Nutritional concerns of a vegetarian diet among adolescents in Indonesia

Suyanto

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Nutritional concerns of a vegetarian diet among adolescents in Indonesia

A thesis submitted in partial fulfillment of the requirement for the degree of Master of Public Health

By
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Abstract

Background: In Indonesia, general opinion finds it is still hard to accept that vegetarianism is suitable for adolescence. Hence, the increase of popularity of vegetarianism among adolescents has raised a concern about possible risk to get nutritional deficiencies.

Objective: This thesis reviews available literature on nutritional concerns of vegetarian adolescents and links those with Indonesia context. Evaluation of this topic is aimed to improve Indonesian adolescent health status and to strengthen Indonesia Vegetarian Society activities on vegetarian promotion in the future.

Methodology: Review of journal papers was conducted. Literature was obtained from Pubmed database and KIT library as well. While Web based document was explored by using Google search engine. For complementing the result of studies, my direct observation during living with vegetarian adolescents was used.

Results and Conclusions: In principle a well planned vegetarian diet appears to neither lead to deficiencies nor harmful effects on the growth and development in adolescence. Iron, protein, calcium, zinc, fatty acid and vitamin B12 were highlighted as the critical and key nutritional needs for them. Those nutrients can be obtained appropriately when adolescents follow Vegetarian Food Pyramid. However, lack of nutrition information, resistances from doctors and lack of support by parents which is experienced by some of Indonesian adolescents could potentially lead to nutritional deficiencies and effect on growth and development. Hence Indonesia Vegetarian Society, Ministry of Health, and other stake-holders responses and measures to raise stake-holder's awareness is needed.

Keyword: Adolescents, Indonesia, nutritional status, vegetarian

Abbreviation and acronyms

AA	Arachidonic Acid
ACC/SCN	Administrative Committee on coordination/sub-committee on nutrition
ADA	American Dietician Association
ALA	Alpha-Linolenic Acid
BMI	Body Mass Index
CED	Chronic Energy Deficiency
DHA	Docosahexaenoic Acid
EAA	Essential Amino Acid
EPA	Eicosapentaenoic acid
FAO	Food Agriculture Organization
IDG	Indonesia Dietary Guidelines
IDA	Iron Deficiency Anemia
IMH	Indonesia Ministry of Health
INN	Indonesia Nutrition Network
ITS	Iron Tablet Supplementation
IVS	Indonesia Vegetarian Society
IVU	International Vegetarian Union
KIT	Koninklijk Instituut Voor de Tropen
LA	Linoleic Acid
MDG	Millenium Development Goal
MLA	Meat Livestock Association
MoH	Ministry Of Health
NHHS	National Health and Household Survey
NCD	Non Communicable Disease
PCRM	Physician Committee for Responsible Medicine
RDA	Recommended Daily Allowance
SARS	Severe Acute Respiratory Syndrome
SUSENS	Socio economic surveys

UK	United Kingdom
UNDP	United Nation Development Program
USA	United States of America
USDA	United States Department of Agriculture
US-NIH	United States National Institute of Health
VRG	Vegetarian Resources Group
WHO	World Health Organization
WHO-EMRO	WHO- East Mediterranean Region Office
WHO-SEARO	WHO-South East Asia Region Office

Chapter I. Introduction

I am a Medical Doctor from Indonesia and now working on National Education Department as public health lecturer. Additionally, I also have been involved voluntary on Indonesia Vegetarian Society (IVS), Pekanbaru branches for 5 years.

Since last decade, the number of vegetarians has increased steadily in Indonesia. It indicates more conscious about their health. However, the increase of popularity of vegetarianism has raised many concerns about health impact particularly in adolescents because of their high nutritional requirements and doctors generally are prejudiced against vegetarian diet for adolescents. In addition, I realize that vegetarian adolescents have lack of access to information which makes them vulnerable on health.

To address these issues, I review the literature of studies conducted on adolescent vegetarian about nutrient requirements and vulnerabilities. I hope this study can help IVS in its effort to give information about nutritional aspects of adolescent vegetarian. Further, at my place of work, I will propose to my department that vegetarian nutrition could be taught in medical school.

Chapter II Background Information of the Country

2.1. Indonesia General Information

2.1.1. Geographic

Indonesia is an archipelago in South East Asia consisting of 17,000 islands and straddling the equator. The largest islands are Papua, Kalimantan, Sumatera, Sulawesi and Jawa. As an archipelagic country, the transportation and communication requirements are vital and this will carry the height of the operational cost in the implementation of health and development. Additionally, the cross-road position between big countries in the world can bring negative impacts toward public health with the possibility of entry of various diseases from outside world as happened on Severe Acute Respiratory Syndrome (SARS) cases on 2002.

Predominantly mountainous and the meeting point of 2 active volcano belts, Indonesia has potentially to have earthquakes and even tsunami likes happened in Aceh. This condition makes Indonesia vulnerable for natural disaster threatening the social life.

Typically, Indonesia is characterized by two tropical seasons, dry and rainy. During September to April was rainy season. The rainfall was about 700mm–7000mm per year. However, Indonesia temperature is quite high (26ºC - 28ºC) with humidity was around 70% to 90%. This condition is an ideal reservoir for the reproduction of various vectors and pathogens (cited in MoH 1999).

2.1.2. Demographic

With a population of 222 million people in 2006, Indonesia is the fourth largest country in the world. About 55.07% of the population is the adult population (15-49 years old) while children under five comprised 8.88% of the total population. The total population is projected to reach 280 million in 2025 with an annual growth of 1.35% (Bappenas 2005). However, expected the growth will turn down to 0.92% in 2025 because the declining of fertility rate is faster than the declining of mortality rate. The growth of population is also signaled by the change in age structure of the population where there is a shift from young population age structure to old population age structure (Bappenas 2005).

2.1.3. Religion and Culture

Bhinneka Tunggal Ika or Unity in Diversity is Indonesia motto. There are more than 300 ethnic groups living in the whole archipelago and nearly every ethnic has its native languages. However, Bahasa Indonesia is the official language. Indonesia has the largest Muslim population (88.58%) in the world, while other religion are Protestant (5.79%), Roman Catholic (3.07%), Hindu (1.73%), Buddhist (0.61%), Kong Hu Chu (0.10%) and other (0.11%) (Bappenas 2005).

2. 1.4. Political system and current situation of Indonesia

Indonesia is a unitary state in the form of republic based on Pancasila, as an ideal base, and 1945 Decree, as a constitutional base. The President, as the head of the country and the head of government, is the one who holds the highest executive and was elected directly by people.

Administratively, Indonesia was divided into 33 provinces. It consists of 349 districts and 91 municipalities, 5,263 sub districts and 69,929 villages. With the implementation of the Act No. 22 year 1999 about Regional Governance and Act No. 25 year 1999 about Economic Balance between Central and Regional Governments, it is an opportunity for the regions to implement development including development in health sector (MoH 1999).

2.2. Indonesia Health Profile

2.2.1. Health Policy and System

The vision of Indonesia health development is to improve people awareness, willingness and capability for a healthy life. For achieving this purpose, president issued President's Decree No. 7/2005 covers improving access to public services. The target is increased life expectancy at birth, decreased infant mortality rate and maternal mortality rate and nutritional status improvement (cited in MoH 2006).

It is realized that it is difficult to reach that target without contribution from non-health sector development as well as community roles. Therefore, to reach the highest public health status, government

encourages community empowerment. The collaboration with other sectors and all partners including the private sectors and general community is done to ensure the achievement in the health development.

Indonesia has health facilities which consist of:" a) 987 hospitals (government, army, state owned enterprise and private; b) 32,955 primary health facilities (health center, sub health center, mobile health center) and c) 267,883 community based health facilities (integrated service post, maternity post and drug post)" (Atmarita 2005). However, these facilities were not distributing equally because of geographic and demographic variation.

2. 2.2. The Major Health Problems

Hunger and under nutrition in children is the problem in Indonesia, especially for the poor. Infectious diseases like TB and Malaria exacerbated by malnutrition are still major devastating problems. Indonesia neonatal mortality rate is higher than WHO- South East Asia Region Office (SEARO) Region countries, although mortality in children 1-4 years old has substantially declined. Diarrhea and pneumonia are major causes of under five mortality deaths (MoH 2005). Preterm births account for almost one-third of neonatal death

Historically, infectious diseases were the main causes of mortality in Indonesia. However, in the last few years, the emerging in the prevalence of Non-Communicable Diseases (NCD) is considered as significant public health problems. National health and household survey 1980 to 2001 estimated the proportional mortality due to NCD increased from 15.41% (1980) to 48.53% (2001) (Atmarita 2005).

2.2.3. Dietary patterns and lifestyle factors affecting health

The information for dietary patterns in Indonesia could be considered from Socio economic surveys (SUSENS) (Atmarita 2005). The data showed that the quality of food consumption is still unbalanced. The higher proportion of cereal consumed explains that poverty is one of major issues to cause malnutrition The consumption of fruit and vegetable is low only 40 and 37 kg per capita per year respectively; it is lower than FAO recommendation 65.75 kg (Siswono, 2003). In addition, there is tendency of increased meat and prepared food consumption from year 1995 to 2003 which may be explained by a tendency of people eating out.

The information for physical activity is very limited for Indonesia. SUSENS data showed only 19% urban population do regular physical activity[1] and 17% for rural population. Another issue for life style is smoking. Data showed the prevalence of smoking among male adults exceeds 40 percent smoking. The household expenditure for cigarette amongst smokers increased from 9.3% (1995) to 13.15% (2003) (Atmarita 2005).

2.3. MDG Achievement

Since ratified MDGs summit on 2000, Indonesia has made significant progress towards attaining the Millennium Development Goals (MDGs). The development goals and indicators of the Medium Term National Plan 2004-2009 and the National Poverty Reduction Strategy are in line with the MDGs as shown the National Community Empowerment Programme policy for creating the job for thousands of Indonesians living in rural, and the Social Safe Net for giving the guarantee for the poor to access health and education services.

According to World Bank Report, Indonesia is classified as a 'middle-income' country with the Gross National Income per capita was US $1,420/year on 2006. Since 6 years, there has been stability in macro economic situation which is reflected by growth rate of Gross Domestic Products of 6.3% in 2007. The growth economic contribute to improvement rank of Human Development Index from 117 in 2003 to 108 in 177 countries in 2007, but still among the worst in South-East Asia. The national poverty rate is 16.6% in 2007. This means that more than 37 million people are poor. In achieving MDG target in poverty reduction, government aims to reduce the poverty to 7.5% by 2015 (Bappenas 2007).

One of the obstacles in achieving national MDG targets is how to implement them at province and district level given the capacity in local human resources. Hence in the future more resources need to be allocated for addressing capacity issues at the local level. In addition, the current situation of the impact of oil price rise could be hindering Indonesia in achieving MDG targets.

[1] SUSENS asked people over 10 years old if they do physical activity more than 30 minutes everyday besides their regular activities.

Chapter III Problem statement, Objectives and methodology

3.1. Problem Statement

Nutrition status in adolescence[2] is one of health aspects that need attention. Adolescents live in a critical life phase that can impact on their dietary habits affecting both nutrient intake and needs. Several nutrients are at greater deficiency risk mainly iron, calcium and protein during this period (WHO 2005).

Chronic Energy Deficiency (CED) and Iron Deficiency Anemia (IDA) remain the most devastating problems facing the Indonesian adolescents. The available data from National Health and Household Survey (NHHS) showed among younger women (15- 19 year), the prevalence of risk of CED[3] was 35 % and the prevalence of CED[4] was 22%. Meanwhile about 45.8.% of the male and 57.1% of the female on age group 10-14 and about 58,3% of the male and 39.3% of the female on age group 15-44 were IDA[5] (MoH 2005). In spite of CED and IDA problems, over weight and obesity in adolescence is also seen in Indonesia (Atmarita 2005). The NHHS data showed the rate of overweight (BMI > 25) among young people at age 18- 24 year are 5 % in male and 8 % in female. The increasing of obesity in adolescents will lead to increasing on some Non-Communicable Diseases (NCD) prevalence like diabetes, dislipidemia, obesity, cardio vascular disease and so on.

So far, Indonesia made an effort to carry out the nutritional improvement program by publishing the current Indonesia Dietary Guidelines (IDG) (MoH 2002), and promoting about balanced diet in schools (Bappenas 2002). The aim of these guidelines is to make one

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[2] "Use and meanings of the terms 'adolescents', 'youth', and 'young people' vary in different societies around the world, depending on political, economic and socio-cultural context. A distinction is drawn by WHO/ UNFPA, Adolescents as 10-19 year olds (early adolescence 10-14 and late adolescence 15-19), Youth as 15-24 year olds and Young People as10-24 year olds." In this thesis adolescents are defined by following WHO/UNFPA definition.

[3] The prevalence of risk of Chronic Energy Deficiency is measured on reproductive women by using mid arm circumference length with cut-off point < 23.5 cm

[4] The prevalence of CED on reproductive women is measured by using body mass index with cut-of point BMI <18.5)

[5] Iron Deficiency Anemia is situation where hemoglobin concentration is below the normal standard. For women the cut- off point is 12 gr % and for men is 14 gr %.

to get ideal nutritional status and have good nutritional behavior by consuming balanced diet. This diet provides the right balance of carbohydrate, fat and protein to reduce risks for chronic diseases, and those are obtained from a variety of foods that are available (MoH 2002).

In current year, vegetarianism has become increasingly popular among people including on adolescents in western countries since 1990s (Larrson 2002, Thane 2003, MLA 200?). For adults, health concerns have been indentified as main motivation for vegetarian (Fox and Ward 2008), for adolescents the main reasons to become vegetarian are ethical concern and keeping of body weight (Larrson 2002, Ryan 1997). This happened maybe as Sabate (2003) assert "vegetarian diet are viewed more as improving health than as causing disease, in contrast with meat based diet".

Yet, there is no study both on number and motivation to become vegetarian and on impact of vegetarian diet to Indonesian adolescent health status. However, from my experience there seem to be a trend of escalating numbers of vegetarians in adolescence because of religious reasons.

The growing of vegetarianism in Indonesia has attracted Indonesia Ministry of Health (IMH) to know more about this diet. On the welcome speech of IMH on the South East Asia Vegetarian Congress in Jakarta on May 2008, government hoped that Indonesia Vegetarian Society (IVS) could help to give nutrition education to community and contribute to reduce NCD prevalence. On the other hand, IMH also warned that people on the growth and development period, like to the pregnant women, baby, child and adolescence, need a variety of food from animal and vegetable sources for reaching the optimal growth (INN 2008).

In the fields, there is less special concern about nutrition for vegetarian adolescents from doctors in Indonesia. Very few doctors accept vegetarian diets as a healthy option. There is an opinion that because of not eating meat, vegetarian diet would caused under nutrition and anemia. Accordingly this diet is not suitable on adolescence. In addition, when talking with me, some adolescents also complained that they got the pressure not only from surrounding likes their parents who were alarmed about their health but also the feel insecure due to lack of information about health and nutrition.

Therefore, this thesis analyzes about nutritional aspects of a vegetarian diet in adolescence and its possible risk to get nutrient deficiencies and disturb the growth and developments. Evaluation of this topic is essential as it can help adolescents to reduce the possibility of health problems and to strengthen IVS programs about vegetarian promotion in the future. Widely, it can contribute in achieving the better nutritional status in Indonesian adolescents and MDG targets as well. Further from public health perspective, I hope it also can improve the global population health since there are many people choosing vegetarian diets in the world.

3.2. Objectives

3.2.1. General Objective:

To explore nutritional aspects of a vegetarian diet on adolescents in the Indonesia context

3.2.2. Specific Objective:

1. To describe the characteristics, the distribution and the practices of vegetarian in Indonesia

2. To review adolescence nutrition requirements and vulnerabilities from perspective of vegetarianism

3. To formulate recommendation for improving the nutritional and health status of adolescents vegetarian in Indonesia

3.3. Methodology

3.3.1. Data Collection and Analysis Technique

To achieve the above-mentioned objectives, the study collected data from a number of literature sources like:

(i) The previous studies related to vegetarianism published in journal; Data was collected through library and electronic search engines. KIT library were used to obtain the literature. Meanwhile Pubmed were searched for electronic journals.

(ii) International and national policies about adolescent and vegetarianism; Here with I explored web-based document using Google search engine including websites of FAO, WHO, IVU, ADA , MoH.

(iii) Documented paper learnt about vegetarianism campaign and service provision in Indonesia. Here with I got from Indonesia information sources published by IVS.

All publications obtained from these sources will be reviewed for getting relevant data. The data comprised: basic nutrient requirement for adolescence, possibility health problems related to vegetarian diet and nutritional aspect of vegetarian diet.

Key word used: Adolescents, dietary intake, Indonesia, Iron deficiency anemia, nutritional status, vegetarian, protein, growth and development.

Limitation of study

The main difficulty in this study is very few Indonesia studies both on nutritional status of vegetarian adolescents and vegetarians in general as well. Most of studies about vegetarianism were obtained from abroad research. So for complementing the result of studies, my direct observation during living with vegetarian adolescents was used. However, even though I am a member of IVS, but I try to be objective when analyzing the data.

Chapter IV Becoming Vegetarian

4.1. Vegetarianism in General

4.1.1. Definition of vegetarian

People may have the incorrect usage towards the understanding of the vegetarian. They consider the vegetarian term came from words vegetable[6] so as many people have a negative image of a vegetarian diet, at first for the person who was used to eat meat in the their menu. According to International Vegetarian Union (IVU 2008), "vegetarian come from a latin word 'vegetus' that was meaning fresh and lively". This perspective is referred in the benefit of the vegetarian especially if being seen from the aspect of the health.

Although vegetarian diet focuses on plants for food including fruits, vegetables, dried beans and peas, grains, seeds and nuts, small amounts of egg or dairy products are also included. Hence, vegetarian diet can be categorized as lacto-ovo-vegetarian, lacto-vegetarian, ovo-vegetarian, and vegan (IVU 2008). Beyond those categories, there are a group of people who still eat poultry or fish, but not red meat. The term used to describe these groups is semi-vegetarian (Melina and Davis 2003).

Table 1. The Classification of Vegetarian Diet

Type of vegetarian diet	Food criteria
Vegan	Avoid all animal derived foods (including milk, other dairy product, poultry, fish and other seafood)
LactoVegetarian /ovovegetarian	Ovo vegetarian include eggs but avoid milk and other dairy products, fish and other seafood. Conversely, lactovegetarians include dairy exclude eggs and other animal derived product
Lacto ovo vegetarian	Includes milk, other dairy products and egg; Avoids meat, poultry and seafood

Sources: Classification of various vegetarian diets (Barr Susan and Rideout Candice, 2004), with little modification

[6] According to o*nline Etymology Dictionary,2001 Douglas Harper,* vegetarian is irregular formation from vegetable (n.) + -arian, as in agrarian, etc.

4.1.2. The prevalence of vegetarianism in the world

There is a growing of a number of vegetarian in Western countries and Asia. Results survey conducted by Vegetarian Resources Group (VRG 2003) reported that in 1997 was received 1% of the American inhabitants was the vegetarian. This figure increased to 2.5 % during 2000 and aproximately 2.8% of American adult population (5.8 million people) in 2003 followed a vegetarian diet. News pool survey during 2000 reported 2% of the Australian inhabitants were vegetarian (cited in Susianto, 2008) Meanwhile in Canada estimated 4% of adult population choosing vegetarian life styles (ADA Report 2003). In Netherlands estimated during 1998 about 1% of population was vegetarians but, about 6% mentioned that they ate meat less once a week (Dagnelie 2003). In Taiwan the Council of Agriculture (cited from Taiwan Review, 2008) estimated vegetarians account for 14 percent of Taiwan's population (3.2 million) and estimated 20-42% of India population declared as vegetarian (USDA 2001).

4.1.3. The Vegetarian motivation

For many people, being vegetarian is more than just a preference (Rice, Pamela 2003); it is a way of life. People do so for "upholding religious reason, promoting reverence for life, protecting the environment, supporting personal health" (Melina and Davis 2003) or a combination of the above. Concern with health and compassion for animal are common reason to eliminate meat from ones diet (Reed 2008). These factors also are making differentiation between groups of vegetarian and non vegetarian as Rozin found vegetarian are more conscious about health and moral issues than non vegetarian (Rozin cited in Wilson et al 2004).

History noted that vegetarianism has been evident in religious and culture all over the world (IVU 2008). It was practiced among religious group such as Hinduism, Buddhism and Christian. Famous people like Phytagoras and Mahatma Gandhi all chose vegetarian as a part of efforts to sustain humanity. Even before 1841, the people who ate vegetables called as Phytagoreans (IVU, 2008).

Although still many people who considered the vegetarian was identical to the Buddhist religion, evidently the vegetarian term was personally introduced by a Christian clergyman during 1842. There is

difference between Budhism and Christian on vegetarianism view, "the Eastern religion base their dietary choice on principle of compassion for all living being, while the Seventh– day Adventists promote vegetarianism on the basis of its benefit to human health" (Melina and Davis 2003)

Supporting personal health is a reason to become vegetarian. The advances in nutrition research indicate that vegetarian diet contributes to human health; Diets largely based on plant foods could prevent nutrient deficiencies and reduce risk of diet-related chronic diseases like hypertension, Coronary Heart Disease, type 2 Diabetes, obesity and cancer (Philips and Segasothy 1999). Further, Sabate (2003) on his review to main themes on vegetarian nutrition published in journal between 1966 and 1995 concluded that "diets largely based on plant food, such as well balanced vegetarian diets, are viewed more as improving health than as causing disease, in contrast with meat based diet".

In current years, people realize vegetarian diet is beyond health; it is a lifestyle of their effort to protect the planet (Reed 2008). Although their main reason for becoming vegetarian were not environment considerations, but they became much interested in the environment after becoming vegetarian. For example related with global warming and food crisis facing the world now[7], Italian Vegetarian activists sent the proposal to FAO that we need more plant based food instead of meat for providing enough food and preventing the hunger mainly in poor countries (Moriconi et al 2002). On July 2008, "the vegetarian lobby has seized on the UK Cabinet Office's suggestion that an environmentally responsible diet should contain less meat and dairy products" (Meat Info 2008).

4.1.4. Vegetarian Food Pyramid

In the past, there was misconception about vegetarian diet. People assumed that this diet is deficient in nutrients mainly protein, iron and vitamin B12 (Sabate 2003). This condition occurred perhaps vegetarians did not practice the well balanced diet. Plenty of studies have demonstrated that the observed deficiencies were usually due to

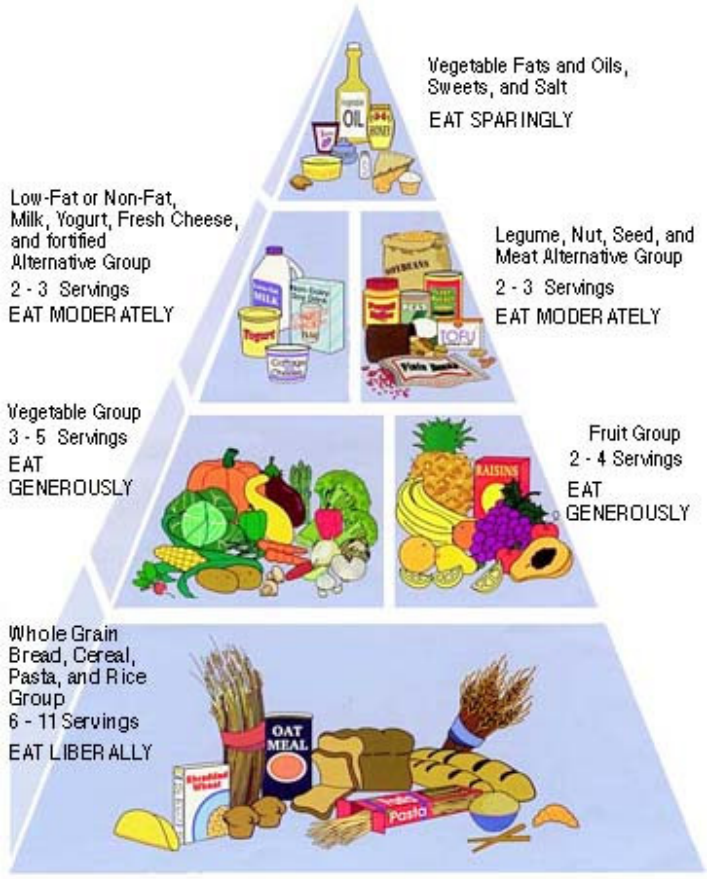
[7] Dr Niek Koning of Wageningen University said "the drought (related with global climate change) and increasing demand of meat in Asia is reasons for the rising food prices". FAO predicted that for producing 1 Kg meat spent more land and water than 10 kg plant food. As much as 38% of the world's grain harvest and more than 90% of the world's soybeans go to feed animals that we later eat.

poor meal planning (Leitzmann 2005). However, today vegetarian is more accepted as a healthy and feasible diet. The position paper on vegetarianism of the American Dietetic Association states that: "It is the position of the American Dietetic Association and Dieticians of Canada that appropriately planned vegetarian diets are healthful, nutritionally adequate, and provide health benefits in the prevention and treatment of certain diseases". Further this diet is suitable for all of age groups (ADA reports 2003).

There is no single food that provides all of the nutrients. Hence variety of kind of food is crucial. For helping vegetarian in choosing diets that meet the nutritional recommendation, vegetarian diet pyramid[8] can be used as guidelines.

Figure 1, Vegetarian diet pyramid

[8] The Third International Congress on Vegetarian Nutrition on 1997 has released the Vegetarian Food Pyramid. Unfortunately, there is no vegetarian food pyramid is used for Indonesia context.



Sources: Vegetarian food pyramid (VegSource.com, 2008)

Melina and Davis (2003) in their book *The new becoming Vegetarian* have described the practical pointers about designing the diet by using Vegetarian food guide.

- "Eat a wide variety of foods from each group
- Be moderate in your intake of concentrated fats, oils, and added sugars, if used
- Aim for an hour of physical activity each day
- Drink six to eight glasses of water and other fluids each day"

By following this guide, vegetarians can learn about a wide variety of the food and make assessment of their diet. However, as diet becomes more restrictive as in the cases of vegans, it may be more difficult to get all the necessary nutrients (Asok 2003). A vegan diet, for examples, eliminates food sources of vitamin B12, as well as milk products, which are a good source of calcium.

4.2. Vegetarianism in Indonesia

4.2.1. Indonesia Vegetarian society (IVS)

One of organizations that promote vegetarianism throughout the world is International Vegetarian Union (IVU). The idea of IVU originally came from England Vegetarian Society which was a nonreligious organization founded in 1847. The movement spread to continental Europe and the USA (1850) and in 1908 the IVU was founded in Dresden. IVU has several branches in entire of the world including Indonesia and on July 2008 IVU took 38th congress in Dresden (IVU 2008).

On August, 08, 1998, Indonesia Vegetarian Society (IVS) was established for accommodating the Indonesian people choosing vegetarian life style (IVS 2008). Today, this organization has 45 branches spread in all of big and medium city in Indonesia. IVS claim its organization is the first vegetarian organization in Indonesia and was registered on IVU. The membership of IVS was opened for all of the community levels, even though a majority of IVS member is Budhist. In spite of IVS, there are several others vegetarian organization or community practicing vegetarian in Indonesia, like Indonesia Vegan Society, Brahma Kumaris and Seventh day Adventist.

IVS aimed at distributing love to all creatures, spreading information of vegetarianism, and saving the planet with a plant based diet. For achieving that mission, IVS have done various activities like vegetarian nutrition seminar, food bazaar and published vegetarian book. On May 2008, Indonesia became the host of South East Asia Vegetarian Congress, and next year (2009) as the host of Asia Vegetarian Congress and on 2010 as the host of International Vegetarian Union Congress. The others activity is a celebration of the World Vegetarian Day which takes every year on 1st October, *The World Vegetarian Day*. Also every year on 25th November, *The Meatless Day*, this organization makes the campaign to ask the person to make the commitment become the vegetarian for a day and if enabled at the same time, making them becomes the member of IVS. In current year, IMH welcomes the IVS activities on nutrition education about vegetarianism and there is a plan to develop a join program to enhance people awareness about food balanced consumption (INN 2008).

IVS diet policy now is to encourage its members to choose lacto ovo vegetarian. To arouse the interest of the community in becoming the

IVS member, organization gave new members several books about health benefit of vegetarianism and vegetarian cooking guidelines. The members also have the right to get a price discount in IVS partner restaurants and in Medika Griya Hospital by showing their member cards. Every three months, IVS publishes the paper, Info Vegetarian, as information media for the members.

4.2.2 Distribution of Followers and Practice of Vegetarianism in Indonesia

4.2.2.1. Followers of Vegetarianism

The number of vegetarians in Indonesia is not known exactly, but the number increases. This could be seen from the flourish of vegetarian restaurant in several cities in Indonesia which became as IVS partner. Moreover there are several hospitals such as Medika Griya or Advent Hospital which maintains the vegetarian menu both for its patients and staff, in an effort to incorporate holistic health principles in the treatment of disease (The Jakarta Post 2002).

Estimated there are hundreds of thousand of vegetarians in Indonesia, including regular or temporary vegetarians. Most of them are vegetarian because of religion; the biggest proportion is Maitreya Buddhism, followed by others Budhism, Hinduism and Christian. Based on my experience, there is a lot of people practicing vegetarian diet but they do not join to IVS member. In Riau province, where I live for example, most of Buddhist followers there practice vegetarian. Mainly, they are adult and elderly people who have practiced vegetarian either occasionally or permanently for more than 10 years. They live on village and rural, and somehow they do not know about IVS, because IVS activity are mainly in big city.

The number of vegetarians registered to IVS when established on 1998 around five thousand people and now (on 2008) there are about 70.000 members (cited in Susianto 2008). Religion and health concern is the two most common reason joining Indonesia Vegetarian society (IVS 2008). The trend of increasing the number of IVS members could be an indication that the overall number of vegetarians is growing in Indonesia.

4.2.2.2 Practices of Vegetarian diet in Indonesia

Actually there is no difficulty to practice vegetarian diet in Indonesia. Indonesian mainly Javanese and Sundanese eat vegetarian food daily, somehow without realized that was vegetarian food. Gado- Gado (steamed cabbage and sprouts, with rice, tofu and peanut sauce), orak arik (fried tempeh with red chili and ginger), cah kangkung (the leafy green vegetable fried with little oil and chilly), and sayur nangka (curried jackfruit with coconut milk) are the example of Indonesia traditional vegetarian food. The unique of Indonesian taste is they have a lot of spicy and hot.

Since most vegetarians in Indonesia are Chinese ethnic, they can also get the choice to eat in Chinese restaurant or vegetarian special restaurant. Most Chinese restaurant provides vegetarian food and non-vegetarian as well. The vegetarian restaurant is also easily found in all of big city in Indonesia, generally their cuisine was mostly inspired by the gastronomic culture of China. They provide the kinds of food that look similar with meat or fish. For replacing the meat, the use of soya bean products, and meat analog are available in Indonesia market mainly imported from Taiwan.

Indonesia vegetarian diet is a little bit different with western vegetarian diet. My experience here, seldom do western use the meat analog product since they prefer to eat salad or more vegetables. Once time, I ate pita and falafel in vegetarian stand in Amsterdam; there were plenty of salad, tomato and others vegetable. In KIT restaurant, vegetarian food looks more natural.

Indonesians commonly do not eat raw vegetable; they cook that by frying on high temperature and giving much monosodium glutamate to enhance the taste. It is not so good because the content of vitamin will be damaged. Fruit is also seldom found on the meal; in fact it is a essential part of vegetarian diet. High price of fruit maybe a reason.

Tempe is one of favorite vegetarian food in Indonesia. The use of tempe is widespread here. Fresh tempe is rich with flavonoid that can inhibit lipid peroxidase (IVS, 2005). However, study by Purwantyastuty (cited in INN 2003) found, the higher temperature, the lesser isoflavone. Tempe Isoflavone amounts will down to 81% on *tempe goreng* (fried tempe) , 69% on *keripik* (crispy tempe), 54% in *sambal goreng* (fried tempe with little oil), 27% in *bacem tempe* (tempe soup), and 22% on *lodeh* (coconut milk cooked with tempe). It is the challenges for vegetarian cuisine in Indonesia to maintain the nutrition contents during cooking process.

In addition, although lacto ovo vegetarian, Indonesian did not use dairy product like milk and cheese as much as Western. One of reasons why they did not eat cheese, because of animal contents (rennet); and for milk, perhaps because of lactose intolerance or its price is relatively expensive. However, the use of egg is moderate (2 – 3 servings per week).

4.3. Indonesia Nutrition Policy about Vegetarianism

4.3.1. The past policy

The current Indonesia Dietary Guidelines (IDG) promotes the balanced diet that people should require enough calories from carbohydrate, protein and fat with the right proportion. The difference with the previous is the new guidelines emphasize the importance of high intake of vegetable and fruit and reduce the intake of high saturated fat, sugar and salt (MoH 2002).

In the past, the IDG focused with the requirement of quantity of calorie by stressing the importance of protein intake. It was true that Chronic Energy Deficiency (CED) and Iron Deficiency Anemia (IDA) were a big problem in community. Hence, the easiest way to meet the protein was by eating animal protein as containing high amount of protein and iron. Government encouraged their people to eat much animal protein such as meat or fish; animal protein was viewed as the high protein value. When I was kid, the nutrition motto 4 sehat 5 sempurna (4 health food group and 5 became perfectly) was very famous. 4 health groups are rice, vegetable, fruit, and protein. While added with milk, it became perfect.

There is opinion that eating solely vegetable with out meat is a symbol of poor. In fact, many Indonesian people practically live with vegetarian diet because of not having the choice to buy the meat, but they were disgrace. Not wonder, even poor wanted to buy meat or chicken at last once at a year. If they knew Indonesia traditional plant protein, so with the same price, they could have got more kilogram plant protein with same protein quality. The similar opinion was also occurred in government level. Suharto (Indonesia President at that time) pressed his people,"Don't be a tempe nation". It means, tempe is a symbol of poor food. In fact, tempe is inexpensive protein for Indonesia, and even western viewed tempe as natural protein product (Seth 1999). However now, situation is conducive for tempe,

government has changed their opinion and encourage people to eat more plant protein.

4.3.2. The Current Policy

The current data show Indonesia faces the double nutritional problem. When many people still live on under-nutrition, there are the small groups living on over-nutrition. Over nutrition contributes to increasing of morbidity and mortality of the NCD. The proportion of death because of Cardio Vascular Diseases increased from 9.1% on 1986 to 48.53% on 2001: Ischemic heart disease from 2.9% in 1986 to 14.9% (2001): Stroke from 5.5% in 1986 to 11.5% in 2001 and cancer from 3.4% in 1986 to 6% in 2001 (Atmarita 2005).

Cultural and social economic could be determinant for over nutrition. Ratna Juwita (cited in INN 2003) in study on three ethnics in Indonesia found; Minangkabau (living on Sumatra) which has the high lipid plasma level has the high prevalence of obesity and CVD compared than Javanese (living on Java) or Bugis (living on Sulawesi). The study found it is related with food culture. Minangkabau food was commonly meat with santan (coconut oil) and less vegetable, but Javanese and Bugis food were mainly vegetable, tofu, and less meat. Meanwhile, Soekirman (2000) concluded that the increase of income per capita in current years influenced the high intake of meat[9] and finally created the over-nutrition in certain groups.

The goverment now realizes that dietary patterns are crucial. Modifications in diet can be expected to reduce the risk of disease and even prevent it. Diet Nutrition and the Prevention of Chronic Disease (WHO/ FAO 2003) report recomended for combating NCD, the share of energy intake should be made by decreasing in fats (and their various components), protein and sugar, and increasing in vegetable, fruit, together with regular physical activity.

Although still concerning with nutrition deficiency, but the new attention is how to prevent unbalanced intakes and diet-related NCD. The new IDG also do not stress much to eat the animal protein. In one paragraph of protein requirements, the new IDG mentioned that "vegetarian diet could meet the protein need as long as vegetarians eat various plants and know about the diversity of protein plant sources" (MoH 2002).

[9] As Bannet Law predicted when the household average income raised; it will be followed by the improvement of adult food quality. Energy proportion from carbohydrate source will decease and conversely energy proportion from fat and protein will increase (cited from Soekirman, 2005)

In recent year, the awareness of health benefit and environmental protection by eating plant based diet also attracts some Indonesia scientists to do the researches and follow this diet (IVS 2008). Mainly the topic of their researches is about the anemia vulnerability among adult vegetarian. IMH itself welcomes vegetarian diet as one of healthful diet, and request IVS to help in balanced nutrition promotion, particularly in encouraging community awareness to increase fruit and vegetable consumption and to decrease animal fat consumption (INN 2008). In this context, eventhough IMH did not mentioned spesifically vegetarian diet, but this is good news for IVS as now people begin to accept vegetarian diet as one of good healthy options.

Chapter V Adolescence nutritional requirements from perspective of vegetarianism

5.1. Prevalence and motivation for vegetarianism in adolescents

Although only a minority of adolescents report consuming a vegetarian diet, but vegetarianism among this age group has gained popularity over the years (Donovan cited in Kong and Stang, 2005). Their motivation often comes from concerns about animal rights or body appearance rather than from a desire to improve nutritional quality of their diet (Melina and Davis 2003). Study by Ryan (1997) in UK found the most frequent reason become to vegetarian were ethical reasons or to keep body weight. While Lamisse (2005) mentioned that concern for better health, a desire to lose weight, ethical reason and religious background were the motivations of vegetarian adolescents.

Estimated in USA, about 2% of adolescent declared vegetarian and around 0.5% of this age group are vegan (ADA Report 2003). Meanwhile in Sweden studies conducted on students found, of whom 5% called themselves vegetarians and 2% of that group stated as vegan (Larsson 2002) and in UK, 8% of adolescents aged 11 to 18 were vegetarian (Thane 2003).

However, there is no data available about motivation or prevalence vegetarian amongst adolescent in Indonesia. My experience in Indonesia, there is trend of increasing a number of vegetarians in adolescence because of religious reasons and estimated about 20% of IVS member is youth people (IVS 2008).

5.2. Nutrition role on Adolescent Growth and Development

Adolescence is the period of life between the ages of 10 -19 years (WHO 2005). It is a transition phase when children become adults. Growth during this period is faster than at any other time in an individual's life except the first year. As an adolescent grow through physical and biochemical changes, all these changes create the requirement enough nutrients. Then, most of nutrient will take a metabolism process creating energy to meet the high demands of

physical and cognitive growth and development (Stang and Story 2005).

The physical growing during adolescence will bring the emotional change like search for identity, concern with appearance, need for peer acceptance and active life style that can significantly affect their eating behaviour and nutrition status (WHO 2005). In addition their busy activities somehow make them to skip meal and eat junk food such as fried potato.

The nutrition status in adolescence is critical for their life on future and even for next generation of any country. The nutritional problem on this period can influence nutritional status in next stage of life cycle (ACC/SCN 2000)[10] ; Inappropriate diets like high fat and sugar consumption and physical inactivity during this period increases vulnerability to chronic diseases in adulthood (McGill, et al 2000) even in the poorest countries.

5.3. Nutritional requirements on vegetarian adolescents

Vegetarian adolescents have nutritional needs that are the same as any other adolescent (Reed 2003). They need enough nutrients for paying several growth spurts during this time. So, it is crucial to ensure the variety of foods like snacks and meal containing sufficient calories, protein, fat, mineral and vitamins. However in this section, I just highlight some of nutrients that need to get more attention.

5.3.1. Energy

Energy needs for adolescents are various depended on sex, age, body composition, pubertal development, and physical activity (Lifshitz, Tarim, & Smith 1993 in Muso Robert 2002, Stang and Story 2005). The reason includes difference in height and weight (boys gain more muscle mass and heavier skeleton than fat as compared to girls), early maturation of females (protein requirements on 11-14 year old girls are equal to the boys of same ages group but are much less for 15-18 years old girls as compared to their male counterparts), and variation

[10] Malnutrition in the early adolescence year of girl can disturb normal growth and pubertal development. Further the malnourished girl will contribute to increased morbidity and mortality associated with pregnancy and delivery, and then also to increased the risk delivering low birth-weight babies.

in physiological needs for some nutrients by sex for instance difference in the requirement of iron.

Table 2: Recommended dietary allowances (RDA) for selected nutrients during adolescence

	Female		Male	
Nutrients	11-14 yr	15-18 yr	11-14 yr	15-18 yr
Energy (kCal)	2200	2200	2500	2800
Proten (g)	46	44	45	59
Iron (mg)	15	15	12	12
Ca (mg)	1200	1200	1200	1200
Zn (mg)	12	12	15	15
Vit A (µgr)	800	1000	800	1000
Vit D(µgr)	10	10	10	10
Vit C (µgr)	50	60	50	60
Folio Acid (µgr)	150	180	150	200

Source: Food and Nutrition Board, National Academy of Science National Research Council, Recommended Dietary Allowances, 10th ed, Washington DC (1989) cited in WHO-SEARO, 2006

IDG recommended the energy RDA for woman adolescent are 2000-2200 kilocalories, whereas for man adolescence are between 2400-2800 kilocalories. Factor that must be got attention to determine the energy requirement for adolescent is the physical activity like sport which joins both in the school and in outside the school. The active adolescence needs more energy than inactive adolescence.

The balanced diet principle should be considered when getting calories. Take care of obtaining enough calories from carbohydrate and fat sources, so that protein may be used for the body's maintenance. The calories were recommended around 50-70% came from the carbohydrate, and others are from protein around 10-20% and fat around 15-25% (MoH 2002).

5.3.2. Protein

Protein is an important nutrient required for the building, maintenance, and repair of tissues in the body. Amino acids, the building blocks of protein, can be synthesized by the body or ingested from food. One needs 20 different amino acids in which 10 of them are Essential

Amino Acid (EAA)[11] obtained from food. Four of 10 EAA called *limiting amino acids*: sulfur-containing ones (methionine and cysteine), tryptophan, and lysine were mainly found in animal products. If a person's diet is deficient in one of them, this will limit the usefulness of the others, even if those others are present in otherwise large enough quantities (Melina and Davis 2003). This is a reason why meat is called as high quality protein.

One misperception of vegetarian diet is that it is low in protein. In fact, "the percentage of calories from protein for non root vegetables is 20% to 40%, for legumes is 20% to 37% and for grains, nuts, and seeds it is 10% to 17%" (Davis cited in Panebianco 2007). However, plant foods do not always offer all of EAA in a single given food. For example, beans are high in lysine, but low in the sulfur containing amino acids. In contrast, many grains are low in lysine, but high sulfur-containing amino acids (IVS 2005).

Table 3 The appropriated food combination for getting complementary proteins

Food Sources	Amino acid deficiency	Recommended Combination
Grain	Isoleusin	Rice + Bean Corn + Bean Wheat flour + Bean
Legum	Triptofan	Bean + Rice Bean pea + Wheat Soyabean+ Wheat+ Rice
Vegetable	Isoleusin	Brocoli Cabbage + Cereal + Mushroom Cauli flower + Pea Bean

Sources: Kecukupan Protein Vegetarian, IVS, 2005

Hence vegetarians need complementary proteins, various protein food sources that eaten together enable a person to meet the standards of a high biologic protein diet than either would have alone. Because of differences in amino acid make-up, when plant sources are combined,

[11] The 10 essential amino acids (EAA) which cannot be produced by the body must be obtained from the diet include: Valine, Leucine, isoleucine, the sulfur-containing amino acids: methionin, and cystein, the aromatic amino acids: pheniyalanin and thyrosin, tryptophan, threonin, and lysine.

the strengths of one make up for the deficiencies in another for example by eating beans and bread, tofu with rice or peanut butter sandwich (IVS 2005).

Soya is a good source of protein as it contains the eight essential amino acids which the human body needs[12]. Soya can be consumed either as soybeans themselves or as soya products like soymilk, tofu, tempe, miso (soya bean paste), and vegetarian meat (Textured vegetable Protein). Tempe, Indonesia traditional food made from soya bean fermentation by using Rhizopus, are the excellent protein sources for vegetarian in which the amount of protein of 100 gram tempe are quite similar with 100 gram meat (IVS 2005). It is also low in calorie and fat, devoid of cholesterol, and it is good sources of fiber, vitamin E and iron (see table 4 below).

Table 4.The nutritional comparison between Tempe and meat in 100 gram portion

Component	Tempe	Beef	Chicken
Calori	149	207	302
Protein	18.3	18.8	18.2
Fat	4	14	25
Carbohydrate	12.7	0	0
Calcium	129	11	14
Iron	10	2.8	1.5
Vitamin A	50	810	810

Sources: Indonesia Vegetarian Society (2005)

Based on IDG, the RDA of protein for the adolescence is 1.5 -2.0 gram/kg/day. It is equivalent with 66 gram per day for the boy aged 16-19 year and 51 gram per day for the girl. Adolescent Lacto ovo vegetarians eating eggs and dairy products should not worry about their protein needed (Melina and Davis 2003) and for vegans, protein could be obtained from grains about 60%, legumes about 35% and 5% from leafy greens (Melina and Davis 2003).

5.3.3. Iron

[12] Based on the protein digestibility corrected amino acid score (PDCAAS), which is the standard method for determining protein quality, isolated soy protein can meet protein needs as effectively as animal protein, whereas wheat protein eaten alone, for example, may be 50% less usable than animal protein (Solae Company, 2003)

Iron is a crucial component of red blood cells. Iron requirements are very high in adolescents as a result of the expansion of the total blood volume, particularly during the period of rapid growth. Iron requirements for boys increase during the growth spurt. With the slowing of growth, at the end of puberty, iron requirements decline. Girls usually have their growth spurt before menarche, but growth is not finished at this time. Their total iron requirements are therefore considerable (FAO/WHO 2004). The adolescent girl is therefore at risk for developing IDA due to the combined effects of continuing growth, menstrual iron losses and a low intake of dietary iron (Beard John 2000).

The iron status of vegetarians is always of concern since the predominant source of iron is the non-hem form. There are two forms of dietary iron: heme and non-heme (WHO-EMRO 1996). Heme iron is more easily absorbed (15-35%) than non-heme iron (2-20%), which comprises the remaining iron in animal food such as red meats, fish, and poultry. Non-heme iron is found mainly in plant foods. The absorption of non-heme iron is influenced by inhibitors and enhancers factors.

Tannins (found in tea), calcium (from milk and cheese), polyphenols, and phytates (found in legumes and whole grains) can decrease absorption of non-heme iron (WHO-EMRO 1996). The food technique found that phytate can be hydrolyzed by soaking and sprouting beans, grains, and seeds (cited in ADA Report 2003).

The WHO (1996) recommended food that stimulates iron should be added to the diet such as with fruits containing vitamin C or fermented food. "A study of vegetarian Indian children with iron-deficiency anemia, a 100-mg tablet of vitamin C at both lunch and dinner for 60 days caused a drastic improvement in their anemia (cited from Norris 2002)". However concerns were raised about the possibility of contradictory dietary recommendation. For example, most vegetarians depend on soya or legume that contains phytat as the main sources of protein, but phytat in soya bean products can inhibits the bioavailability of iron. So, vegetarian are more vulnerable to IDA than non-vegetarian. Another is calcium. Calcium is recommended for prevention of osteoporosis while it is an inhibitor of iron absorption (WHO-EMRO 1996).

Laboratory experiment showed as tea contains polyphenol which form a complex with iron in the stomach, it could reduce iron absorption (ADA report 2003). WHO-EMRO (1996) promoted that tea drinking

should be done after meals at least after half an hour. However, the study on South African found even though 15% women had an IDA, but those who drunk the most tea had higher iron content in their blood. This research demonstrated that IDA is not significantly caused by tea consumption (Hogenkamp 2008). However, in this context, I prefer to follow WHO suggestion while waiting that specific Indonesia research may provide more definitive data about tea culture and iron level on the blood.

Since meat is not present to enhance the absorption of non heme iron, iron bioavailability was 70% (WHO-EMRO 1996) lower. Thus vegetarians may need almost 80% higher than the values for omnivores (cited in Barr 2004). The RDAs for omnivorous is 8 mg/day for men and 18 mg/day for premenopausal woman; for vegetarian, the recommendation for men and premenopausal women are 14.4 mg/day for men and 32.4 mg/day respectively (Reed 2001). While the RDA iron for adolescent vegetarian is shown in table 5.

Table 5. Recommended Dietary Allowance for iron for Vegetarian

Age	**Iron mg**
9-13	14.4
Boys 14-18	19.8
Girls 14-18	27

Sources: Reed, Mangel. Vegetarian Nutrition Update Volume X ,Number 4. 2001

The main source of iron for vegetarian is dark green leafy vegetable and kind of beans[13]. Vegetable consumption could improve iron status because of containing iron and in addition, pro-vitamin A in vegetable will improve vitamin A status, the result could be increased iron level (DePee et al 1996). The studies about vegetable consumption related with iron status in Indonesia by DePee et al (1996) found vegetable consumption (cassava leaves, spinach and carrot) could improve iron status in anemic breastfeeding women in rural area in West Java because of containing hon-haem iron and pro-vitamin A carotenoid as enhancing factors, but there was not significantly increasing on hemoglobin and hematocrit. That studies supports recommendation to eat a variety of fruits and vegetables.

[13] See table 6 showed the selected Food sources of non-hem iron on annex 1.

5.3.4. Calcium

Calcium is needed for bone development in adolescence (FAO/WHO 2004). The requirement for calcium in adolescence relatively is higher because of acceleration of muscle and skeleton development compared to child or adult periods. More than 20% of body height growth and about 50% of bones mass increasing were reached in adolescence[14] (WHO-SEARO 2006). Inadequate calcium level in the blood can result in increased risk for the development of osteoporosis in the future life (Key 1994).

Calcium level in the blood depends on absorptive efficiency and excretory rate (FAO/WHO 2004). Calcium absorption refers to the amount of calcium that is absorbed from the digestive tract into our body's circulation. On most intakes, only about 25-30% of dietary calcium is effectively absorbed and obligatory calcium losses are relatively large. It affected by the calcium status of the body, vitamin D status, age, pregnancy and plant substances in the diet. Vitamin D can enhance calcium absorption. Phytic acid and oxalic acid, which are found naturally in some plants, may bind to calcium and prevent it from being absorbed optimally (FAO/WHO 2004).

Calcium excretion refers to the amount of calcium eliminated from the body in urine, feces and sweat (FAO/WHO 2004). Calcium excretion can be affected by many factors including dietary sodium, protein, caffeine and potassium. Diets high in sulfur-containing amino acids may increase losses of calcium from bone. Foods with a relatively high ratio of sulfur-containing amino acids to protein include eggs, meat, fish, poultry, dairy products, nuts, and many grains. Excessive sodium intake may also promote calcium losses.

Although it is true that osteoporosis can be attributed to calcium deficiency, but in fact, there are higher rates of osteoporosis in high income countries because a lot of animal protein consumption draining calcium than Asian who ate a few of calcium and protein. Hence the ratio of dietary calcium to protein is more predictive of bone health than calcium intake alone. Typically, this ratio is high in lacto-ovo-vegetarian diets and favors bone health (cited in ADA report 2003).

Theoretically calcium allowance based on animal protein intake of 20-40 mg for adolescents is 1000 mg (FAO/WHO 2004). Vegetarian diets

[14] The peak rate of calcium in adolescence is 300-400 mg daily: it occurs earlier in girls but continues longer in boys. Bones will continue to add more mass until around age 30, when peak bone mass is reached. Peak bone mass is the point when the maximum amount of bone is achieved.

maybe have a low absorption of calcium as plant foods contain oxalic and phytic acids, interfering with calcium absorption. However, vegetarian diets that contain less protein may reduce calcium excretion. It makes the calcium RDA for vegetarian female adolescent is 600-700 mg/day and 500-700 mg/day for the male (US-NIH 2008).

The most common sources of calcium are dairy products (FAO/WHO 2004). Lacto ovo vegetarians can get adequate calcium intake by consuming milk or dairy products, but for vegan these sources are not acceptable. Yet, vegans may be at increased risk for inadequate intake of calcium. Therefore, it is important for vegans to include adequate amounts of non-dairy sources of calcium in their daily diet such as dark green leafy vegetables, tofu and calcium-fortified food or consider taking a calcium supplement to meet their recommended calcium intake[15] (US-NIH 2008).

5.3.5. Vitamin B12

Vegetable and fruit provide an abundance of vitamins to meet one's nutritional needs. However, there is one vitamin, called vitamin B12, which does present a genuine nutritional issue. Hence Vitamin B12 is one of the greatest concerns in the vegetarians (Asok 2003, Lloyd-Wright et al 2000). Vitamin B12 helps maintain healthy nerve cells, DNA and red blood cells (FAO/WHO 2004).

Vitamin B12 is found mainly in animal products and is rarely found on the plant. B12 is produced by bacteria and other one-celled organism in the small intestines of animal. In active analogs of vitamin B12 maybe present on bacterial contaminated- plant such as sprilulina, sea vegetables, tempe and miso (cited in ADA Report 2003). Unless fortified, no plant food contains significant amounts of active vitamin B-12.

For vegan, a reliable source of the vitamin B12 are fortified breakfast cereals, fortified soymilk, fortified meat analogues or supplements containing the active form of vitamin B12, called cobalamin or cyanocobalamin. Lacto-ovo-vegetarians can get adequate vitamin B-12 easily from dairy foods and eggs if these foods are consumed regularly. The B12 recommended dietary allowance in adolescent and adults is 2.4 micrograms per day (Asok 2003).

[15] See table 7 showed selected food sources containing calcium for vegetarian on annex 1.

Vegan has a risk to get vitamin B12 deficiency. Asok (2003) indicated that vegans who do not regularly consume reliable sources of vitamin B-12 tend to get macrocytic anemia. Maternal vitamin B-12 intake and absorption during pregnancy appear to have a more important influence on vitamin B-12 status of the infant than do maternal vitamin B-12 stores. Vegans mother whose diet lacks vitamin B12 has the risk to have infant born with irreversible neurolic abnormalities (Asok 2003). Thus vitamin B-12 from supplements (at least 10 µg a day) and fortified foods (at least 2.4 µg daily) is suggested for vegans (Melina and Davis 2003).

5.3.6. Zinc

Zinc is an essential component of many enzymes and plays a role in cell division and immunity[16] (FAO/WHO 2004). In adolescence, zinc is needed for the growth process as well as the sexual maturity, especially for the male. The RDA for zinc was set at 11 mg/day for men and 8 mg/day for women (ADA report 2003). Some zinc sources for vegetarians are fortified cereal, legumes, nuts, eggs, soy foods, and dairy products.

Zinc bioavailability and amounts tend to be lower in plant foods compared to animal sources since phytate binds zinc, and no animal protein which is believed to enhance zinc absorption. Some food preparation techniques, such as soaking and sprouting beans, grains, and seeds as well as leavening bread, can reduce binding of zinc by phytate and increase zinc bioavailability (ADA report 2003).

5.3.7. Fatty Acids

Although vegetarian diets are generally lower in total fat, saturated fat, and cholesterol than are nonvegetarian diets, they provide comparable levels of essential fatty acids (PCRM 2008). Our body needs the fatty acids alpha-linolenic acid (ALA) and linoleic acid (LA) from food. ALA, an omega-3 fatty acid, is converted in the body to eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) although with a low efficiency. LA, an omega-6 fatty acid, is converted in the body to arachidonic acid (AA).

[16] When zinc is provided as a supplement to children in lower-income countries, it reduces the frequency and severity of diarrhoea, pneumonia, and possibly malaria.

ALA is present in leafy green vegetables, nuts, vegetable oils such as canola and soy, and especially in flaxseed and flaxseed oil. Good sources of EPA and DHA are fish (both finfish and shellfish and their oils and eggs) and organ meats. LA is found in meat, vegetable oils (e.g., safflower, sunflower, corn, soy), and processed foods made with these oils. It is important for vegetarians to include foods that are rich in omega 3 and omega-6 fatty acids on a daily basis (PCRM 2008).

The recommended ratio of n-6 to n-3 fatty acids is in the range of 2:1 to 4:1 (Davis and Penny 2003). It is important to take these two fats in the proper ratio as well. Omega-6 fatty acids compete with omega-3 fatty acids for use in the body, and therefore excessive intake of omega-6 fatty acids can be a problem. Whereas vegetarian diets are generally rich in n-6 fatty acids (specifically LA), these diets can be low in n-3 fatty acids, resulting in an imbalance that can inhibit production of the physiologically active long chain n-3 fatty acids, EPA, and DHA.

Most studies show vegetarians, and particularly vegans, to have lower blood levels of EPA and DHA than non-vegetarians (Davis and Penny, et al 2003). Recently, vegan sources of DHA derived from microalgae have become available as supplements in non-gelatin capsules. Algae sources of DHA have been shown to positively affect blood levels of DHA and of EPA through retro conversion (ADA Report 2003).

Chapter VI Adolescence nutritional vulnerabilities from perspective vegetarianism

6.1. Indonesian Vegetarian Adolescents vulnerabilities situation

The increase of popularity of vegetarianism has raised many concerns about health impact particularly in adolescents because of their high nutritional requirements. Even though there is an evidence that vegetarian have lower incidences of degenerative disease and cancer than do non-vegetarian (ADA report 2003, Philips and Segasothy 1999), but the risk of having some nutrient deficiencies could occur; Deficiencies of iron, vitamin B12, calcium, and zinc are the most common problem reported in vegetarian especially vegan (Bederova 2000, Dagnelie 2003, Thane 2003, Antoni 2003).

Vegetarian adolescents who grow in the non-vegetarian family commonly have the problem with their parents about their new diet (Melina and Davis 2003). When chicken, rice and vegetable arrived on the dinner table, they ate just non meat portion of family meal and snacks on fries and even, they did not eat more plant based protein because of no food availability or inadequate knowledge. It makes the parents tend to be less than supportive because their teenager eating unusual and when the parent did not give attention to them, their children would have the chance to develop nutritional deficiencies.

In contrast, adolescents who have been raised in vegetarian family, their nutritional status grow well. Study by Sabate (cited in Melinda and Davis 2003) found that these adolescents are well nourished and they have less tendency to be obese and eat less junk and more eat fruit and vegetable than meat eating peers.

Most of vegetarian adolescents in Indonesia commonly live in non-vegetarian family and their parents commonly dislike when heard their children becoming vegetarian. That condition occurred because general opinion finds it is still hard to accept that vegetarian is suitable for adolescence. Even among Budhist followers, commonly people said vegetarian is good when one becomes older and not for younger. The impact is parents seldom give the permission to their children to practice vegetarian diet. In addition, most doctors here think that adolescence need meat because of containing iron and other

micronutrients and plant can not provide enough nutrients. It is not wondering because when I studied medicine, there were no vegetarian issues in school.

Hence eating at home is problematic. This condition made adolescents can not meet enough nutritional need from their family meal because commonly they eat together with family. Some of adolescents tried to still eat just vegetable which is served mix with meat, but the quantity and quality of that food is poor because of not containing enough nutrients. Others because of tight religious norm decided not to eat that food. They preferred to eat on the restaurants or on the temple canteen and certainly, it took the cost.

In addition, when talking with me, some adolescents also complained that they got the pressure not only from surrounding likes their parents who were alarmed about their health but also the feel insecure due to lack of information about health and nutrition. When adolescents get sick, with out complete laboratory examination, the doctors commonly blame their diets and do not give nutrition information or education.

6.2. Controversy about nutritional vulnerabilities on vegetarian adolescents

IDA and CED are the main nutrition problems for Indonesian adolescents. People commonly suggested their children to eat meat for requiring the iron and protein, and Indonesia Nutrition Network (INN 2005) in the guidelines for control anemia in young women recommended to eat meat because of easy absorption animal based iron. Regarding of that, this section will be focused to that condition.

Donovan and Gibson (cited in Sekhon 2001) noted that" lacto-ovo and semi-vegetarian adolescent females had energy intakes less than two-thirds of Canadian recommendations and concluded that they were more at risk for nutrient inadequacies than those following omnivorous diets". In Indonesia, even though IMH agree that vegetarian diet will give health benefit, but mentioned adolescence still need animal based food (INN 2008). There is a worry that vegetarian diet on adolescence will disturb government program to reduce IDA and CED as targeted on MDG.

In contrast, on study multi-ethnic by Cheryl (2002) in USA as shown on table 8 (appendix 2) concluded that "adolescent vegetarians were

significantly more likely to meet the Healthy People 2010 objectives, especially for fat intake and fruits and vegetables. This suggests that vegetarianism may provide a healthy dietary pattern for adolescents, particularly if it is well planned to address potential deficiencies."

6.2.1 Iron Deficiency Anemia

IDA is the most prevalent micronutrient deficiency among adolescents both in developing or developed countries. WHO estimates that 27 percent of adolescents in developing countries are anemic; in developed Western countries such as the USA, England and Australia, the incidence of IDA can be as high as 20% in young children and adolescents (Thane 2007, WHO 2004).

The prevalence of anemia among Indonesia adolescent is showed on table 9 below. Low iron intake and poor sanitation could be a reason why anemia still became problem in Indonesia. The worm prevalence in Indonesia scholar children was around 60-70% (MoH 2006). Data below show that the prevalence of IDA in female reproductive age is lower than men. This is assumed due to iron supplementation for the pregnant women and women at reproductive age.

Table 9 Prevalence of Iron Deficiency Anemia on 2001

	10-14 year	15-44 year
Male	45.8	58.3
Female	57.1	39.5

Sources: Atmarita, Nutrition problems in Indonesia

6.2.1.1. The cause of IDA

The WHO has develop diagram that IDA could be happened due to low iron intake (low intake of iron rich foods, low availability of iron rich foods, cultural), increased demands (growing periods, pregnant, blood loos), and inadequate absorption (inhibitor and enhancer factors, dietary pattern). In developing countries, the cause is complex-a mix low intake of iron sources and infectious disease and mainly affecting both of sex groups; in developed countries, the IDA mainly only affected female adolescence related their diet pattern in association with blood loss.

Iron is the trace minerals of greatest concern when considering the nutritional value of vegetarian diets. Geofrey (2007) wrote on his article "meat is a core food in the diet for adolescents because it provides significant amounts of iron and other micronutrients". The Meat and Livestock Australia (200?) in its response related with WHO recommendation to reduce meat consumption wrote "reduction of the meat consumption of women and younger people was associated with more specific concerns about lack of iron in the vegetarian diet. Estimated 20% of women aged 15-30 years maybe iron deficient (serum feriritin <16µg/L) and around 40% may have low iron stores (serum ferritin <30µg/L)". Study by Thane (1997) in UK, found adolescent vegetarian girl had significantly poorer iron than meat eaters.

Study in Slovakia (Bederova 2000) showed "a Lactoovovegetarian adolescent has nutritional risk if the values of iron and calcium are considered, but it has positive aspects on lipid parameters, protein values, and antioxidant parameters". While, study by Donovan (cited in Lamisse 2005) demonstrated that iron and zinc deficiency is more common in adolescent vegetarians than in omnivores because "the low iron and zinc intakes and higher fiber and phytat intake in lacto-ovo-vegetarians leads to a decreased bioavailability in non-heme iron and zinc".

Since vegetarian eat much legume or rice that contain phytate, and depended on non-haem iron, the low bioavailability of iron sources from vegetarian diet may be influence to lower levels of serum feritin. However, The American Dietetic Association's Position Paper on Vegetarian Diets (ADA Report 2003) says, "Incidence of iron deficiency anemia among vegetarians is similar to that of non-vegetarians. Although vegetarian adults have lower iron stores than non vegetarians, their serum ferritin levels are usually within the normal range."

Hallberg (cited in Ryan 1997) in study to Dublin school girl found whether low serum feritin (< 15 µg/L) as identified in 42% of the girls, only 3 % were found to be iron deficiency. Some study (cited in Barr and Rideout 2004) found that vegetarians are more likely to have non-anaemic iron deficiency (i.e depleted iron stores with serum ferintin < 12 µg/L but normal haemoglobin concentration). These finding indicated that low iron stores may not be a cause for concern; declining serum feritin concentration may reflect a normal physiological response to maintain iron haemostasis.

A study in Swedish adolescents showed there was no significant difference in the prevalence of low iron status between vegan and omnivores (Larsson and Johansson 2002). The study also found female vegan had a higher iron intake than female omnivores, but low iron status was found in both of groups (23 % of omnivores and 20 % of vegan), indicating a female (related with blood loss) rather than a vegan problem (dietary intake).

There is no study about IDA prevalence on vegetarian adolescents in Indonesia. However, there are several studies conducted on vegetarian adult. Herman et al (2000) in study on 30 samples of Lacto ovo vegetarian and 30 samples of non-vegetarian in Jakarta found statistically, there is no difference in hemoglobin concentration between lacto ovo vegetarian and non vegetarian, even there is a tendency that hemoglobin concentration of lacto ovo vegetarian (15.7 g%) are higher than non-vegetarian (14.8 g%). It perhaps due to the intake of vitamin C and Fe of vegetarian (139.93 mg and 12.84 mg) is higher than non- vegetarian (81 mg and 12.63 mg). The similar result were also reported by Salim (2005) which found there is no different in hemoglobin concentration between lacto ovo vegetarian (13.46 g%) and non vegetarian (13.13 g%), and in number of anemia.

6.2.1.2. Special Consideration for Indonesian

In my opinion, Indonesia vegetarian adolescents who follow well balanced diet should not be considered to get a risk of IDA. From available literature, there is no difference in iron intake and anemia prevalence between vegetarian and non-vegetarian. However, a special attention should be given for vegetarian adolescents related with cultural or food habit such as drinking tea or coffee with meals, low dairy products intake and seldom did provide fruit with meals.

It is recommended that adolescents to eat more vegetable and combine with fruit at meal as Indonesia was low in fruit and vegetable consumption. Some local vegetable such as spinach, broccoli, okra provide abundant iron and synergic effect will increase by combination with fruit like orange or tomato. Indonesian is insufficient calcium intake, so low dairy product intake is not the problem at this time. In addition, it is better to follow WHO suggestion (WHO-EM 1996) that tea drinking should be drink after meals at least after half an hour.

In order to reduce anemia prevalence amongst women reproductive age, Indonesia has the policy to give iron tablet supplementation

(ITS). In fact, supplements are not necessary if the Vegetarian Food guide is followed, but in certain conditions such as those who are watching calories, are very active in sport or during menstruation, a multivitamin mineral supplement that provides the recommended level of a wide range of micronutrients, including iron and zinc, may be appropriate (Melina and Davis 2003).

WHO recommends that iron fortification is important instead of ITS. Iron fortification has been successful in developed country and it is the most direct to eliminating iron deficiencies (WHO-EM 1996). The low of IDA incidence in developed countries perhaps because of this policy; Indonesia has the fortification law (MOH 2002) that some products like salt, sugar, rice and wheat flour should have the minimum iron amounts.

When Indonesia can control worm infection, and fortify all of products, the risk of IDA could be lowered in vegetarian through well planned vegetarian diet.

6.2.2. Chronic Energy Deficiency

The diet that adolescents receive during childhood and adolescence will determine their growth and development. The failure to get enough energy will hinder the growth and development. One of indicators of the growth is Body Mass Index (BMI). BMI is used as a screening tool to identify possible weight problems such as underweight or overweight.

Data on CED are largely unavailable for adolescents. In Indonesia, the BMI measurement on adolescent is only conducted to female adolescent to know the prevalence of chronic energy deficiency. It is found 22 % of female adolescence at age 15-18 years was under weight (BMI < 18.5) (Atmarita 2005).

6.2.2.1. The Cause of Chronic Energy Deficiency

CED can manifest when body do not get adequate diet in terms of both quantity and quality of food. CED can also be manifested because of compromised metabolism due to any diseases. Household insecurity, live hood insecurity, intra household allocation of food and food

practices are direct factors influencing adolescent does not meet their full range of dietary needs. In many developing countries, poverty is considered as the root of this factor (WHO-SEARO 2006). However, cultural and lack of nutrition knowledge could also have a stronger role.

Study in young adolescent of Seventh-day Adventists found that " there were no significant differences between vegetarian and omnivores groups in mean heights, weights, mid-arm circumferences, triceps skinfold thicknesses, and weight-for-length indexes" (Tayter and Stanek 1989). Study in Flemish vegetarian adolescent found that adolescence vegetarian have relatively lower body weights and skin-fold thicknesses than do non vegetarians, but their growth and sexual maturation status were within the normal range (Marcel et al, 1999).

Studies on older adolescence conducted by Larsson and Johansson (2002) found although vegetarian tend to have a lower BMI, but still in normal range. Table 10 showed that there is no significant difference between female omnivores and vegan in body weight and BMI, but there were significant difference in body weight and BMI between male vegan and male omnivores ($p < 0.01$). All of those studies indicated that vegetarian adolescent is growing normal and did not effect on growth and developments.

Table 10 BMI and Weight assessment of Adolescents Omnivores and Vegan in Sweden

Male omnivores (n=14)	**Male vegan (n=15)**	**P**
Weight 70.9 ± 5.0 kg	65.9 ± 7.0 kg	< 0.01
BMI 22.0 ± 1.3	20.5 ±2.1	< 0.01
Female vegan (n=15)	**Female omnivores (n=15)**	
Weight 65.9 ± 7.0 kg	60.1 ± 8.8 kg	not significant
BMI 23.1 ± 4.0	21.1 ± 2.7	not significant

Sources: Larrson and Johansson, 2002

There is no study about energy intake in adolescent vegetarian. However, Herman (2000) on study conducted to adult vegetarian in Indonesia found "there is tendency that energy and protein intake non vegetarians (1826 kcal and 51.16 g) is higher than of lacto ovo-vegetarians (1810 kcal and 42.54 mg), but it is not significant". Compared with national energy and protein requirement standard, both are low.

In spite of low BMI, the persistence of delayed menarche on girl also indicated poor nutrition. Today girls commonly reach menarche early before 12.5 years. The high calories and protein-based meat is said to be cause of early menarche (Catherine 2000). Sabat (cited in Kong and Stang 2005) found that "pre adolescent lacto ovo vegetarian experience a delay in menarche compared to their non-vegetarian peer. However, by late adolescence, all of vegetarian female were tall or taller than their non-vegetarian counterpart." In fact, the delay menarche may prove benefit in the future, such as reducing of the risk of breast cancer (Kong and Stang 2005).

In reality, the lower weight perhaps the positive vulnerability. Study by Oxford Vegetarian found vegetarians tend to be leaner and their weights are generally closer to desirable levels. This may be one of reasons why many female vegetarians prefer this diet for keeping their body weight. Oxford Vegetarian Study concluded that it perhaps partly because of a higher fibre intake and a lower intake of animal fat (Appleby 1998). Further it will give benefit to reduce the risk of NCD on adulthood.

6.2.2.2. Special consideration for Indonesia

Malnutrition and poverty still remain the problem for Indonesia in efforts to achieve the target MDG Goal 1, to reduce poverty and hunger by halves on 2015. Even though there is a tendency that Indonesia is on the track, but it still remain 6% of the population eating less than the minimum calories that they should consume and there is 49% of population who live below 2 US $ (UNDP 2007). It could influence adolescent nutrition status as they have difficulties to get enough good food.

Indonesian people spend more than 70% of income on food (Atmarita 2005). It indicated that malnutrition occurred because of inadequate access to food. The pro animal protein policy actually made poor to became vulnerable in access to food. People tend to think that animal's food was more nutritious than plant food, and they spent much money to buy animal food rather than plant food. The poor people , who also had inaccesibily to get adequate food due to poverty, did not have good awareness that they can get the nutritious food with the limited budget from plant food. The impact of those are they can not buy enough 'high protein nutrition food' (animal) because it is more expensive.

In my opinion, the malnutrition is not solely caused by lack of animal protein, but because of little access to get adequate calorie and lack of vegetable consumptions containing protein. Today even the meat consumption increases, but the malnutrition is still problem and even creates the new problem, double burden diseases. So, the problem is because of unequal distribution of calories amongst community.

Vegetarian could be a solution to reduce hungry and malnutrition in Indonesia. Vegetarian give the chance to people to access more food. Goodland (2001) suggested that poverty, as well as malnutrition can best be reduced by plant based diets. Poverty is a main root of under nutrition, but for preventing under nutrition, it shoud not wait to succesfully reducte poverty. Nutrition improvement program can be done although the people is still poor (Soekirman 2000). Plant based food is cheaper than animal based food as source of protein and calories and in addition plant based food gives much health benefits. By eating plat based food, poor people will learn that they can improve their nutritional status with the simplest food.

In addition, Indonesia has abundant of natural-plant resources for better living conditions and agriculture plays the main role for the country's economic. By eating diversity plant based food, people will get enough calorie-protein (Panebianco 2007) as the World Health Organization Study Group says "Progressively, it was realized that even in totally vegetarian diets containing a diversity of foods, plant sources tended to complement each other in amino acid supply. If the energy needs of the child or adult are met by these diets, then so are the protein needs" (cited in Melina and Davis 2003).

Chapter VII Conclusions and recommendations

7.1. Conclusions

Vegetarianism has become increasingly popular among people including on adolescents in current years (Larrson 2002, Thane 2003, MLA 200?), perhaps because this diet offers health benefit (Philips and Segasothy 1999). Nevertheless, there are still justified concerns about some critical nutrients that may cause nutritional deficiencies (Ryan 2000), especially as diverse groups of adolescents may have very different motivation to follow a vegetarian diet (Lamisse 2005) like in Indonesia, religious seem as the most motivation.

Some studies found the vegetarian in adolescence has the risk to get IDA (Thane 2003, Bederova 2000, MLA 200?), but other studies showed the iron intakes in vegetarian diets are similar to or somewhat higher than those of omnivores (Larsson 2002, Cheryl 2002) and even found the incidence of IDA is similar amongst vegetarian and non-vegetarian (Huang 2000, Larsson 2002, ADA report 2003). This means vegetarians practicing well balanced diet should not be considered to have a risk of IDA (Huang 2000).

IDA mainly occurred because of the relatively poor absorption of iron from the diet (Huang 2000), consequently vegetarian adolescents should know about dietary factors that enhance and inhibit non-haem iron absorption like eating vitamin C-rich fruits and vegetables with non haem-iron sources at meal and avoiding consuming black tea during the meal (WHO-EM 1996). In addition The risk of getting IDA could be lowered in vegetarian community through a well planned vegetarian diet (ADA Report 2003) and be supported by iron fortified food (Huang 2000, WHO-EM 1996) and deworming policy (WHO EM 1996).

The effect on growth and development is also discussed in this thesis. There is an opinion that vegetarian practices in adolescence could influence the energy intake and further give impact to development and growth (INN 2008), but from several studies suggest there is no difference between vegetarian and non vegetarian on energy intake and on development and growth as well (Tayter and Stanek 1989, Marcel et al, 1999, Cheryl 2000). Even though, delayed menarche could happen (Sabate in Kong and Story 2005) and vegetarians tend

to have a lower BMI (Larsson, 2002), but those conditions perhaps offer health advantages (Appleby 1998).

Two issues above are crucial as IDA and CED are the main nutrition problems in Indonesia (INN 2005). Meat based diet which is practiced by most of Indonesia adolescents is believed to provide an immediately accessible source of protein and iron to control those condition (INN 2005), but high intake of saturated fat (mainly found in meat), sugar and salt and physical inactivity during adolescence will create over-nutrition and may lead to metabolic syndrome and cancer (WHO/FAO 2003) in adulthood. Therefore in this context, it is never too early to start practicing healthy eating behavior. Vegetarian diet could be considered as one of health diet alternatives as Cheryl (2002) found that vegetarian adolescents can achieve the good health status and supported by Sabate (2003) studies that people now views vegetarian diets is healthier than meat based diets.

Nutritional deficiencies occurred amongst vegetarian were usually due to poor meal planning (Leitzmann 2005). In this context, Indonesia adolescents who practice vegetarianism may be advised to be more conscious about their health. They need about 2200-2400 kcal daily (MoH 2002) and it can be obtained by eating a variety of foods from the different groups as shown on Vegetarian Food Pyramid (legumes, whole grains, cereals, nuts, seeds, fruits, vegetables, egg and dairy products).

However the balanced diet principle should be considered. Take care of obtaining enough calories from carbohydrate and fat sources, so that protein may be used for the body's maintenance. At least, 50-70% of calories should come from carbohydrate sources, from protein around 10-20% and fat around 15-25% (MoH 2002). By following this principle, Lacto ovo vegetarian should not worry about daily protein intake (Melina and Davis 2003) and for vegans, protein could be obtained from grains about 60%, legumes about 35% and 5% from leafy greens (Melina and Davis 2003). Tempe and tofu are very good sources of protein that can be easily found in Indonesia.

The good sources of vitamin B12, Calcium, Zinc, Iron and Fatty Acid which are key and critical nutrients for adolescents (ADA report 2003) is recommended getting from foods. Supplements are not necessary if the Vegetarian Food guide is followed, but in certain conditions such as those who are watching calories, are very active in sport or during menstruation, a multivitamin mineral supplement that provides the recommended level of a wide range of micronutrients, including iron

and zinc, may be appropriate (Melina and Davis 2003). However, by the same author vitamin B-12 from supplements (at least 10 µg a day) and fortified foods (at least 2.4 µg daily) is suggested for vegans.

Yet, the studies assessing the effects of a vegetarian diet on IDA and growth and development in adolescents have not been conducted in Indonesia, but from available literature there is indication that a well planned vegetarian diet appears to neither lead to deficiencies nor harmful effects on the growth and development in adolescence. However, from my experience often adolescents do not get appropriate information and advice on good nutritional practices being a vegetarian. Both parents and doctors are prejudiced and there is generally a lack of updated info. Consequently in this condition, vegetarian practices could affect the adequacy of nutrient intake and potentially lead to nutritional deficiencies and effects on growth and development. Hence strategies for preventing adolescents from vulnerabilities should be prepared.

7.2. Recommendations

With the omission of meat (and fish) products in the diet, one can still have a wholesome diet. In order to achieve that, one should have some nutritional knowledge and pay attention to the health aspects. However, as vegetarians live in a non-vegetarian world, therefore IVS can use advocacy, research and divulgation strategies to give awareness for stakeholders about well planned vegetarian diet.

Target group: Policy Maker, University Researchers and Health workers

Activities to be undertaken

a. Conduct national / international vegetarian seminar under the patronage of policy makers

As the current nutrition policy focuses on balanced diet that encourage people to eat much vegetable and fruit and less saturated fat, IVS can use this opportunity by giving advocacy to raise the awareness of policy makers such as Indonesia Ministry of Health, Indonesia Nutrition Network, Indonesia Doctors Associations, and university lectures/

researchers about vegetarianism related with prevention of NCD and nutrient deficiencies as well.

The Asia and International Vegetarian Congress in Indonesia next year may be the best opportunity for Indonesian policy makers to know more about this diet. IVS can call IMH and university researchers as one of keynote speakers. In fact, it was done on last South East Vegetarian Congress by inviting IMH to give welcome speech. Hence IVS be supposed to develop a concise plan of action for presentation to that seminar.

b. Sensitize all health workers dealing with vegetarianism

Every year on Vegetarian Day and Meatless day, IVS can conduct local seminar by inviting Regional INN and IDA members to emphasize them that now there is paradigm shift on vegetarianism; whether in the past, most medical literature wrote about gaps/ deficiencies on vegetarian diet, but recently more attention for health benefit of vegetarian diet.

IVS also can prepare the brochures and distribute those to all health facilities about health benefit and nutritional aspect of vegetarian diet. The content of brochure should be practical but scientific sound. Particularly for adolescence issues, IVS can send articles that highlight vegetarian during adolescence can lead to lifelong healthy eating habits and give more health benefit.

Sensitizing of health workers is crucial as most of doctors generally are prejudiced against vegetarian diet for adolescence. In fact as Huang (2000) revealed "Nutritionist and doctors should not try to influence a person's choice of eating style, but should provide balanced nutrition messages and encourage the public to eat right". The doctors can help adolescents by showing the way to prevent deficiencies by providing accurate information about vegetarian nutrition and food. When vegetarian adolescents get sick, it is elegant when doctors make a comprehensive diagnosis and do not immediately judge because of their diet.

Additionally, medical faculty also should be got priority by IVS. The misconceptions about vegetarianism among doctors happened perhaps because of lack of updated information. It is not surprisingly that they are not able to advise their patients about vegetarianism. In fact, there are many people choosing vegetarian now, so it is appropriate that vegetarian diet could be required on nutrition curricula in medical

faculty as one of healthy diet alternatives. In the future, we hope the fresh graduate doctors will have a new paradigm about this diet.

c. Develop researches on nutrition assessments and nutrition perception of adolescents

To date, there is no study about effect of a vegetarian diet on adolescent nutrient intakes or on growth and developments in Indonesia. Further, Knowledge, Attitude, and Practice survey and a study on anthropometric data, biochemical data and dietary intake among different vegetarian and non-vegetarian adolescents may provide more comprehensive and useful data. Particularly, dietary monitoring of total caloric and vitamin and micronutrient intake to achieve the recommended level is crucial to prevent nutrient deficiencies. Thus IVS collaborate with nutritionist can create tools like a 24-Hour Food Recall and Food Frequency Questionnaire for providing adequate information what adolescents eat.

Until now there is no guideline for Indonesian vegetarian. Hence IVS collaborate with nutritionists can develop specific Indonesia guidelines. The availability of guidelines will help vegan or lacto ovo vegetarian to achieve micronutrients concerned into concrete foods or foodstuffs that are feasible in Indonesia. Next, the result can be used for giving recommendation to MoH as revision of IDG by considering nutrient intake for vegetarian.

Target Group: Adolescents, Parents, Media and Community

Activities to be undertaken:

a. Develop and distribute dietary education material

As the first vegetarian organization in Indonesia, IVS has the moral task to maintain vegetarian spirit. Estimated about 20% of IVS members are youth people and they need special consideration regarding of their nutritional need. IVS can develop the program to

arouse their knowledge about health like making the vegetarian camp or creating the special website for those groups. For no internet access area, the local IVS staff can use leaflet, poster, flyers, and invite adolescents to discuss about their diet on certain occasion.

The balanced information about positive and possibly negative consequences and challenges of different vegetarian diets to its members is crucial. It is because most of motivation member to join is religious reason, so for them, the health aspects sometimes is not the priority. It is IVS task to give more information to them. If the members are well informed, also about possible difficulties of having a healthy vegetarian diet and how to cope with them, then both the IVS and vegetarian lifestyles will gain respect from the health sector.

b. Give priority on parent as well as adolescent focused outcomes

Vegetarian adolescents commonly live all of the day with their parents. Their food is depended on family menus. Inviting parents on IVS activities and giving them supporting, information, and food preparation skill maybe a persuasive ways to increase their awareness about vegetarianism. Food preparation advice given should provide clear description of the diet on both size and number of servings per day and if necessary by providing recipes from local food.

The parents' role here is crucial. Thus they should be aware about their children's diet. The parents can help their children to be well nourished by:

- Keeping a variety of energy source foods like whole grain bread, rice, noodles and crackers as well as fruits, vegetables and dairy products. The use of oils, margarines, and sweeteners may be included.
- Encouraging adolescents to contribute to meals by helping with meal planning and preparation.
- Remembering that adolescents have the right to their own food choices. Parents' job is to stock the variety of health food.
- Encouraging involvement in IVS activities that will increase their knowledge of vegetarianism.

c. Build School/ Religious places based nutrition interventions

IVS can develop cooperation with the schools on creating vegetarian friendly atmosphere and giving adolescents information how to explore

their nutrient intake and needs, for example by stressing the important of eating breakfast and providing vegetarian food in school canteen.

Because motivation of adolescents become vegetarian is religious, IVS can conduct a training of trainer's workshop for religious activist about well planned vegetarian diet and early detection of IDA and CED. Next they can convey this message for adolescents during religious activities. In addition, IVS also can provide some vegetarian information paper on religious places.

d. Maintain good cooperation with communities

In this part, the strategies are intended for promotion of vegetarian in community. Vegetarianism can be promoted by using behaviour change program through communication. Here the good cooperation with vegetarian actors/actress, athletes, public figures and media should be maintained. IVS has many times invited them to attend IVS activities by sharing their experience about vegetarianism.

Media take important role on spreading messages to community; IVS can write on newspaper about benefits and tricks of fighting of vulnerabilities of vegetarian diet regularly. Radio interactive talk show can be used to grip what the communities think about vegetarian and the same time to increase their awareness of vegetarian. Vegetarian food recipes can be demonstrated on cooking demo on television program or published on magazine in order to give knowledge about dietary diversification.

Also IVS can make lobbying with restaurants and supermarket to provide vegetarian food on their stands. The availability of vegetarian food will help vegetarian find their food easily and finally can give contribution to improve their nutritional need. In addition Vegetarian food bazaar which is always doing by IVS is a good idea to introduce this diet to community.

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Annex 1. Selected Food Sources of Iron and Calcium

Table 6 Selected food Sources of non hem iron

Food Sources	Milligrams per serving
Ready-to-eat cereal, 100% iron fortified, ¾ cup	18
Oatmeal, instant, fortified, prepared with water, 1 cup	10
Soybeans, mature, boiled, 1 cup	8.8
Lentils, boiled, 1 cup	6.6
Beans, kidney, mature, boiled, 1 cup	5.2
Ready-to-eat cereal, 25% iron fortified, ¾ cup	4.5
Tofu, raw, firm, ½ cup	3.4
Spinach, boiled, drained, ½ cup	3.2
Spinach, canned, drained solids ½ cup	2.5
Raisins, seedless, packed, ½ cup	1.5
Whole wheat bread, 1 slice	0.9
White bread, enriched, 1 slice	0.9

Sources: Dietary Supplement Fact Sheet: Iron. US Office of Dietary Supplements. National Institutes of Health

Table 7. Selected food sources of Calcium

Food Sources	Calcium (mg)
Yogurt, plain, low fat, 8 oz.	415
Bread, whole wheat, 1 slice	20
Cheddar cheese, 1 ½ oz shredded	306
Milk, non-fat, 8 fl oz.	302
Milk, reduced fat (2% milk fat), no solids, 8 fl oz.	297
Milk, whole (3.25% milk fat), 8 fl oz	291
Broccoli, raw, ½ cup	21
Tofu, firm, made w/calcium sulfate, ½ cup	204
Soy beverage, calcium fortified, 8 fl oz.	80-500
Orange juice, calcium fortified, 6 fl oz.	200-260
Spinach, cooked, ½ cup	120
Chinese cabbage, raw, 1 cup	74

Sources: Dietary Supplement Fact Sheet: Calcium. Office of Dietary Supplements. US National Institutes of Health.

Annex 2. Differences in Selected Dietary factors between vegetarian and non vegetarian on Adolescence

Table 8 Differences in Selected Dietary factors between vegetarian and non vegetarian on Adolescence

Table 3. Differences in Selected Dietary Factors Between Vegetarians and Nonvegetarians*

Dietary Factor	Vegetarian (n = 262)	Nonvegetarian (n = 4259)	*P* Value
Calories, kcal	1972.9 (81.0)	2092 (19.8)	.15
Protein, g	70.0 (2.9)	75.3 (0.7)	.08
Calcium, mg	1070.4 (43.4)	1089.7 (10.6)	.67
Zinc, mg	11.4 (0.5)	11.7 (0.1)	.54
Iron, mg	16.1 (0.6)	14.7 (0.1)	.03
Vitamin A, U	9931.1 (448.1)	8480.4 (109.8)	.002
Vitamin B_6, mg	1.7 (0.1)	1.7 (0)	.94
Vitamin B_{12}, µg	6.3 (0.4)	7.2 (0.1)	.02
Vitamin C, mg	157.0 (6.8)	149.4 (1.7)	.27
Folate, µg	348.8 (13.2)	307.9 (3.2)	.003
Linoleic acid, g	10.9 (0.5)	11.8 (0.1)	.15
Cholesterol, mg	186.0 (9.6)	221.7 (2.3)	<.001
Caffeine, g	53.2 (2.9)	43.6 (0.7)	.001
Fiber, g	18.8 (0.7)	16.1 (0.2)	<.001
Regular soda, daily servings	1.2 (0.1)	1.4 (0)	.004
Diet soda, daily servings	0.3 (0)	0.1 (0)	<.001
Fruit drink, daily servings	0.4 (0)	0.5 (0)	.02
Fast food, times in past week	1.9 (0)	2.1 (0)	.001
Percentage of calories from protein	13.7 (0.2)	14.3 (0)	.01
Percentage of calories from carbohydrate	60.9 (0.6)	56.4 (0.1)	<.001
Percentage of calories from total fat	26.9 (0.4)	30.1 (0.1)	<.001
Percentage of calories from saturated fat	9.3 (0.1)	10.7 (0)	<.001
Percentage of calories from polysaturated fat	5.4 (0.1)	5.7 (0)	.02
Percentage of calories from monosaturated fat	10.0 (0.1)	11.4 (0)	<.001
Servings of fruit	2.7 (0.1)	2.3 (0)	.003
Servings of vegetables	2.4 (0.1)	1.9 (0)	<.001
Servings of fruits and vegetables	5.1 (0.2)	4.2 (0)	<.001

*Data are presented as adjusted means and SEs; all analyses were controlled for sex and race.

Sources: Cheryl,2002