VITAMIN SUPPLEMENT INTAKE, EATING PATTERNS AND LIFESTYLE AMONG WORKERS IN TEMERLOH TOWN, PAHANG

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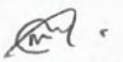

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ABBREVIATIONS

Abbreviation

US	United States
RDA	Recommended Dietary Allowances
FFQ	Food Frequencies Questionnaires
Etc	Et cetera
PUFA	Polyunsaturated fatty acids
IU	International Unit
Gla	Gama-carboxyglutamyl
ThDp	Thiamine diphosphate
Yr	Year
B2	Riboflavin
B6	Pyridoxine
B12	Cobalamin
AI	Adequate Intake
S.maxima	Spirulina maxima
EPA	Eicosapentaenoic acid
DHA	Docosahexaenoic acid
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization
UNU	United Nations University
FAO	Food and Agriculture Organization
CDC	Centers for Disease and Prevention

SYMBOLS & UNITS

Symbols

α	Alpha
β	Beta
£	US dollar
%	Percentage
p	Chi-square
r	Pearson coefficient

Units

mg	Milligrams
g	Grams
m^2	Meters in square
d	Density
µg	Micrograms
RE	Retinol equivalent
kJ	Kilojoules
Kcal	Kilocalories
lb	Labs

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CHAPTER 1

INTRODUCTION

1.1. Introduction

Rapid and marked socioeconomic advancements in Malaysia for the past two decades have brought about significant changes in the lifestyles of communities. These include significant changes in the dietary patterns of Malaysians, such as the increase in consumption of fats and oils and refined carbohydrates and a decreased intake of complex carbohydrates. This resulted in a decline in the proportion of energy from carbohydrates, while an increase in the percentage contribution of fat has been observed. Changes in meal patterns are also evident: more families eat out, busy executives skip meals, and the younger generation miss breakfasts and rely too much on fast foods. Many Malaysians have the mistaken belief that the consumption of vitamin and mineral supplements can make up for the lack of these nutrients in their daily diets. In addition, communities have become generally more sedentary (Tee, 1999).

There are popular misconceptions people have about vitamin supplements. First of all, their misconception is that multivitamin supplement could lower the homocysteine levels whereby blood levels of homocysteine above 6.3 causes a steep progressive risk of heart attack. Next misconception is

that they are natural. This is not true as we know that the most natural form in which a vitamin can be found is food. To get the vitamin or mineral into pill form requires many extraction processes and then condensation into a tablet that is far from natural. The next misconception is that a good supplement will meet all the nutritional needs. No such single supplement exists because everything we need could not fit into a gulp-size pill. In addition, many food factors that enhance absorption or have disease fighting properties are found only in food. For example phytochemicals, naturally occurring compounds in plant foods have been found to be cancer-fighting. Other nutrients and food factors may not have been discovered or identified yet. Supplement companies can put only the known nutrients into their pills (Ransley, Donnelly & Read, 2001).

To date, there are over 9,229 species of plants containing phytochemicals, which occur in ordinary food. Broccoli, for example, has about 34 phytochemicals. By relying on supplements, we may be missing out on some key nutrients. According to some new and exciting research it appears that the trace mineral boron is essential to humans. This mineral is most abundant in apples, pears, grapes, and many vegetables, but it is not commonly found in a multivitamin/mineral supplement (Piper, 1996).

It was believed that Vitamin C & Vitamin E appear to play a protective role in muscle cells by reducing associated oxidative damage to lipids, nucleic acids, and protein. The use of dietary antioxidants like vitamin E found in food or

in supplement form to reduce exercise induced muscle injury have met with mixed success. The nature of these results appear to reflect a diversity of factors including the antioxidant(s) tested, the nature and timing of the exercise, the age and fitness of the subjects, and the methodology for assessing oxidative stress (Sacheck & Blumberg, 2001).

Another popular misconception is that a healthy diet does not need vitamin supplements. Unfortunately, powerful advertising techniques can cultivate a nutritional inferiority complex in even the most rational person. Furthermore, there is the issue regarding the safety of vitamin supplement intake. Nutrients in high levels can be dangerous. For example, an epidemiologic study on elderly people in the United States suggested that there was an increase in the incidence of hip fracture with intakes of 1,500 to 2,000μg of retinol per day, which is approximately twice the current recommended dietary allowance (RDA) for adults (Penniston, 2003).

A lot of people feel that they would be 'better' if they took vitamin supplements. In fact, with a good diet, supplements are not necessary. It has been claimed that the intelligence of schoolchildren may be increased if vitamin supplements are given: well-designed trials have not confirmed this. Groups for whom supplements may be required include those with impaired absorption due to illness, those with increased needs due to illness or surgery, and in pregnancy.

Women who have had a child with neural tube defect require folate supplements (Piper, 1996).

Vitamin and minerals are micronutrients, but are considered small in comparison to macronutrients only because the body requires a small amount, not because they are any less important. Micronutrients and macronutrients work together as a team to run the body. Just as carbohydrates, fats, and proteins are essential to the body as energy- containing nutrients, vitamins and minerals are essential as activators, regulators, and providers in the many complex physiological activities, continuously taking place in our bodies. Theoretically, a normal, healthy individual consuming a variety of foods, in adequate amounts, can obtain all of the nutrients needed by the body from food, but for many people this can be different. Current research indicates that we may need more of some nutrients than previously thought-in terms of preventing some major diseases and degenerative conditions (Tribole,1992).

With so many misconceptions and uncertainty on intake of vitamin supplements among people with different eating patterns, ages, races, sexes and economic status, this research was timely and important. This study was attempted to determine eating patterns and lifestyles, of different levels of income, various ages, sexes and races.

1.2. Objective

1) To determine vitamin supplement intake among the professionals and non professionals.

2) Obtain the food & nutrient consumption of respondents through 24Hour recall method and FFQ and compare these with the Malaysian RDA.

3) To determine factors that reduce and encourage vitamin supplement intake and relationship between vitamin supplements intake with awareness, knowledge, perceptions, eating patterns and lifestyle of respondents.

CHAPTER 2

LITERATURE REVIEW

2.1. Nutrition: Concepts, Tools and Guidelines

2.1.1. Nutrition Defined

Nutrition is defined as nutrients obtained from food, a process by which an individual takes in food from the mouth, through the esophagus, stomach, small intestine, large intestine, all the processes involved in the utilization of food substances by which growth, repair, and maintenance of activities in the body as a whole or in any of its parts are accomplished including ingestion, digestion, absorption, and metabolism, assessment and dietary methods of nutrient consumption, and health related disease (Whitney & Rolfes,1999).

2.1.2. The Malaysian Dietary Guidelines & Recommended Dietary Allowances

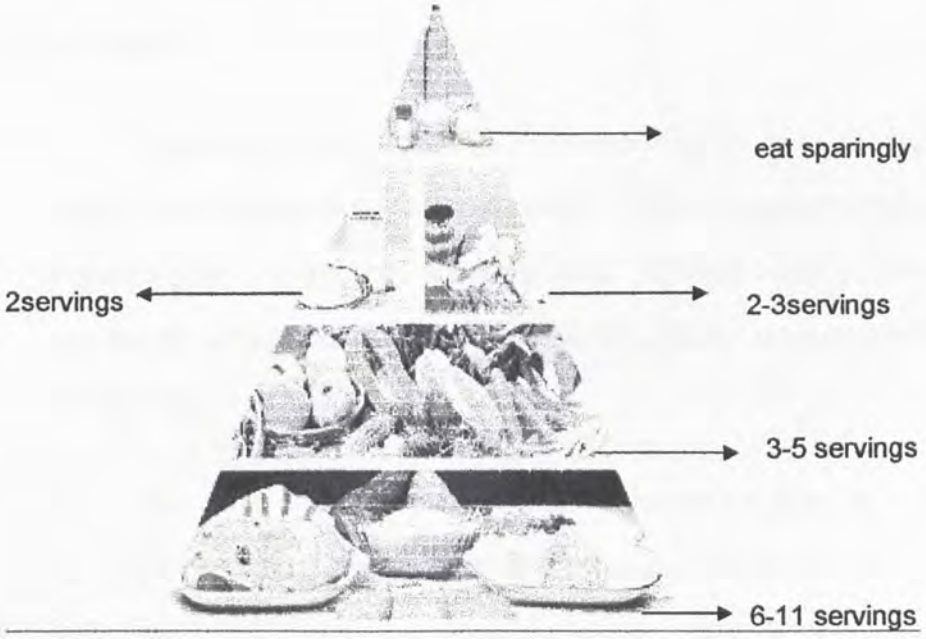
The Malaysian Food Guide Pyramid has 4 different levels and contains 5 major food groups that should be consumed in order to maintain a daily well balanced diet. Healthy people who eat a variety of foods using the Food Guide Pyramid should be able to obtain all the vitamins needed to maintain good health. At the bottom of the pyramid are groups of bread, cereals, rice and pasta, followed by groups of fruits and vegetables, groups of meat,

poultry, fish, eggs then milk, yogurt & cheese group. The tip of the food guide pyramid includes the fats, oils and sweets group which should be consumed sparingly (Nutrition Society of Malaysia, 2000-2005).

Table 2.1: Food groups and serving size.

Food groups	Serving size
Cereals and grains	6-11
Vegetables	3-5
Fruits	3-4
Meat and meat products	2-3
Milk and milk products	2
Oil and fat	Eat sparingly

Source: (Nutrition Society of Malaysia, 2000-2005).



Source: (Nutrition Society of Malaysia, 2000-2005).

Figure 2.1: Food Guide Pyramid.

RDA is the amount of dietary intake required to meet the body's nutrient needs. The value of RDA varies among different ages, sexes, and also depends on the body mass index (BMI) of individuals. Normally, boys or men would have a higher requirement of RDA as compared to girls or women. The table for RDA is different for various countries because it depends on the community's dietary intake, body mass index (BMI), basal metabolic rest (BMR), environment condition of the country, and also the lifestyle. The Malaysian RDA includes energy in kilocalories (kcal), protein, Calcium, Iron, Vitamin A, Thiamine, Riboflavin, Niacin, Folic acid, Vitamin B12 and Ascorbic acid. However, it is not complete and still lacking of several nutrients like fats, carbohydrates, Vitamin D, E and K and minerals. Refer to Table of Malaysian RDA in Appendix A (Nutrition Society of Malaysia, 2000-2005).

2.1.3. Nutrients

There are 6 major classes in nutrients, which are carbohydrates, proteins, lipids, vitamins, minerals and water. Each and every nutrient has its important role in maintaining a healthy body. Carbohydrates, proteins and fats provide energy, but carbohydrates are the primary sources (Whitney & Rolfes, 1999).

There are four main functions of carbohydrates besides providing energy. First of all, it acts in protein sparing action. When there are enough carbohydrates, they spare proteins for primary function of building and repairing body tissues. Carbohydrates aid in normal fat metabolism, whereby when there are sufficient carbohydrates, the body is protected from ketones produced during incomplete fat oxidation. Hence, carbohydrates also provide

fiber to our body. Each group of carbohydrate provides 4 Kcal (Whitney & Rolfes, 1999).

Proteins are the basic material of every body cell. It contains carbon, hydrogen, oxygen, nitrogen and some sulfur. Each group of protein provides 4 Kcal. Proteins are found in animal and plant based foods, examples are meats, fish, eggs, milk poultry and fish. The functions of proteins are to build and repair body tissue, regulate body functions, and also to provide energy (Whitney & Rolfes, 1999).

Fats provide energy and are essential for the functioning and structure of body tissues. It is a part of body membranes, protects organs and bones from injury, serves as insulation from cold and provides a feeling of satiety after meals. There are saturated fats, monounsaturated, polyunsaturated, hydrogenated and cholesterol. Each serving of fats provides 9 Kcal (Whitney & Rolfes, 1999).

Vitamins are organic compound that are essential to enable the body to use energy provided by fats, carbohydrates and protein. There are two types of vitamins; fat soluble vitamins (A, D, E & K) and water soluble vitamins (B, C & Folic acid). Whereas for minerals, they are inorganic elements that function to build body tissues, regulate body fluids or assist in body functions. Minerals are divided into major minerals (calcium, phosphorus, potassium, chloride, sodium, magnesium, and sulfur) and trace minerals (iron, iodine, selenium, copper, zinc, manganese, fluoride, chromium, and molybdenum) (Whitney & Rolfes, 1999).

Water constitutes from 50-60% of body weight. Functions of water are as a component of all body tissues, a solvent for nutrients and wastes,

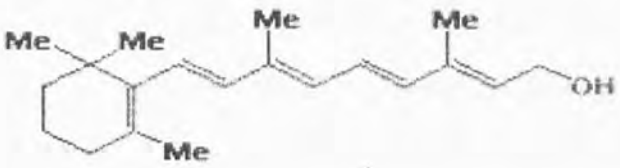
essential for hydrolysis and metabolism, lubricant of joints and digestion and help to regulate body temperatures (Whitney & Rolfes, 1999).

2.2. Vitamins

Vitamins are organic compound that are essential in small amounts for body processes. Vitamins themselves do not provide energy, thus enables the body to use the energy provided by fats, carbohydrates and proteins. Each vitamin has a specific function or functions within the body. Food sources of vitamins vary, but generally a well-balanced diet provides sufficient vitamins to fulfil body requirements. Vitamins are classified into fat soluble vitamins (A, D, E & K) and water soluble vitamins (B, C & Folic acid) (Whitney & Rolfes, 1999).

2.2.1. Fat Soluble Vitamins (Vitamins A, D, E and K)

Vitamin A consists of two basic forms, which is retinol that is the active form of vitamin A and carotenoids, the inactive form of vitamin A. The chemical name of vitamin A is retinol [3, 7-dimethyl-9- (2, 6, 6, trimethyl-1-cyclohexen-1-yl)-2, 4, 6, 8-natetraen-1-ol] (American Society of Nutritional Sciences, 2005).



Source: (Medicinal food news, 1997-2005).

Figure 2.2: Retinol.

Retinol is found in fatty animal foods such as liver, butter, cream, whole milk, cheese and egg yolk. Besides that, it is also found in foods such as low fat milk products, cereals that have been fortified with vitamin A, although these are not the best sources. Provitamin A, or beta-carotene is a carotenoid that is found in green leafy and yellow vegetables and fruits. The best sources are spinach, broccoli, pumpkin, mango and cantaloupe (American Society of Nutritional Sciences, 2005).

Table 2.2: RDA for vitamin A.

Gender	United States	Malaysia
Adult males	1000 ug Retinyl Equivalents (RE)/d;	750 ug RE.
Adult females	800 ug RE.	750 ug RE.

Source: (American Society of Nutritional Sciences, 2005).

The role of vitamin A in gene expression explains the anti-cancer and anti-acne effects of vitamin A. The presence of several nuclear binding proteins for retinoic acid as well as numerous controls on the metabolism and plasma transport of vitamin A provide an exquisite system for controlling the effects of vitamin A (American Society of Nutritional Sciences, 2005).

In addition, vitamin A is essential for maintaining healthy eyes and skin, for normal growth and reproduction, and for a healthy immune system. Besides that, it also helps in preventing infections of the nose, throat, and the gastrointestinal tract. However, it should not be taken in excess of the RDA as it will cause complications or intoxication (>200 mg RE) to occur (American Society of Nutritional Sciences, 2005).

Vitamin D3 (cholecalciferol) and vitamin D2 (ergocalciferol) are stored in body fat. Vitamin D (either vitamin D2 or vitamin D3) is metabolized in the liver to 25-hydroxyvitamin D and then to 1, 25-dihydroxyvitamin D in the kidney. The major functions of vitamin D are to increase the efficiency of calcium absorption and to mobilize calcium stores from the bones in order to maintain the serum calcium and phosphorus concentrations within the normal physiological range (American Society of Nutritional Sciences, 2005).

Table 2.3: RDA for vitamin D.

Age	RDA
0 - 12 months	1,000IU (25 µg)/day
51 - 70 years	400 IU (10 µg)/day
> 71 years	600 IU (15 µg)/day
Pregnant and lactating women,	2,000 IU (50 µg)/day.

Source: (American Society of Nutritional Sciences, 2005).

Good food sources are milk properly fortified with vitamin D, fatty fish such as salmon and mackerel, cod liver oil, fish liver oil, some breads and cereals, and some egg yolks. In humans, deficiency symptoms include rickets in children, osteomalacia in adults, muscle weakness, bony

deformities, muscle spasms of the larynx (laryngospasm) and hands (carpopedal spasm), generalized convulsions and tetany (American Society of Nutritional Sciences, 2005).

With that, young children suffering from vitamin D deficiency and develop rickets causes malformed bones and pain in infants, thus their teeth may be poorly formed, late in appearing and subject to decay. Osteomalacia in adults causes softening of bones and osteoporosis, that is brittle porous bones will occur if lack of vitamin D (American Society of Nutritional Sciences, 2005).

Vitamin E is an essential fat-soluble vitamin that includes eight naturally occurring compounds in two classes designated as tocopherols and tocotrienols. The most widely accepted biological function of vitamin E is its antioxidant properties. Vitamin E is the most effective chain-breaking, lipid-soluble antioxidant in biological membranes, where it contributes to membrane stability (American Society of Nutritional Sciences, 2005).

Table 2.4: RDA for vitamin E.

Gender	RDA
male	10 mg
female	8 mg

Source: (American Society of Nutritional Sciences, 2005).

The requirement for vitamin E increases with higher intakes of polyunsaturated fatty acids (PUFA). The recommended ratio of vitamin E to PUFA is 0.4 mg d-α-tocopherol per gram of PUFA. In defining the ideal intake, factors to consider are intake of other antioxidants, age,

environmental pollutants, and physical activity (American Society of Nutritional Sciences, 2005).

Vegetables and seed oils including soybean, safflower, and corn; sunflower seeds; nuts; whole grains; and wheat germ are the main sources of tocopherols. Leafy vegetables also supply an appreciable amount of this nutrient. However, animal products and most fruits and vegetables are generally poor sources (American Society of Nutritional Sciences, 2005).

Vitamin K_1 is called phylloquione, vitamin K_2 is known as menaquinone whereas a synthetic vitamin K is called menadoine. Vitamin K deficiency has been defined as a disruption of blood clotting due to diminished Gla (gamma-carboxyglutamyl) content of the vitamin K-dependent coagulation factors. Bleeding due to the lack of vitamin K is very rare in older children and adults, presumably, because vitamin K is produced by intestinal bacteria and a small fraction is absorbed from ileum and colon (American Society of Nutritional Sciences, 2005).

Table 2.5: RDA for vitamin K.

Age	RDA(µg/day)	Age	RDA(µg/day)
0-6 months	5	females 15-18 years	55
6-12 months	10	females 19-24 years	60
1-3 years	15	females 25 years and older	65
4-6 years	20	Pregnant and lactating women and males	15-18
7-10 years	30	19-24 years for males	70
11-14 years	45	25 years and older for males	80

Source: (American Society of Nutritional Sciences, 2005).

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