OBESITY AND RELATED FACTORS AMONG STUDENTS GRADE 7 – 12 IN PHUTTHA MONTHON DISTRICT, NAKHON PATHOM PROVICE, THAILAND

NGUYEN THANH

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Thesis
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ABSTRACT

Obesity is a worldwide epidemic. In Thailand, with a rapidly changing society, obesity prevalence is increasing dramatically both in adult and children.

A cross-sectional study was conducted in Phutha Monthon district, Nakhon Pathom province, Thailand in 2008. The objective was to determine the prevalence of obesity and its related factors among students grade 7-12. Two hundred and thirty students were selected by multi-stage cluster sampling with proportional size. Student anthropometry was measured by the researcher and a questionnaire was used to assess factors related to obesity.

The study revealed that the prevalence of obesity among the sample was 8.7 %, fat was 6.04 % and slightly fat was 5.65%. Paternal occupation had a significant relationship to obesity status. This revealed indirectly that family income had an association with obesity. There was no significant association between gender, parental marital status, parental education level, birth order and obesity. The result showed that students who ate fruits more than three times per week were 3.69 times more at risk of obesity than those who ate fruits less than or equal to 3 times per week (adjusted odds ratio: 3.69, 95% CI 1.04-13.13). Other food consumption such as fast food, fatty food, was not significant association with obesity. Physical activities and nutritional knowledge were also found to be not significant factors in this study. There was no significant difference of time spent in watching TV, passive entertainment activities between the obese and non obese group.

The large potential for obesity to develop is alarming. Obese and fatty students needs to be monitored closely. This study has produced result that contradict many previous studies so the results need to be treated with great care and unless further research confirm them. The common method of avoiding obesity such as promoting healthy food and physical activities should be continued.

KEY WORDS: OBESITY/ EATING HABIT / PHYSICAL ACTIVITY

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LIST OF ABBREVIATIONS

ADDs	:	Adults with Dental Diseases
AIHD	:	ASEAN Institute for Health Development
BMI	:	Body Mass Index
CHD	:	Coronary Heart Disease
EGAT	:	Electricity Generating Authority of Thailand
EST	:	Ecological Systems Theory
GPA	:	Grade Point Average
NHANES	:	National Health and Nutrition Examination Survey
NCHS	:	National Center for Health Statistics
NIDDM	:	Non Insulin Dependent Diabetes Mellitus
WHO	:	World Health Organization
WHR	:	Waist to Hip Ratio

CHAPTER 1
INTRODUTION

1.1 Rationale and justification

1.1.1 Obesity the worldwide epidemic

Excess body weight poses one of the most serious public health challenges of 21st century for all over the world. Nowadays obesity is not only a problem of developed countries, but also developing countries. Evidence is now emerging to suggest that the prevalence of overweight and obesity is increasing worldwide at an alarming rate. Both developed and developing countries are affected. Moreover, as the problem appears to be increasing rapidly in children as well as in adults, the true health consequences may only become fully apparent in the future (1).

In 1995, there were an estimated 200 million obese adult worldwide and another 18 million under five children classified as overweight. As 2000, the number of obese adults has increased to over 300 million. In developing country, it is estimates that over 115 million people suffer from obesity and related problems (2). WHO's latest projections indicated that globally in 2005:

- Approximately 1.6 billion adults (age 15+) were overweight;
- At least 400 million adults were obese.
- At least 20 million children under the age of 5 years are overweight globally

WHO further projects that by 2015, approximately 2.3 billion adults will be overweight and more than 700 million will be obese (3).

Obesity has reached epidemic proportions globally and is a major contributor to the global burden of chronic disease and disability. Often coexisting in developing countries with under-nutrition, obesity is a complex condition, with serious social and psychological dimensions, affecting virtually all ages and socioeconomic groups.

Increased consumption of more energy-dense, nutrient-poor foods with high levels of sugar and saturated fats, combined with reduced physical activity, have led to obesity rates that have risen three-fold or more since 1980 in some areas of North America, the United Kingdom, Eastern Europe, the Middle East, the Pacific Islands, Australasia and China. The obesity epidemic is not restricted to industrialized societies; this increase is often faster in developing countries than in the developed world.

Obesity and overweight pose a major risk for serious diet-related chronic diseases, including type 2 diabetes, cardiovascular disease, hypertension and stroke, and certain forms of cancer. The health consequences range from increased risk of premature death, to serious chronic conditions that reduce the overall quality of life. Of especial concern is the increasing incidence of child obesity (4). Once considered a problem only in high-income countries, overweight and obesity are now dramatically on the rise in low- and middle-income countries, particularly in urban settings.

1.1.2 Obesity situation in East and Southeast Asia region.

The republic of Korea's National Nutrition Survey of 1995 found that 1.5 % population had BMI > 30 and 20.5% had BMI 25-29.9. In China in the National Nutrition Survey of 1992 less than 2% of population had BMI > 30. In urban regions (excluding Beijing, Shanghai and Tianjin), 12.3% of men and 14.4% of women had BMI 25 to 30 (comparable figures for rural regions were 5.3 and 9.8 % respectively). In Japan in the National Nutrition Survey during 1990 – 1994 less than 3% of the population had BMI > 30 and approximately 24.3 % of man and 20.2 % of women had BMI 25 – 29.9 . In the Second National Health and Morbidity Survey of Malaysia in 1996 16.6% of the population (aged ≥ 18) had BMI 25 – 30 with 4.4% possessed BMI > 30. The above figures showed the marked ethnic and cultural variation in the prevalence of obesity across the region (5).

1.1.3 Obesity situation in Thailand

Thailand is transitioning from an agricultural economic structure and rural society toward industrialization, commerce, and increased urbanization. Accompany a rapidly changing society, Thai obesity prevalence is increasing dramatically both in adult and children. Data from three studies conducted by the same research center in Thailand suggested that diet-related chronic diseases, including obesity, are increasing in affluent urban populations. The first study was conducted in 1985 among 35-54-year-old Thai officials of the Electricity Generating Authority of Thailand (EGAT); it was found that 2.2% of the 2703 men, and 3.0% of the 792 women, had a BMI >30, whereas BMI of 25-29.9 (grade I obesity) were higher (23.3% in men and 18.4% in women). The second study was conducted in 4,069 adults with dental diseases (ADDs), consisting of 1,247 men and 2,822 women, aged 19-87 years during September 1989-August 1990. The results demonstrated that 1.7% of men and 2.4% of women were in grade II obesity, whereas 14.2% of men and 15.9% of women were in grade I obesity. The third study in 1991 was smaller (66 men and 453 women), and had a broader age range(19-61 years), but also assessed nutritional factors in affluent urban Thais (Ramathibodi Hospital staff, RHS). Results of this study showed that 3.0% of men and 3.8% of women had a BMI > 30. Prevalence figures for BMI 25-29.9 were considerably higher (15.2% in men and 23.2% in women). In 1991, the first report on National Health Examination Survey of Thailand was conducted in 13,300 adults, aged > 20 years. The results revealed that 12% of men and 19.5% of women (total 16.7%) had BMI 25-30, whereas 1.7% of men and 5.6% of women (total 4.0%) had BMI >30 (5).

1.1.4 Childhood and adolescents obesity trend

The prevalence of childhood and adolescents obesity is increasing worldwide. In USA, the prevalence of overweight (defined by the 85th percentile of weight for height) among 5-24 years old from a biracial community of Louiciana (n = 11564) increased approximately twofold between 1973 and 1994. Further more, the yearly increases in relative weight and obesity during the latter part of the study period (1983 – 1994) was approximately 50% greater than those between 1973 and 1982 (6). A similar trend has been observed in Japan; the frequency of obese schoolchildren (>

120% SBW standard body weight) age 6 -14 years increased from 5% to 10%, and that of extremely obese (> 140% SBW) children from 1% to 2% during the 20 years between 1974 and 1993. The increase was most prominent in male students aged 9 – 11 years. Early obesity leads to an increased prevalence of obesity – related disorders. In the Japanese study, approximately one –third of obese children grew into obese adults (7).

Childhood obesity is not confined to the industrialized countries, as high rate are already evident in some developing countries. The prevalence of obesity among schoolchildren aged 6 -12 years in Thailand, as diagnosed by weight for height exceeding 120% of the Bangkok reference, rose from 12.2% in 1991 to 15.6% in 1993 (8), and in recent study of 6 -18 year old male schoolchildren in Saudi Arabia, the prevalence of obesity was found to be 15.8% (9). In China, the overall prevalence of obesity increased from 4.2% in 1989 to 6.4% in 1997 among children aged 2 – 6 years. The increase largely occurred in urban areas, where the prevalence of obesity increased from 1.5% in 1989 to 12.6% in 1997 and prevalence of overweight increased from 14.6% to 28.9% at the same period.

1.1.5 The important role of adolescent health

While the health and well-being of all age groups is important, the developmental nature of adolescence leads to special considerations and needs for this population. Rapid growth and development in adolescence leads to new needs, such as those related to: changes in body proportions, size, weight and image; emotional changes; new sleep patterns and needs; developing sexuality and reproductive functioning; and social/peer pressures.

Adolescence is a period in which many life-long patterns of behavior are established, including health promotion/disease prevention behaviors and care-seeking patterns. The extent to which health and other services are available, accessible and culturally acceptable to teens can affect adult care-seeking and other health-promoting activities.

Adolescent health provides the foundation for adult health status. Preventable health problems in adolescence can become chronic health conditions in adulthood. Adolescent obesity, low-calcium intake, sexually transmitted infections, smoking, and substance abuse, for example, can all result in serious, long-term health conditions later in life.

Adolescence, like other developmental stages, has its own unique epidemiology. It is important to develop population-based data on adolescents and to use this data to develop sound policies and programs specifically targeted to the needs of youth.

Societal messages to youth are often confusing and contradictory, adding to the difficulty of successfully navigating the transition to adulthood. Mixed messages and expectations from adults, including media imagery, regarding adolescent independence, responsibilities and sexuality.

Adolescence is a period of unique challenges, particularly for vulnerable youth including those with disabilities and special needs. Social pressure to “fit in” may lead to painful exclusion, which may have long-term psychosocial consequences. Promoting inclusion and social acceptance is particularly critical at this developmental stage (10).

The obesity prevalence of Thailand in general and of Nakhon Pathom province in particular is alarming, on the other hand there were some studies of obesity among primary shool students but no study of higher grade of students who in the adolescent period. Therefore this study was conducted for assessing the prevalence of obesity among students grade 7-12 in Nakhon Pathom province, describing the eating habit, physical activities, and nutritional knowledge of students, the relationship between these factors and obesity were examined.

1.2 Research question

How is the prevalence of obesity and related factors among students grade 7 – 12 in Phuttha Monthon district, Nakhon Pathom province, Thailand

1.3 Research objectives

1.3.1 General objective

Assess the prevalence of obesity among students grade 7–12 in Phuttha Monthon district, Nakhon Pathom province, Thailand

1.3.2 Specific objectives

a. Examine the obesity prevalence among students grade 7–12 in Phuttha Monthon district, Nakhon Pathom province, Thailand

b. Describe knowledge of obesity of students grade 7–12 in Phuttha Monthon district, Nakhon Pathom province, Thailand

c. Describe eating habit and physical activities of students grade 7–12 in Phuttha Monthon district, Nakhon Pathom province, Thailand

d. Determine the relationship between eating habit, physical activities, knowledge and obesity in students grade 7–12 in Phuttha Monthon district, Nakhon Pathom province, Thailand

1.4 Theoretical framework

1.4.1 Human ecological theory

Ecological Systems Theory, also called "Development in Context" or "Human Ecology" theory, specifies four types of nested environmental systems, with bi-directional influences within and between the systems. The theory was developed by Urie Bronfenbrenner . Since its publication in 1979, Bronfenbrenner's major statement of this theory, The Ecology of Human Development has had widespread influence on the way psychologists and others approach the study of human beings and their

environments. As a result of his groundbreaking work in "human ecology", these environments, from the family to economic and political structures, have come to be viewed as part of the life course from childhood through adulthood.
this theory mentioned to five systems:

– Microsystems

The context in which an individual lives such as family, peers, school, neighborhood, most direct interactions with agents.

– Mesosystems

Mesosystem includes relations between Microsystems, connections between contexts. Relation of family experiences to school experiences, school to church, family to peers for example: child who experiences parental rejection may have difficulty with school; certain peer influences may cause family turmoil

– Exosystems

Exosystem are experiences in a social setting in which an individual does not have an active role but which nevertheless influence experience in an immediate context, for example: a parent's job experiences will affect family life which, in turn, will affect children

– Macrosystems

Includes attitudes/ideologies of the culture in which individuals live, for example Judeo-Christian ethic, democracy, ethnicity

– Chronosystems

The patterning of environmental events and transitions over the life course; effects created by time or critical periods in development, for example: disruptive effects of divorce peak one year after the divorce, with effects more negative for sons that for daughters

1.4.2 Application of Ecological systems theory

Ecological Systems Theory (EST) conceptualizes human development from an interactive contextual perspective (11). According to EST, development, or change in individual characteristics, cannot be effectively explained without consideration of the context, or ecological niche, in which the person is embedded. An ecological niche includes not only the immediate context in which a person is embedded, but also the contexts in which that context is situated. In the case of a child, the ecological niche includes the family and the school, which are in turn embedded in larger social contexts including the community and society in general. In addition to these larger contexts, characteristics particular to the child, such as gender and age, interact with familial and societal characteristics to influence development. To summarize, according to EST, development occurs as a result of interactions within and among these contexts; that is, characteristics of the child interact with processes in the family and the school, which themselves are influenced by characteristics of the community and society at large (12). The application of EST to predictors of childhood overweight is illustrated in figure 1.

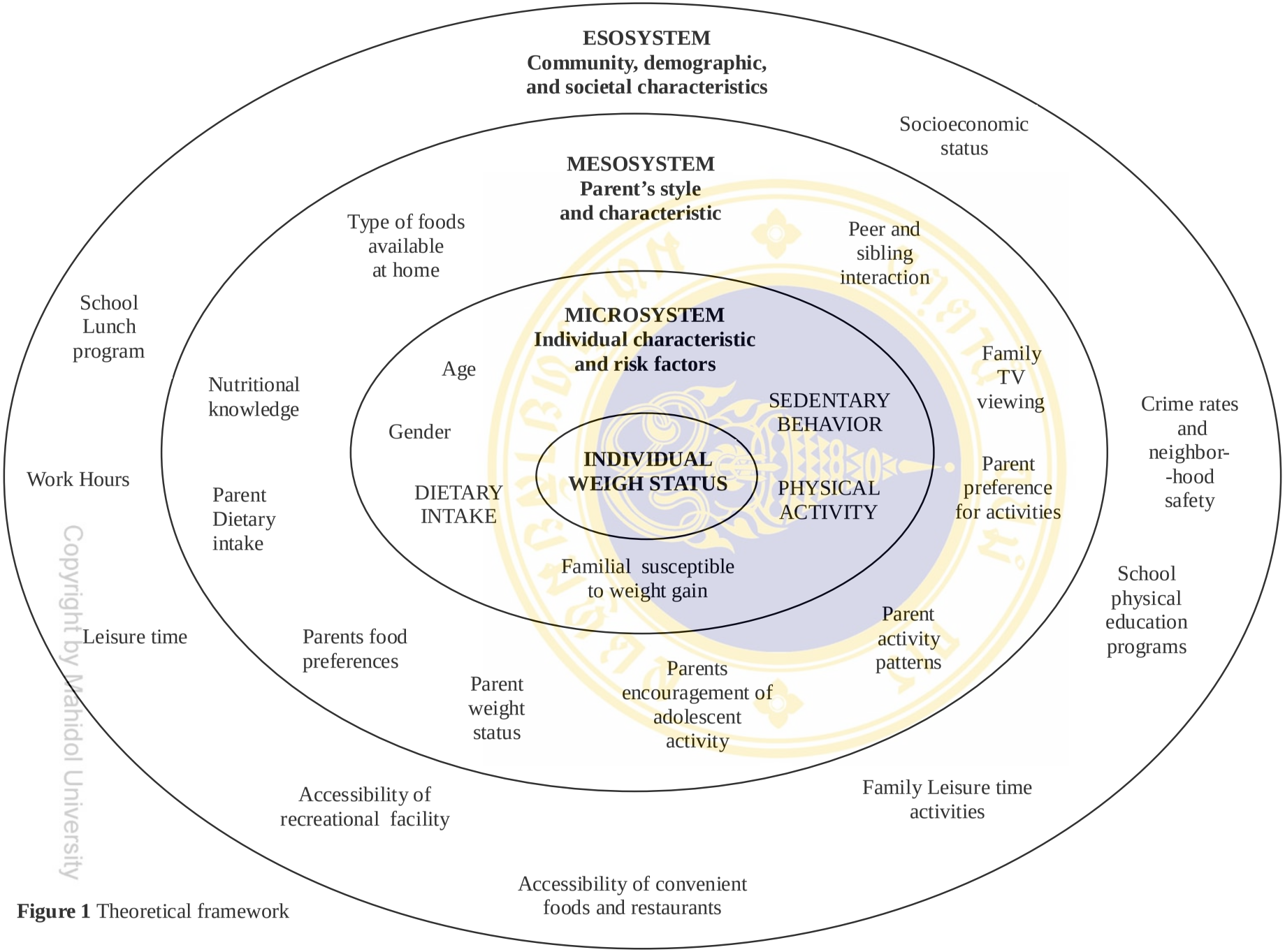

Figure 1 Theoretical framework

1.5 Conceptual framework

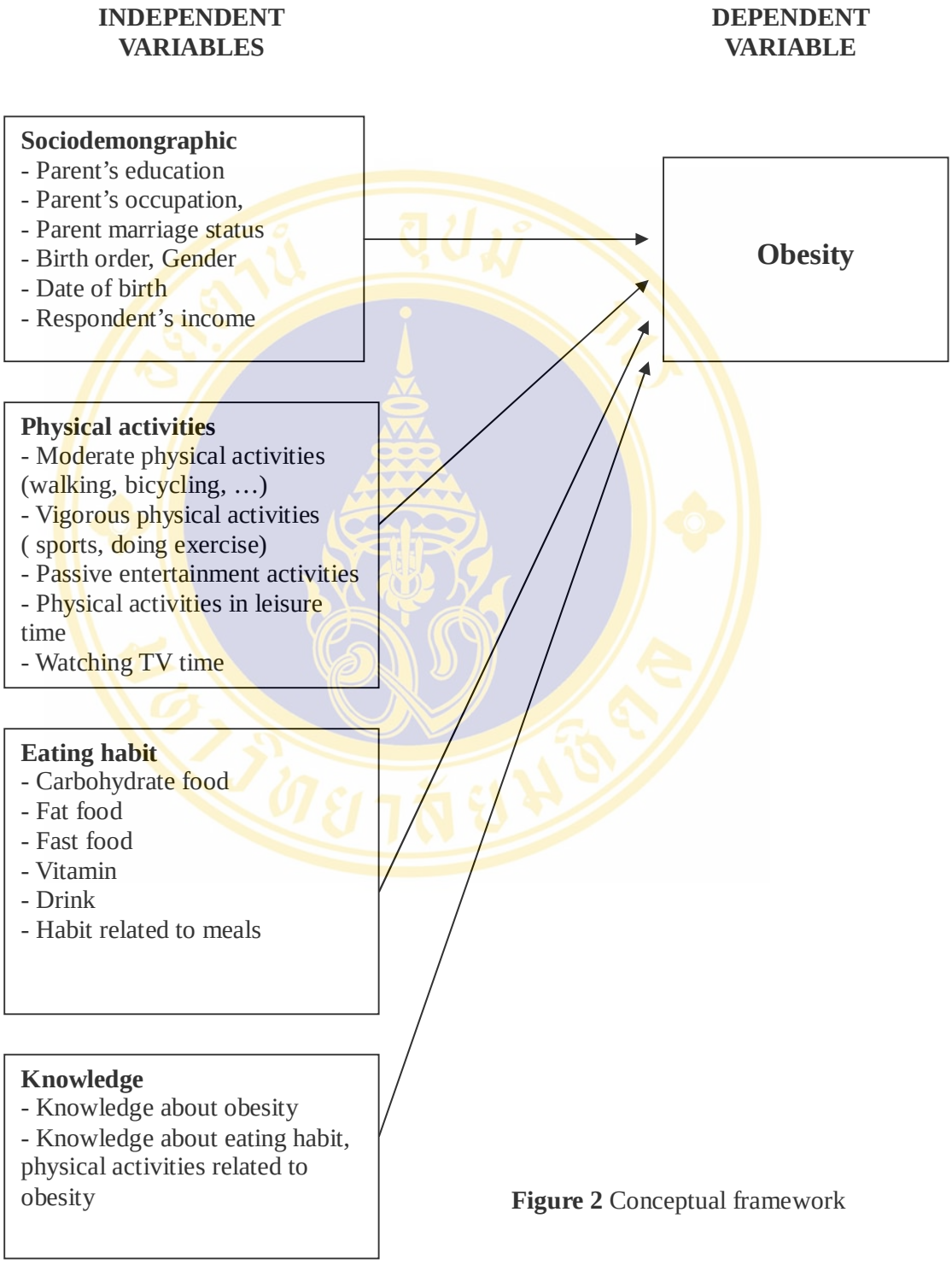

Figure 2 Conceptual framework

1.6 Operational definition of variables

Birth order: Birth order is the chronological order of sibling births in a family.

Parent's occupation: Main occupation in this study are related to presents job of respondent's parents such as :Farmers, Laborers, Business, Government officers. No job mean that they don't have any job or have temporary job.

Parental marriage status: Living together, Divorced, Living separately.

Respondent's income: Total a mount of money (Thai baht) that a individual usually is given by their parents or relatives or other sources daily.

BMI: Body mass index is a simple index of weight for height that is commonly used to classify underweight, overweight and obesity. It is defined as the weight in kilograms divides by the square of the height in meters (kg/m^2) (1).

BMI for age: BMI is used differently for children. It is calculated the same way as for adults, but then compared to typical values for other children of the same age. Instead of set thresholds for underweight and overweight, then, the BMI percentile allows comparison with children of the same sex and age. A BMI that is less than the 5th percentile is considered underweight and above the 95th percentile is considered obesity. Children with a BMI between the 85th and 95th percentile are considered overweight.

Eating habit: The practices related to food intake, include kinds of foods, how to eat. Eating habit were based on the questionnaire

Everyday: seven days per week

Often : four to six days per week

Sometime : one to three days per week

Never: never eat that kind of food

Meal: Time for eating foods that bought from food store or prepared by family. Other factors concerned to a meal are number of meals, time for a meal, latest meal in a day,

Fast food: Foods designed for ready availability, use or consumption and sold at eating establishments for quick availability or take-out. In this research fast food are all kinds of food which are sold in fast food store system like McDonalds, KFC, Burger King, Pizza Hut and so on. Otherwise times of having fast food is important in eating habit

Physical activities: Physical activities is generally defined as any bodily movement produced by skeletal muscles that result in energy expenditure above resting level

Moderate intensive physical activities: Activities that raise the heartbeat and leave the person feeling warm and slightly out of breath. These activities include walking, bicycling, housework, gardening and done at least 5 days per week, 30 minutes per day

Vigorous intensive physical activities: Activities enable people to work up a sweat and become out of breath. They usually involve sport or exercise for example football, running, basket ball, badminton, swimming, tennis at least 3 days per week and 20 minutes per days (13).

Passive entertainment activities: Sedentary Entertainment activities that result in energy expenditure similar resting level such as watching TV, go on internet, chatting, computer game, reading book..

Knowledge about eating habit and physical activities concerned with obesity: referred to knowing of obesity and factors affect to obesity like physical activities, eating habit. It was measured by questionnaire.

1.7 Limited of the study

Although conducted with a lot of efforts, this study still had many limitation. At first, this was a cross sectional study, so it just has described the situation of the small sample, may not reflect all population. For studying nutritional status, a large sample size was necessary, but here only 230 residents were included therefore the result may have some bias . This study tried to described obesity status and some related factors only, did not mentioned about causal relationship.

Secondly, to assess the eating habit, this study used self administered questionnaire, the questionnaires did not include the detail in each group of food and in daily eating activities as well so researcher could not approach to resident's eating habit comprehensively. Food frequency questionnaire was limited in that measurement errors could occurred, such as respondents bias through misunderstanding the instructions for completing the questionnaire. Apparent misunderstanding of the food frequency section of the questionnaire led to a much lower response rate through incorrect responses due to misinterpretation. This lowered response rate would have influenced the representative and thus may have biased the data.

Thirdly, in this study eating habit, physical activities were assessed by questionnaire. Energy intake, energy expenditure and energy balance were not approached, this was a disadvantage in reflex the nature of association between food consumption, physical activities and obesity.

Lastly, although an Anthropometric measurement procedure was set up before measuring weight and height, coordinators were attended a short training about that, but some errors may occurred in measurement process, this more or less may affected to the result of the study.

CHAPTER 2
LITERATURE REVIEW

2.1 Definition of obesity

Obesity is often defined as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired. The underlying is the undesirable positive energy balance and weight gain. However, obese individuals differ not only in the amount of excess fat that they store, but also in the regional distribution of that fat within the body. The distribution of fat induced by weight gain affects the risks associated with obesity and the kinds of disease that result (1).

2.2 Assessment of obesity

Anthropometry include a set of simple, inexpensive and non – invasive methods to assess both the size and composition of the human body. Height and Weight are considered to be the most useful anthropometric measures for monitoring nutritional status, such as underweight, overweight and obesity. The anthropometric indices derived from these measures need to be specified by age and gender and are often considered more useful than the measures alone. In that respect, weight for height is considered a most useful index for assessing the preschool children. The body mass index (BMI), calculated as weight (kg) divided by height squared (m^2), is a simple index of weight for height commonly used to classified underweight, overweight and obesity in adults. Since it does not distinguish between weight associated with muscles and weight associated with fat, BMI provides only a crude measure of body fatness. Other indices such as waist and hip circumferences, measure the other aspects of the body composition and fat distribution and have independent

and often opposite effect on cardiovascular disease risk factors. Waist circumference is a relative simple an convenient measure and can be used to assess the quantity of abdominal fat. Hip measurement provide additional variable information about gluteofemoral muscles mass and bone structure, and hip circumference is negatively associated with health outcome in women. The waist – to – hip ratio (WHR) may there for be a useful measure, since it also includes the accumulation of fat on the hip; such as an accumulation may be beneficial for health (14).

For children and adolescents, overweight and obesity are defined differently and use different approaches. Before the launch of the new WHO Growth standard in April 2006, the use of the weight – for – height index was recommended for the classification of overweight in preschool children; this index was defined as a weight – for – height greater than + 2 standard deviations (SD) of the United State National Center for Health Statistics (NCHS)/WHO international reference median. Apart from the weight – for – height index, The WHO 2006 Standard provide BMI – for – age values that can be used for the early detection of a growth pattern leading to increased obesity risk. Also, WHO is reviewing the development of a new reference for school – age children and adolescents. Until this review is completed, WHO recommends the use of age – and gender – specific BMI – for – age percentiles for children in the United States, where overweight is defined at a BMI > 85 percentile and obesity as a BMI > 95 percentile (14).

2.3 Determinants of obesity

Determinants of obesity can be related to either dietary intake or physical activity or to both, and they can be genetic, psychosocial, behavioral, or environmental. In addition, determinants of obesity can vary, depending on other factors, such as age of the person. Although in the past, much emphasis was placed on individual risk factors for obesity, recent reviews and recommendations have focused on the contribution of environmental factors to the development of obesity. In fact, researchers refer to the environment in which we live as an obesogenic “obesity – promoting” environment or as a toxic environment because of the decrease in

opportunities for physical activity as well as the increasing supply of highly palatable, energy – dense, low – nutrient foods (15). Some researchers argue that increasingly "obesogenic" environments are probably the main driving force behind the obesity epidemic (16). Excess weight accumulation occurs with an imbalance in energy, cause by either a surplus of energy intake (calories from food) or lack of energy expenditure (physical activity) (17).

2.4 Consequences of obesity

2.4.1 Health consequences

The major health consequences associated with overweight and obesity, namely NIDDM, CHD, hypertension, gallbladder disease, psychosocial problems and certain types of cancer. The risks of suffering from NIDDM, gallbladder disease, dyslipidaemia, insulin resistance and sleep apnea are greatly increased in the obese (relative risk much greater than 3). The risks of CHD and osteoarthritis are moderately increase (RR 2-3) and the risks of certain cancers reproductive hormone abnormalities and low back pain are slightly increased (RR 1-2) (1).

– Cardiovascular disease

Obesity predisposes an individual to a number of cardiovascular risk factors including hypertension, raised cholesterol and impaired glucose tolerance. However, long term prospective data now suggest that obesity is also important as an independent risk factor for CHD related morbidity and mortality (18). The Framingham Heart Study ranked body weight as the third most important predictor of CHD among males, after age and dyslipidaemia. Similarly, in women, a large scale prospective study in USA found a positive correlation between BMI and the risk of developing CHD. Weight gain substantially increased this risk.(19).

– Hypertension and stroke

The association between hypertension and obesity is well documented. Both systolic and diastolic blood pressure increase with BMI, and the obese are at higher risk of developing hypertension than lean individuals. Community – wide surveys in

USA (NHANES II) show that the prevalence of hypotension in overweight adults in those aged 20-44 years is 5.6 times greater than that in those aged 45 – 74 years old, which in turn is twice as high as that for non overweight adults. The risk of developing hypertension increases with the duration of obesity, especially in women, and weight reduction leads to fall in blood pressure (1).

– Cancer

A number of studies have found a positive association between overweight and the incidence of cancer, particularly of hormone dependent and gastrointestinal cancers. Greater risks of endometrial, ovarian, cervical and postmenopausal breast cancer have been documented for obese women. While there is some evidence for an increased risk of prostate cancer among obese men. The increased incidence of these cancers in the obese is greater in those with excess abdominal fat and is thought to be a direct consequence of hormonal change (20). The incidence of gastrointestinal cancers, such as colorectal and gallbladder cancer, has also been reported to be positively associated with body weight or obesity in some but not all studies. And renal cell cancer has consistently been associated with overweight and obesity, especially in women (21).

– Diabetes mellitus

A positive association between obesity and the risk of developing NIDDM has been repeatedly observed in both cross-sectional (22), and prospective studies (23). The consistency of the association across populations despite difference measures of fatness and criteria for diagnosing NIDDM reflects the strength of the relationship.

The risk of NIDDM increases continuously with BMI and decreases with weigh loss. Analysis of data from two prospective studies illustrates the impact of overweight and obesity on NIDDM; about 64% of male and 74% of female cases of NIDDM could theoretically have been prevented if no one had had a BMI over 25 (23). Detailed analyses of the relationship between obesity and NIDDM have identified certain characteristics of obese persons that further increase the risk of developing this condition, even after controlling for age, smoking and family history

of NIDDM. These include obesity during childhood and adolescence, progressive weight gain from 18 years and intra-abdominal fat accumulation (24). Lack of physical activity and an unhealthy diet, both of which are associated with lifestyle in industrialized countries, are also import modifiable risk factors for overweight and obesity. The prevalence of NIDDM is 2-4 fold higher in the less physical activity individuals compare with the most physical active (25).

– Gallbladder disease

Obesity is a risk factor for gallstones in all age group and, in both men and women, gallstones occur three to four times in obese compare with non-obese individuals and the risk is even greater when excess fat is located around the abdomen. The relative risk of gallstones increases with BMI, and data from the Nurse's Health Study suggest that even moderate overweight may increase the risk (1).

– Pulmonary diseases

Obesity impairs respiratory function and structure, leading to physiological and pathophysiological impairments. The work of breathing is increased in obesity, mainly as a result of extreme stiffness of the thoracic cage consequent on the accumulation of adipose tissue in and around the ribs, abdomen, diaphragm. Hypoxemia is common, partly because the low relaxation volume causes ventilation to occur at volumes below the closing volume, and is exacerbated when lying down because of the reduced functional residual capacity (1).

– Disability

In 1990, Rissanen et al showed that obese Finnish adults suffered more often than normal – work disability due to cardiovascular and musculoskeletal disease. A study of obese Swedes showed that obesity accounted for 10% of productivity loss due to sick leave or work disability and that, in particular, disability associated with waist circumference. In addition, symptoms of osteoarthritis are more severe in heavier patients (14).

– Mortality

Most studies report relationships between BMI and mortality. BMI comprised both fat mass and fat free mass, both affecting the risk of mortality independently (47) and in opposite directions. Waist circumference is a better alternative than BMI for identifying elderly man with an increased risk of mortality. (14) There is an almost linear relationship between BMI and death. The longer the duration of obesity, the higher the risk. Severe obesity is associated with a 12-fold increase in mortality in 25-35 years old compared with lean individuals (1).

– Reduced life expectancy

Some studies have calculated the number of reduced years of life expectancy caused by obesity. The Framingham study calculated that obesity (BMI ≥ 30 kg/m^2) at the age of 40 years was related to a loss of 6 – 7 years of life. Fontaine et al. calculated that a BMI ≥ 33 kg/m^2 from age 40 years was related to a loss of 2 – 3 years. The studies used different calculation methods and were base on different cohorts (14).

– Health consequences of childhood obesity

Attention to childhood overweight and obesity is highly warranted, as overweight and obese children are likely to be obese into adulthood (26) and to have non – communicable disease (27) at younger age. Obese children also have a direct increased risk of diseases (28), and they often suffer from stigmatization (29). Given the rapid increase in the prevalence of childhood obesity, the health consequences are likely to be underestimated. For most noncommunicable conditions resulting from the obesity, the risk depend partly on the age of on set and duration of obesity. Obese children suffer from both short – term and long – term health consequences.

Dietz and Robinson (30) have reviewed these in detail, and they are summarized here. Obesity has social consequences related to stigmatization of obese children and adolescents, resulting in clearly diminished chances of social and economic performance in adult life. The health consequences include an increased risk for metabolic abnormality, such as type 2 diabetes (31), and non – alcoholic fatty

liver disease (32) and sleep – associated breathing disorders such as obstructive sleep apnea syndrome (33).

Cook et al. (34) showed that 4% of adolescents and nearly 30% of overweight adolescents in United State met the criteria of metabolic syndrome. This has important implications for their future risk of type 2 diabetes and cardiovascular diseases. In addition, obese adolescents also have an increased risk of hepatic steatosis, gallstones, hypertension, sleep apnea and orthopedic complications. Very few studies have examined the long term effects, but results from these studies suggest that they are similar to those in obese adult (35). Also fatty liver disease has long been recognized as a feature of childhood obesity, and the presence of the fatty fibrosis in liver tissue appear to be linked to the duration of obesity rather than the extent.

In Thailand. L Mo-suwan et al. conducted a study in 1207 grades 3 - 6 and 587 grades 7 - 9 students in 1999. The result showed that being overweight and becoming overweight during adolescence (grades 7 - 9) was associated with poor school performance, whereas such an association did not exist in students grades 3 - 6.

Michelle J. Pearce et al showed that obese boys reported more overt victimization and obese girls reported more relational victimization compared with their average-weight peers. Obese girls were also less likely to date than their peers. However, both obese boys and girls reported being more dissatisfied with their dating status compared with average-weight peers. The results suggest that obese adolescents are at greater risk for mistreatment by peers and may have fewer opportunities to develop intimate romantic relationships; this may contribute to the psychological and health difficulties frequently associated with obesity.

2.4.2 Economic consequences

Becoming overweight or obese has economic consequences. These include the direct costs of health services, the indirect costs associated with lost economic production and individual costs, such as the purchase of so-called slimming products. Calculations in the United States indicate that, in comparison with people of normal

weight (BMI of 20.0–24.9 kg/m2), obese people (BMI above 30 kg/m2) had 36% higher annual health care costs and overweight people (BMI of 25.0–29.9 kg/m2) had 10% higher annual health care costs. The cumulative costs of several major diseases, measured over eight years, showed a close link with BMI. For men aged 45–54 years with a BMI of 22.5, 27.5, 32.5 or 37.5 kg/m2, the cumulative costs were US$ 19 600, US$ 24 000, US$ 29 600 and US$ 36 500, respectively. Of course, the premature death of obese people may partly reduce lifetime costs, but they may also be greater at older ages, as the cumulative effects of prolonged obesity become apparent. The indirect costs of obesity are associated with lost productivity: absence from work due to ill health or premature death. Estimates of such losses in England indicate that these costs could amount to twice the direct health care costs. Indirect costs are further discussed below. One of the reasons for the recent increases in the cost of obesity is the rising cost of treatment using prescription drugs. Estimates were also provided for France and Japan, using individual data. One finding of the Japanese study is interesting: while the prevalence of obesity is relatively low, the associated costs approximated the average costs in other countries (14).

Other studies have estimated the additional health care use and cost per obese person. Sturm, Finkelstein et al. and Thorpe et al. all found health care costs for obese people to be around 35% higher, mainly because of higher medication use and costs. The costs of different obesity treatment regimes have also been considered. Narbro et al. studied the consequences of surgical and conventional obesity treatment and found, after six years, no significant change in total medication costs for obese people. Wolf added that the long-term effects of treatment contain a large amount of uncertainty, and there is thus no clear evidence on the economic consequences of obesity treatment. The studies mentioned all addressed the cost of obesity, mostly measured by a BMI of ≥ 30 kg/m2. Some also estimated the health care costs of pre-obese people (mostly using a BMI of 25–29.9 kg/m2).The relationship between overweight and health care needs and costs is less pronounced, but these costs are likely to be significant, given that the total numbers of pre-obese people in the population are generally at least as high as the numbers of obese people. Quesenberry et al. (14) showed that pre-obese people aged 20–60 years had higher health care costs

than normal-weight people, while neither pre-obesity nor obesity was significantly associated with increased costs in the elderly. For all ages, overweight people had increased costs for pharmaceuticals, but not other components of outpatient services, such as minor surgery and radiology. The real cost of therapy in developing countries exceed those in developed countries because of extra burden associated with the use of scarce foreign exchange to pay for imports of expensive equipments and drugs, as well as the need for the specialized training of staff (1).

2.4.3 Social bias, prejudice and discrimination

Obesity is highly stigmatized in many countries, in terms both of the perceived undesirable bodily appearance and of the character defects that it is supposed to indicate. Even children as young as 6 years of age describe the silhouette of an obese child as “lazy”, “dirty”, “stupid”, “ugly”, “liar”, “cheat” more often than drawings of other body shape (1).

Obese people have to contend with discrimination. Analyses of large surveys have shown that, compared with their non obese peers, those who are obese are likely to complete fewer years at school, and less likely to be accepted by prestigious schools or to enter desirable professions. A large prospective study conducted in the USA has shown that women who were more likely to have lower family incomes, higher rates of poverty and lower rates of marriage than women with various other forms of chronic physical disability during adolescence (36).

The negative stereotypes and attitudes of heath professionals (including doctors, medical students, nutritionists and nurses) towards obesity are of particular importance. Awareness of these negative attitudes may make the obese reluctant to seek medical assistance for their condition (37). Doctor may be less interested in managing overweight patients, believing that they are weak-willed and less likely to benefit from counseling.

2.5 Physical activities and obesity

In various population groups, a large number of cross – sectional showed an inverse (and expected) association between habitual physical activities and indicators of obesity (38). People who are overweight or obese display lower levels of cardiorespiratory fitness than those of normal weight (39). The few longitudinal cohort studies (38) suggest that high levels of physical activities may attenuate weight gain overtime. In quantitative terms one additional hour of brisk walking per day associated with a decrease of about 25% of risk of obesity (BMI over 30 kg/m^2), as indicated by a six – year follow – up of women from the Nurses' Health Study (40).

Evidence from prospective studies documents the importance of the amount of time dedicated to sedentary occupations, as a separate behavior from physical activity or inactivity, in relation to weight gain. A recent report from the Nurses' Health Study showed that two hours of additional television viewing was associated with a 25 % increased risk of becoming obese during six – year follow – up (38). This association was independent not only of habitual physical activity but also food intake. High cardiorespiratory fitness during childhood and adolescence has been associated with a lower percentage of body fat and a healthier cardiovascular profile (41,42), while childhood adiposity is associated with an unfavorable lipid profile (43).

A recent review of the available evidence (44) indicated that data from prospective studies suggest that increased physical activity and decreased sedentary behavior protect again weight gain in childhood and adolescence. The magnitude of the effects identified, however, was consider small. Interestingly, there is some indication that physical activity in childhood and adolescence may be associated with body composition in adulthood (39). Some longitudinal studies have suggested that low cardiorespiratory fitness during childhood and adolescence is associated with later cardiovascular risk factors, such as hyperlipidaemia, hypertension and obesity (45).

2.6 Using of television, videogame, computer concerned to obesity

Although both adults and children spend much time in sedentary activities, more data are available for children and adolescents. A recent nationally representative media study found that youth aged 2 – 18 spend average of 5 hours and 29 minutes per day using various type of media. In a recent longitudinal study, television viewing between ages 5 – 15 years remained a significant predictor of adult BMI, even after adjustment for childhood socioeconomic status. In another study, however, the direct relationship between hours of television viewing and overweight disappeared after controlling for ethnicity and social economic status. Thus, although research supports the link between television viewing and obesity, it is likely that the relationship is complex and may be modified by other factors, such as the media on food choice (46).

2.7 Eating habit and obesity

Information on per capita energy consumption has shown that energy intake has increased during the past several decades (47). Data from the annual loss – adjusted, per capita analysis of the U.S food supply in 2000 indicated an increase in food consumption of approximately 300 calories, or 12 percent, over the 1985 levels. Most of the increase in calories is attributable to increases in consumption of grain products (largely refined grains), added fats, and added sugars.

A recent analysis of NHANES data (NHANES III, NHANES 1999 – 2000) found that the number – one contributor to energy intake was soft drinks, which supplied 7.1 percent of energy intake in1999 – 2000 (48). Similarly, using data from the Nationwide Food Consumption Survey and the Continuing Survey of Food Intake by Individuals, investigators reported that between 1977 and 2001, total daily energy intake from soft drinks rose on average from 2.8 percent to 7 percent, representing nearly a tripling of calories, while energy intake from fruit drinks per person grew from 1.1 percent to 2.2 percent. Milk supplied 5 percent of energy for all age groups,

down from 8 percent over the 24 years. Servings of sweetened beverages also increased for every age group, while servings of milk decrease for all (49). An increased consumption of sweetened drinks, snacks, snack food items (such as potato chips), and food consumed away from home by children and young adult has been shown to be associated with obesity and weight gain.

2.8 Fast food and obesity

World Heath Organization indicate that an increase of energy intake, and nutrient poor foods with high levels of saturated facts and sugars is partly to blame for the increased number of overweight and obese individuals (1). A study on the effects of fast food consumption among children also found that fast food could be one of the factors for increased prevalence of obesity in children. It was found that children who ate fast food consumed more total and saturated fat, more carbohydrates, sugar and less dietary fiber, milk, fruit and vegetables. Of the 6212 children and adolescents, 30 % ate fast food any given day, and they ate an average of more than 187 calories per day than those children who did not eat fast food. These additional calories per day can account for an extra six pound per year (50, 51).

In America, fast food industry has not only transform the American diet, but the landscape, economy, workforce, and popular culture. Fast food is relative “good “ in taste, inexpensive and convenient that it has become a “ common place that it has acquired an air of inevitability, as though it were somehow unavoidable, a fact of life. Statistic show that on any given day, 1/4 of the adult population visit a fast food restaurant (52). Millions of people buy fast food everyday, super sizing their value meals thinking they are saving money and time without thinking of the actual cost of super sizing their value meals: gaining weight.

An increase in the capita number of restaurants may also play a role in the rising rates of obesity. A recent economic analysis of adults obesity conclude that the per capita number of restaurants has positive and significant effect on BMI and the probability of being obese the study’s authors also note that growth in the per capita

number of restaurants, especially fast-food restaurants, may be largely a response to the increasing scarcity and value of household or nonmarket time.

A 2004 study reported that prevalence of fast food restaurants in the United States was associated with obesity on a statewide basis. Frequency of fast food use may also be associated with increased risk of obesity, though its effects on promoting positive energy balance and weight gain (14).

Fast food is ubiquitous in society, even in public schools and hospitals. Fast food consumption in children has increased from 2 percent of total calories in 1977 – 1978 to 10 percent of calories in 1994 – 96. Fast foods and other unhealthful foods such as soda, candy, savory snacks, and children are often the target audience for these advertisements. Young children are specially vulnerable to commercial promotion because they lack the skills to understand the difference between information and advertising. A American National household survey reported that when socioeconomic and demographic variables are controlled, increased fast food consumption by children was associated with boys, increase age, increased household income. Children who ate fast food consumed more total energy and poorer diet quality (more added sugars, more sugar – sweetened beverages, less milk, and fewer fruit and nonstarchy vegetable) on days with fast food than on days without it (14).

2.9 Gender and obesity

Sex refers to ascribed biological status of being female or male (as differentiated by anatomy and physiology), while gender refers to achieved social status of being a woman or a man (as defined by psychosocioculturreal factors). Clear sexual dimorphism exists in body weight, with females generally having more stored body fat than male and being more likely than male to be obese. Many sex differences are physiological and linked to reproductive functioning with more overall subcutaneous fat in females and the distribution of body fat deposits being greater in lower body for females and upper body for males (53).

Beyond biological sex differences in body fat, substantial social and psychological gender differences exist, with fatness and thinness being more likely to be female and feminist issue. Women are judged by and more concerned about their physical appearance than men, with body weight and body shape being a major criterion for judging female attractiveness stigmatization of the body weight is more prevalent and severe for women than men leading to pressures in postindustrial societies that make body weight a normative discontent for most women (53).

Overall sex and gender are overriding characteristics when considering obesity. The prevalence and meaning of weight are so different for men and women that much obesity research is done only on one sex or the other, and most data about weight is presented separately for man and female. Clearly, body weight and obesity are gendered issues.

2.10 Parent's occupation and obese adolescents

Rolland Cachera and colleagues indicated that the individual susceptibility to obesity is either due to or correlated with father's occupation. They assessed caloric intake and body mass index in 1 to 3 years old and 7 to 12 year old children of families with father in unskilled versus skilled occupations. Several interesting finding emerged in both samples. As others have reported, there were no differences in intake across body composition, even when comparing lean versus obese children. Likewise, children of unskilled fathers had higher caloric intake than children of skilled fathers, and there was more obesity in families with unskilled fathers. These result suggest that given the same intake, children with unskilled fathers are more likely to become obese than children with skilled fathers (54).

2.11 Parent's education

Education has been associated with health outcomes perhaps though its influence on many lifestyle characteristics, including diet and exercise. The most

commonly used measure of education is the number of school years completed, type of school attended, and degrees or certificates obtained (55).

Parent's education, especially mothers have great influence on the nutritional status such as obesity. The study on prevalence and patterns of obesity in seven to nine years old children in urban Khon Kaen, Northeast Thailand indicated that the children were more likely to be obese if the parents have high income, with high mother's education is the strongest social risk factor (56).

2.12 Related studies

– Studies on childhood and adolescent obesity in Thailand

Childhood obesity is an increasing problem in developed countries. Its persistence into adulthood with accompanied health risks has raised many concerns. In a country with rapid growing economy and changing life styles such as Thailand, the natural history of obesity in school children aged 6-12 years was investigated. Yearly weight and height measurements were performed from 1991 onwards. Of 1,156 primary school children enrolled in 1991, two year follow-up was possible in 1,106 cases. Prevalence of obesity, as diagnosed by weight-for-height > 120% of the Bangkok reference, rose from 12.2% in 1991 to 13.5% in 1992 and 15.6% in 1993. In two years, 74 non-obese children became obese while 28 obese children showed the opposite trend. For those obese children who attended the weight control program, their body mass indices and triceps skinfold thickness increased significantly less than those of the non-attendees in the first year. These findings persisted in the second year but were of a smaller magnitude. Results of this study demonstrate the trend of increasing obesity in school children in the transitional society and the short term benefit of a weight control program (8).

In 2005 the authors conducted a longitudinal study of weights and heights of school children in 3 secondary schools in Bangkok beginning at Grade VII and followed their weights and heights until they were at Grade XII in the schools the result showed that The prevalence of overweight at Grade VII of boys and girls are

13.6% and 9.9% and the prevalence of boys and girls at Grade XII are 14.0% and 10.4%, respectively. The prevalence of obesity in the first year in school (Grade VII) in boys and girls are 26.8% and 13.5%, and the prevalence in Grade XII are 15% and 10.8%, respectively (57).

– Study on primary school children in Nakhon Pathom province

Results of a study in 2004 revealed a prevalence of obesity among primary school children in Nakhon Pathom municipal school Nakhon Pathom Province, Thailand was 26%. The results of this study showed that age of students, sex, paternal obesity, meal frequency, snack consumption frequency, and a high consumption of fried food were significantly associated with obesity among primary age school children (58).

– Study on relationship between childhood obesity and adult obesity

In 1997, a study was conducted in 854 Americans, they found that In young adulthood (defined as 21 to 29 years of age), 135 subjects (16 percent) were obese. Among those who were obese during childhood, the chance of obesity in adulthood ranged from 8 percent for 1- or 2-year-olds without obese parents to 79 percent for 10-to-14-year-olds with at least one obese parent. After adjustment for parental obesity, the odds ratios for obesity in adulthood associated with childhood obesity ranged from 1.3 (95 percent confidence interval, 0.6 to 3.0) for obesity at 1 or 2 years of age to 17.5 (7.7 to 39.5) for obesity at 15 to 17 years of age. After adjustment for the child's obesity status, the odds ratios for obesity in adulthood associated with having one obese parent ranged from 2.2 (95 percent confidence interval, 1.1 to 4.3) at 15 to 17 years of age to 3.2 (1.8 to 5.7) at 1 or 2 years of age. And the conclusion is: Obese children under three years of age without obese parents are at low risk for obesity in adulthood, but among older children, obesity is an increasingly important predictor of adult obesity, regardless of whether the parents are obese. Parental obesity more than doubles the risk of adult obesity among both obese and non-obese children under 10 years of age (59).

David S. Freedman et al conducted a Cohort study based on examinations between 1973 and 1996 in Bogalusa, Louisiana. The result showed that Childhood BMI is associated with adult adiposity, but it is possible that the magnitude of this association depends on the relative fatness of children (60).

– Study on effects of obesity to school performance

To study the association between current or previous weight status and school performance among children and young adolescents L Mo-suwanet al conducted a study in 1207 grades 3 - 6 and 587 grades 7 - 9 students in Hat Yai municipality, southern Thailand. They found that Overweight subjects (BMI value >85th percentile of the NHANES-I data for age and gender) in grades 7 - 9 had a mean GPA 0.20 point (95% confidence interval (CI).0.04, 0.37) lower than that of the normal weight children after controlling for gender, age, school and grade. They were twice more likely to have low grades (lower than 2 on the scales of 0 - 4) of mathematics and Thai language than normal weight children. There were no associations between GPA or individual subject grades and previous BMI status in 1992. Children in grades 7 - 9 who became overweight over the two years, had a mean GPA of 0.48 point lower than those who did not become overweight (95% CI.0.12, 0.84). In grades 3 - 6 subjects, however, becoming overweight had no effect on GPA and individual subject scores. Being overweight and becoming overweight during adolescence (grades 7 - 9) was associated with poor school performance, whereas such an association did not exist in children (grades 3 - 6) (61).

– Study related to discrimination toward obesity adolescent

To examine associations between obesity and peer relations in adolescents, specifically testing the hypotheses that obese adolescents are more frequent victims of peer aggression and are less likely to develop romantic relationships, a study was conducted in a high school in a small southern New England city. Measures of overt and relational victimization, as well as dating status and satisfaction, were collected for a group of 416 ninth- through twelfth grade students (51.7% girls). Body mass index was computed for each teen based on self-reported height and weight data. Results revealed that obese boys reported more overt victimization and obese girls

reported more relational victimization compared with their average-weight peers. Obese girls were also less likely to date than their peers. However, both obese boys and girls reported being more dissatisfied with their dating status compared with average-weight peers. The results suggest that obese adolescents are at greater risk for mistreatment by peers and may have fewer opportunities to develop intimate romantic relationships; this may contribute to the psychological and health difficulties frequently associated with obesity (62).

CHAPTER 3
METHODOLOGY

3.1 Research design

This study design was a cross-sectional study

3.2 Study site

The study was sited in Phuttha Monthon district, Nakhon Pathom province, Thailand

3.3 Study population

Study population was students grade 7 – 12 studying in Kanchanabhisek vidyalaya school in Phuttha Monthon district, Nakhon Pathom province, Thailand

3.4 Exclude criteria

Those students who were using any kind of medicine or drug more than 5 during the data collection were not included.

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3.5 Obesity criteria

Classification of obesity in this study based on Thai National Center for Health Statistic (NCHS) growth standard (63). It was a comparison of observed weight of child expressed as Z scores of the expected weight of a child that height, Additionally, Z score of weight for age and Z score height for age were used to assess nutritional status of the students. These references value were Thai standard. Classification as follows:

Table 1 Thai nutrition standard weight for height

No	Z scores expected weight for height	Nutritional status
1	< -2 SD	Slim
2	-2 SD – <-1.5 SD	Skinny
3	-1.5 SD – 1.5 SD	Proportionate
4	> 1.5 SD – 2 SD	Slightly fat
5	> 2 SD – 3 SD	Fat
6	> 3 SD	Obesity

Table 2 Thai nutrition standard weight for age

No	Z scores expected weight for age	Nutritional status
1	< -2 SD	Light
2	-2 SD – <-1.5 SD	Under weight
3	-1.5 SD – 1.5 SD	Average weight
4	> 1.5 SD – 2 SD	Over weight
5	> 2 SD	Heavy

Table 3 Thai nutrition standard height for age

No	Z scores expected height for age	Nutritional status
1	< -2 SD	Short
2	-2 SD – <-1.5 SD	Slightly short
3	-1.5 SD – 1.5 SD	Average height
4	> 1.5 SD – 2 SD	Slightly tall
5	> 2 SD	Tall

This study also use WHO Child Growth Standards 2007 to assess the students nutritional status and then compare with the result of Thai standard. Weight and height will be measured, calculate BMI, the weight in kilograms divides by the square of the height in meters (kg/m^2) (1), then compared with BMI – for – age and gender table following the WHO recommendation. Classification of obesity based on the WHO Child Growth Standards 2007 (64).

Table 4 WHO nutrition standard BMI for age

No	Classification	Percentiles BMI (kg/m^2)
1	Under weight	5^{th}
2	Normal range	$5^{th} – 85^{th}$
3	Overweight	$85^{th} – 95^{th}$
4	Obesity	$\geq 95^{th}$

3.6 Sample size

$$n = \frac{Z^2_{\alpha/2}(pq)}{d^2}$$

$$n = \frac{(1.96)^2(0.15 \times 0.85)}{0.05^2} = 196$$

n: required sample size

p = 15% (57)

q = 1 – p = 85%

$Z_{\alpha/2}$ = 1.96 (95% confidence interval for 2 tail test)

d = the precision was set at 5%

3.7 Sample technique : Multi – Stage Cluster sampling

The study population was selected in five steps:

– First step: determined the number of high school (senior and junior high school) in Phuttha Monthon district, Nakhon Pathom province. (The were 7 schools)

– Second step: simple random sampling technique was performed to select one school

– Third step: in selected school, determined the number of class in each grade

– Fourth step: in each grade simple random selected one classes

– Fifth step: all students in selected class were chosen to include in the study

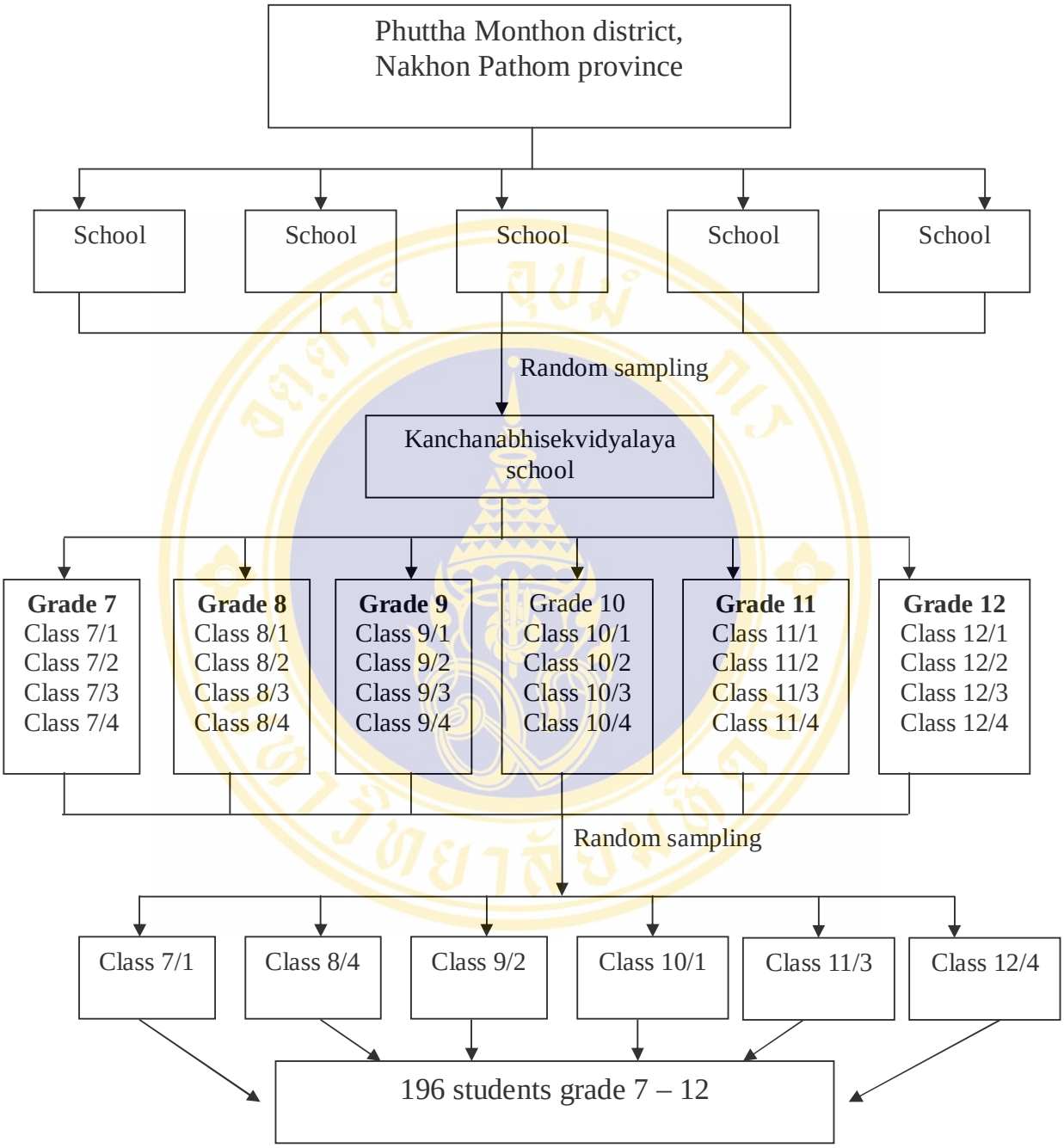

Figure 3 Sampling technique diagram: Multi – Stage Cluster sampling

3.8 Research instrument for data collection

3.8.1 Anthropometric measurement

Anthropometric measurement of weight and height have done by the researcher using weighing scale and height scale. After the measurements of weight and height, the data were written into the recording form.

– Measure Weight

Students were weighed using a platform scale on a uncarpeted floor. Check equipment regularly to make sure they are accurate measurements. Scales was calibrated on a routine basis. Calibration involves putting known weights on the scale to check accuracy.

Procedure

1. Ask the student to remove shoes and bulky clothing.

2. Place the sliding beam weights in the “zero” position before the student steps on the scale.

3. Ask the student to stand still with both feet in the center of the platform.

4. Record the measurement to the nearest 1/4 kilogram.

5. Return the sliding beam weights to the “zero” position.

– Measure Height

A standing height board or stadiometer was used. This device had a flat, vertical surface on which a measuring rule is attached. It also has a moveable right angle block or headpiece and either a permanent surface to stand on or the entire device is mounted on the wall of a room with a level, uncarpeted floor.

Procedure

1. Before begin, ask the student to remove shoes, hat and bulky clothing such as coats and sweaters. Ask the student to remove or undo hairstyles and hair accessories that interfere with the measurement.

2. Direct the student to stand erect with shoulders level, hands at sides, heels together and weight evenly distributed on both feet. The student's feet are flat on the floor or foot piece, with heels comfortably together and touching the base of the

vertical board. There are four contact points between the body and the stadiometer: head, upper back, buttocks and heels.

3. Ask the student to look straight ahead. When the chin is correctly positioned, the back of the head may no longer make contact with the board.

4. Ask the student to breathe in and maintain his or her position. Lower the headpiece until it firmly touches the crown of the head and is at a right angle with the measurement surface. Check the contact points to ensure the lower body stays in the proper position and the heels remain flat. Read the measurement at eye level.

5. Record the height to the nearest 1 centimeter

3.8.2 Questionnaire

For the data collection, a structured questionnaire was used. The questionnaire had been prepared in English and was translated into Thai language. The questionnaire comprised of the following sections:

Part 1: Respondent's sociodemography included of: sex, year of birth, birth order, parents marriage status, father's occupation, mother's occupation, respondent's daily income.

Part 2: Respondent's eating habit included of kinds and frequency of food consumption such as carbohydrate, fat food, vitamin, drink, fast food, habit concerned to everyday meals, habit concerned to fast food.

Part 3: Respondent's physical activities in a week, divided into five category: moderate intensive physical activities, vigorous intensive physical activities, passive entertainment activities and watching TV time

Part 4: Knowledge of respondents about obesity and related factors was assessed by closed questions and opened questions .

3.9 Validity and reliability test of instrument

The pre–test of questionnaire was done before collecting real data. The pre-test questionnaire was conducted among 41 students in Kanchanabhisekvidyalaya school, Phuttha Monthon district, Nakhon Pathom province. The pre-test respondents were excluded from the real data collection. Kuder Richardson formula 20 was calculated to test the reliability for the questionnaire of Knowledge on obesity and related factors. The KR 20 was 0.72, after deleting 3 lowest score questions which were very difficult for respondents, the KR 20 was up to 0.75

3.10 Data collection procedure

3.10.1 Data collection training

Questionnaire was translated into Thai language and a research assistance team from AIHD were asked to help collecting data. Before collecting data research assistance team and researcher discussed. The purpose of discussion was to help research assistance team understand questionnaire clearly and ensured that they can transfer of researcher's ideas to respondents exactly. Another part of the discussion was anthropometric procedure, some simple technique for collecting weight and height were introduced and unanimous according to guidelines.

3.10.2 Collecting data

Data collection procedure took place on 17th January in Kanchanabhisek vidyalaya school, Phuttha Monthon district, Nakhon Pathom province. Students grade 7th – 12th were introduced the questionnaire then answered themselves, after that their weight and height were measured and recorded by researcher and research assistance team.

3.11 Data analysis procedure

3.11.1 Data entry and cleaning

The questionnaire was labeled and coded by the researcher. Data were analyzed by using Minitab software version 13.00. Data were cleaned and edited before analysis.

3.11.2 Statistical method

– Descriptive statistics

Descriptive statistics (frequency, percentage, mean, standard deviation, maximum, minimum and median) was used to describe the distribution of variables such as: sociodemographic factors, foods concerned with eating habit, characteristic of daily meals, physical activities, knowledge on obesity, Z score BMI – for –age and related factors.

– Inferential statistics

Obesity in WHO standard: from height and weight dimension, body mass index was calculated, then compared with BMI – for – age percentile table according the WHO's recommendation.

Obesity in Thai Standard: from data of date of birth, weight and height, Z score was calculated by using nutrition statistic software (source: Institute of Nutrition, Mahidol University, Thailand) which used Thai standard to determine the obese group. Target population were divided into two group obesity and non obesity.

Sociodemography: for describing sociodemographic factors, both quantity and quality variable were use. Qualitative variables were: gender, parent's marriage status, parent's occupation. Chi–square test was used in order to determine the relationship between sociodemographic factors and obesity.

Eating habit included frequency of four groups of food consumption: carbohydrate, fast food, vitamin and drink. Consuming fast food was described by nominal variable frequency of eating fast food per week. By using variables like

number of meal per day, time for the last meal in a day, characteristics of daily habit concerned to the meals were assessed. Crude odds ratio and 95% confident interval were calculated to examine the relationship of these eating habit variables and obesity.

Physical activity was divided into four main group: vigorous activities, moderate activities, passive entertainment activities and leisure time. These variables were defined by frequency and time spend for them per day. Transports for going to school, watching TV time were paid attention. Crude odds ratio and 95% confident interval were calculated to examine the relationship of these physical activity variables and obesity.

Student's knowledge of obesity and related factors. There were 25 questions for interview. For each question, the student who answered correctly were given 1 score, while who answered incorrectly or don't know were given 0 score. Maximum score a student could get is 25 . Median, first and third quartile were calculated. Above third quartile was assigned as good, from first quartile to third quartile was assigned fair and below first quartile was assigned as poor. Chi–square test was used to determine relationship between student's knowledge and obesity status. Multiple logistic regression was performed to determine the relationship between risk factors (such as gender, fruit, milk, snack consumption) and obesity. Statistical software Minitab version 13.0 was used for all statistical analysis.

CHAPTER 4
RESULTS

There were 230 students grade 7 – 12 included in this study. Student's anthropometry were measured on 17th January 2008 in Kanchanabhisekvidyalaya school, Phuttha Monthon district, Nakhon Pathom province, Thailand. Students answered the questionnaire themselves.

4.1 Prevalence of obesity among students

Table 5 Nutritional status of the students classified by BMI for age using WHO standard

Obese status	Frequency (n=230)	percent
Obesity	17	7.39
Overweight	17	7.39
Normal	164	71.30
Underweight	32	13.91

Using BMI for age according to WHO recommendation 2007 to assess obese status of students, the prevalence of obese students is 7.39%.

Table 6 Nutritional status of the students by Thai standard weight for height

Obese status	Frequency (n=230)	percent
Obese	20	8.70
Fat	14	6.09
Slightly fat	13	5.65
Proportionate	152	66.09
Skinny	18	7.83
Slim	13	5.65

Obesity status of students was determined by assessing weight for height and classifying obesity according to Thai standard. Table 6 showed The prevalence of obesity in this study was 8.7% (20 students among 230 surveyed students).

Table 7 Nutritional status of the students by Thai standard weight for age

Nutritional status	Frequency (n=230)	percent
Heavy	36	15.65
Over weight	20	8.70
Average weight	163	70.87
Light	5	2.17
Under weight	6	2.61

Table 7 shows the prevalence of heavy students was 15.65%, overweight 8.7% and underweight was 2.61%

Table 8 Nutritional status of the students by Thai standard height for age

Nutritional status	Frequency (n=230)	percent
Tall	12	5.22
Slightly tall	21	9.13
Average height	187	81.30
Slightly short	9	3.92
Short	1	0.43

Table 8 shows that majority (81.30%) of students was average height. Tall students were 14.35% and short students were 4.35%.

Table 9 Comparison of median (Z score weight for age) between obesity and non obesity

Obesity status	Number	Median	QD	p value
Obesity	20	3.655	0.617	< 0.001 *
Non obesity	210	0.2500	0.871	

* Mann Whitney test

Table 10 Comparison of median (Z score height for age) between obesity and non obesity

Obesity status	Number	Median	QD	p value
Obesity	20	0.9000	0.776	0.2422 *
Non obesity	210	0.5400	0.698	

* Mann Whitney test

As shown in Table 9, 10 median of Z score weight for age was significant difference between obese and non obese students ($p < 0.001$), median of Z score height for age was not significant difference ($p = 0.2422$).

4.2 Sociodemographic status of the students

4.2.1 Characteristics of the student's sociodemographic status

There were 101 males (43.91%) and 129 females (56.09 %) in this study. Their average age were 185 months (15 years 4 months) , youngest students was 150 months (12 years and 5 months) and the oldest was 229 months (19 years and 1 months).

More than one half of students (62.61%) were the first child in their family and their parent have stayed together (86.96%). As shown in Table 11, 68.45% of student's father have good education from diploma and higher, and 33.78% of them run their own business, 34.67 % were government officers. The percentage of student's mother who had good education was quite high (63.88%), only 30.84% run their own business, 20.26 % were government officers and 27.32 % were housewife and no job.

The average allowance that a student got from their parents was 60 baht per day, at less 20 baht , maximum was 200 bahts and majority of them (83.04%) received 50 -100 bahts per day.

Table 11 Frequency and percentage of the students by sociodemographic status

Characteristic	**Frequency**	**Percent**
Age group	**(n=230)**	
12	7	3.04
13	44	19.13
14	46	20.00
15	36	15.65
16	35	15.22
17	37	16.09
≥18	25	10.87
Age (month)		
Median = 185.00 QD = 18		
Grade level	**(n=230)**	
7	37	16.09
8	42	18.26
9	41	17.83
10	35	15.22
11	37	16.09
12	38	16.52
Gender	**(n=230)**	
Male	101	43.91
Female	129	56.09

Table 11 Frequency and percentage of the students by sociodemographic status (cont.)

Characteristic	Frequency	Percent
Birth order	**(n=230)**	
First	144	62.61
Second	68	29.57
≥ third	18	7.83
Parents marriage status	**(n=230)**	
Living together	200	86.96
Divorced	9	3.91
Living separately	10	4.35
father died	8	3.48
mother died	3	1.30
Father's occupation	**(n=225)**	
Business	76	33.78
Employee	9	4.00
Farmer	16	7.11
Government officer	78	34.67
Laborer	38	16.89
No job	5	2.22
Other	3	1.33
Missing	5	
Father's education	**(n=225)**	
Primary school	30	13.33
Secondary school	19	8.44
High school	22	9.78
Diploma	60	26.67
Bachelor	74	32.89
Master	17	7.56
PhD	3	1.33
Missing	5	

Table 11 Frequency and percentage of the students by sociodemographic status (cont.)

Characteristic	Frequency	Percent
Mother's occupation	**(n=227)**	
Business	70	30.84
Employee	18	7.93
Farmer	10	4.41
Government officer	46	20.26
Housewife	52	22.91
Laborer	19	8.37
No job	10	4.41
Other	2	0.88
Missing	3	
Mother's education	**(n=227)**	
No education	2	0.88
Primary school	43	18.94
Secondary school	14	6.17
High school	23	10.13
Diploma	49	21.59
Bachelor	84	37.00
Master	12	5.29
Daily allowance (bahts/day)	**(n=230)**	
>100	16	6.96
50-100	191	83.04
< 50	23	10.00
Median = 60 QD = 25		

4.2.2 Relationship between student's sociodemographic factors and obesity status

Table 12 Relationship between sociodemographic factors and obesity status

Sociodemographic factors	Obesity status		χ^2 (df)	p-value
	Obesity (%)	Non obesity (%)		
Gender				
Male	11 (10.89)	90 (89.10)	1.093	0.296
Female	9 (6.98)	120 (93.02)	(1)	
Birth order				
First	11 (7.64)	133 (98.36)	0.542	0.462
≥ Second	9 (10.47)	77 (89.53)	(1)	
Parent's marriage status				
Living together	20 (10)	180 (90)		0.084***
Other*	0 (0)	30 (100)		
Father's occupation				
Business	7 (9.21)	69 (90.79)	6.418	**0.040**
Government officer	11 (14.10)	67 (85.90)	(2)	
Other**	2 (2.63)	74 (97.37)		
Father's education				
High school and lower	6 (8.50)	65 (91.50)	0.125	0.939
Diploma	6 (10.00)	54 (90.00)	(2)	
Bachelor and higher	8 (8.50)	86 (91.50)		
Mother's occupation				
Business	6 (8.60)	64 (91.40)	2.086	0.555
Government officer	5 (10.87)	41 (89.13)	(3)	
Housewife	7(11.29)	55 (88.71)		
Other	2 (4.08)	47 (95.92)		
Mother's education				
High school and lower	8 (9.76)	74 (90.24)	1.507	0.471
diploma	2 (4.08)	47 (95.92)	(2)	
Bachelor and higher	9 (9.38)	87 (90.62)		

* Other: Divorced; living separately; father died; mother died
** Other: laborer, employee, no job, farmer
*** Fisher exact test

As shown in Table 12, though the percentage of obese male students (10.89 %) greater than obese female students (6.89 %) but this difference was not significant. Similarly, birth order and parent's marriage status had no significant relationship with obesity.

There were higher percentage of obesity between the students whose father run his own business or was a government officer, compared with those whose fathers were laborer, employee, no job, or farmer. This was found statistical significant association ($p < 0.05$), Father's occupation had relationship with obesity status but father's education did not associate with obesity. There was not significant association between mother's occupation, mother education and obesity status of the students.

Table 13 Relationship between the student's daily allowance and obesity

Daily allowance	Obesity status		p-value
	Obesity (%)	Non obesity (%)	
≥ 50 bahts/day	16 (7.73)	191 (92.23)	0.234*
< 50 bahts/day	4 (17.39)	19 (82.61)	

* Fisher exact test

Table 13 shows that 7.73 % of the students whose daily income was more than 50 bahts per day were obese, 17.39 % of those who had less than 50 bahts per day were obese, it's seemed to be a negative association between daily income and obesity status but there no significant association was found.

Table 14 Comparison of student's daily income between obese and non obese group

Obesity status	Number	Median	QD	p-value
Obesity	20	70.00	22.50	0.6976*
Non obesity	210	60.00	25.50	

*Mann Whitney test

When compare daily income of obese students and non obese students, there was no significant difference between two groups.

4.3 Eating habit of the students

4.3.1 Characteristics of eating habit

Majority of the students (74.35 %) had 3 meals per day (breakfast, lunch and dinner) and proportion of the students who had less than 3 meals per day (18.70 %) were greater than those who had more than 3 meals per day (6.96 %). Nearly seventeen percent used to have the last meal during 8pm-10pm, and there were 2 students (0.87 %) used to had meal after 10 pm.

There were 46.52 % of the students used to eat fast food, among them 50.47 % had fast food more than 2 times per week and the number of students ate snacks (such as chips, donut, pastry) more than 3 days per week were 21.74 %. The students who reported to have soft drink more than 3 three days per week were (23.91 %)

Carbohydrate consumption included starch (Potatoes, bread, Noodle) and sugar (chocolate, ice cream, sweet, candy), the result showed that 32.61 % of the students used to consume starch more than 3 days per week was and that for sugar was 33.91 %. Regarding fat foot consumption, 53.91 % of the students ate fat food like fried chicken, fried pork, fried potatoes, roasted beef, more than 3 times per week, meanwhile 93.04 % of students used cooking oil, butter, cheese, mayonnaise less than 3 times per week. The proportion of eating eggs more than 3 days per week was 61.30%.

Vegetables and fruits were consumed a lot by the students, 70.87 % of them used to have vegetables more than 3 times per week, among them 53.37 % ate everyday. Similarly 63.48 % had fruits more than 3 days per week, among them 42.46 % ate everyday.

Among four kind of drinks: Full cream milk, cacao, soft drink, fruit juice. Full cream milk was drunk most, 69.57 % of the students reported using milk more than 3 times per week, among them 70.63 % drank it everyday, cacao was the second choice, more than forty percent drank cacao 4-7 times per week. Just 11.74 % drank fruit juice everyday.

Table 15 Frequency and percentage of the students by food consumption

Food consumption	**Frequency (n=230)**	**percent**
Potatoes, bread, biscuit, cake, Noodle		
≤3days/week	155	67.39
>3days/week	75	32.61
chocolate, ice cream, sweet, candy		
≤3days/week	152	66.09
>3days/week	78	33.91
Fried food: fried chicken, fried pork, fried potatoes		
≤3days/week	106	46.09
>3days/week	124	53.91
Cooking oil salad, butter, cheese, mayonnaise		
≤3days/week	214	93.04
>3days/week	16	6.96
Eggs		
≤3days/week	89	38.70
>3days/week	141	61.30
Snacks: chips, pastry or donuts		
≤3days/week	180	78.26
>3days/week	50	21.74

Table 15 Frequency and percentage of the students by food consumption (cont.)

Food consumption	Frequency (n=230)	percent
Vegetable		
≤3days/week	67	29.13
>3days/week	163	70.87
Fruit		
≤3days/week	84	36.52
>3days/week	146	63.48
Full cream Milk		
≤3days/week	70	30.43
>3days/week	160	69.57
Cacao: ovaltine, Milo		
≤3days/week	137	59.57
>3days/week	93	40.43
Soft drink		
≤3days/week	175	76.09
>3days/week	55	23.91
Fruit juice		
≤3days/week	144	62.61
>3days/week	86	37.39
Usually eat fast food		
No	123	53.48
Yes	107	46.52
Fast food per week		
> 3 times	13	12.15
2-3 times	41	38.32
1 time	53	49.53
Number of meal per day		
< 3 meals	43	18.70
3 meals	171	74.35
> 3 meals	16	6.96
Time of last meals everyday		
<18h	42	18.26
18 - 20h	148	64.35
20 - 22h	38	16.52
>22 h	2	0.87

4.3.2 Relationship between eating habit and obesity

Table 16 below shows the relationship between food consumption and obesity. Obesity status was divided into 2 group: non obese group and obese group, Food consumption was divided into 2 group: eating less than or equal 3 times per week and more than 3 times per week. Crude odds ratio and 95% confident interval were calculated to measure the strength of the association.

Table 16 Relationship between food consumption frequency and obesity status

Food consumption frequency	Obesity (%)	Non obesity (%)	Crude odds ratio (95% CI)	p-value
Potatoes, bread, biscuit				
> 3 days / week	6 (8.00)	69(92.00)	0.88 (0.32 - 2.38)	0.795
≤ 3 days / week	14(9.03)	141(90.67)	1	
chocolate, ice cream, sweet, candy				
> 3 days / week	4(5.13)	74(94.87)	0.46 (0.15 - 1.42)	0.178
≤ 3 days / week	16(10.53)	136(89.47)	1	
Fried food: fried chicken, pork				
> 3 days / week	13(10.48)	111(89.52)	1.66 (0.64 - 4.32)	0.302
≤ 3 days / week	7(6.60)	99(93.40)	1	
Cooking oil salad, butter, cheese				
> 3 days / week	2(12.50)	14(87.50)	1.56 (0.33 - 7.39)	0.578
≤ 3 days / week	18(8.41)	196(91.59)	1	
Eggs				
> 3 days / week	15(10.64)	126(89.36)	2.00 (0.70 - 5.71)	0.195
≤ 3 days / week	5(5.62)	84(94.38)	1	
Snacks: chips, pastry or donuts				
> 3 days / week	1(2.00)	49(98.00)	0.17 (0.02 - 1.32)	0.091
≤ 3 days / week	19(10.56)	161(89.44)	1	
Vegetable				
> 3 days / week	13(7.98)	150(92.02)	0.74 (0.28 - 1.95)	0.547
≤ 3 days / week	7(10.45)	60(89.55)	1	

Table 16 Relationship between food consumption frequency and obesity status (cont.)

Food consumption frequency	Obesity (%)	Non obesity (%)	Crude odds ratio (95% CI)	p-value
Fruit				
> 3 days / week	17(11.64)	129(88.36)	3.56 (1.01 - 12.52)	**0.048**
≤ 3 days / week	3(3.57)	81(96.43)	1	
Full cream Milk				
> 3 days / week	13(17.11)	63(82.89)	4.33 (1.65 - 11.37)	**0.003**
≤ 3 days / week	7(4.55)	147(95.45)	1	
Cacao: ovaltine, Milo				
> 3 days / week	9(9.68)	84(90.32)	1.23 (0.49 - 3.09)	0.664
≤ 3 days / week	11(8.03)	126(91.97)	1	
Soft drink				
> 3 days / week	4(7.27)	51(92.73)	0.78 (0.25 - 2.44)	0.668
≤ 3 days / week	16(9.14)	159(90.86)	1	
Fruit juice				
>3days/week	11(7.64)	133(92.36)	0.71 (0.28 - 1.78)	0.463
≤3days/week	9 (10.47)	77(89.54)	1	

According to the results, fruit consumption have significant association with obesity (p value = 0.048). The students who had fruits more than 3 days per week were 3.56 times more likely to get obese compared to those who had fruits less than or equal to 3 days per week

A significant association between obesity and full cream milk consumption also was found (p value = 0.003). The students who had full cream milk more than 3 days per week were 4.33 times more likely to get obese compared to those who had it less than or equal to 3 days per week

Table 17 Relationship between daily meal and obesity status

Eating habit	Obesity (%)	Non obesity (%)	Crude odds ratio (95% CI)	p-value
Usually eat fast food				
Yes	11(10.28)	96(89.72)	1.45(0.58 - 3.65)	0.428
No	9(7.32)	114(92.68)	1	
Fast food per week				
≤ 3 times	10(10.64)	84(89.36)	1.43(0.17 - 12.18)	0.744
> 3 times	1(7.69)	12(92.31)	1	
Number of meal per day				
> 3 meals	2(12.50)	14(87.50)	1.56(0.33 - 7.39)	0.578
≤ 3 meals	18(8.41)	196(91.59)	1	
Time of last meal everyday				
> 20h	3(7.50)	37(92.50)	0.83(0.23 - 2.96)	0.768
≤ 20h	17(8.95)	173(91.05)	1	

Characteristic of daily meal such as fast food consumption, times of fast food per week, number of meals per day, time of last meal every day did not have significant association with obesity status. (Table 17)

Table 18 Multiple logistic Regression of gender, snack, fruit, milk intake toward obesity

Predictor	Adjusted odds ratio	95% CI for OR	p-value
Gender			
Male	1.51	0.59 - 3.87	0.396
Female	1		
Snack			
> 3 days / week	0.18	0.02 -1.41	0.102
≤ 3 days / week	1		
Fruit			
> 3 days / week	3.69	1.04 - 13.13	**0.044**
≤ 3 days / week	1		
Full cream milk			
> 3 days / week	0.74	0.28 - 2.01	0.561
≤ 3 days / week	1		

Using multiple logistic regression to determine if variables such as gender, fruit, milk, snack consumption could significantly predict the obesity status. After adjusting the students who had fruits more than 3 days per week were 3.69 times more likely to be obese compared to those who had fruits less than or equal to 3 days per week (95% CI: 1.04 - 13.13; p = 0.044). Other factors were no longer association with obesity status.

4.4 Physical activities of the students

4.4.1 Characteristic of physical activities of the students

As shown in Table 19, majority of the students (88.65 %) went to school by car or bus, only 6.55 % go on foot, 4.37 % by motorbike and 0.44 % by bicycle.

Around 35.22 % of the students played sport like football, running, badminton, swimming more than 3 times per week and 71.80 % played sport more than 20 minutes each times.

Around 42.17 % of the students joined in moderate physical activities such as walking, cycling, housework, gardening more than 5 times per week and 38.05% spent more than 30 minutes each time.

Concerned with passive entertainment activities such as: go on internet, chatting, computer game, reading book, nearly all of students joined in these activities, 45 % did it everyday. Students usually spent average 2.5 hours for these passive entertainment activities. They spent at less 10-15 minutes per day and maximum was 12 hours per day.

In the time of passive entertainment, more than fifty percent ate some kinds of food and the most favorite food was snack (75.86 %)

Average time for watching TV was 3 hours per day and more than fifty five percent had some kind of food when watching TV, among them, 73.23 % consumed snack

Only 18.69 % of the students spent their leisure time for active activities such as sport and moderate physical activities, majority (81.31 %) used their leisure time for inactive activities like watching TV, passive entertainment, sleeping.

Table 19 Frequency and percentage of the students by physical activities

Physical activities	**Frequency**	**percent**
Mean to go to school everyday	**(n=299)**	
Car/bus	203	88.65
Motorbike	10	4.37
Bicycle	1	0.44
On foot	15	6.55
Times of playing sport per week	**(n=230)**	
< 3 times	114	49.57
≥ 3 times	81	35.22
Never	35	15.22
Length of playing sport per times	**(n=195)**	
< 20 mins	55	28.20
≥20 min	140	71.80
Times of moderate activities per week	**(n=230)**	
< 5 times	129	56.09
≥ 5 times	97	42.17
never	4	1.74
Length of moderate activities each times	**(n=226)**	
< 30 mins	140	61.95
≥ 30 min	86	38.05
passive entertainment activities	**(n=230)**	
Everyday	104	45.22
Often	78	33.91
Sometime	46	20.00
Never	2	0.87
Length of passive entertainment activities each times		
Median = 2.5 QD = 0.75		
Food during passive entertainment activities	**(n=230)**	
No	114	49.57
Yes	116	50.43

Table 19 Frequency and percentage of the students by physical activities (cont.)

Physical activities	**Frequency**	**percent**
Kind of food during passive entertainment activities	**(n=116)**	**percentage**
Sweet/Cake	17	14.65
Fast food	2	1.72
Snack	88	75.86
Soft drink	9	7.77
Length of Watching TV per day		
Mean = 3 QD = 1		
Food during watching TV time	**(n=230)**	
No	103	44.78
Yes	127	55.22
Kind of food during watching TV time	**(n=127)**	
Sweet/Cake	12	9.45
Fast food	7	5.51
Snack	93	73.23
Soft drink	15	11.81
Activities in leisure time	**(n=230)**	
Vigorous	30	13.04
Moderate	13	5.65
Passive	121	52.61
TV	62	26.96
Other	4	1.74

4.4.2 Relationship between physical activities and obesity

Table 20 Relationship between obesity status and physical activities

Physical activities	Obesity (%)	Non obesity (%)	Crude odds ratio (95 % CI)	p-value
Mean to go to school everyday				
car/bus	20(9.80)	184(90.20)	-	0.998
Other: motorbike, bicycle, On foot	0(0.00)	26(100.00)		
Times of playing sport				
≥ 3 times	6(7.41)	75(92.59)	0.75 (0.27 - 2.12)	0.586
< 3 times	11(9.65)	103(90.35)	1	
Length of playing sport per times				
≥ 20 mins	9(6.43)	131(93.57)	0.40 (0.15 - 1.11)	0.078
< 20 min	8(14.55)	47(85.45)	1	
Times of moderate activities				
≥ 5 times	7(7.22)	90(92.78)	0.72 (0.28 - 1.87)	0.498
< 5 times	13(9.77)	120(90.23)	1	
Length of moderate activities				
≥ 30 mins	14(10.00)	126(90.00)	0.68 (0.25 - 1.83)	0.440
< 30 min	6(6.98)	80(93.02)	1	
Passive entertainment activities				
> 3 days / week	18(9.89)	164(90.11)	2.52 (0.56 - 11.28)	0.225
≤ 3 days / week	2(4.17)	46(95.83)	1	
Food during passive entertainment activities				
Yes	10(8.62)	106(91.38)	0.98 (0.39 - 2.46)	0.968
No	10(8.77)	104(91.23)	1	

Table 20 Relationship between obesity status and physical activities (cont.)

Physical activities	Obesity (%)	Non obesity (%)	Crude odds ratio (95% CI)	p-value
Kind of food for passive activities				
Snack	6(6.82)	82(93.18)	0.44 (0.11-1.68)	0.230
Other *	4(14.29)	24(85.71)	1	
Food during watching TV time				
Yes	11(8.66)	116(91.34)	0.99 (0.39 - 2.49)	0.984
No	9(8.74)	94(91.26)	1	
Kind of food when watching TV				
Snack	8(8.60)	85(91.40)	0.97 (0.24 - 3.90)	0.969
Other*	3(8.82)	31(91.18)	1	
Activities in leisure time				
Active: Vigorous, Moderate	3(6.98)	40(93.02)	0.83 (0.23 - 2.96)	0.768
Inactive: Passive, TV, Other	17(19.54)	70(80.46)	1	

* Other: Sweet/Cake, Fast food, Soft drink

Crude odds ratio and 95 % confident interval were calculated to measure the strength of relationship between obesity and physical activities, as shown in Table 20. There was no significant association between physical activities and obesity.

Table 21 Comparison length of time spend for passive entertainment activities, watching TV between obese and non obese group

Length of time		Obesity	Non obesity	p-value
Passive entertainment	Number	20	210	0.7914*
	Median, QD	3.00, 0.95	2.50, 0.75	
Watching TV	Number	20	210	0.7606*
	Median, QD	2.70,1.00	3.00, 1.00	

* Mann Whitney test

Mann Whitney test was applied to compare the median of time spent for passive entertainment activities and for watching TV, there were no significant difference between obese group and non obese group.

4.5 Knowledge of the students on obesity and related factors

4.5.1 Frequency and percentage of correct answer

The results in Table 22 showed that majority of the students answered correctly most of the questions about knowledge on obesity and related factors. There were 6 questions about causes and consequences of obesity (number: 5, 7, 10, 11, 20 ,25) that the percentages of correct answer were less than 60%.

Each correct answer was given one score, and zero score for each incorrect answer, the maximum score a student could get was 25. Knowledge score was not normal distribution therefore score lower than first quartile was assigned as low, from first quartile to third quartile was fair and greater than third quartile was good. Frequency and percentage of knowledge level were shown in Table 21

Table 22 Frequency and percentage of the students by correct answer

No.	Knowledge item	Correct answer	
		Frequency (N=230)	Percent
1	Obesity is An infectious disease	118	81.74
2	Obesity is Excess weight	202	87.83
3	Obesity is Shortage of physical activities	200	86.96
4	Obesity is Eating too much	210	91.30
5	Cause of obesity is Positive balance food intake	133	**57.83**
6	Cause of obesity is Poor physical activities	190	82.61
7	Cause of obesity is Bacteria	136	**59.13**
8	Consequence of obesity is Heart disease	177	76.96
9	Consequence of obesity is “don’t have friends”	201	87.39
10	Consequence of obesity is “Can not run”	132	**57.39**
11	Consequence of obesity is Sleeplessness	126	**54.78**
12	Consequence of obesity is Low school performance	188	81.74
13	Obesity is a disease	198	86.09
14	Obesity is very dangerous	182	79.13
15	Obesity can be prevented and treated	212	92.17
16	Obese is not a good person	225	97.83
17	Eat a lot of fat food can cause obesity	217	94.35
18	Fast food is not good for obese	185	80.43
19	Many kind of soda can cause obesity	205	89.13
20	Reduce eating carbohydrate can prevent obesity	113	**49.13**
21	Eating a lot of sweet does not concern to obesity	202	87.83
22	Doing more Physical activities can prevent obesity	226	98.26
23	Doing exercise frequently can gain more weight	199	86.52
24	The more we take a rest, the less weight we gain	115	**50.00**
25	Obesity is not harmful for our health	189	82.17

Table 23 Frequency and percentage of the students by knowledge level

Knowledge level	Frequency (N=230)	percent
Good	44	19.13
Fair	140	60.87
Low	46	20.00

4.6.2 Relationship between obesity status and knowledge

Table 24 Relationship between obese status and knowledge

Knowledge level	Obesity status		χ^2 (df)	p-value
	Obesity (%)	Non obesity (%)		
Good	7(15.91)	37(84.09)	3.790	0.150
Fair	9(6.43)	131(95.57)	(2)	
Low	4(8.70)	42(91.30)		

Table 24 shows the result that there was no significant relationship between nutrition knowledge of the students and their obese status.

CHAPTER 5
DISCUSSION

5.1 Prevalence of obesity among the students in Phuttha Monthon district

The present prevalence of obesity among students in Phuttha Monthon district was classified by Thai standard weight for height. The prevalence found in this study was 8.7 % was similar with the study of Germaine L et al. They found that prevalence of obesity among children 7 to 9 years old in government school in Northeast of Thailand was 8.3 % (56). By contrast these results was different from the other study below :

Table 25: The prevalence of obesity from previous studies.

Area	Author/year	Age range (years)	Prevalence of obesity (%)
Bangkok	Suttapreyasri, et al, 1990	6-18	14.3
Hat Yai	Mo-suwan, et al, 1993	1-12	14.3
National Nutrition Survey	Thai MOPH, 1994	Primary school	11.2 – 16.9
Southern	Tontisirin, 1999	Primary school	14.0
Nakhon Pathom	Yunimar Usman, 2004	6-12	26.0

In1995 Mari Hitara et al conducted a study in the Phattalung Province, Thailand the prevalence of obese children 7-12 years old were 22.1 %, 5.8 %, 2.7 % respectively for three type of school Elite school (for high income family), low income school and district school (66).

In 2000, a study was conducted in Saraburi Province, Thailand. The result showed that prevalence of childhood obesity was 22.7% in urban and 7.4% in rural areas (67).

Phuttha Monthon is the rural area, income per capital is lower than other urban area so the prevalence of obesity may be lower. On the other hand, Phuttha Monthon district share the border with Bangkok metropolitan, the socioeconomic status here may be better than the other rural area hence the prevalence of obesity is greater. Compare with the other rural area.

In the study of Yunimar Usman, 2004 (58), prevalence of obesity in primary school, Nakhon Pathom province was 26%, it was much more higher than this study, but the criteria for classifying obesity was different between two studies. In Yunimar Usman's study Z score (weight for height) greater than 2 SD was classified obesity but in this study Z score from 2 SD to 3 SD was fat, greater than 3 SD was obesity. Therefore the result was different. In addition, the difference in target population was affected to the result.

By using WHO standard (BMI for age) to assess nutritional status, the prevalence of obesity was 7.39 % less than that by Thai standard. WHO recommendation may base on nutrition surveys in Europe and American, that adolescent were taller and heavier than adolescent in Southeast Asian countries, therefore the cut off point for classifying nutritional status was higher than Thai Standard. This may lead to lower prevalence of obesity.

5.2 Sociodemographic factors of the students

5.2.1 Gender

This study found that the prevalence of obesity of male and female students were 10.89 % and 6.98 %, higher than that found in the study of Elisabete Ramos et al 2006 (68). Their result showed the prevalence of obesity (corresponding to WHO overweight category) was 6.6 % in boys and 5.7 % in girls. Another study in Thai primary students in Nakhon Pathom province showed those figures in males and females were 41.89 % and 16.67 %. (58) Though there were some differences, but the tendency was male adolescents were more obese than females. The explanation may concern with the social perception and culture, Obese boys were more acceptable than obese girls.

5.2.2 Father occupation

As shown in this study, father's occupation had a significant association with obesity status. Around 13.24 % of the students whose fathers run their own business or was a government officer were obese meanwhile 2.63 % of those whose father was farmer, laborer, no job, employee were obese. This may be explained that these jobs (business, government officer) have higher income than the others.

Using Chi-square test to determine the relationship between father's occupation and student's daily allowance, the result revealed the significant association. (appendix Table A1) This showed indirectly that family income had impact to obesity status. That result was consistent with other study carried out in Thailand and other South East Asian countries (69,70) which was converse to what was often found in the United States of America and other higher income countries (71). It was noted that developing countries on a transition to greater wealth form a continuum commencing with an association between high socioeconomic status and obesity, moving towards and association found in middle income countries (72).

No statistical relationship was found between father's mother's education levels and obesity status of children. It was in contrary with study by Langendijk et al 1999. (56) which reported that mother's education levels and father's education levels have significant different between obese children and normal children. They also mentioned when stratified by the father's education (high, low) the relationship of mother's education on outcome of obesity was modified. Under the strata of high father education the odds ratio was 1.04 (0.50, 2.17) and under the strata of low father education the odds ratio was 6.91 (2.39, 20.56), while the crude odds ratio was 2.23 the odds ratio differ by stratum interaction. Since the odds ratio not only differ from the crude odds ratio but also from each other, there was effect modification by the father's level of education. This means that the observed association of mother's education level with obesity of the child was conditioned by the father's education level.

5.3 Eating habit of the students

5.3.1 Fruit and vegetable consumption

This study found positive significant association between fruit consumption and obesity. After adjusted the result showed that students who have eaten fruit more than three times per week were at risk of being obese 3.69 times greater than those ate less than or equal 3 times per week. (adjusted odds ratio: 3.69, 95% CI 1.04-13.13). There was no relationship between vegetable consumption and obesity. These relationship were different among studies.

One large prospective study has observed that increasing fruit and/or vegetable intake was associated with a reduced risk of major weight gain (≥ 25 kg) or becoming obese (BMI ≥ 30 kg/m^2) (73). Another prospective study also found that increased consumption of vegetables was associated with a lower risk of obesity (74), but two found no such relationship (75). Only one prospective study focused on children; they were aged 9–14 years at baseline and followed for three years. In 8203 girls there was no association between obesity and the consumption of fruit or vegetables. In boys, vegetable intake was inversely related to changes in BMI z-score, but the effect was no longer statistically significant after adjustment for energy intake (76). Fruit consumption in this study was not approached in detail hence consumption of various kind of fruit was not clarified, this may lead to difference results from the other studies.

5.3.2 Milk consumption

There was a significant association of milk consumption and obesity (crude OR 4.33, 95% CI: 1.65 - 11.37). it seemed to be that more milk intake the higher prevalence of obesity. This was in contrary with the cohort study of Schulz M et al among 17369 adults in Germany, both men and women who lost weight over a two-year period reported a higher intake of milk and milk products than those who maintained their weight (77). The difference may explained by the role of confounder “sugar” one factor have strong relationship with obesity (78,79), this study did not distinguish milk with sugar or not.

5.3.3 Fast food consumption

A study in 2004 among 6212 children and adolescents 4 to 19 years old in the United States concluded that consumption of fast food among children in the United States seems to have an adverse effect on dietary quality in ways that plausibly could increase risk for obesity (50). And Ebbeling, D.B. et al 2002 also suggested that Fast-food consumption has strong positive associations with weight gain and insulin resistance, suggesting that fast food increases the risk of obesity and type 2 diabetes (14). In this study no significant association between obesity and fast food was found. There may be two reasons. At first, in Thailand fast food was quite expensive particularly with adolescent, hence they could not approach it easily, the second in Phuttha Monthon district, there were not many fast food restaurant compared with urban area like Bangkok metropolitan therefore fast food consumption among adolescent here was not so high.

5.3.4 Meal and obesity

There was no association between frequency of meal per day and obesity in this study, it was inconsistent with the some other studies conducted in Europe and America. A study conducted on 1209 black girls and 1166 white girls from ages 9–19 years found that increased meal frequency was related to decreased likelihood of overweight for black girls (80). Another result from a study on 4370 children from 5 to 7 years old found the prevalence of obesity decreased by number of daily meals: three or fewer meals, 4.2% (95% confidence interval: 2.8 to 6.1); four meals, 2.8% (95% CI, 2.1 to 3.7); and 5 or more meals, 1.7% (95% CI, 1.2 to 2.4). These effects could not be explained by confounding due to a wide range of constitutional, sociodemographic, and lifestyle factors. The adjusted odds ratios for obesity were 0.73 (95% CI, 0.44 to 1.21) for four meals and 0.51 (95% CI, 0.29 to 0.89) for five or more meals. An increased meal frequency was inversely related to the prevalence of childhood overweight and obesity, suggesting that frequent meals might be protective (81).

5.4 Physical activities

5.4.1 Physical activities and obesity

Association between physical activities and obesity were found in many studies. A recent review of the available evidence indicated that data from prospective studies suggested that increased physical activity and decreased sedentary behavior protect against weight gain in childhood and adolescence (82).

A cross-sectional study was conducted in 445 17-y-old adolescents and their mothers We observed significant interactions between physical activity and obesity variables in 2 of our 3 models (ie. gender and BMI), which indicated that the independent association between physical activity and obesity was steeper in the males than in the females (83).

The results of a cross-sectional study of 780 children aged 9–10 years old from Sweden and Estonia suggested that physical activity of vigorous intensity may have a greater effect on preventing obesity in children than does physical activities of lower intensity, whereas both total and at least moderate to vigorous physical activity may improve children's cardiovascular fitness (84).

No significant association of physical activities with obesity was found in this study. This was inconsistent with above studies. It's may because in this study physical activities was assessed by insufficient questionnaires and accelerometry was not used, that was one of our limitation. However the relationship between physical activities and obesity was not simple, there were complicated interaction among three factors physical activity (energy expenditure) food consumption (energy intake) and obesity.

5.4.2 Time for watching TV and obesity

Using Mann Whitney test to compared the median of time that students had spent for watching TV and passive entertainment activities, the result showed that no significant difference between obese and non obese group was found. It's was

consistent with that found in the study of Yunimar Usman 2004 and Germaine Langendijk et al 2000 (65, 58), Other study had indicated that television viewing alone, as an index of inactivities, was strongly associated with obesity (85). This mean the relationship between obesity and watching TV was sophisticated, it may concerned to other factors for example eating food during watching TV time or impact from food advertisement on TV programs.

5.5 Knowledge on obesity and related factors

For assessing knowledge of student on obesity and related factors, this study used 25 questions to interview students. These questions were divided into 4 groups : definition of obesity, cause of obesity, consequences of obesity and relationship of obesity with the other factors. For questions on causes and consequences of obesity, many students have incorrect answer or don't know (nearly 50 %) , it suggested the demand of further health education for these issues. Consistent with study of Thakur and D' Amico, 1999; Gordon Larsen, 2001 (85,86), This study did not found any association between nutritional knowledge of students and their obesity status.

CHAPTER 6
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The objective of the study was to determine the prevalence of obesity among students grade 7 – 12 in Phuttha Monthon district, Nakhon Pathom province, Thailand. In addition eating habit, physical activities and nutritional knowledge were described. This study attempted to identify the relationship between these factors and obesity status.

The subjects of the study were 230 students age 12-18 years old in Kanchanabhisekvidyalaya school, Phuttha Monthon district, Nakhon Pathom province, Thailand. Data were collected in 17th January, 2008, all students were measured weight and height followed standard procedure, after that a questionnaire was answered by each student to assess four factors: sociodemographic, eating habit, physical activities and nutritional knowledge. Data input were finished by using statistical software.

The data were analyzed using four statistical techniques. Basis statistic was used for calculate frequency and percentage of variables. Mann Whitney test was used to compare median of some continuous variables between obesity and non obesity group. Multiple logistic regression was applied to identify the relationship between eating habit, physical activities variables and obesity status. Chi-square test was used to determine association between sociodemographic factors and obesity status. Multiple logistic regression was applied to determine if the independent variables of the study (gender, fruit, milk, snack consumption) could significantly predict the obesity status. Statistical software Minitab version 13.0 was used for all statistical analysis

.

Using Thai standard weight for height, this study revealed that the prevalence of obesity among students grade 7 – 12 in Phuttha Monthon district, Nakhon Pathom province, Thailand was 8.7 %.

There 101 males (43.91 %) and 129 females (56.09 %) were included in this study, gender and some other sociodemographic factors such as birth order, parents marriage status didn't have significant relationship with obesity, student daily income was the same between obesity and non obesity group.

Regarding Father's occupation, the percentage of obesity among students whose fathers were business men or government officers were higher than those whose fathers was laborer, farmer, no job, employee. There was statistical significant association between father's occupation and obesity status.

Eating habit such as number of meal per day, time of last meal in a day, fast food consumption did not have any significant association with obesity status. There were two kinds of food have association with obesity status, they were fruit, (crude odds ratio: 3.56; 95% CI: 1.01-12.52, p value = 0.048), milk (crude odds ratio: 4.33; 95% CI: 1.65-11.37). After adjusting the result revealed that students who ate fruit more than three times per week were at risk of being obese 3.56 times greater than those ate less than or equal 3 times per week. (adjusted odds ratio: 3.69; 95% CI: 1.04-13.13; p value = 0.044)

Regarding physical activities, More than 84 % played sport like football, running, badminton, swimming every week, 98.26 % joined in moderate physical activities such as walking, cycling, housework, gardening every week, 45 % students reported join in passive entertainment activities such as: go on internet, chatting, computer game, reading book every day. No significant association between physical activities and obesity was found. Average time spent for passive entertainment activities and watching TV was not significant different between obesity and non obesity group. More than 50 % of the student reported they usually ate snack when watching TV or in the time of chatting, computer game, reading book.

The students had very low knowledge on cause and consequence of obesity. However knowledge on obesity and related factors did not have significant relationship with obesity.

6.2 Recommendation

6.2.1 For health promotion

– Although the prevalence of obesity among students was 8.7 %, lower than the figure found in National Nutrition survey 1994 (11.2 % - 16.9 %) but if potential group of obesity (include fat and slightly fat) are added, the figure would be 20.44%, it is an alarming figure. Because if potential group of obesity are not paid attention, they would be obesity group in near future. Therefore, health programs for obesity prevention should be promoted continuously in students in both junior high school and senior high school. It is recommended that prevalence and incidence of adolescent obesity should be monitored closely for public health purposes.

– Although no association was found between obesity and intake of fast food, fat food, it is still evident that those food consumption plays an important role in the aetiology of obesity. Hence health promotion on healthy food consumption should be emphasized not only for students, but also for community. In addition, fruit, milk, snack consumption that was found association with obesity should be paid attention.

– It is recommended that school based programs be introduced for early prevention of the development of obesity and the establishment of lifelong healthy behavior. These program should focus not only on eating habit, physical activities, but also to knowledge on obesity and related factors.

6.2.2 For future research

– Further study on obesity and related factor should be conducted continuously so that contribute to observe and prevent obesity in the future. A larger sample size should be selected to reflect the prevalence of obesity and its relationship with related factors.

– A self administered questionnaire that used in this study is appropriated to be a reference in other research, but it should be adjusted more. Assessing weight and height of the target population should be done by researcher, self reported figure may have bias.

– Although some significant associations between food consumption were found in this study, but it is recommended that others such as fast food, fat food should be studied more, pattern of daily meal should be assessed in more detail.

– The association between vigorous, moderate activities, passive entertainment activities and obesity were not supported in this study, it is recommended that they are important factors affect to obesity status, hence they should be paid more attention.

– There were studies support the association between time spent for watching TV and obesity, particularly between threesome watching TV time, consuming food when watching TV and obesity, therefore further study could focus more on this problem.

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APPENDIX

APPENDIX A

Table A1 Relationship between father's occupation and Student's daily income

Father's occupation	Student's daily income		χ^2 (df)	p value
	< 50 baht (%)	≥ 50 baht (%)		
Business man	15(19.73)	61(80.26)	7.335 (2)	**0.026**
Government officer	31(39.74)	47(60.26)		
Other	22(30.99)	49(69.01)		

Table A2 Frequency and percentage of food consumption of students

Potatoes, bread, biscuit, cake, Noodle,	**Frequency (n=230)**	**percent**
7 days/week	18	7.83
4-6days/week	57	24.78
1-3 days/ week	151	65.65
Never	4	1.74
chocolate, ice cream, sweet, candy		
7 days/week	15	6.52
4-6days/week	63	27.39
1-3 days/ week	139	60.43
Never	13	5.65
Fried food: fried chicken, fried pork, fried potatoes		
7 days/week	34	14.78
4-6days/week	90	39.13
1-3 days/ week	98	42.61
Never	8	3.48

Table A2 Frequency and percentage of food consumption of students (cont.)

Cooking oil salad, butter, cheese, mayonnaise	**Frequency (n=230)**	**percentage**
7 days/week	2	0.87
4-6days/week	14	6.09
1-3 days/ week	130	56.52
Never	84	36.52
Eggs		
7 days/week	35	15.22
4-6days/week	106	46.09
1-3 days/ week	87	37.83
Never	2	0.87
Snacks: chips, pastry or donuts		
7 days/week	14	6.09
4-6days/week	36	15.65
1-3 days/ week	127	55.22
Never	53	23.04
Vegetable		
7 days/week	87	37.83
4-6days/week	76	33.04
1-3 days/ week	61	26.52
Never	6	2.61
Fruit		
7 days/week	62	26.96
4-6days/week	84	36.52
1-3 days/ week	78	33.91
Never	6	2.61

Table A2 Frequency and percentage of food consumption of students (cont.)

Full cream Milk	**Frequency (n=230)**	**percentage**
7 days/week	113	49.13
4-6days/week	47	20.43
1-3 days/ week	62	26.96
Never	8	3.48
Cacao: ovaltine, Milo		
7 days/week	33	14.35
4-6days/week	60	26.09
1-3 days/ week	107	46.52
Never	30	13.04
Soft drink		
7 days/week	15	6.52
4-6days/week	40	17.39
1-3 days/ week	117	50.87
Never	58	25.22
Fruit juice		
7 days/week	27	11.74
4-6days/week	59	25.65
1-3 days/ week	120	52.17
Never	24	10.43
Eat fast food		
No	123	53.48
Yes	107	46.52
Fast food per week	**(n=107)**	
> 3 times	13	0.12
2-3 times	41	0.38
1 time	53	0.5

Table A2 Frequency and percentage of food consumption of students (cont.)

Full cream Milk	**Frequency (n=230)**	**percentage**
Number of meal per day		
< 3 meals	43	18.70
3 meals	171	74.35
> 3 meals	16	6.96
Time of last meals everyday		
<18h	42	18.26
18 - 20h	148	64.35
20 - 22h	38	16.52
>22 h	2	0.87

APPENDIX B

Self administered questionnaire

QUESTIONAIRE
No.:……

(Before interview, please ask respondent whether they are using any kind of medicine or drug. Those who are using any kind of medicine or drug more than 5 days at the moment are not target population of this study)

Weight……..kg

Height……..cm

Part 1: Background

1. Gender □ 1. male □ 2. female

2. Date of birth (dd/mm/yy) ……/……./……...

3. What is your birth order in your family?
□ 1st □ 2nd □ ≥ 3rd

4. Parents marriage status
□ 1. Living together □ 4. father died
□ 2. Divorced □ 5. mother died
□ 3. Living separately □ 6. parent died

5. What is your Father's occupation?
□ 1. No job □ 4. Business
□ 2. Farmer □ 5. Government officer
□ 3. Laborer □ 6. Other, please specify…….

6. What is your Father's education?
□ 1. No education □ 5. Diploma
□ 2. Primary school □ 6. Bachelor
□ 3. Secondary school □ 7. Master
□ 4. High school □ 8. PhD
□ 9. Other, please specify…….

7. What is your Mother's occupation?
□ 1. No job □ 4. Laborer
□ 2. Household □ 5. Business
□ 3. Farmer □ 6. Other, please specify…….

8. What is your Mother's education?

□ 1. No education
□ 2. Primary school
□ 3. Secondary school
□ 4. High school
□ 5. Diploma
□ 6. Bachelor
□ 7. Master
□ 8. PhD
□ 9. Other, please specify…….

9. How much do you usually have per day (in THB?)

……

Part 2: Eating habit

10. How often do you eat this kind of food bellow?

***Everyday**: 7 days per week; **Often** : 4-6 days per week; **Sometime** : 1-3 days per week; **Never**: never eat*

Food items	Never	Sometime	Often	Everyday
Carbohydrate				
Potatoes, bread, biscuit, cake, Noodle,				
chocolate, ice cream, sweet, candy				
Fat food				
Fried food: fried chicken, fried pork, fried potatoes, roasted beef, dried pork skin				
Cooking oil salad, butter, cheese, mayonnaise				
Eggs				
Snacks: chips, pastry or donuts				
Vitamin				
Vegetable				
Fruit				
Drink				
Full cream Milk				
Cacao: ovaltine, Milo				
Soft drink: (give example…..)				
Fruit juice				

11. Do you usually have fast food at KFC, McDonald, PIZZA, and Burger King?

□ 1. Yes □ 2. No *(If the answer is "no" skip to question no. 13)*

12. How many times per week do you usually eat fast food?

□ 1 time □ 2 -3 times □ > 3 times

13. How many meals do you usually have everyday

□ < 3 meals □ 3 meals □ > 3 meals

14. What time do you usually have the last meals of the day?

□ <18h □ 18 – 20h □ 20 – 22h □ >22 h

Part 3: Physical activities

15. How do you usually go to school everyday?
□ 1.By car/bus □ 2.by motorbike □ 3.by bicycle □ 4.on foot

Vigorous physical activity

16. How many times per week do you play sport such as football, running, basket ball, badminton, swimming, tenni..? *(If the answer is "never" skip to question no. 18)*
□ Never □ < 3 times □ ≥ 3 times

17. How long per times do you usually spend for playing above sports?
□ < 20 mins □ ≥ 20 min

Moderate physical activity
18. How many times per week do you have activities such as: walking, cycling, housework, gardening... *(If the answer is "never" skip to question no. 20)*
□ Never □ < 5 times □ ≥ 5 times

19. How long per time do you usually spend for above activities?
□ < 30 minutes □ ≥ 30 minutes

Passive entertainment activities

20. How often do you usually spend for passive entertainment activities such as: go on internet, chatting, computer game, reading book *(if the answer is "never" skip to question 24)*
□ 1. Never □ 2. Sometime □ 3. often □ 4. Everyday

***Everyday**: 7 times per week; **Often** : 4-6 times per week; **Sometime** : 1-3 times per week; **Never**: never do it*

21. How long per day do you usually spend for these passive entertainment activities?
…….hours

22. Do you usually have food during the time of the passive entertainment activities?
□ 1. Yes □ 2. No *(if the answer is "no" skip to question 24)*

23. What kind of food do you have at that time?
□ 1. Sweet/Cake
□ 2. Snack
□ 3. Fast food
□ 4. Soft drink

24. How long per day do you spend for Watching TV?
…….hours

25. Do you usually have food during the time of watching TV?
□ 1. Yes □ 2. No *(If the answer is "no" skip to question no. 27)*

26. What kind of food do you have during the time of watching TV?
□ 1. Sweet/Cake
□ 2. Snack
□ 3. Fast food
□ 4. Soft drink

27. What do you usually do in your leisure time? *(choose only 1 answer*)
□ 1. Vigorous physical activity such as football, running, basket ball, badminton, swimming, tennis…and other sport
□ 2. Moderate physical activity such as: walking, cycling, housework, gardening...
□ 3. Passive entertainment activities such as: go on internet, chatting, computer game, reading book…
□ 4. Watching TV
□ 5. Other, please specify……..

Part 4: knowledge about Obesity and related factor

For the following statements please choose **Yes** if you agree, **No** if you disagree and if you are not sure or do not know, please check column **don't know**

28. What is the obesity?

□ 1. An infectious disease	□ Yes	□ No	□ don't know
□ 2. Excess weight	□ Yes	□ No	□ don't know
□ 3. Shortage of physical activities	□ Yes	□ No	□ don't know
□ 4. Eating too much	□ Yes	□ No	□ don't know

29. According to your idea: What may be the cause of obesity?

□ 1. Positive balance food intake	□ Yes	□ No	□ don't know
□ 2. Poor physical activities	□ Yes	□ No	□ don't know
□ 3. Bacteria	□ Yes	□ No	□ don't know

30. According to your idea: What are consequences of obesity?

□ 1. Heart disease	□ Yes	□ No	□ don't know
□ 2. Do not have friends	□ Yes	□ No	□ don't know
□ 3. Can not run	□ Yes	□ No	□ don't know
□ 4. Sleeplessness	□ Yes	□ No	□ don't know
□ 5. Low school performance	□ Yes	□ No	□ don't know

For the following statements please specify whether you think it is **true** or **false** statements, if you are not sure or do not know, please check column **don't know**

	Knowledge items	**True**	**False**	**Don't know**
31	Obesity is a disease			
32	Obesity is very dangerous			
33	Obesity can be prevented and treated			
34	Obese is not a good person			
35	Eat a lot of fat food can cause obesity			
36	Fast food is not good for obese			
37	Many kind of soda can cause obesity			
38	Reduce eating carbohydrate can prevent obesity			
39	Eating a lot of sweet does not concern to obesity			
40	Doing more Physical activities can prevent obesity			
41	Doing exercise frequently can gain more weight			
42	The more we take a rest, the less weight we gain			
43	Obesity is not harmful for our health			

Please say " thank you" to respondents for their kind cooperation

BIOGRAPHY

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