CHAPTER 1

INTRODUCTION

Anemia occurs when the level of body hemoglobin is lower than that in normal people for the same age and sex and in the same environment. The most common kinds of anemia are due to nutritional deficiencies such as iron, folic acid and less commonly, vitamin B 12 and protein. Other common causes of anemia are congenital defects of hemoglobin production, namely, sickle cell anemia and other hemoglobinopathies, including thalassemia. Protozoal infections and infestations, particularly malaria and hookworm, are also important direct causes of anemia.

Iron is a mineral found in every cell of the body. Iron carries oxygen around the body in the form of hemoglobin in red blood cells, giving life to each individual cell. Iron deficiency affects over 2 billion people globally, which is approximately one-third of the whole world population, living in all countries.

The amount of iron which is absorbed from food depends on the form of iron and on other constituents of the diet. In meat and fish nearly all the iron is present as heam iron. Heam iron is absorbed much better than inorganic iron from vegetables and is little affected by other constituents in the diet. Heam absorption increases in iron deficiency and is reduced when the body is overloaded with iron. The iron in vegetables is present as nonheam complexes in which iron is bound in an insoluble form to proteins, phytate,

oxalates, phosphates and carbonates. Enhancers of iron absorption are (1) heam iron which is found only in meat, poultry, and fish. Another important enhancer is (2) vitamin C. Inhibitors of iron absorption include polyphenols in certain vegetables, tannins in tea, phytate in bran and calcium in dairy products. Vegetarian diets are low in heam iron. However, iron bio-availability in a vegetarian diet can be increased by careful planning of meals to include other sources of iron and enhancers of iron absorption.

Three stages characterize the development of iron deficiency anemia:

- Iron depletion, the first stage and is characterized by a progressive reduction in the amount of storage of iron in the liver.

- Complete exhaustion of iron stores characterizes the second stage. As a result, the plasma iron supply to the erythropoetic cells is progressively reduced. Exercise performance also appears to be reduced at this stage.

- Iron deficiency anemia, the third and final stage of iron deficiency, is caused by an exhaustion of iron stores and declining levels of circulating iron.

Iron deficiency anemia is a stage of inadequate amount of red blood cell caused by lack of iron to meet the body's requirement. This insufficiency may be due to inadequate iron intake, reduced bio-availability of dietary iron, increased needs for iron or chronic blood loss especially from hookworm infestation. When prolonged, iron deficiency leads to iron deficiency anemia.

Iron deficiency is the only micro-nutrient deficiency which still exists in developed countries where other forms of malnutrition have already been virtually eliminated.

The people most affected by iron deficiency are women and children of preschool age. Often, more than 50 percent are anemic. In young children, iron deficiency causes developmental delays and behavioral disturbances, and in school children, lower learning ability. In pregnant women, it increases the risk of pre-term delivery and delivering a low birth-weight baby. In adults, iron deficiency causes fatigue and lower work capacity (Babara, Rainer, Werner, & Soemilah, 1997). Moreover, those with iron deficiency are more prone to infectious diseases such as respiratory and gastrointestinal tract infections.

Iron deficiency generally develops slowly and is not clinically apparent until anemia is severe even though functional consequences already exist. Where iron deficiency anemia is prevalent, iron deficiency exists approximately in the same number. Therefore, an effective control programme to control and prevent iron deficiency anemia will benefit to human health especially women of reproductive age by providing better iron stores for future pregnancies.

In Thailand, large scale surveys for the prevalence of iron deficiency anemia were conducted by the Nutrition Division, Department of Health, Ministry of Public Health. It was revealed that the prevalence of anemia in preschool children (Hematocrit < 33%) was 15% in 1991. In 1993, the prevalence of anemia in pregnant women (Hemoglobin < 11 g/dL) was 37% and the prevalence in schoolchildren (Hemoglobin < 12 g/dL) was 17% .

In 1995, the National Nutrition Survey revealed the prevalence of anemia in women aged 15-49 years (Hemoglobin < 12 g/dL) was 16.8%. Later in 1997, in a factory in the central region, the prevalence of anemia among women of reproductive age of 15-44 years (Hemoglobin < 12 g/dL) was 37.2%.

While fortification of staple foods with iron can improve iron nutrition and play a major role in preventing iron deficiency, specific groups of people are likely to need oral iron supplements to prevent and control iron deficiency anemia. Thus oral iron supplements can be an effective intervention in an integrated approach to prevent iron deficiency and iron deficiency anemia.

The past focus of many anemia interventions and international support for these interventions has been on daily oral supplementation of pregnant women with tablets containing ferrous sulfate. Major organizations, including INACG, WHO, and UNICEF, now recommend routine iron supplementation for young children, adolescents and women of reproductive age when the level of anemia in a population is more than 40%. Many trials of weekly iron dose supplementation yielded positive results.

The treatment of iron deficiency anemia is technically quite simple requiring only the administration of medical iron. Prevention is more complex. Treatment of iron deficiency anemia must rely on medical iron, since dietary changes alone cannot correct iron deficiency anemia, especially in severe cases. The treatment of choice is oral administration of ferrous fumarate, gluconate or sulfate. Several studies have shown that a weekly iron tablet supplementation was equally effective in improving iron status as a daily

iron tablet supplementation. The advantages of weekly iron tablet supplementation include:

- reduced number of tablets
- reduced cost.
- better compliance.

Women often stop to take daily iron supplementation after a while due to side effects.

Based on positive results in Indonesia, Malaysia and China (George, & George, 1999.) iron tablets, Ferrous Sulfate (60 mg iron elemental) in a weekly dose was supplemented to women of reproductive age in this study.

In addition to addressing anemia during pregnancy, public health services should implement policies that ensure the provision of adequate iron to non pregnant women of reproductive age. Strong advocacy and considerable assistance are required to help with programme design and mobilizing resources and efforts to prevent iron deficiency.

In 2000, the department of Health, MOPH launched the program "Healthy Workplace" throughout the country. A bronze, silver and golden certificate was presented to the small- medium enterprises (SMEs) workplace which met the criteria of "Clean and Safe", "Unpolluted Place" and "Healthy Personnel". The provision of weekly Ferrous Sulfate (60 mg elemental iron) is one element in "Healthy Personnel". Action Research was conducted on weekly iron supplementation and nutrition approach to control and prevent iron deficiency in order to improve iron status among the target group and also to test the feasibility of the programme for further sustainability.