**CHAPTER II**

**LITERATURE REVIEW**

## 2.1. CRITERIA FOR DIAGNOSIS OF OVERWEIGHT AND OBESITY IN ADULTS

Criteria for diagnosis of overweight and obesity are not uniform in all the countries of the world. In adults, the currently accepted classifications are based on body mass index (BMI), which is calculated by dividing the weight in kilograms by the square of height in meters ($kg/m^2$). According to World Health Organization, 1997 the classification of overweight and obesity should be standardized on an international basis: BMI < 18.5 underweight, BMI between 18.5-25 normal, BMI $\geq$ 25 overweight; BMI $\geq$30 obesity. However, these standards base on Europids may not indicate morbidities in certain ethnic group, especially in Asia- pacific region. Throughout the Asia-pacific region, there are differences in obesity prevalence and body fat distribution. For example, In a study of 1513 Hong Kong Chinese, the risk of diabetes, hypertension starts to increase at BMI of about 23 $kg/m^2$ (Ko et al 1999). Similar, Deurenberg-Yap M. et al (2000) studied the relationship between body fat percentile and body mass index (BMI) in three different ethnic groups in Singapore (Chinese, Malays, and Indians) in order to evaluate the validity of the BMI cut-off points for obesity. For Chinese and Indians, the study suggests using a BMI of 27.0 as the cut-off points for obesity (instead of 30), and using Body Mass Index of 21 as the cutoff for overweight (instead of 25), because these values match the same body fat percentage as Caucasians. The obesity for Singapore Indians

would be 26 because body composition differences between ethnic groups in Singapore. In Taiwan, According to Yi-Chin Lin et al (2003), definition of overweight and obesity for Taiwanese is BMI =24-26.99 kg/m$^2$ and $\geq$ 27 kg/m$^2$ respectively.

In Asians, the cut-offs for overweight and obesity are lower than WHO, 1997 criteria. Asians have a greater visceral fat, BMI as low as 23 kg/m$^2$ may be associated with related diabetes or insulin resistance in them.

*Table 1: Proposed classification of weight by BMI in adult Asians*

| Classification | BMI (kg/m$^2$) | Risk of co-morbidities |
|---|---|---|
| Under weight | < 18.5 | Low (but risk other clinical problems increased) |
| Normal | 18.5-22.9 | Average |
| Overweight | $\geq$23 | |
| At risk | 23-24.9 | Increased |
| Obese – class I | 25-29.9 | Moderate |
| Obese – class II | $\geq$ 30 | Severe |

Source: The Asia –Pacific perspective: Redefining obesity and its treatment 2000.

In Vietnam, there were some previous studies about overweight and obesity in adults such as Doan T.V. (2000), Nguyen K.H. (1996-2001) and Ha H.K. (1997). These studies classified overweight and obesity using WHO definition (BMI $\geq$ 25 overweight; BMI $\geq$30 obesity) because there is no criteria for Vietnamese. Therefore I chose these cut

offs for adults in my study in order to compare the results with previous studies in Vietnam.

BMI has some limitations because it is an indirect measurement of body fat. Although BMI value is same for both sexes and all ages they do not correspond to the same degree of fatness in different population. BMI does not take into account body frame and the proportion of lean mass, which means that some individuals are not accounted eg. athletes. Some people have high BMI but they are not overweight or obese such as: in pregnancy, fluid overload (heart failure, nephrotic syndrome, ascites), medication adverse effect (sultphonylureas, corticosteroid, valproate), Endocrine problem (hypothyroidism, cushing's disease), and excessive muscular development (athletes). Despite these limitations BMI is used commonly to classify overweight and obesity.

## 2.2. CRITERIA FOR DIAGNOSIS OF OVERWEIGHT AND OBESITY IN CHILDREN.

**Using BMI** percentile standards established by WHO, nutritional status may be classified as shown in table 2

*Table 2: Classification of overweight and obesity in children*

| BMI | Classification |
| --- | --- |
| Under 5th percentile | Underweight |
| At 5- 84.9 percentile | Normal |
| At 85-94.9 percentile | Overweight |
| Up or above 95 percentile | Obesity |

## 2.3. RELATED FACTORS TO OVERWEIGHT AND OBESITY IN CHILDREN

According to WHO 1997, the major factors related to overweight and obesity are dietary factors, physical activity patterns, socio-economic and cultural factors influencing energy intake and physical activity pattern. Genetic factors may also be involved.

**Figure 1 Conceptual Framework: Determinants of overweight and obesity in school children**
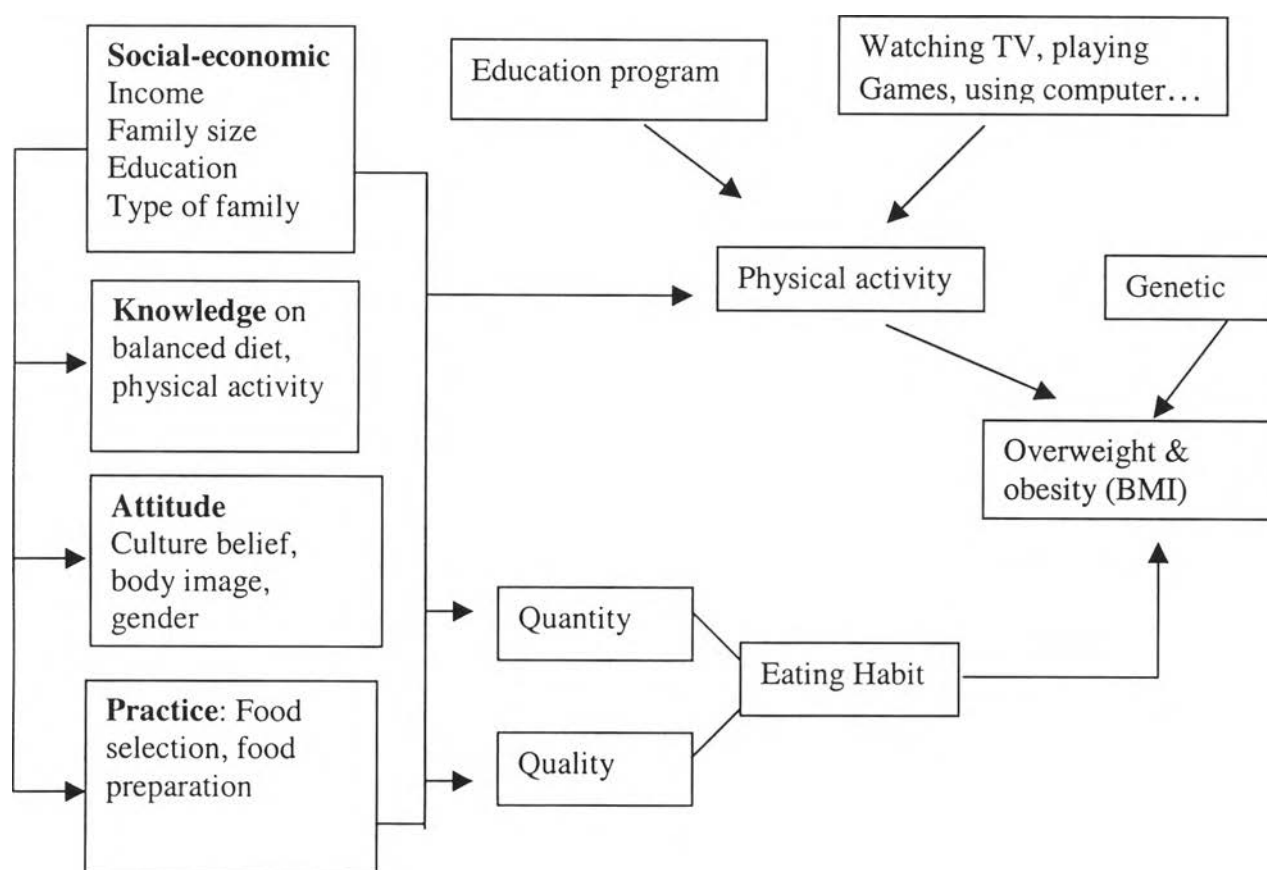
Figure 1 explains the determinants of overweight and obesity in children. Genetic factors, physical activities, and eating habit are the major factors affecting overweight in children. Eating habit and physical activity of children are affected by socio-demographic characteristics, their knowledge and attitude, and also by mother's knowledge, attitude and practice on selection and preparation of food.

(1). SOCIO –ECONOMIC

Socio economic status is defined as the amount of income, occupation, and education level of the primary providers of the family. Obesity has strong negative association with socio-economic status (SES) among women in developed countries; in developing countries the rate of obesity rises in line with increasing socio-economic status (Jane Wardle,2001). In 1989, Sobal and Stunkard performed a broad review of 144 publications that related socio-economic status and obesity. The relationship between obesity and socio-economic status for both men and women in developed countries were not consistent. Thirty studies of women in developed countries found a direct relationship between these factors, 28 studies found an inverse relationship, and 2 found no relationship.

In contrast the studies conducted in developing countries found direct relationship between obesity and socio-economic status for both men and women. In developing countries such as India, A survey was conducted in 1998 by Reddy, B. Nirmala showed that there was the positive relationship between socio-economic and body mass index. Data was collected from 1,119 individuals, aged 18 to 75 years, from socio economic diverse populations in southern Andhra Pradesh, India. Better socio economic status by

group and decreased physical activity were also correlated with increase in mean BMI. Other survey conducted by Bharati (1989) reported that there was a positive association between body dimensions and socio economic status in southern West Bengal. The nutrition situation of any community is based on certain socio economic conditions, such as occupation, per capita income and some times even population social background. BMI has a strong relationship with socio economic conditions and pattern of food intake.

Delpeach et al (1994) reported a large prevalence of low BMI in rural areas and high BMI in urban areas of the Congo, a central African country. They also found that BMI has positive association between body dimensions and socio economic changes overtime.

In Viet Nam there were some studies on the relationship between socio- economic and overweight conducted by Nguyen T.H.(1997); Le T.H. (1999), Do K.L.(2000). The results of these studies showed that the prevalence of overweight and obesity in groups with high economic level was higher than group with low economic level.

## (2). DIETARY FACTORS AND PHYSICAL ACTIVITY PATTERNS

According to WHO 1997, obesity is a consequence of an imbalance between energy intake and energy expenditure. If total energy intake has exceeded energy expenditure the person will have an excessive amount of fat and may lead obesity. WHO in 1999 stated that "Dietary factors and physical activity pattern have a strong influence on the energy balance equation and can be considered to be the major modifiable factors

through which many of the external forces promoting weight gain act" said by WHO 1999.

Chu N.F. (2001), Taiwan, showed that the causes of obesity are multi-factorial and the relationship between factors and obesity is complicated. This increasing prevalence of obesity was also seen in Taiwanese adults and children, which may partly be explained by an imbalance of energy intake and expenditure. For example, total energy available increased from 2661.7 to 2999.2 calories /day and fat intake rose from 63.5 to 128.4 g/day during 1970 to 1989 in Taiwan. Of course, increasingly sedentary life styles including excessive TV watching and physical inactivity are partly to blame for this trend.

Mabel A. Yap (1994) in Singapore conducted a case –control study of 400 children with obesity (mean age 10 years) and their parents to determine some of the factors likely to be associated with obesity in primary school children. It concluded that the factors of obesity in children were dietary practices and intake, activity patterns, family history and social factors.

In Vietnam many previous studies proved that there were association between nutritional status of children and dietary, physical activities (Le T.H.(1996), Cao Q.V. (1995), Nguyen T.T.H. (2001)).

(3). GENETIC FACTORS

In addition to environmental influences, certain individuals with a familial history of obesity may become obese. According to Stuck and Frock, who studied a large

numbers of twins and found similarities in children of biological parents. This study indicated that genetic influences are very important in the etiology of obesity.

Obesity tends to run in families, suggesting that it may have a genetic cause. However, family members share not only genes but also diet and lifestyles that may contribute to obesity. Separating these lifestyle factors from genetic ones is often difficult. There is growing evidence to point to heredity as strong determining factor of obesity.

However, some important trends in obesity cannot be explained by genetics. For example in 1995 there were an estimated 200 million adults worldwide classified as overweight; in 2000 the numbers of overweight in adults were over 300 million. The cause of such a large increase in this short time is probably environmental and not genetic (Bray, 1998).

(4). KNOWLEDGE OF MOTHERS:

In Vietnam, mothers are the people who prepare food for children. Therefore, knowledge and practices of mothers on nutrition may play an important role in the nutritional status of children. Most of the previous studies on malnutrition were focused on group of under 5 years children. There were few studies conducted in primary school children. The results of studies conducted by Dam T.T.(2000), Saito et al.; Le T.H. (1999)  Wu FL. Yu S. et al. (2003)  found that there were close relationship between knowledge, attitude and practice of mothers on nutrition and nutritional status in their children.