

**CONSUMERS' KNOWLEDGE AND PERCEPTION ON
DIETARY FATS AND PALM OIL**

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**THIS DISSERTATION IS SUBMITTED TO THE SCHOOL OF FOOD SCIENCE AND
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ABSTRACT

CONSUMERS' KNOWLEDGE AND PERCEPTION ON DIETARY FATS AND PALM OIL

Dietary fats and palm oil are mostly consumed by people and found widely in cooking oil, butter, margarine and other related products. The objective of this study is to know consumers' general knowledge and their perception towards dietary fats. This also includes identifying consumers' knowledge and perception specifically on palm oil. There were 594 consumers who participated in this survey. This survey was carried out at K.K. Plaza, Wisma Merdeka, Kompleks Karamunsing and Center Point which are located in Kota Kinabalu city, Sabah. A set of questionnaire consisting of four parts were distributed to subjects for them to answer. Data analysis was carried out using SPSS software version 12.0. Data was analyzed through descriptive statistic, Chi-square and Spearman's rank order correlation coefficient. From the 12 questions regarding dietary fats on knowledge, 264 (44.4%) subjects answered 0 to 4 questions correctly, 216 (36.4%) subjects and 114 (19.2%) subjects correctly answered 5 to 8 and 9 to 12 questions respectively. For perception on dietary fats, 409 (68.9%) subjects were conscious of their amount of fat intake where 207 (50.6%) of them were conscious due to health reasons. Besides that, 172 (29.0%) subjects were concerned about the fat content of food products and 184 (31.0%) subjects choose to consume low fat content foods. Moreover, 440 (74.1%) subjects thought that eating high fat content foods can lead to overweightness. Subjects' knowledge towards palm oil showed that 287 (48.3%) subjects were able to answer 0 to 2 questions correctly whereas 207 (34.8%) subjects were able to answer 3 to 4 questions correctly and only 100 (16.8%) subjects were able to answer 5 to 7 questions correctly. In addition, 262 (44.1%) of the subjects thought that price was the most important factor when purchasing palm oil products. This includes 499 (84.0%) of them who were willing to purchase palm oil rather than other types of cooking oil and finally 124 (20.9%) of the subjects thought that palm oil was good for their health. To conclude, consumers' knowledge on dietary fats and palm oil were low in this study. Most of the subjects were conscious of their amount of fat intake daily and they were willing to purchase palm oil as their cooking oil.



ABSTRAK

PENGETAHUAN DAN PERSEPSI PENGGUNA TERHADAP LEMAK DIET DAN MINYAK KELAPA SAWIT

Lemak diet dan minyak kelapa sawit selalunya diambil oleh pengguna dan terdapat secara meluas dalam minyak masak, mentega, majerin dan produk makanan yang berkaitan. Objektif kajian ini adalah untuk mengenalpasti pengetahuan dan persepsi pengguna terhadap lemak diet secara umum. Ia juga bertujuan untuk mengetahui pengetahuan dan persepsi pengguna terhadap minyak kelapa sawit. Seramai 594 orang pengguna terlibat dalam kajian ini. Kajian ini telah dijalankan di K.K Plaza, Wisma Merdeka, Kompleks Karamusing dan Center Point yang terletak di Kota Kinabalu, Sabah. Satu set borang soal selidik yang mempunyai empat bahagian telah diedarkan kepada subjek untuk dijawab. Perisian SPSS versi 12.0 telah digunakan dalam kajian ini. Data-data ini dianalisa dengan menggunakan analisis statistik kekerapan, analisis khi kuasa dua dan ujian korelasi. Daripada 12 soalan mengenai pengetahuan lemak diet, sebanyak 264 (44.4%) subjek menjawab 0 hingga 4 soalan secara betul, 216 (36.4%) subjek dan 114 (19.2%) subjek menjawab secara betul 5 hingga 8 soalan dan 9 hingga 12 soalan masing-masing. Seterusnya bagi persepsi terhadap diet lemak, terdapat sebanyak 409 (68.9%) subjek yang mementingkan pengambilan jumlah lemak dengan 207 (50.6%) subjek disebabkan faktor kesihatan. Di samping itu, terdapat 172 (29%) subjek mementingkan kandungan lemak dalam produk makanan dan 184 (31.0%) subjek memilih untuk mengambil makanan yang mengandungi kandungan rendah lemak. Terdapat 440 (74.1%) subjek berpendapat bahawa pengambilan makanan yang mengandungi kandungan lemak tinggi dapat menyebabkan kelebihan berat badan. Bagi pengetahuan subjek berkaitan dengan minyak kelapa sawit, ia menunjukkan sebanyak 287 (48.3%) subjek dapat menjawab betul 0 hingga 2 soalan, manakala 207 (34.8%) subjek dapat menjawab betul 3 hingga 4 soalan dan hanya 100 (16.8%) subjek dapat menjawab betul sebanyak 5 hingga 7 soalan. Di samping itu, sebanyak 262 (44.1%) subjek berpendapat bahawa harga merupakan faktor yang paling penting dalam pembelian produk minyak kelapa sawit. Ia juga melibatkan seramai 499 (84.0%) daripada keseluruhan subjek yang rela untuk membeli minyak kelapa sawit daripada jenis minyak masak yang lain dan keseluruhannya, sebanyak 124 (20.9%) daripada jumlah subjek berpendapat bahawa minyak kelapa sawit adalah berkhasiat untuk kesihatan. Kesimpulannya, pengetahuan pengguna terhadap lemak diet dan minyak kelapa sawit adalah rendah dalam kajian ini. Kebanyakan subjek menitikberatkan jumlah lemak harian yang diambil oleh mereka dan biasanya mereka akan memilih minyak kelapa sawit sebagai minyak masak mereka.



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LIST OF SYMBOLS

>	More than
<	Less than
%	Percentage
mg	Milligram
cm	Centimeter
kg	Kilogram
g	Gram
ml	Mililiter
kcal	Kilocalorie
X ²	Chi-square value
&	and
P	Significant value at 5%
N	Total respondents

CHAPTER 1

INTRODUCTION

1.1 Introduction

Dietary fats are fats found in foods. Fats are macronutrients for humans, who need to consume less than 65g, requires 30% energy of daily reference value (2000 kcal) as recommended by the World Health Organization (WHO) (Ong & Goh, 2002). Fats are one of the essential nutrients of the human diet which are sources of energy in concentrated form. Fats supply about one fold energy compare to the same weight of protein and carbohydrate (Lawson, 1995).

The major fat in the diet for Malaysians is palm oil. Food Balance Sheets for Malaysia indicate that the per capita the palm oil consumption of Malaysians reaches approximately 17g/head/day which is probably the highest for the oil in the world. Palm oil is produced from the fruit of the *Elaeis guineensis* palm. It should be the preferred choice of food manufactures and consumers because of its nutritional benefits and versatility (Ong & Goh, 2002).

According to adequate amounts of essential fatty acids are required to maintain normal body function. However, intake of too much fat, in particular the wrong types of fats in the diet, will increase the risk of chronic disease. The health reports nowadays showed that peoples who are having a high fat diet are truly more prone to diabetes, high blood pressure and cardiovascular diseases (Grosvenor & Smolin, 2002). This stated



the importance of people's knowledge and perception about dietary fats and fat consumption in their diet. In Malaysia, more people are prone to health risk or diseases due to consuming high fat food products, therefore this survey was conducted to know the subjects' knowledge and perception on dietary fats in general. Besides that, consumers today were still not aware of the occurrence of palm oil towards health benefits, so this is part of the study that were being carried out as well.

In order to understand more about Malaysians' (particularly those in Kota Kinabalu area) knowledge and perception on dietary fat as well as palm oil, this survey was carried out in four crowded locations in Kota Kinabalu area. Those locations were K.K Plaza, Wisma Merdeka, Kompleks Karamusing and Centre Point, where the subjects were randomly selected.

1.2 Objectives

1. To know the consumers' general knowledge on dietary fats.
2. To know the consumer' general perception on dietary fats.
3. To identify consumer's knowledge and perception specifically on palm oil.



CHAPTER 2

LITERATURE REVIEW

2.1 Nutrients

The word 'nutrients' is derived from the term nutrition, which is a branch of knowledge dealing with body facts. Nutrients are essential for supporting the body's optimum health and regulating body processes, such as heart rate and digestion. It as nourishing substances in food those provide energy and promote growth and maintenance to the consumers' body (Drummond & Brefere, 2004). There are six classes of nutrient: carbohydrates, lipids, proteins, water, vitamins and minerals. Carbohydrates, lipids, proteins together with water are referred as macronutrients that amounts of required are measured in kg or g. Vitamins and minerals are which amount of required measured in mg and μg referred as micronutrients (Grosvenor & Smolin, 2002).

2.2 Lipids

Lipids are a class of compounds that are soluble in organic compound such as acetone, chloroform and ether but not in water (Drummond & Brefere, 2004). Lipids are found in the body and diet as phospholipids, sterols, fatty acids and glycerides. Each of them has their own structure and function (Grosvenor & Smolin, 2002).



2.2.1 Phospholipids

Phospholipids are lipids that attached to phosphate group. There are formed from four components: fatty acids, a negatively-charged phosphate group, an alcohol and a backbone. Phospholipids with a glycerol backbone are known as glycerophospholipids or phosphoglycerides. There is only one type of phospholipid with a sphingosine backbone; sphingomyelin. Phospholipids are a major component of all biological membranes, along with glycolipids and cholesterol (Grosvenor & Smolin, 2002).

2.2.2 Sterols

Sterols, or steroid alcohols are a subgroup of steroids with a hydroxyl group in the 3-position of the A-ring. They are amphipathic lipids synthesised from Acetyl coenzyme A. The overall molecule is quite flat. The hydroxyl group on the A ring is polar. The rest of the aliphatic chain is non-polar.

Sterols are important for the physiology of eukaryotic organisms. They form part of the cellular membrane where they modulate their fluidity and function and participate as secondary messengers in developmental signaling. Different organisms utilize different sterols. The most important ones are cholesterol, phytosterols, and some steroid hormones in animals, and campesterol, sitosterol and stigmasterol in plants (Vaclavik, 1999).



2.2.3 Fatty Acids

Fatty acid is a carboxylic acid (or organic acid), often with a long aliphatic tail (long chains), either saturated or unsaturated. Depending on the context, fatty acids may be assumed to have at least 8 carbon atoms, e.g., caprylic acid (octanoic acid). Most of the natural fatty acids have an even number of carbon atoms, because their biosynthesis involves acetate which has two carbon atoms. Industrially, fatty acids are produced by the hydrolysis of the ester linkages in fat or biological oil (both of which are triglycerides), with the removal of glycerol. Many studies have suggested that Saturated Fatty Acid raise Total Cholesterol, Low – Density Lipoprotein Cholesterol and High – Density Lipoprotein cholesterol, and that Poly Unsaturated Fatty Acid lower them (Hayes, 2002).

2.2.4 Glyceride

The main constituents of both animal fat and vegetable oils are glycerin molecules with three fatty acids attached, known as triglycerides. Triglycerides (also known as triacylglycerols or triacylglycerides) are the main constituent of vegetable oil and animal fats. They come mostly from fat in the diet or from carbohydrates eaten in excess of the body's need (Spiller, 2004). The chemical structure of triglyceride is $\text{CH}_2\text{COOR}-\text{CHCOOR}'-\text{CH}_2-\text{COOR}''$. Where R, R', and R'' are long alkyl chains; the three fatty acids RCOOH , $\text{R}'\text{COOH}$ and $\text{R}''\text{COOH}$ can be all different, all the same, or only two the same.

Chain lengths of the fatty acids in naturally occurring triglycerides can be from 3 to 22 carbon atoms, but 16 and 18 are most common. Shorter chain lengths may be found in some substances (butyric acid in butter). Typically, plants and animals have natural fatty acids that comprise only of even numbers of carbon atoms due to the way they are bio-synthesised from acetyl CoA, however bacteria possess the ability to synthesise odd- and branched-chain fatty acids (Grosvenor & Smolin, 2002). Consequently, ruminant animal fat contains significant proportions of branched-chain fatty acids, due to the action of bacteria in the rumen.

Most natural fats contain a complex mixture of individual triglycerides; because of this, they melt over a broad range of temperatures. Cocoa butter is unusual in that it comprises only of a few triglycerides, one of which contains palmitic, oleic and stearic acids in that order. This gives rise to a fairly sharp melting point, causing chocolate to melt in the mouth without feeling greasy.

2.3 Dietary Fats

Fats play a vital role in maintaining healthy skin and hair, insulating body organs against shock, maintaining body temperature, and promoting healthy cell function. Vitamins A, D, E, and K are fat-soluble meaning they can only be digested, absorbed, and transported in conjunction with fats. So fats are sources of essential fatty acids, an important dietary requirement. They also serve as energy stores for the body, where are broken down in the body to release glycerol and free fatty acids. The glycerol can be later converted to glucose by the liver and thus used as a source of energy. The fatty



acids are a good source of energy for many tissues, especially heart and skeletal muscle (Grosvenor & Smolin, 2002).

Nutritional fat is a mixture of many types of triglycerides, which differ in the length of their fatty acid chains, as well as the number and position of single and double bonds between their carbon atoms. Fat molecules contain only oxygen, hydrogen, and carbon atoms. In food, there are two types of fats: saturated and unsaturated.

2.3.1 Saturated Fats

Saturated fatty acids do not contain any double bonds or other functional groups along the chain. The term "saturated" refers to hydrogen, in that all carbons (apart from the carboxylic acid $[-COOH]$ group) contain as many hydrogens as possible. In other words, the omega (ω) end contains 3 hydrogens (CH_3-) and each carbon within the chain contains 2 hydrogens ($-CH_2-$). Saturated fatty acids form straight chains and, as a result, can be packed together very tightly, allowing living organisms to store chemical energy very densely. The fatty tissues of animals contain large amounts of long-chain saturated fatty acids (Grosvenor & Smolin, 2002). In IUPAC nomenclature, fatty acids have an -oic acid suffix. In common nomenclature, the suffix is usually -ic.

Some saturated fatty acids are Acetic (CH_3COOH), Butyric ($CH_3(CH_2)_2COOH$), Lauric ($CH_3(CH_2)_{10}COOH$), Myristic ($CH_3(CH_2)_{12}COOH$), Palmitic ($CH_3(CH_2)_{14}COOH$), Stearic ($CH_3(CH_2)_{16}COOH$), Arachidic ($CH_3(CH_2)_{18}COOH$).



2.3.2 Unsaturated Fats

Unsaturated fatty acids are of similar form, except that one or more alkene functional groups exist along the chain, with each alkene substituting a singly-bonded " $-\text{CH}_2-\text{CH}_2-$ " part of the chain with a doubly-bonded " $-\text{CH}=\text{CH}-$ " portion (that is, a carbon double bonded to another carbon). The two hydrogen atoms (H) that are bound to the doubly-bonded carbon atoms (C) can occur in a cis or trans configuration. A cis configuration means that the two hydrogen atoms are on the same side of the chain. Because of the polarization of the hydrogen atoms, the hydrogen atoms repel each other and cause the chain to bend. The more double-bonds the chain has in the cis configuration, the more bent it is. When a chain has many cis bonds, it becomes quite curved. For example, oleic acid, with one double bond, has a "kink" in it, while linoleic acid, with two double bonds, has a more pronounced bend. Linolenic acid, with three double bonds, forms a hooked shape (Drummond & Brefere, 2004).

A trans configuration, by contrast, means that the two hydrogen atoms occur on opposite sides of the chain. As a result, they don't cause the chain to bend much, and their shape is similar to the straight saturated fatty acids. In most naturally occurring unsaturated fatty acids, each double bond has $3n$ carbon atoms after it, for some n , and all are cis bonds. Most fatty acids in the trans configuration (trans fats) are unnatural and the result of human processing. The differences in geometry between these various types of unsaturated fatty acids, as well as between saturated and unsaturated fatty acids, plays an important role in biological processes, and in the construction of biological structures (such as cell membranes).



2.4 Source of Dietary Fats Foods

Both separated fats (eg. cooking oils, margarines, butter, shortenings, etc.) and unseparated fats (fats in the tissues of food) contribute to the total fat in our diet. In Malaysia, vegetable cooking oils form the main source of fat in habitual diets, contributing as much as one-half to two-thirds (13%-18% kcal) of the total fat which approximates 60-70 g. Unseparated fats from rice, vegetables and fruits, pulses and nuts, wheat products, and santan form another 4% kcal (10g), while the remaining 6% kcal (15g) or so are contributed by animal fats from eggs, chicken, beef, other meats, fish, anchovies and squid (Ng, 1995 & Ng, 1997).

Palm olein and its popular blends form the bulk of the cooking oils available at local retail outlets and supermarkets. As such, palm oil is the major fat in the diet of Malaysians. Food Balance Sheets for Malaysia indicate that the per capita palm oil consumption approximates 17g/head/day which are probably the highest for the oil in the world.

2.4.1 Saturated Fats

There are several kinds of naturally occurring saturated fatty acids, with their only difference being the number of carbon atoms, from 1 to 24. Some common examples of saturated fatty acids are butyric acid with 4 carbon atoms (contained in butter), lauric acid with 12 carbon atoms (contained in mother's milk, coconut oil, palm oil, and cocoa butter), myristic acid with 14 carbon atoms (contained in cow milk and dairy products),



palmitic acid with 16 carbon atoms (contained in meat), stearic acid with 18 carbon atoms (also contained in meat) (Drummond & Breferre, 2004).

Fat that occurs naturally in living matter such as animals and plants and that is used as food for human consumption contains a varying proportion of saturated and unsaturated fat. Foods that contain a high proportion of saturated fat are butter, ghee, suet, tallow, lard, coconut oil, cottonseed oil and palm oil, dairy products (especially cream and cheese), meat as well as some prepared foods.

Dehydrogenation converts saturated fats to unsaturated fats, while hydrogenation accomplishes the reverse. The 2005 Dietary Guidelines for Americans recommend that healthy people consume less than 10 percent of calories from saturated fats daily. Meats, baked goods, and full-fat dairy products are the main sources of saturated fats in most diets. Coconut, palm, and palm kernel oils also contain saturated fats (Drummond & Breferre, 2004).

2.4.2 Unsaturated Fats Foods Source

Monounsaturated and polyunsaturated fatty acids are unsaturated fats. When they replace saturated fats in the diet, they help reduce blood cholesterol levels and thus lower the risk of heart disease. The 2005 Dietary Guidelines for Americans recommend keeping total fat intake between 20 and 35 percent of calories with most fats coming from sources of polyunsaturated and monounsaturated fatty acids such as fish, nuts, and vegetable oils.



Canola, olive, peanut, high oleic safflower and sunflower oils, and nuts are rich in monounsaturated fats. Sources of alpha-linolenic and linoleic acids, which are unsaturated fats and essential, include vegetable oils, walnuts, and flaxseed.

2.5 Recommended Daily Fat Intake

There are long standing and consistent recommendations from numerous professional, clinical, and governmental groups to moderate dietary fat consumption. For optimal health one should avoid the extremes of too much or too little fat in the diet. This is because there are two fatty acids – linoleic acid (omega-6s) and linolenic acid (omega-3s) that cannot be made by the body and so must be supplied in the diet. These fatty acids, known as essential fatty acids, are needed in small amounts for many functions in the body such as growth and healthy skin, as well as protecting against certain diseases. Vegetable, nut and seed oils tend to be good sources of omega-6 fats, while oily fish is a great source of omega-3 fats, needed to prevent blood clotting, thereby lowering the risk of stroke and heart disease. In the other hand, the diet which contains too much fat will contribute to major health problems, e.g., coronary heart disease, cancer, stroke, diabetes, hypertension, and obesity. Too little fat may result in caloric deficiency, dry skin, decreased resistance to disease, irregular of lack of menses, muscle wasting, and retarded growth in young children.



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