Chapter 1

Introduction

1.1. Background

Vegetarian diet is gaining popularity today. In the United States, it is estimated that the proportion of adult population adopting vegetarian diet is accounted for 4.5% of the population (Leahy, Lyons, & Tol, 2010). Meanwhile in the United Kingdom, 7% of the population have decided to be vegetarians. Other surveys conducted in Australia and Israel reported that 1% and 5% of the population following vegetarian diet respectively (Radnitz, Beezhold, & DiMatteo, 2015). In Indonesia, the growth of vegetarianism is also shown remarkable figures in the last decade. One of the largest vegetarian communities in Indonesia, Indonesia Vegetarian Society (IVS), has an increasing number of members since its establishment in 1998 with total members of 5,000 people to 500,000 in 2010 (Fikawati et al., 2012).

A vegetarian diet primarily consists only plant-based foods (called vegan), but some may still include eggs (called ovo-vegetarian), or dairy products (called lacto-vegetarian), or both eggs and dairy products (called lacto-ovo-vegetarian) (Cena, Heneman, & Zidenberg-Cherr, 2011), which may reflect their motives for becoming vegetarian, such as health benefits, ethical considerations, environmental issues, and religious factors (Radnitz et al., 2015). As a result of high consumption of plant-derived foods, vegetarians have been demonstrated to have a lower body mass index, total serum and low-density lipoprotein cholesterol levels, and blood pressure which reduced the risk of major chronic diseases than non-vegetarians (Craig, 2015). However, the absence of animal source foods put vegetarians at a greater risk to nutritional deficiencies due to lower amount of nutrients, especially calcium, iron, and vitamin B12. In addition, plant foods have components that affect the absorption and metabolism of some micronutrients, such as phytates and oxalate that can interfere the absorption of calcium and iron, and thus may predispose them to micronutrient deficiencies. This micronutrient deficiencies leads to a variety

of health problems, such as anemia and decreased bone mineralization. Therefore, the most restrictive vegetarian diet, vegan diet, has a higher risk of micronutrient deficiencies than other type of vegetarian diets (Cena et al., 2011).

Micronutrient deficiency is a worldwide problems affecting all genders, ages, and certain risk group (Tulchinsky, 2010), including young and apparently healthy women. In order to optimize both women's health and her offspring, micronutrients are critical throughout their lifetime: during adolescence, reproductive years, pregnancy, and during post-menopausal period (Dunneram & Jeewon, 2015). Some women's dietary patterns that eliminate all micronutrient-rich animal foods will adversely affect their nutritional status and related health consequences (Fayet-Moore, Petocz, & Samman, 2014). The deficiency of iron, calcium, and vitamin B12 is common and of concern among women of reproductive age (Fayet, Flood, Petocz, & Samman, 2014).

Women have a high risk of nutritional deficiency anemia (iron deficiency anemia and vitamin B12 anemia) due to monthly blood loss during menstruation. Anemia is a public health problem across the world, especially in developing countries. According to World Health Organization (WHO), the global prevalence of anemia is 24.8% or 1.62 billion people with the highest prevalence rates are noted in non-pregnant women, 468.4 million (Mahajani & Bhatnagar, 2015). Such thing also happened in Indonesia. Result from Riset Kesehatan Dasar (2013) found that 21.7% population in Indonesia have anemia due to low intake of animal source foods which provide enormous amount of nutrients. Both iron and vitamin B12 are more readily bioavailable in animal products. In the case of vitamin B12, all the requirements must be met from animal-derived foods as they are predominantly found in animals. Thus, a diet that avoids animal products is more likely to be deficient in iron and vitamin B12 due to limited food supply. Study of Mahajani & Bhatnagar (2015) compared the prevalence of anemia between vegetarians and non-vegetarians women in India found that 40% of vegetarians had moderate anemia, 60% had mild anemia, whereas 46.66% of non-vegetarians were in the normal category.

Women, furthermore, due to hormonal changes during menstruation and pregnancy, are more susceptible to weakened of bones and osteoporosis. Getting enough calcium is essential to interfere this issue. The best way to get enough calcium is to eat a variety of healthy foods from different food groups, including fish with edible bones, milk, and dairy products. A type of vegetarian diet which still contain animal products rich in calcium can still meet their calcium requirements compared with vegan diet. A total of 104 persons (7.1%) of vegans in the study of Clarys et al., (2014) were found to have the lowest intake of calcium, 738 mg/day, where the highest calcium consumption was found in the semi-vegetarians and pesco-vegetarians which had 1470 mg/day.

A balanced and varied diet in both vegetarian and non-vegetarian women of reproductive age can affect nutritional status of women's health and well-being. Micronutrient deficiencies, moreover, are also associated with adverse pregnancy outcomes. Therefore, the objective of this current study was to assess the adequacy of micronutrients intake, particularly in iron, calcium, and vitamin B12 of vegetarians and non-vegetarians women, as well as to investigate the contribution of different food groups to the adequacy of micronutrients intake.

1.2. Objectives

- To assess the difference in micronutrients (iron, calcium, and vitamin B12) intake in vegetarians and non-vegetarians women.
- To determine the adequacy of micronutrients (iron, calcium, and vitamin B12) intake in vegetarians and non-vegetarians women.
- To investigate the food categories that contribute the most to micronutrients (iron, calcium, and vitamin B12) intake in vegetarians and non-vegetarians women.

1.3. Hypothesis

- There is difference in consumption levels of calcium, iron, and vitamin B12 among vegetarians and non-vegetarians women.
- Non-vegetarian women have adequate intake of calcium, iron, and vitamin B12.
- Women's diet which include animal source foods contribute the most to calcium, iron, and vitamin B12 intake.

1.4. Benefit of the study

The findings of the study would provide great benefits to:

- **The body of knowledge**. This gives them the information about micronutrient and adequacy of iron, calcium, and vitamin B12, as well as food choices in both vegetarians and non-vegetarians. The finding of the study could also be used for supplementary literature for further research.
- **The academia**. This gives them a valuable contribution for further research in vegetarianism. This study may also be continued or replicated.
- **The society**. This will help them find out the level of nutrients, well-balanced diet and food diversity to improve both vegetarians and non-vegetarians women's health and wellbeing.