-informed judgements and offer recommendations based on solid data, which advances knowledge and helps researchers make well-informed decisions across a range of subject areas (Brown & Wilson, 2021).

This study delved deeper into variety milk marketed in Kota Bharu, Kelantan, comparing the nutritional value of cow's milk to plant-based milk. We'll be focusing on six essential nutrients: fat, protein, carbs, calcium, vitamin D, and vitamin B12. We will be able to examine the labels of different brands of plant-based and cow's milk by gathering samples from major grocery and supermarket stores in Kota Bharu, Kelantan. This will enable us to compare the various varieties of milk in terms of these vital elements and draw a clear picture of how they differ.

3.2 Study Location

This study will be conducted in supermarkets located in Kota Bharu, Kelantan, ensuring that it accurately captures the milk choices available to residents of the region. Supermarkets serve as the primary source for groceries in urban areas, and focusing on Kota Bharu allows for targeting the most accessible locations for a significant portion of the state's population. Supermarkets have a greater selection of milk products than do local stores. By collecting samples from various supermarkets, this study can ensure that its data encompasses the full range of cow's milk options and plant-based milk readily available in Kota Bharu. This

diversity in sampling locations allows for a more comprehensive comparison of the nutritional content of these milk varieties.

3.3 Selection Area

3.3.1 Inclusion Criteria

- i. Cow's milk and plant-based milk readily available for purchase at specified supermarket in Kota Bharu.
- ii. Milk samples with comprehensive label with the product type, brand name, ingredients list, and nutritional information for each serving size must be attached to every sample.

3.3.2 Exclusion Criteria

- i. Milk samples with incomplete or unclear labelling information.

3.4 Sampling Method

Purposive sampling will be used in this study to choose milk samples from Kota Bharu, Kelantan, supermarkets. Purposive method is a non-probability sampling procedure in which researcher uses his or her judgement to select those items based on specific criteria relevant to the research objectives. This approach guarantees the collection of data that accurately describes the milk options available to Kelantanese residents by purposefully selecting samples which fulfil particular criteria in line with the research objectives.

In this situation, having both plant-based and cow's milk options available in the chosen supermarkets is one of the selection criteria's criteria. The study captures a wide and varied range of milk products that are typically available to customers in Kota Bharu by concentrating on supermarkets, which act as the main providers of food products in urban areas.

Furthermore, each milk sample included in the study must have a comprehensive label containing crucial information such as the product type, brand name, ingredient list, and nutritional information per serving size. This guarantees accuracy and transparency in the process of collecting data. The brand name makes it possible to identify and differentiate between different products. The ingredient list offers information about the milk's composition, which is critical for identifying any allergens or additions. The nutritional information per serving size enables exact study of micronutrient content, making it easier to compare different milk types and brands. Following these predetermined guidelines will help the study get high-quality data that will be appropriate for detailed analysis.

Overall, the focused collection of milk samples that correctly reflect the variety of milk options available to Kelantanese residents is made possible by the purposive sampling strategy used in this study. The study seeks to provide important insights into the nutritional composition of plant-based milk variants and cow's milk in the local market by focusing on supermarkets and selecting samples based on particular criteria. This would ultimately enable consumers to make informed dietary decisions.

3.5 Data Collection

To ensure this study accurately reflects the variety of milk products available in Kota Bharu, a systematic approach will be followed during supermarket visits. Firstly, all available brands and types of cow's milk and plant-based milk will be documented. From this array of options, meticulously selected samples meeting pre-defined criteria will be chosen. These criteria include ensuring that the milk is commercially available in the supermarket, has clear and complete labelling information, and is fresh and undamaged.

The aim is to collect the target sample size for each milk type at each supermarket. However, if a particular store lacks enough qualifying options, the next store on the list will be visited. For each chosen sample, essential details such as the brand name, product type, and supermarket location will be recorded. By adhering to this sampling method, a representative selection of readily available milk options across Kota Bharu supermarkets will be assembled. This comprehensive approach will provide a robust foundation for analysing the nutritional content of these milk varieties and ultimately empower Kelantanese consumers with valuable insights into their dietary choices.

3.6 Data Analysis

The data collected will be analysed using the IBM Statistical Package of Social Science System (SPSS) Statistic Version 29.0. In the context of comparing cow's milk and plant-based milk (almond, soy and oat), Kruskal-Wallis H test, a non-parametric statistical method appropriate for comparing three or more independent groups when the assumptions of normality are not met. This test will evaluate whether there are significant differences in the median nutrient levels among the four milk types. The independent variable will be the type of milk (cow's, almond, soy, and oat), while the dependent variables will include carbohydrate content, protein, fat, vitamin D, calcium, vitamin B12, and fiber. If the Kruskal-Wallis test yields significant results (p -value < 0.05), pairwise comparisons will be performed using the Mann-Whitney U test to determine whether there are differences in the nutrient levels between

two independent groups. To account for multiple comparisons and control for Type I error, a Bonferroni correction will be applied, adjusting the significance threshold based on the number of pairwise comparisons made. The adjusted p-value will be used to interpret the significance of individual comparisons.

Additionally, the Percent Daily Value (%DV) for calcium, vitamin D3, and vitamin B12 will be calculated for each type of milk to assess its contribution to an average adult's daily nutrient needs, based on the Recommended Nutrient Intake (RNI) for Malaysia, established in 2017. This will be done using the formula:

$$\%DV \text{ for calcium} = \left(\frac{\text{Nutrient content per 100ml}}{1000\text{mg}} \right) \times 100\%$$

$$\%DV \text{ for vitamin D3} = \left(\frac{\text{Nutrient content per 100ml}}{2.4 \text{ IU}} \right) \times 100\%$$

$$\%DV \text{ for vitamin B12} = \left(\frac{\text{Nutrient content per 100ml}}{15\text{mcg}} \right) \times 100\%$$

CHAPTER 4: RESULTS

4.1 Data Collection of Different Type of Milk

Table 4.1.1 and 4.2.1 present the data collected on the nutritional content of different types of milk, including cow's milk, almond milk, soy milk, and oat milk. The tables display the nutrients content such as carbohydrate, protein, fat, calcium, vitamin D3, vitamin B12 and fiber for each type of milk. Each nutrients values are provided 100 per ml to allow for an accurate comparison of the nutritional content on the four types of milk.

Table 4.1.1: Data Collection of Cow's Milk

Product Name	Energy (kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Calcium (mg)	% DV Calcium (%)	Vitamin D3 (IU)	% DV Vitamin D3 (%)	Vitamin B12 (mcg)	% DV Vitamin B12 (%)	Fiber (g)	Price (RM)	Price/100ml (RM/100ml)
2n2 Full Cream Milk	65.00	4.30	3.20	3.80	122.00	12.20	N/A	N/A	N/A	N/A	N/A	8.90	0.89
AL-MAHEERA Full Cream	64.00	4.80	3.30	3.60	120.00	12.00	N/A	N/A	N/A	N/A	N/A	6.60	0.66
AL-MAHEERA Low Fat	47.00	4.90	3.30	1.60	120.00	12.00	N/A	N/A	N/A	N/A	N/A	6.60	0.66
Anlene	52.00	6.20	3.70	1.40	278.00	27.80	4.20	42.00	0.20	5.00	N/A	7.20	0.72

AUSTRALIAN yarra Low Fat	44.30	4.30	3.40	1.50	122.00	12.20	N/A	N/A	N/A	N/A	N/A	8.25	0.82
BRIGHT COW FULL CREAM MILK	70.70	6.00	3.70	3.20	242.00	24.20	N/A	N/A	N/A	N/A	N/A	8.50	0.85
DAIRY RICH Full Cream Milk	64.00	5.20	3.10	3.40	115.00	11.50	N/A	N/A	N/A	N/A	N/A	6.80	0.68
DAIRY RICH Low Fat Milk	46.00	6.00	2.50	1.30	150.00	15.00	2.30	23.00	0.08	20.00	N/A	6.80	0.68
DIAMOND PURE A2 PROTEIN MILK	81.00	4.80	2.70	4.00	81.00	8.10	N/A	N/A	N/A	N/A	3.00	8.80	0.88
DUTCH LADY Fresh Milk	64.00	4.80	3.50	3.50	121.00	12.10	N/A	N/A	N/A	N/A	N/A	7.30	0.73
DUTCH LADY Full Cream	63.00	5.60	2.70	3.30	150.00	15.00	2.30	23.00	0.18	4.50	N/A	5.90	0.59
DUTCH LADY Low Fat	44.00	5.70	2.60	1.20	150.00	15.00	2.30	23.00	0.18	4.50	N/A	6.60	0.66

EMBORG Full Cream Milk	47.00	5.10	3.30	1.5 0	118.00	11.80	N/A	N/A	0.44	11.00	0.00	9.95	0.99
Enrico's Full Cream	64.00	3.20	5.00	3.5 0	115.00	11.50	N/A	N/A	N/A	N/A	N/A	6.50	0.65
F&N Magnolia 100% Fresh Milk	66.00	4.80	3.20	3.8 0	120.00	12.00	N/A	N/A	N/A	N/A	N/A	8.49	0.84
F&N MAGNOLIA Full Cream	65.00	5.40	3.40	3.3 0	66.00	6.60	N/A	N/A	N/A	N/A	N/A	5.99	0.59
F&N MAGNOLIA Low Fat	49.00	5.50	3.40	1.5 0	75.00	7.50	2.50	25.00	N/A	N/A	N/A	7.75	0.77
F&N Magnolia Super Slim Skim Milk	45.00	6.90	4.00	.10	137.00	13.70	N/A	N/A	N/A	N/A	N/A	6.99	0.69
FARM FRESH LACTOSE FREE LOW FAT MILK	44.30	4.30	3.40	1.5 0	133.00	13.30	N/A	N/A	N/A	N/A	N/A	9.05	0.90
FARM FRESH	65.00	4.30	3.40	3.8 0	130.00	13.00	N/A	N/A	N/A	N/A	N/A	10.4 0	1.04

ORGANIC MILK													
FARM FRESH SKINNY LOW FAT	44.30	4.30	3.40	1.50	122.00	12.20	N/A	N/A	N/A	N/A	N/A	8.60	0.86
FARM FRESH YARRA Full Cream	64.30	5.00	3.20	3.50	127.00	12.70	N/A	N/A	N/A	N/A	N/A	6.50	0.65
FARMHOUSE FRESH MILK	66.00	4.80	3.20	3.80	120.00	12.00	N/A	N/A	N/A	N/A	N/A	10.99	1.09
FARMHOUSE LOW FAT MILK	46.00	5.00	3.70	1.20	180.00	18.00	N/A	N/A	N/A	N/A	N/A	10.99	1.09
FARMHOUSE OMEGA LOW FAT MILK	46.00	5.00	3.70	1.20	180.00	18.00	N/A	N/A	N/A	N/A	N/A	10.99	1.09
Fernleaf Full Cream	67.00	6.00	3.30	3.30	110.00	11.00	2.50	25.00	N/A	N/A	N/A	6.65	0.66
Fernleaf Low Fat	46.00	6.00	3.30	1.00	130.00	13.00	2.50	25.00	N/A	N/A	N/A	6.65	0.66

Goodday Aussie Fresh Pasteurised Milk	66.00	4.40	3.40	3.90	126.00	12.60	N/A	N/A	N/A	N/A	N/A	7.99	0.79
Goodday Full Cream	66.00	5.40	3.10	3.60	150.00	15.00	2.50	25.00	N/A	N/A	N/A	6.80	0.68
Goodday Low Fat	49.00	5.60	3.40	1.40	150.00	15.00	2.50	25.00	.40	10.00	N/A	5.99	0.59
HENRY JONES AUST. ORGANIC A2 PROTEIN MILK	65.40	4.30	3.50	3.80	130.00	13.00	N/A	N/A	N/A	N/A	N/A	10.90	1.09
Lotus's Full Cream Milk	64.00	5.20	3.10	3.40	115.00	11.50	N/A	N/A	N/A	N/A	N/A	6.79	0.67
Lotus's Low Fat Milk	49.00	4.40	3.20	2.00	127.00	12.70	N/A	N/A	N/A	N/A	N/A	6.79	0.67
MaestroFarm Low Fat Milk	49.00	7.30	4.50	.20	150.00	15.00	N/A	N/A	N/A	N/A	N/A	9.00	0.90
MARIGOLD Full Cream Milk	61.00	4.90	3.00	3.30	100.00	10.00	1.20	12.00	N/A	N/A	N/A	5.99	0.59

MARIGOLD HL Low Fat Milk	51.00	6.20	4.20	1.0 0	150.00	15.00	2.30	23.00	.40	10.00	N/A	9.20	0.92
MARIGOLD Low Fat Milk	50.00	5.70	3.40	1.5 0	130.00	13.00	1.20	12.00	N/A	N/A	N/A	5.99	0.59
Meadow Fresh Low Fat Milk	46.00	4.80	3.50	1.5 0	130.00	13.00	N/A	N/A	N/A	N/A	.00	6.99	0.69
MILKLAB Full Cream	65.00	4.80	3.30	3.6 0	120.00	12.00	N/A	N/A	N/A	N/A	N/A	9.79	0.97
MILKY HOKKAIDO Pasteurized Full Cream	67.00	6.30	3.40	3.2 0	110.00	11.00	N/A	N/A	N/A	N/A	N/A	8.99	0.89
Nestle OMEGA plus	50.00	5.50	3.10	1.8 0	150.00	15.00	.60	6.00	N/A	N/A	N/A	9.40	0.94
nutrigen Low Fat Milk	56.00	7.70	3.00	1.5 0	161.30	16.10	N/A	N/A	N/A	N/A	N/A	8.99	0.89
nutrigen Whole Milk	66.00	5.20	3.10	3.7 0	103.60	10.30	N/A	N/A	N/A	N/A	N/A	6.20	0.62
Oldenburger Full Cream Milk	64.00	4.80	3.30	3.5 0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.15	0.81

PROMESS WHOLE MILK	65.00	4.80	3.30	3.6 0	120.00	12.00	N/A	N/A	N/A	N/A	N/A	7.20	0.72
Promex Full Cream	63.00	5.10	3.10	3.3 0	150.00	15.00	2.25	22.50	N/A	N/A	N/A	7.25	0.72

Table 4.1.2: Data Collection of Plant-Based Milk

Product Name	Type of Milk	Energy (kcal)	Carbohydrate (g)	Protein (g)	Fat (g)	Calcium (mg)	% DV Calcium (%)	Vitamin D3 (IU)	% DV Vitamin D3 (%)	Vitamin B12 (mcg)	% DV Vitamin B12 (%)	Fiber (g)	Price (RM)	Price/100ml (RM/100 ml)
137 Degrees Almond Milk Original	Almond	33.00	1.70	0.60	2.5 0	111.00	11.10	N/A	N/A	N/A	N/A	0.00	19.9 9	1.99
137 Degrees Almond Milk Unsweetened	Almond	33.00	0.60	1.00	3.0 0	111.00	11.10	N/A	N/A	N/A	N/A	0.00	19.9 9	1.99
ALMOND KOKA Original	Almond	43.00	6.30	0.90	1.6 0	N/A	N/A	N/A	N/A	N/A	N/A	3.20	15.9 9	1.59
ALMOND KOKA	Almond	33.00	3.80	0.80	1.6 0	N/A	N/A	N/A	N/A	N/A	N/A	3.20	15.9 9	1.59

Unsweetened														
FARM FRESH Almond Milk Original	Almond	53.00	5.00	1.30	3.10	130.60	13.00	N/A	N/A	N/A	N/A	N/A	14.00	1.75
FARM FRESH Almond Milk Unsweetened	Almond	41.50	2.10	1.30	3.10	130.60	13.00	N/A	N/A	N/A	N/A	N/A	14.00	1.75
marusan Original Almond Milk	Almond	37.50	3.55	0.70	2.25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	6.90	0.69
marusan Unsweetened Almond Milk	Almond	37.50	3.55	0.70	2.25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	8.05	0.80
So Good Almond High Protein	Almond	39.00	.30	4.10	2.30	120.00	12.00	N/A	N/A	.40	10.00	.30	14.99	1.49
So Good Almond Original	Almond	123.00	3.60	0.60	1.40	120.00	12.00	N/A	N/A	.40	10.00	.30	12.90	1.29

Thai coco Almond Milk	Almond	76.00	14.40	0.40	1.8 0	4.00	.40	.00	.00	N/A	N/A	4.40	19.9 9	1.99
UFC Velvet Almond Milk Original	Almond	35.00	3.00	0.80	2.1 0	103.00	10.30	N/A	N/A	N/A	N/A	.30	13.8 5	0.13
UFC Velvet Almond Milk Unsweetene d	Almond	24.00	.40	0.80	2.0 0	106.00	10.60	N/A	N/A	N/A	N/A	.30	13.8 5	0.13
Cheers Soya Bean	Soy	46.00	7.50	2.00	.90	N/A	N/A	N/A	N/A	N/A	N/A	.00	2.30	0.76
Delite Soy Milk	Soy	32.00	4.50	2.10	.60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.50	0.25
drinho SOYA BEAN MILK	Soy	45.00	5.30	2.30	1.5 0	N/A	N/A	N/A	N/A	N/A	N/A	.50	3.15	0.31
F&N SEASONS Minuman Kacang Soya	Soy	36.00	5.30	1.50	1.0 0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.39	0.23

FARM FRESH UHT SOY MILK ORIGINAL	Soy	58.00	6.60	3.90	1.80	96.50	9.65	N/A	N/A	N/A	N/A	1.00	9.60	0.96
HOMESoy No Sugar Added	Soy	39.00	2.30	3.00	1.60	120.00	12.00	1.13	11.30	N/A	N/A	.50	4.70	0.47
HOMESoy Original	Soy	44.00	5.10	2.30	1.50	N/A	N/A	N/A	N/A	N/A	N/A	.50	3.25	0.32
HOMESoy Soy Milk No Sugar Added	Soy	39.00	2.30	3.00	1.60	120.00	12.00	1.13	11.30	N/A	N/A	1.50	4.69	0.46
Joybean Soy Milk Original	Soy	50.00	6.50	2.00	1.90	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3.00	0.93
marusan Soy Milk	Soy	128.00	15.30	4.20	5.60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12.49	1.24
MIKO SOY MILK	Soy	41.00	4.80	2.10	1.50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.35	0.42
MILKLAB Soy Beverage	Soy	60.00	5.00	3.30	3.00	120.00	12.00	N/A	N/A	N/A	N/A	.50	7.45	0.74