

**NUTRITIONAL STATUS AND SELF-ESTEEM IN
SECONDARY SCHOOL-AGE STUDENTS OF SRINAGARINDRA
THE PRINCESS MOTHER SCHOOL, PHAYAO (SW.PY)**

SRILA SATOH

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE (NUTRITION)
FACULTY OF GRADUATE STUDIES
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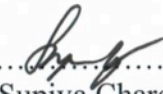
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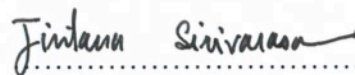
.....
Miss Srila Satoh
Candidate



.....
Assoc. Prof. Preeya Leelahagul,
D.Sc. (Nutrition)
Major advisor



.....
Mrs. Supiya Charoensiriwath,
Ph.D.
Co-advisor



.....
Miss Jintana Sirivarasai,
Ph.D.
Co-advisor



.....
Prof. Banchong Mahaisavariya,
M.D., Dip Thai Board of Orthopedics
Dean
Faculty of Graduate Studies
Mahidol University



.....
Assoc. Prof. Naline Chongviriyaphan,
M.D., Ph.D.
Program Director
Master of Science Program in Nutrition
Faculty of Medicine,
Ramathibodi Hospital and
Institute of Nutrition Mahidol University

Thesis
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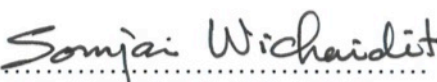
was submitted to the Faculty of Graduate Studies, Mahidol University
for the degree of Master of Science (Nutrition)

on
June 23, 2014


.....
Miss Srila Satoh
Candidate


.....
Assoc. Prof. Preeya Leelahagul,
D.Sc. (Nutrition)
Member


.....
Asst. Prof. Somsri Charoenkiatkul,
D.Sc. (Nutrition)
Chair


.....
Assoc. Prof. Somjai Wichaidit,
Ph.D.
Member


.....
Mrs. Supiya Charoensiriwath,
Ph.D.
Member


.....
Miss Jintana Sirivarasai,
Ph.D.
Member


.....
Assoc. Prof. Visith Chavasit,
Ph.D. (Food Science)
Director
Institute of Nutrition
Mahidol University


.....
Prof. Banchong Mahaisavariya,
M.D., Dip Thai Board of Orthopedics
Dean
Faculty of Graduate Studies
Mahidol University


.....
Prof. Winit Phuapradit,
M.D., M.P.H.
Dean
Faculty of Medicine,
Ramathibodi Hospital,
Mahidol University

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NUTRITIONAL STATUS AND SELF-ESTEEM IN SECONDARY SCHOOL-AGE STUDENTS OF SRINAGARINDRA THE PRINCESS MOTHER SCHOOL, PHAYAO (SW.PY)

SRILA SATOH 5337163 RANU/M

M.Sc. (NUTRITION)

THESIS ADVISORY COMMITTEE: PREEYA LEELAHAGUL, D.Sc.,
SUPIYA CHAROENSIRIWATH, Ph.D., JINTANA SIRIVARASAI, Ph.D.

ABSTRACT

This was a prospective study conducted among adolescents aged 12-18 years at Srinagarindra the Princess Mother School, Phayao (SW.PY) a coeducational secondary boarding school located in Phayao Province, Thailand. This study included 713 students consisting of 337 males and 376 females. Nutritional status and self-esteem were assessed during the 24-week study period. The Thai Five-Scale Test of Self-esteem for Children (FSC) questionnaire was used to assess self-esteem scores among students. This study provided nutritional therapy on diet-related chronic diseases (obesity, anemia, hyperuricemia, hypercholesterolemia and hypertriglyceridemia) to all students based on nutritional education, food behavior, food menu modification, and exercise at baseline and every 8th week for 24 weeks. This research aimed to assess the relationship between nutritional status and self-esteem and to assess the effects of nutritional therapy on self-esteem.

Based on BMI-for-age, 5.9% of all students were underweight, 10.9% were at risk of being overweight, and 8.3% were overweight whereas based on percentage of body fat, there were low, over, and excess body fat students at 13.2%, 4.3%, and 4.8%, respectively. Moreover, the prevalence of anemia, hyperuricemia, hypertriglyceridemia, and hypercholesterolemia among students was 10.1%, 61.4%, 2.1%, and 10.8%, respectively. Providing nutritional therapy for 24 weeks improved nutritional status among students while prevalence of being overweight, excess body fat, anemia, hyperuricemia, and hypercholesterolemia was reduced by 22.0%, 50.0%, 67.6%, 29.8%, and 63.4%, respectively.

Self-esteem scores of normal weight students at baseline were significantly higher than overweight students in the area of body image. Self-esteem scores between students who had normal and abnormal blood parameters did not differ significantly. Body weight had an effect on perception of health. Abnormal blood parameters had no effect on perception of health. From this study, nutritional status among students improved after 24 weeks; however, self-esteem scores were not significantly different, which may be due to mild degrees of obesity in this study, and self-esteem scores were not low.

KEY WORDS: SELF-ESTEEM / ADOLESCENT / NUTRITIONAL THERAPY

121 pages

ภาวะโภชนาการกับความรู้สึกลึกซึ้งภายในตนเองของนักเรียนระดับมัธยมศึกษา

โรงเรียนเฉลิมพระเกียรติสมเด็จพระศรีนครินทร์ พะเยา (สว.พย)

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ศรีลา สะเตาะ 5337163 RANU/M

วท.ม. (โภชนศาสตร์)

คณะกรรมการที่ปรึกษาวิทยานิพนธ์: ปรียา ลีพกุล, D.Sc., สุปียา เจริญศิริวัฒน์, Ph.D.,
จินตนา ศิริวราศัย, Ph.D.

บทคัดย่อ

งานวิจัยนี้ศึกษาผลของภาวะโภชนาการกับความรู้สึกลึกซึ้งภายในตนเอง ของนักเรียนประจำ อายุ 12-18 ปี ที่โรงเรียนสว.พย. 713 คน เป็นหญิง 337 คน ชาย 376 คน ระยะเวลาศึกษานาน 24 สัปดาห์ ประกอบด้วย การประเมินและติดตามผลทางด้านโภชนาการทุก 8 สัปดาห์ ซึ่งได้แก่ ภาวะโภชนาการด้านต่างๆ การให้โภชนบำบัดด้วยวิธีการด้านโภชนศึกษา เปลี่ยนพฤติกรรมกรรมการบริโภคอาหาร กิจกรรมประจำวัน และปรับปรุงเมนูอาหารโรงเรียนร่วมกับการประเมิน และติดตามผลความรู้สึกลึกซึ้งภายในตนเองเมื่อเริ่มต้นและสิ้นสุดการศึกษาด้วยแบบสอบถาม FSC ฉบับภาษาไทย

เมื่อดูภาวะอ้วนพอมตามเกณฑ์ดัชนีมวลกาย พบว่า ร้อยละ 5.9, 10.9, และ 8.3 มีภาวะพอม เสี่ยงต่อน้ำหนักเกิน และน้ำหนักเกิน ตามลำดับ และเมื่อตัดสินด้วยปริมาณไขมันในร่างกาย พบว่า ร้อยละ 13.2, 4.3 และ 4.8 มีภาวะเนื้อเยื่อไขมันน้อย ไขมันเกินและไขมันเกินมาก ตามลำดับ พบภาวะ โลหิตจาง กรดยูริกสูง ไตรกลีเซอไรด์สูง และโคเลสเตอรอลสูง ร้อยละ 10.1, 61.4, 2.1, และ 10.8 ตามลำดับ หลังจากให้โภชนบำบัด 24 สัปดาห์ นักเรียนมีภาวะโภชนาการดีขึ้น (ความชุกของภาวะน้ำหนักเกิน เนื้อเยื่อไขมันเกินมาก โลหิตจาง กรดยูริกสูง และโคเลสเตอรอลสูง ลดลง ร้อยละ 22.0, 50.0, 67.6, 29.8, และ 63.4 ตามลำดับ

ความรู้สึกลึกซึ้งภายในตนเองของนักเรียนน้ำหนักตัวปกติ มีคะแนนสูงกว่าน้ำหนักเกิน อย่างมีนัยสำคัญทางสถิติ แต่ไม่พบความแตกต่างอย่างมีนัยสำคัญของคะแนนระหว่างนักเรียนที่มีผลเลือดผิดปกติและปกติ และพบว่าภาวะอ้วนพอมมีผลต่อความรู้สึกลึกซึ้งทางด้านสุขภาพ แต่ภาวะผลเลือดผิดปกตินั้นไม่มีผล เมื่อสิ้นสุดการศึกษานักเรียนมีภาวะโภชนาการดีขึ้น แต่อย่างไรก็ตามไม่พบความแตกต่างของคะแนนความรู้สึกลึกซึ้งภายในตนเอง อาจเป็นเพราะ นักเรียนมีระดับความอ้วนที่ไม่รุนแรง และคะแนนความรู้สึกลึกซึ้งภายในตนเองตอนเริ่มการศึกษาไม่ได้อยู่ในระดับที่ต่ำ

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LIST OF ABBREVIATION

BMI	Body mass index
cm	Centimeter
cont.	Continued
dL	Decilitre
FM	Fat mass
FFM	Fat free mass
FSC	The Five-Scale Test of Self-esteem for Children
HDL	High density lipoprotein cholesterol
Hb	Hemoglobin
Kcal	Kilocalorie
Kg	Kilogram
LDL	Low density lipoprotein-cholesterol
M.	Mathayom
m	Meter
mg	Milligram
mL	Milliliter
n	Number
r	Pearson correlation coefficient
RSE	Rosenberg's Self-esteem Scale
SD	Standard deviation
SPSS	Statistical package for the social science
SW.PY	Srinagarindra the Princess Mother School, Phayao
TG	Triglyceride
TBW	Total body water
WHO	World health organization

CHAPTER I

INTRODUCTION

1.1 Background and Rationale

Self-esteem is defined as self-confidence, self-value, and self-respect from self-appraisal to reflect a person's attitude toward themselves (1-2). It is an essential drive to better one's quality of life and basic need to succeed in life. Without self-esteem, one may find happiness in life difficult to achieve (3). Persons with high self-esteem will have higher self-confidence, self-value, self-respect than those with lower self-esteem, however self-esteem should not be used to justify that one is better than anyone else but should be used to reaffirm one's worth or potential in life. Persons with low self-esteem will have lower self-confidence, self-value, self-respect and feel more self-conscious about their weaknesses (4).

Two factors are known to affect self-esteem: Internal factors (e.g. physical attributes, general capacity, ability and performance, affective states, self-value, aspirations, gender, problems and pathology) and External factors (e.g. relationships in families, school, social status and friendships) (5). Nowica et al., (6) reported that an internal factor such as obesity affects obese girls' self-esteem level, especially higher among late adolescent group (16-25 years) than adolescent group (12-16 years) and preadolescent group (<12 years). Similarly Paxton (7) found that obese students in Grades 6-8 had lower self-esteem than normal weight students while no significant differences were found in obese boys and girls. Franklin et al., (8) reported that obesity in boys affects their self-esteem in athletic competency and physical appearance while obesity in girls affects their self-esteem in social acceptance, athletic competency and physical appearance. However, when compared between sexes, obese girls had lower self-esteem in social acceptance and physical appearance than obese boys.

Braet et al., (9) found a positive correlation in terms of self-esteem; when children and adolescents lose weight, they have higher self-esteem. On the contrary, Beer et al., (10) reported no significant differences in self-esteem between obese adolescents and normal weight adolescents.

Srisinsup (11) studied the association between body image and self-esteem among high school students in Bangkok and reported that students who had high self-esteem were more satisfied with their appearance than students who had low self-esteem. However, body weight based on body mass index (BMI) did not have any effect on self-esteem.

Thadaprom (12) studied body image and self-esteem of 360 male and female high school students in Bangkok and found that 113 overweight adolescents ($BMI=25-25.9 \text{ kg/m}^2$) were moderately satisfied with their body image while 119 obese adolescents ($BMI>30 \text{ kg/m}^2$) were high levels of their body image dissatisfaction (self-perception of body as being fat). Normal weight adolescents had higher satisfaction of their body image than obese adolescents. In addition, adolescents who had normal weight had higher self-esteem than overweight and obese adolescents.

Thyansilp (13) studied the effects of family relationships on self-esteem among adolescents aged 15-24 years and found a positive correlation between self-esteem and good relationships with parents, closeness to family, and loose parenting style. Moreover, students with high educational level had a higher self-esteem than students with low educational level. Tungsuwannawong (14) studied 409 adolescents and found positive relationships between self-esteem and family functioning in all six areas; affective responsiveness, behavior control, family roles, communication and problem solving.

World Health Organization (WHO) reported that obesity is a problem in many countries including Thailand and it leads to many diseases such as diabetes, hypertension and hyperlipidemia, and which may lead to psychosocial problems later on (15). Rattanayosee and Leelahagul (16) studied 820 high school students aged between 12-18 years old and found that 22.1 % and 28.1% of male and female students were obese. In the Waisai Health Project (17), it was reported that among 833 students 11.4% and 3.7% of male and female students were obese. In-iw et al., (18)

studied 5,071 students aged 11-18 years and found that 14.1% were obese of which 50% had psychosocial problems such as negative thinking of self-image, low self-esteem and lack of confidence.

During adolescence, the body undergoes physical, mental, social and thinking process development, with rapid emotional changes (19). If adolescents were faced with low self-esteem, it would affect their decision-making capabilities and individual capacity development, thus reflecting their quality of life in the future.

Studies on the relationships between self-esteem of Thai adolescents with or without obesity and diet-related chronic diseases are limited. This research therefore will determine whether there is improvement in nutritional status using the nutritional therapy to help improve self-esteem in Thai adolescents with obesity and diet-related chronic diseases.

1.2 Objectives

- 1.2.1 To assess the relationships between nutritional status and self-esteem.
- 1.2.2 To assess the effects of nutritional therapy on self-esteem.

CHAPTER II

LITERATURE REVIEW

2.1 Self-esteem

2.1.1 Definition of self-esteem

Rosenberg defined self-esteem is self-evaluation as a positive or negative attitude towards oneself based on self-characteristics, self-satisfaction and self-acceptance (1).

Coopersmith defined self-esteem is self-evaluation and expressed as an attitude of accepting or not accepting the self and indicates extent to which individual believes him self to be capable, successful, significant, and worthy (1).

Pope et al, defined self-esteem is self-evaluation between perceived self and ideal self. The self-esteem will be positive if a good match between the perceived self and ideal self (2).

In conclusion, self-esteem is the self-confidence, self-value, self-respect from self-appraisal to reflect of individual being. Self-esteem is also expressed in attitude toward themselves.

2.1.2 Factors influence of self-esteem

Two factors are known to affect self-esteem (5)

2.1.2.1 Internal factor

1. Physical attributes are derived from appearance, weight, height, health, strength, dress and beauty.

2. General capacity, ability, and performance, 3 factors have relationship. Persons have high or low self-esteem depends on the ability to do something to successful, especially in students, self-esteem link to intelligence and academic performance. When students have high intelligence that lead to high level of academic performance, students have positive self-esteem. However, some

students have low level of academic performance may be positive self-esteem, because they have other special ability.

3. Affective states is self-evaluation from self-experience and interaction with others. An affective state reflects feeling of the individuals e.g. happiness, satisfaction, or anxiety.

4. Self-value is value of an individual depends on one's value and value of individual considers which importance is different. However, self-value depends on social value that is self-value will increase if compatible with social value.

5. Aspiration is individual compare own performance and ability with own target goal. If individual can achieve their target goal, they will have positive self-esteem.

6. Gender; social and most cultural respect male more than female. Male success is often seen as from ability, but female success is seen to be due to effort or lucky. Thus, most males have higher self-esteem than females.

7. Problems and illness; mental and health problems effects on self-esteem. People who have such problems will have negative self-esteem that express in anxiety.

2.1.2.2 External factors

1. Family relationship is importance since the beginning of life, if family has good relationship with children, giving warm, take care, and support, there will make their children have positive self-esteem.

2. School is second order to enhance children's self-esteem. Teacher is responsible for helping students feel confident in their skill, performance and practice to solve problem.

3. Social status including income, occupation, social role, and ancestry have effect on self-esteem, ones who have high social status will have higher positive self-esteem.

4. Friendship, ones who have high acceptance from their friends will have positive self-esteem.

2.2 Adolescence

2.2.1 Definition of adolescence

Keawkangwan defines adolescence is a period of growth between child and adult. During adolescence period, there are rapid and important developments of physical, mental, and social. She divided adolescence into 3 stages that is early (12-15 years), middle (16-17 years), and late adolescence (18-25 years) (19).

Damrisuk stated that adolescence is derived from Latin word “adolescere” which refers to growing to maturity. Age group of adolescence is between 12-21 years (20).

Chanaim states that adolescence is the age of becoming into adulthood. Adolescence is period of reconstruction, transformation (physical growth or maturity), independence, and problems (21).

World Health Organization divided adolescence into 3 different stages that is early (10-15 years), middle (16-19 years), and late adolescence (20-24 years) (22).

2.2.2 Adolescence development (19)

2.2.2.1 Physical development

Adolescence begins with puberty, which occur between ages 12-15 years. Puberty period is the times of rapid physical growth and psychological change. The sign of puberty is breast begin to enlarge, hips widen, body fat increase, and menstruation occur in girls. Testicles and penis getting bigger, muscles grow, and voice cracks and get deeper occur in boys. Both boys and girls have hair grows in pubic and armpits, pimples may appear and also have a growth spurt which rapid increase height and weight. When entering into adolescence period, occurs between 15-18, 19-25 years, physical maturity and reproductive growth leveling off and ending.

2.2.2.2 Emotional development

Adolescence is transition period, emotional rapid change relating to stimulator. Adolescence period have various emotional e.g. anger, jealous,

sadness, worry, love, moody and excitement. Sometime emotional change during adolescence referred to storm and stress.

2.2.2.3 Social development

During adolescence period, they begin to spend more time with their friends and breaking away from their family. Most of adolescents are motivated to join a gang for a sense of connection or to define a new sense of who they are, they tend to do activity together. Changes in secondary sex characteristic stimulate boys and girls interest each other. Relationship of them can change from buddy to couple friends.

2.2.2.4 Intellectual development

Adolescence is also a time for rapid intellectual development. During adolescence they lead to formal operation period which thinking a proportional logic, thinking a proportional reasoning, thinking an isolate variables, and thinking a combinational reasoning.

Moreover, they have self awareness i.e. they find personal identity, they express about their like and aptitude, interest their self-image, require acceptance from other, self-esteem, and try to be themselves.

2.3 Nutritional status and self-esteem

Previous study reported obesity leads to many diseases e.g. diabetes mellitus, hypertension, dyslipidemia, metabolic syndrome, and cardiovascular disease, which are leading cause of morbidity and mortality (15). Moreover, obesity leads to psychosocial problems e.g. negative thinking of self-image, low self-esteem, lack of confidence, and depression (15,18).

In-iw et al., (18) studied in 5,071 Thai adolescent students, aged 11-18 years during 2005 academic year. This study was to determine the dietary pattern, lifestyle factors, and psychosocial concerns. The result showed 14.1% of the students were overweight and obese ($\text{BMI} \geq 25 \text{ kg/m}^2$), 10.2% in males and 3.9% in females. Moreover, 61.7% of 403 students who answered the self-administered questionnaires were overweight and obese, the result from questionnaires show that they had weight

related psychosocial issues, more than half of them reported poor self image, poor self-esteem, having a sense of social isolated, and 87.9% of them had dissatisfaction of actual body weight.

Franklin et al., (8) conducted a cross-sectional survey to evaluate self-esteem by self-perception profile for children with global self-worth in 2,813 Australian children, aged 9-14 years. The results showed that obese boys had lower self-esteem than normal weight boys in athletic competence, physical appearance, and global self-worth while obese girls had lower self-esteem than normal weight girls in social acceptance, athletic competence, physical appearance, and global self-worth. Moreover, obese girls had lower self-esteem than obese boys in social acceptance, physical appearance, and global self-worth.

Pesa et al., (23) studied in 3,204 female participants of National Longitudinal Study of Adolescent Health. The objective was to determine difference of psychosocial between overweight and under/normal weight female adolescent, grades 7-12. The results showed that 21% of 3,204 females had overweight (BMI = 29.3 ± 4.1 kg/m², mean age 16.3 ± 1.7 years) and 79% of 3,204 females had under/normal weight (BMI = 20.6 ± 2.2 kg/m², mean age 15.9 ± 1.8 years). Overweight students had lower self-esteem than under/normal weight students. Moreover, overweight students had lower psychosocial score than under/normal weight students in depression, family connectedness, school connectedness, trouble in school, and sense of community.

Erermis et al., (24) studied in 90 adolescents aged 12-16 years, consist of a clinical study group (n=30), a non-clinical obese group (n=30), and normal weight control group (n=30). The objective was to explore psychopathology in clinical, non-clinical obese, and normal weight control group. Self-esteem score assessment in this study was performed using Rosenberg Self-esteem Scale (SES). The results showed that clinical obese group had lower self-esteem than normal weight control group. Moreover, clinical, and non-clinical obese groups had higher depression than normal weight group.

French et al., (25) a literature reviews from 35 studies on the relationship between self-esteem and obesity. The results in adolescent aged 13-18 years showed that 7 of 9 cross-sectional studies found an inverse relationship between obesity and

self-esteem, 4 of 5 weight loss treatment studies found that self-esteem increased during treatment.

Strauss (26) studied in 1,520 children aged 9-10 years, 4-year follow-up. This research studied self-esteem in childhood obesity by Self-Perception Profile for Children. The results showed that global, and scholastic self-esteem were not significant differences between obese and non-obese children. After 4-years follow-up, obese Hispanic girls and obese white girls had lower global self-esteem than non-obese girls (Hispanic = $p < 0.05$, white = $p < 0.01$). In 13-14 years old children, obese boys, obese girls (both Hispanic and white) had significantly lower self-esteem than their non-obese. However, in obese boys global self-esteem were mildly decreased. Moreover, decreasing self-esteem was associated with significantly increased of loneliness, nervousness, and sadness.

Biro et al., (27) conducted a longitudinal study and the objective of this study was to examine mean and individual changes in self-esteem, and how self-esteem is affected by race and BMI in 2,379 adolescent females (black = 1,213, white=1,116) aged 9-10 years and followed to age 22 years. They defined 3 phases of subjects based on age; Phase I aged 9-12 years (early adolescence), Phase II aged 13-16 years (middle adolescence), and Phase III aged 17-22 years (late adolescence). Moreover, they defined BMI to 3 groups; medium BMI (race- and age-specific BMI within one SD of the mean), low BMI (race- and age-specific BMI was greater than one SD below the mean), and high BMI (race- and age-specific BMI was greater than one SD above the mean). The results showed that overall, self-esteem was greater with lower BMI and greater in black than white females after age 11. When they stratified by race, low BMI had highest self-esteem in black females, med BMI had highest self-esteem in white females, and high BMI had lowest self-esteem in both females.

Mirza et al., (28) conducted a cross-sectional survey to examine the associations among self-reported body image, self-esteem, and BMI in 113 American children and adolescents aged 10-18 years. This research studied self-esteem by using the abbreviated Hare Area-Specific Self-esteem scale, which consist of 3 domains (peer, school, and home). The results showed that overweight were significantly lower self-esteem than normal weight in peer domain ($p < 0.03$). Moreover, overweight and at risk of overweight were higher body size dissatisfaction score.

Renman et al., (29) studied in adolescents aged 14-18 years from public Swedish school for compare self-esteem, social background and academic competence, behavioral problems and lifestyle between obese group ($BMI=33.9\pm3.2$ kg/m²) and non-obese group (20.5 ± 2.0 kg/m²). This research studied self-esteem by using I Think I Am (ITIA), which developed in Sweden. The result showed that total score of ITIA and 4 subscale (skills and talents, mental characteristic, relations with parents, and relations with others) were not significant different between obese and non-obese group, except physical characteristics subscale ($P<0.0001$).

Some of research found the opposite effects of obesity on self-esteem different from the above-mentioned research. According to Srisinsup (11) studied in 1,297 senior high school students in Bangkok about associated factors of body image and relation to self-esteem. The result showed that BMI did not have any effect on self-esteem. However, BMI affect on body image that is underweight and normal weight had higher body image satisfaction than overweight. Moreover, students with high self-esteem had body image satisfaction than those with low self-esteem.

Some of research found the effects of weight lost on self-esteem. According to Walker (30) studied in 57 obese adolescents (mean BMI = 32.6 kg/m²) and 38 normal weight adolescents (mean BMI = 20.3 kg/m²), aged 9-19 years. The objective was to investigate the change in body image, self-esteem, and worries in obese adolescents attended the weight loss camp for mean duration 28 days (range 12-41 days). The result showed obese adolescent who body weight lost 5.6 kg (BMI lost 2.1 kg/m²) can improve self-esteem score in athletic competence, physical appearance, and global self-worth.

Jelalian and Mehlenbeck (31) studied in 16 overweight adolescents (BMI = 32.5 ± 3.1 kg/m²) aged 13-16 years for evaluate the utility of adding a peer-based intervention to a traditional cognitive-behavioral weight management intervention for 16-week. The results showed that adolescent lost weight average 6.7 kg from baseline. They found significant improvements of self-esteem in physical appearance, $p<0.01$, and romantic appeal, $p<0.01$ from Self-Perception Profile for Adolescent (SSPA) as well as global self-worth scale of SSPA was trend toward significant ($P<0.06$). Moreover, physical self-worth from Children's Physical Self-Perception Profile had significant improvements as well, $p<0.05$.

Huang et al., (32) studied in 878 adolescent aged 11-15 years. The objective was to determine the effect of 1-year intervention targeting physical activity, sedentary and diet behaviors on self-reported self-esteem from Rosenberg Self-Esteem Scale, and body image from body dissatisfaction subscale of Eating Disorder Inventory. The results showed that normal weight had higher self-esteem than overweight ($\text{BMI} \geq 95\%$ for age and sex), $p < 0.0001$ as well as normal weight had lower body dissatisfaction than overweight, $p < 0.0001$. Moreover, they found improvement of self-esteem according to weight change status in only boys, $p < 0.006$.

CHAPTER III

MATERIALS AND METHODS

3.1 Study Design

This study was a 24-week prospective study aimed to assess the self-esteem scores, perception of body shape, perception of height, perception of health, perception of blood parameters, perception of skin color, and perception of academic performance in SW.PY students, aged 12-18 years. This study also studies about the relationship among nutritional status, self-esteem scores, and the above-mentioned perception. Some of these students had diet-related chronic diseases, obese, anemia, hyperuricemia, and dyslipidemia, this study provided nutritional therapy to students based on nutritional education, food behavior, food menu modification, and exercise at baseline and every 8th week for 24 weeks.

3.2 Ethical approval remarks

The study was approved by the Ethical Clearance Committee on Human Rights Related to Research Involving Human Subjects Faculty of Medicine, Ramathibodi Hospital, Mahidol University. Written informed consent was obtained. (Appendix A)

3.3 Subjects

3.3.1 Inclusion criteria

3.3.1.1 All of SW.PY students study in 2012 academic year.

3.3.1.2 Students are willing to participate throughout the study, and their parents were allowed them to participate.

3.3.2 Exclusion criteria

3.3.2.1 Students who can not participate throughout this study and/or withdrawal.

3.3.2.2 Students who have some diseases, e.g. type I DM, learning disorder.

3.3.3 Subjects enrollment and informed consent

The researchers invited the students to participate in this research project via the school meeting. The researchers explained in detail to all students who gave written informed consent at the beginning of the study.

3.4 Data collections

3.4.1 General information were collected from questionnaire at week 0. (Appendix B)

3.4.1.1 General information

3.4.1.2 Socio-economic information

3.4.1.3 Health information

3.4.2 Nutritional status

3.4.2.1 Body composition assessment was performed at weeks 0, 8, 16, 24. Height was measured with calibrated stadiometer and body composition was assessed by using TANITA BC-420MA Body Composition Analyzer, Tanita Co., Ltd., Tokyo, Japan (33).

3.4.2.2 Biochemical assessment was performed at weeks 0, 24 including hemoglobin, uric acid, HDL-cholesterol, LDL-cholesterol, triglyceride and fasting plasma glucose. Biochemical assessment was analyzed by using an automate blood BS-400 Chemistry Analyzer, Mindray Bio-Medical Electronics Co., Ltd. (34).

3.4.2.3 Dietary assessment

3.4.2.3.1 Three-days 24-hour dietary record was performed at weeks 0, 8, 16, 24. Students were introduced about 24-hour dietary

record along with sample. Dietary record was used to assess energy intake and distribution of nutrients including carbohydrate, protein and fat (35).

3.4.2.3.2 Questionnaire about dietary behavior and knowledge of diet-related chronic diseases (Appendix B) was performed at weeks 0, 24.

3.4.3 Self-esteem information was performed at weeks 0, 24

3.4.3.1 Perception of body shape, height, skin, health, blood parameters and academic performance was collected from questionnaire (Appendix B). Academic performance was obtained from the school records.

3.4.3.2 Self-esteem was tested by The Thai Five-Scale Test of Self-Esteem for Children (FSC). Suwannee Putthisri and Chatchawan Silpakit (36) translated Pope's FSC into Thai and validated Thai FSC among 408 children aged 10-17 years with Rosenberg's Self-esteem Scale (RSE) and Children Depression Inventory (CDI) and found that Thai FSC had significantly correlated with RSE and CDI ($r=0.85$, $p<0.05$). Moreover, Thai FSC had reliability was 0.85 of Cronbach's coefficient alpha.

3.5 Criteria for nutritional status assessment

3.5.1 Body weight status was classified by BMI of WHO 2007 (37). Obesity was classified by the body fat reference curves for children 2006 (38).

3.5.2 Dyslipidemia was classified by criteria of American Heart Association 2003 (39); low HDL-cholesterol ($HDL < 40$ mg/dL), high LDL-cholesterol ($LDL > 130$ mg/dL), high triglyceride ($TG > 150$ mg/dL).

3.5.3 Plasma glucose status was classified by criteria of American Diabetes Association (40); impaired fasting glucose (glucose =110-125 mg/dL) and diabetes (glucose ≥ 126 mg/dL).

3.5.4 Anemia was classified by criteria of WHO 2001(41) (hemoglobin < 12 g/dL).

3.5.5 Hyperuricemia was classified by criteria of Feig DI and Johnson RJ (42) (uric acid > 5.5 mg/dL).

3.6 Nutritional Assessment

3.6.1 Body composition measurement

Body composition measurement was included height and body composition.

Height was measured with calibrated stadiometer. The students was asked to stand straight in barefoot on horizontal platform with the head in horizontal plane, shoulders, hip, heel, back and knee straight with vertical plane. Height was recorded nearest 0.1 millimeter.

Body composition was included body weight (kg), body fat (%bw), fat mass (kg), fat free mass (FFM: kg), muscle mass (kg), total body water (%), bone mass (kg), and body mass index (BMI: kg/m^2) was assessed by using TANITA BC-420MA Body Composition Analyzer, Tanita Co.Ltd, Tokyo, Japan (33). The measurement procedure required the subject to stand in bare feet on the analyzer.

3.6.2 Biochemical measurement

Twenty milliliters of venous blood were collected from students in the morning after ten hours overnight fast at SW.PY. It was submitted for the determination of blood chemistry including fasting plasma glucose, serum hemoglobin (Hb), serum uric acid, triglyceride (TG), high-density lipoprotein cholesterol (HDL), and low-density lipoprotein cholesterol (LDL) (34).

3.7 Nutritional Therapy

The nutritional therapy for obesity, anemia, hyperuricemia, hypercholesterolemia, and hypertriglyceridemia were performed at weeks 0, 8, 16, and 24.

3.7.1 Nutrition education on diet-related chronic disease was provided to the students for 30-45 minutes (Appendix C).

3.7.2 Various medias were used for counseling and nutritional education such as brochures, posters, power point and video (Appendix C).

3.7.3 Sample of nutritious foods were demonstrated to control such conditions as low calorie foods, low cholesterol foods, seasoning, beverages and snacks.

3.7.4 Modifying canteen-school food menus to reduction fat content, sweetened snacks, high sugar soft drinks, and high caloric bakery.

3.7.5 To increase energy expenditure by encouraging to spend more time on exercise.

3.7.6 Role-playing was one part of nutritional therapy, performed by students.

3.8 Statistical Analysis

All statistical analysis was performed with SPSS version 18 for windows (43).

3.8.1 Descriptive Statistic

General data, socio-economic data, health data, dietary behavior data, knowledge of diet-related chronic disease data, self-esteem questionnaire and nutritional status (body composition, biochemical and dietary assessment) was expressed as mean, percentage, standard deviation and 95% confidence interval.

3.8.2 Inferential Statistic

The relationship between self-esteem and nutritional status was analyzed by Pearson correlation analysis.

The difference of data in sample group was used paired t-test and unpaired t-test, significant difference was considered P value less than 0.05.

The differences of data in various sample groups, data with normal distribution was analyzed by analysis of variance (ANOVA), significant difference was considered P value less than 0.05. Non-normal distribution data was analyzed by non-parametric statistic.

The differences of body composition data in week 0, 8, 16, and 24 were analyzed by repeated measure ANOVA, significant difference was considered P value less than 0.05.

CHAPTER IV

RESULTS

This was prospective study aimed to assess the relationships of nutritional status and self-esteem and assess the effect of nutritional therapy on self-esteem in SW.PY students. The results are presented as the following parts:

- 4.1 General information of the students (questionnaires)
- 4.2 Effect of nutritional therapy on nutritional status
- 4.3 Nutritional status and self-esteem
- 4.4 Relationship among self-esteem, perception, academic performance, and nutritional status

4.1 General information of the students (questionnaires)

Number and percentage of students were presented in **Table 4.1**. The 713 SW.PY students aged 12 to 18 years including 337 males and 376 females, the numbers of M.1-M.3 (junior high school) students were higher than the number of M.4-M.6 (senior high school) students.

Table 4.1 Number and percentage of 713 SW.PY students classified by class level and sex

Level	Total (<i>n</i> =713) <i>n</i> (%) ^a	Male (<i>n</i> =337) <i>n</i> (%) ^b	Female (<i>n</i> =376) <i>n</i> (%) ^b
M.1	168 (23.6)	77 (45.8)	91 (54.2)
M.2	152 (21.3)	76 (50.0)	76 (50.0)
M.3	135 (18.9)	66 (48.9)	69 (51.1)
M.4	96 (13.5)	47 (49.0)	49 (51.0)
M.5	82 (11.5)	33 (40.2)	49 (59.8)
M.6	80 (11.2)	38 (47.5)	42 (52.5)
Total	713 (100.0)	337 (47.3)	376 (52.7)

^a% of 713 students, ^b% of total in each level

Table 4.2 General information of 713 SW.PY students

General data	<i>n</i>	% of total
Sex		
Male	337	47.3
Female	376	52.7
Religion		
Buddhist	701	98.3
Christian	12	1.7
Number of sibling		
1	172	24.1
2	346	48.5
3	92	12.9
4	78	10.9
5	17	2.4
6	8	1.1
Birth order		
1	402	56.4
2	264	37.0
3	36	5.0
4	9	1.3
6	2	0.3
Father age (years)		
25-44	309	43.3
45-64	366	51.3
≥65	10	1.4
Passed away	28	3.9
Mother age (years)		
25-44	432	60.6
45-64	271	38.0
≥65	1	0.1
Passed away	9	1.3

Table 4.3 Socio-economic information of 713 SW.PY students

Socio-economic data	<i>n</i>	% of total
Person who live with		
Father & mother	484	67.9
Father	32	4.5
Mother	100	14.0
Relatives	97	13.6
Parent's marital status		
Married	555	77.8
Divorced	123	17.3
Father passed away	26	3.6
Mother passed away	7	1.0
Father & mother passed away	2	0.3
Family income (Baht/month)		
<10,000	4	0.6
10,000-20,000	248	34.8
20,001-30,000	179	25.1
30,001-40,000	101	14.2
40,001-50,000	80	11.2
>50,000	101	14.2
Money expenses (Baht/month)		
<500	175	24.5
500-1,000	402	56.4
>1,000	136	19.1
The most of expenses		
Stationery	284	25.8
Snack	223	31.3
Personal	306	42.9

General information of 713 SW.PY students were presented in **Table 4.2**. Most of students had a number of siblings 2, were Buddhist, and 56.4% were only child. Most of fathers were in middle adulthood (45-64 years), and mothers were in young adulthood (25-44 years), 51.3% and 60.6%, respectively.

Most of parents were in married status and they live together with their children. The most family income was between 10,000-20,000 Baht/month (34.8%). Student allowances from their parents were 400 to 3,000 Bath/month, most of their expenses were used for miscellaneous goods: fashioned shoes, fashioned bag, and dress (**Table 4.3**).

Table 4.4 shows the parental occupations of 713 SW.PY students. Most of fathers were government official/state enterprise (42.1%) and most of mothers were business/trade (37.6%).

Table 4.5 shows the parents' educational levels of 713 SW.PY students. The most father and mother completed bachelor's degree (32.5%). The highest educational level was doctorate degree (0.3%-1.1%) whereas the lowest educational level was less than primary school (0.6%).

Table 4.6 shows the relationships with other people of 713 SW.PY students. Most of the students feel happy and consult with family sometime when they have problems (49.1%), they feel free to consult with teachers (94.2%), and 50.1% of them had close friends.

Table 4.4 The parental occupations of 713 SW.PY students*

Occupation	Father		Mother	
	<i>n</i>	% of total	<i>n</i>	% of total
Government official /State enterprise	300	42.1	213	29.9
Business/Trade	239	33.5	268	37.6
Personal	56	7.9	58	8.1
Employee	62	8.7	61	8.6
Househusband/Housewife	8	1.1	89	12.5
Agriculture	20	2.8	15	2.1

*fathers passed away n=28, mothers passed away n=9

Table 4.5 The parents' educational levels of 713 SW.PY students*

Educational level	Father		Mother	
	<i>n</i>	% of total	<i>n</i>	% of total
Less than primary school	4	0.6	4	0.6
Primary school	81	11.4	107	15.0
Junior high school	37	5.2	60	8.4
Senior high school	122	17.1	140	19.6
Vocational certificate	57	8.0	49	6.9
High vocational certificate	59	8.3	48	6.7
Bachelor's degree	232	32.5	232	32.5
Master's degree	85	11.9	62	8.7
Doctorate degree	8	1.1	2	0.3

*fathers passed away n=28, mothers passed away n=9

Table 4.6 The relationship with other people of 713 SW.PY students

Relationship	<i>n</i>	% of total
Relationship with family		
You feel happy when you are with your family and you consult with them		
<i>every time</i> when you have problems	341	47.8
<i>sometime</i> when you have problems	350	49.1
You feel uncomfortable when you are with your family and you		
consult with them <i>sometime</i> when you have problems	15	2.1
<i>never</i> consult with them when you have problems	7	1.0
Relationship with teachers		
You feel free to consult with your teachers	672	94.2
You feel uncomfortable to consult with your teachers	41	5.8
Relationship with friends		
Intimate / not quarrel	357	50.1
Less intimate / less quarrel	351	49.2
Quarrel regularly	1	0.1
Like being alone	4	0.6

Table 4.7 Health information of 713 SW.PY students

Disease	<i>n</i>	% of total
Underlying disease		
Allergy	112	15.7
Gastritis/ peptic ulcer	44	6.2
Asthma	13	1.8
Migraine	8	1.1
Sinusitis	6	0.8
Urticaria	4	0.6
Epilepsy	4	0.6
Thalassemia	3	0.4
Anemia	2	0.3
Gastroesophageal reflux disease	2	0.3
Kidney disease	1	0.1
Appendicitis	1	0.1
Inflammatory bowel disease	1	0.1
Hyperventilation	1	0.1
Family medical history related to diet-related chronic diseases		
Diabetes	216	30.3
Hypertension	209	29.3
Obesity	75	10.5
Hypercholesterolemia	62	8.7
Gout	14	2.0
Cardiovascular disease	13	1.8
Cancer	12	1.7
Anemia	7	1.0
Hypertriglyceridemia	5	0.7
Not available	213	29.9

Table 4.7 Health information of 713 SW.PY students (cont.)

Activity	<i>n</i>	% of total
Frequency of exercise (<i>n</i>=623)		
< 3 times/week	223	31.3
3-5 times/week	234	32.8
> 5 time/week	166	23.3
Duration of exercise (<i>n</i>=623)		
< 30 minutes	246	34.5
30-60 minutes	240	33.7
> 60 minutes	137	19.2
Type of exercise (<i>n</i>=623)		
Sports	287	40.3
Jogging	163	22.9
Walking	119	16.7
Physical exercises; aerobics	25	3.5
Housework	20	2.8
Fitness	8	1.1
Yoga	1	0.1
Frequency of watching TV, play on the computer		
< 3 times/week	271	38.0
≥ 3 times/week	442	62.0
Duration of watching TV, play on the computer		
< 30 minutes	236	33.1
≥ 30 minutes	477	66.9
How many hours of sleep a night?		
< 6 hours	133	18.7
6-8 hours	580	81.3

The current illnesses reported by students were 24.7%. The first five order of underlying diseases were allergy, gastritis/peptic ulcer, asthma, migraine and sinusitis. The first five order of family medical history related to diet-related chronic disease were diabetes, hypertension, obesity, hypercholesterolemia, and gout.

Most of the students had exercise (87.4%), 32.8% of them exercised 3-5 times/week, 31.3% of them exercised less than 3 times/week and 23.3% of them exercised more than 5 times/week. Most of the students exercised by playing sports (40.3%), jogging (22.9%), walking (16.7%), and others (7.5%). The students had spent time for watching TV, playing on computer more than or equal to 3 times/week (62.0%) and more than or equal to 30 minutes/time (66.9%). Most of the students slept 6-8 hours a night (81.3%) (**Table 4.7**).

Table 4.8 Dietary behavior of 713 SW.PY students

Dietary habits	Week 0		Week 24	
	n	% of total	n	% of total
Do you eat three meals a day?				
No	109	15.3	100	14.0
Yes	604	84.7	613	86.0
Which meal you skip?				
	(n=109)		(n=100)	
Breakfast	33	4.6	35	4.9
Lunch	26	3.6	11	1.5
Dinner	77	10.8	73	10.2
After meal, you always have snack or dessert?				
No	353	49.5	485	68.0
Yes	360	50.5	228	32.0
Which snack do you prefer?				
Dessert (Bakery/Cake/Bread)	319	44.7	273	38.3
Crispy snack (eg. Potato chips)	351	49.2	392	55.0
Others (eg. meat ball, yogurt)	43	6.0	48	6.7
Do you add seasoning to your meal?				
No	123	17.3	125	17.5
Taste before add	430	60.3	420	58.9
Always add before eating	160	22.4	168	23.6
Which seasoning do you add?				
Sugar	547	76.7	516	72.4
Fish sauce	408	57.2	383	53.7
Vinegar	313	43.9	281	39.4
Do you eat fatty meat?				
Never	111	15.6	126	17.7
Sometime	554	77.7	541	75.9
Always	48	6.7	46	6.5
Do you eat meat with skin?				
Never	116	16.3	147	20.6
Sometime	517	72.5	505	70.8
Always	80	11.2	61	8.6

Table 4.8 Dietary behavior of 713 SW.PY students (cont.)

Dietary habits	Week 0		Week 24	
	n	% of total	n	% of total
How many eggs do you eat a week?				
No	2	0.3	2	0.3
1-3 eggs/week	496	69.6	590	82.5
4-5 eggs/week	165	23.1	101	14.2
6-8 eggs/week	33	4.6	18	2.5
9-15 eggs/week	17	2.4	2	0.3
Which part of egg do you eat? (n=711)				
Whole egg	660	92.6	641	89.9
Only egg white	38	5.3	58	8.1
Only egg yolk	13	1.8	12	1.7
Do you eat organ meats?				
No	164	23.0	226	31.7
Eat all kinds of organ meats	79	11.1	58	8.1
Eat some kinds of organ meats	470	65.9	429	60.2
How many time do you have seafood?				
No	32	4.5	48	6.7
1-2 times/week	375	52.6	363	50.9
3-5 times/week	95	13.3	50	7.0
1-2 times/month	211	29.6	252	35.3
Do you take food supplements?				
No	508	71.2	585	82.0
Yes	205	28.8	128	18.0
If there are vegetables in your food, what will you do?				
Not eat	20	2.8	20	2.8
Eat all kinds of them	359	50.4	422	59.2
Eat some kinds of them	334	46.8	271	38.0
If there are fruits served as dessert after meal, what will you do?				
Not eat	47	6.6	62	8.7
Always eat	666	93.4	651	91.3
Do you dip fruits with sugar, salt and chili?				
No	50	7.0	53	7.4
Sometime	465	65.2	454	63.7
Always	198	27.8	206	28.9

Table 4.8 Dietary behavior of 713 SW.PY students (cont.)

Dietary habits	Week 0		Week 24	
	n	% of total	n	% of total
How much water do you drink a day?				
1-2 glasses/day	24	3.4	19	2.7
3-4 glasses/day	145	20.3	148	20.8
5-7 glasses/day	333	46.7	349	48.9
≥8 glasses/day	211	29.6	197	27.6
Do you drink soft drinks?				
No	208	29.2	309	43.3
Yes	505	70.8	404	56.7
How much soft drinks do you have?				
	(n=505)		(n=404)	
1 bottle/month	3	0.4	4	0.6
1-4 bottles/week	473	66.3	374	52.5
5-8 bottles/week	26	3.6	23	3.2
9-14 bottles/week	3	0.4	3	0.4
Do you drink milk?				
No	6	0.8	28	3.9
Yes	707	99.2	685	96.1
How much milk do you drink a week?				
	(n=707)		(n=685)	
1-3 boxes/week	67	9.4	95	13.3
4-6 boxes/week	156	21.9	166	23.3
7-9 boxes/week	250	35.1	250	35.1
10-15boxes/week	190	26.6	145	20.3
>15 boxes/week	44	6.2	29	4.1

Tables 4.8 shows dietary behavior of 713 SW.PY students. Most of the students ate three meals a day (84.7%), skipped dinner meal (10.8%), skipped breakfast meal (4.6%), and skipped lunch meal (3.6%). Most of the students skipped meals 1-7 day/month (3.0%, 2.7%, and 5.0% for breakfast, lunch, and dinner meals, respectively). If students skipped main meals at school, they replaced their main meals with snacks, bread, milk, yogurt, fruit juice, meatball, hot dog, cup noodle, or fruits. After meals, the students always had snack or dessert (50.5%). The students preferred crispy snack such as potato chip, dessert such as bakery, cake, bread and others such as chocolate, ice-cream, pork ball, yogurt, 49.2%, 44.7%, and 6.0%, respectively. Most of the students added seasoning after tasted (60.3%), sugar were the first order of seasoning which the students added. Most of the students sometime ate fatty meat (77.7%) and meat with skin (72.5%).

Most of the students ate 1-3 eggs/week (69.6%), the whole egg (92.6%), only egg white (3.2%), only egg yolk (1.8%), and some organ meats 65.9%. Most of the students ate seafood 1-2 times/week (52.6%), however followed 4.5% of them did not eat seafood. The student reported their allergic food such as seafood, egg, soybean 15.7%, the students took food supplements such as vitamin, fish oil, calcium, rice bran oil, and iron 28.8%. Most of the students ate all of vegetable from the meals and fruits after meals 50.4% and 93.4%, respectively. The students always ate fruits with salt, sugar and chili 27.8%.

At the end of this study, the percentage of students who reported “skips meals, always have snack or dessert after meal, take food supplements and drink soft drinks” were decreased as well as the percentage of students who reported “never ate fatty meat, never ate meat with skin, and have only egg white” were increased.

First three orders of staple food that students ate, rice (68.4%), glutinous rice (21.2%), and noodle (4.6%). First three orders of cooking method that students always had, boiling (34.4%), frying (20.9%), and stir fry (17.4%). First three orders of taste that students favor, sweet (26.8%), spicy (25.9%), and sour (23.1%). First three orders of meat that students ate, pork (38.1%), fish (25.4%), and chicken (21.7%). First three orders of milk that students ate, flavored milk (24.0%), low fat milk (20.6%), and yogurt beverage (17.1%). The students drank water 5-7 glasses/day (46.7%) and soft drinks (70.8%). Most of the students drank milk (99.2%).

4.2 Effect of nutritional therapy on nutritional status

Nutritional status was assessed from body composition and biochemical data. Body composition data of 713 SW.PY students are shown in **Tables 4.9 – 4.13** and biochemical data are shown in **Tables 4.14 - 4.16**.

Body composition data were divided to M.1-M.3 and M.4-M.6, due to M.1-M.3 aged 12-16 years (early adolescence) and M.4-M.6 aged 15-18 years (late adolescence), which have different growth rate and nutritional requirement.

Mean ($\pm$ SD) of age and body composition parameters of 455 M.1 – M.3 SW.PY students during the study are shown in **Table 4.9**. The mean height, weight, BMI, body fat, fat mass, fat free mass, muscle mass, and TBW (kg) of M.1-M.3 at the end of this study were significantly higher than those at the baseline. However, the mean TBW (%bw) of M.1-M.3 at the end of this study was significantly lower than those at the baseline.

At the baseline, 0.2%, 0.9%, 1.6%, and 1.2% of M.1-M.3 males, M.1-M.3 females, M.4-M.6 males, and M.4-M.6 females had height lower than standard height. At the end of this study, in 0.2% of M.1-M.3 males and 1.2% of M.4-M.6 females, there height were still lower than standard height.

The mean height, weight, fat free mass, muscle mass, TBW (kg), and TBW (%bw) of M.1-M.3 males at the end of this study were significantly higher than those at the baseline, whereas mean body fat and fat mass at the end of this study were significantly lower than those at the baseline. However, all mean body compositions of M.1-M.3 females at the end of this study were significantly higher than those at the baseline, except mean TBW (%bw) at the end of this study was significantly lower than those at the baseline.

Mean ($\pm$ SD) of age and body composition of M.4 – M.6 SW.PY students during the study are shown in **Table 4.10**. The mean height, weight, body fat, and fat mass at the end of this study were significantly higher than those at the baseline, whereas mean TBW (kg) and TBW (%bw) at the end of this study were significantly lower than those at the baseline.

The mean height, weight, body fat, fat free mass, and muscle mass of M.4 –M.6 males at the end of this study were significantly higher than those at the baseline, whereas mean TBW (kg) and TBW (%bw) at the end of this study were

significantly lower than those at the baseline. The mean height, weight, body fat, and fat mass of M.4- M.6 females at the end of this study were significantly higher than those at the baseline, whereas fat free mass, muscle mass, TBW (kg) and TBW (%bw) at the end of this study were significantly lower than those at the baseline.

Table 4.11 shows nutritional status of 713 SW.PY students classified by BMI-for-age as an indicator, based on WHO criteria (37) during the study. At the baseline, the students had normal weight (74.9%), at risk of overweight (10.9%), overweight (8.3%), and underweight (5.9%). At the end of this study, after receiving the nutritional therapy, percentage of normal weight students was increased to 80.8%, underweight, at risk of overweight, and overweight students were decreased to 4.5%, 7.6%, and 7.2%, respectively from baseline.

M.1-M.3 students at baseline, the students had normal weight (72.7%), at risk of overweight (11.6%), overweight (10.3%), and underweight (5.3%). At the end of this study, after receiving the nutritional therapy, percentage of normal weight students was increased to 79.6%, underweight, at risk of overweight, and overweight students were decreased to 3.3%, 8.8%, and 8.4%, respectively from baseline. All the above mentioned body weight status improvement were also observed in male and female M.1-M.3 students, except the percentage of overweight female M.1-M.3 students at the end of this study were increased from 5.5% to 6.3%.

M.4-M.6 students at baseline, the students had normal weight (78.7%), at risk of overweight (9.7%), underweight (7.0%), and overweight (4.7%). At the end of this study, after receiving the nutritional therapy, percentage of normal weight students and overweight students were increased to 82.9% and 5.0%, respectively, whereas underweight and at risk of overweight students were decreased to 6.6% and 5.4%.

All the above-mentioned body weight status improvement were also observed in female M.4-M.6 students. At the baseline of male M.4-M.6 students had normal weight (76.3%), at risk of overweight (11.0%), underweight (8.5%), and overweight (4.2%). At the end of this study, after receiving the nutritional therapy, percentage of normal weight students was increased to 82.2%, at risk of overweight, overweight students were decreased to 5.9%, and 3.4%, respectively and no change of the number of underweight students.

Percentage of body fat is the best parameter to classify obesity. Thus **Table 4.12** shows nutritional status of 713 SW.PY students classified by body fat (%bw) (38) during the study. At baseline, the students had normal body fat (77.7%), low body fat (13.2%), excess body fat (4.8%), and over body fat (4.3%). At the end of this study, after receiving the nutritional therapy, percentage of normal body fat and over body fat students were increased to 83.3%, and 5.2%, respectively, low body fat and excess body fat students were decreased to 8.4% and 3.1%, respectively from baseline. All the above mentioned body fat status improvement were also observed in M.1-M.3 and M.4-M.6 students, except the percentage of excess body fat M.4-M.6 students at the end of this study were increased from 0.8% to 1.2%.

At baseline of male M.1-M.3 students had normal body fat (65.8%), low body fat (15.5%), excess body fat (10.9%), and over body fat (7.8%). At the end of this study, after receiving the nutritional therapy, percentage of normal body fat students was increased to 72.6%, low body fat, over body fat and excess body fat students were decreased to 14.6%, 6.9%, and 5.9%, respectively from baseline. All the above mentioned body fat status were also observed in female M.1-M.3 students, except the percentage of over body fat female M.1-M.3 students at the end of this study were increased from 3.4% to 5.5%.

At baseline of male M.4-M.6 students had normal body fat (70.3%), low body fat (26.3%), over body fat (3.4%). At the end of this study, after receiving the nutritional therapy, percentage of normal body fat students was increased to 81.4%, low body fat and over body fat students were decreased to 16.1% and 2.5%, respectively from baseline.

At baseline of female M.4-M.6 students had normal body fat (84.3%), low body fat (12.9%), over body fat and excess body fat had similar percentage (1.4%). At the end of this study, after receiving the nutritional therapy, percentage of normal body fat, over body fat and excess body fat students were increased to 88.6%, 4.3%, and 2.1%, respectively, low body fat students was decreased to 5.0% from baseline.

When use two criteria together for classify body weight, BMI-for- age and body fat, at the baseline this study found that 80.8% of at risk of overweight students had normal body fat, 14.1% of them had over body fat and 5.1% had excess body fat, thus only 19.2% of at risk of overweight students were obese. In overweight students,

15.3% had normal body fat, 33.9% had over body fat and 50.8% had excess body fat, thus 84.7% of overweight students were obese (**Table 4.13**).

Table 4.14 shows mean ($\pm$ SD) of serum biochemical parameters of 713 SW.PY students at baseline. This study found that 10.1% of 713 SW.PY students were anemia, 7.0% of M.1-M.3 and 15.5% of M.4-M.6 students were anemia. Most of anemia students were females, 96.9% of anemic M.1-M.3 and 100% of anemic M.4-M.6 students. 61.4% of 713 SW.PY students were hyperuricemia (46.6% borderline, 13.7% high, 1.1% very high), 62.2% of M.1-M.3 and 60.1% of M.4-M.6 students were hyperuricemia. The prevalences of hyperuricemia in male students were higher than those in female students (**Table 4.15**).

The prevalences of hypertriglyceridemia in 713 SW.PY students, M.1-M.3 and M.4-M.6 students were 2.1% (1.5% borderline, 0.6% high), 2.2% and 2.0%, respectively. All of high hypertriglyceridemia (TG =200-350 mg/dL) students were males. Most of students had normal HDL-cholesterol levels. 48.9% of 713 SW.PY students were hypercholesterolemia (38.1% borderline, 10.8% high), 46.1% of M.1-M.3 and 53.8% of M.4-M.6 students were hypercholesterolemia (**Table 4.16**).

After giving nutritional therapy, we follow up the above students with abnormal blood chemistry by blood examination, only 265 students participated at the end of study. **Table 4.17** shows mean ($\pm$ SD) of serum biochemical parameters of 265 SW.PY students during the study. At the end of this study, the percentage of students with anemia, hyperuricemia, hypercholesterolemia and low HDL-cholesterol level were decrease from 14.0 to 6.0%, 84.9% to 60.4%, 50.9% to 32.5%, and 8.7% to 7.5%. However, the percentage of hypertriglyceridemia was increase from 1.5% to 11.7%, this evidence may be due to over consumption of sweetened snack during the various festivals at that time, eg. Christmas, New year (**Tables 4.18 - 4.19**).

From diet-related chronic disease questionnaire (total score=67), the students had range score of diet-related chronic disease knowledge from 0 to 46, mean 22.0 ± 8.3 . After 24 weeks nutritional education, their knowledge increase to higher score range 8 to 64, mean 34.0 ± 9.7 .

Table 4.9 Mean ($\pm$ SD) of age and body composition parameters of M.1 – M.3 SW.PY students during the study

Parameter	Total (<i>n</i> =455)		Male (<i>n</i> =219)		Female (<i>n</i> =236)	
	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24
Age (years)	12 - 16	12-16	12 -16	12-16	12 – 15	12-16
Height (cm)	158.5 $\pm$ 7.3	160.1 $\pm$ 7.8 ^{kl}	161.3 $\pm$ 8.2	164.2 $\pm$ 8.0 ^{kl}	155.8 $\pm$ 5.2	156.3 $\pm$ 5.3 ^{kl}
Weight (kg)	50.4 $\pm$ 11.4	51.9 $\pm$ 11.0 ^{kl}	53.1 $\pm$ 13.3	54.6 $\pm$ 12.8 ^{kl}	47.9 $\pm$ 8.6	49.4 $\pm$ 8.3 ^{kl}
BMI (kg/m ²)	19.9 $\pm$ 3.5	20.1 $\pm$ 3.2 ^{kl}	20.2 $\pm$ 4.0	20.1 $\pm$ 3.6	19.6 $\pm$ 3.0	20.2 $\pm$ 2.8 ^{kl}
Body fat (%bw)	20.5 $\pm$ 9.1	21.1 $\pm$ 9.0 ^{k2}	16.4 $\pm$ 9.8	15.4 $\pm$ 8.4 ^{kl}	24.4 $\pm$ 6.4	26.3 $\pm$ 5.8 ^{kl}
Fat mass (kg)	11.0 $\pm$ 7.2	11.4 $\pm$ 7.0 ^{kl}	9.8 $\pm$ 8.6	9.3 $\pm$ 7.9 ^{k3}	12.2 $\pm$ 5.4	13.4 $\pm$ 5.3 ^{kl}
Fat free mass (kg)	39.3 $\pm$ 6.6	40.5 $\pm$ 7.2 ^{kl}	43.3 $\pm$ 6.7	45.3 $\pm$ 6.9 ^{kl}	35.7 $\pm$ 3.9	36.0 $\pm$ 3.8 ^{kl}
Muscle mass (kg)	37.2 $\pm$ 6.3	38.2 $\pm$ 6.9 ^{kl}	41.0 $\pm$ 6.3	42.9 $\pm$ 6.5 ^{kl}	33.6 $\pm$ 3.6	33.9 $\pm$ 3.5 ^{kl}
TBW (kg)	28.8 $\pm$ 4.9	29.6 $\pm$ 5.3 ^{kl}	31.7 $\pm$ 4.9	33.2 $\pm$ 5.1 ^{kl}	26.1 $\pm$ 2.8	26.3 $\pm$ 2.7 ^{kl}
TBW (%bw)	58.2 $\pm$ 6.7	57.8 $\pm$ 6.6 ^{k2}	61.2 $\pm$ 7.2	61.9 $\pm$ 6.1 ^{kl}	55.3 $\pm$ 4.7	53.9 $\pm$ 4.2 ^{kl}

Significantly different from week 0, ^{kl}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

Table 4.10 Mean ($\pm$ SD) of age and body composition parameters of M.4 – M.6 SW.PY students during the study

Parameter	Total (<i>n</i> =258)		Male (<i>n</i> =118)		Female (<i>n</i> =140)	
	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24
Age (years)	15 - 18	15-19	15 - 18	15 - 19	15 - 18	16 - 19
Height (cm)	163.6 $\pm$ 7.4	164.4 $\pm$ 7.7 ^{kl}	169.2 $\pm$ 5.4	170.6 $\pm$ 5.4 ^{kl}	158.8 $\pm$ 5.1	159.2 $\pm$ 5.0 ^{kl}
Weight (kg)	55.7 $\pm$ 10.3	56.2 $\pm$ 10.1 ^{kl}	59.8 $\pm$ 9.7	60.5 $\pm$ 8.8 ^{k2}	52.2 $\pm$ 9.5	52.6 $\pm$ 9.7 ^{k3}
BMI (kg/m ²)	20.7 $\pm$ 3.1	20.7 $\pm$ 3.1	20.8 $\pm$ 3.0	20.8 $\pm$ 2.7	20.7 $\pm$ 3.2	20.7 $\pm$ 3.3
Body fat (%bw)	19.6 $\pm$ 8.9	20.4 $\pm$ 8.7 ^{kl}	12.2 $\pm$ 5.7	12.7 $\pm$ 4.7 ^{k3}	25.7 $\pm$ 6.1	26.8 $\pm$ 5.5 ^{kl}
Fat mass (kg)	11.1 $\pm$ 6.3	11.6 $\pm$ 6.1 ^{kl}	7.8 $\pm$ 4.7	8.0 $\pm$ 4.0	13.9 $\pm$ 6.1	14.6 $\pm$ 6.0 ^{kl}
Fat free mass (kg)	44.6 $\pm$ 8.4	44.6 $\pm$ 8.7	52.0 $\pm$ 5.8	52.4 $\pm$ 5.5 ^{k3}	38.3 $\pm$ 4.0	38.0 $\pm$ 4.2 ^{k2}
Muscle mass (kg)	42.1 $\pm$ 8.0	42.2 $\pm$ 8.3	49.3 $\pm$ 5.5	49.7 $\pm$ 5.2 ^{k3}	36.1 $\pm$ 3.6	35.8 $\pm$ 3.8 ^{k2}
TBW (kg)	32.5 $\pm$ 6.1	31.7 $\pm$ 6.3 ^{kl}	37.9 $\pm$ 4.2	37.2 $\pm$ 4.2 ^{k2}	28.0 $\pm$ 2.9	27.1 $\pm$ 3.3 ^{kl}
TBW (%bw)	58.7 $\pm$ 6.6	56.6 $\pm$ 6.5 ^{kl}	64.0 $\pm$ 4.3	61.9 $\pm$ 4.4 ^{kl}	54.2 $\pm$ 4.5	52.2 $\pm$ 4.1 ^{kl}

Significantly different from week 0, ^{kl}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

Table 4.11 Nutritional status of 713 SW.PY students classified by BMI-for-age as an indicator, based on WHO criteria (37) during the study

BMI for age	Total						M.1 – M.3						M.4 – M.6					
	Total			Male			Female			Total			Male			Female		
	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	
	0	24	0	24	0	24	0	24	0	24	0	24	0	24	0	24	0	24
	$n(\%)^a$	$n(\%)^a$	$n(\%)^b$	$n(\%)^b$	$n(\%)^c$	$n(\%)^c$	$n(\%)^d$	$n(\%)^d$	$n(\%)^b$	$n(\%)^b$	$n(\%)^c$	$n(\%)^c$	$n(\%)^b$	$n(\%)^c$	$n(\%)^c$	$n(\%)^d$	$n(\%)^d$	$n(\%)^d$
Under-weight	42 (5.9)	32 (4.5)	24 (5.3)	15 (3.3)	15 (6.8)	11 (5.0)	9 (3.8)	4 (1.7)	18 (7.0)	17 (6.6)	10 (8.5)	10 (8.5)	10 (8.5)	8 (5.7)	8 (5.7)	7 (5.0)	7 (5.0)	7 (5.0)
Normal-weight	534 (74.9)	576 (80.8)	331 (72.7)	362 (79.6)	139 (63.5)	161 (73.5)	192 (81.4)	201 (85.2)	203 (78.7)	214 (83.0)	90 (76.3)	97 (82.2)	90 (76.3)	113 (80.7)	113 (80.7)	117 (83.6)	117 (83.6)	117 (83.6)
At risk of over-weight	78 (10.9)	54 (7.6)	53 (11.6)	40 (8.8)	31 (14.2)	24 (11.0)	22 (9.3)	16 (6.8)	25 (9.7)	14 (5.4)	13 (11.0)	7 (5.9)	13 (11.0)	7 (5.9)	12 (8.6)	7 (5.0)	7 (5.0)	7 (5.0)
Over-weight	59 (8.3)	51 (7.2)	47 (10.3)	38 (8.4)	34 (15.5)	23 (10.5)	13 (5.5)	15 (6.3)	12 (4.6)	13 (5.0)	5 (4.2)	4 (3.4)	5 (4.2)	7 (5.0)	4 (3.4)	9 (6.4)	9 (6.4)	9 (6.4)
Total	713 (100)	713 (100)	455 (100)	455 (100)	219 (100)	219 (100)	236 (100)	236 (100)	258 (100)	258 (100)	118 (100)	118 (100)	118 (100)	140 (100)	140 (100)	140 (100)	140 (100)	140 (100)

^a% of total students, ^b% of total class, ^c% of total male in each class, ^d% of total female in each class

Table 4.12 Nutritional status of 713 SW.PY students classified by body fat (%bw) (38) during the study

Total										M.1 – M.3						M.4 – M.6					
Body fat	Total			Male			Female			Total			Male			Female					
	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week	Week				
	0	24	0	24	0	24	0	24	0	24	0	24	0	24	0	24	0	24			
	$n(\%)^a$	$n(\%)^a$	$n(\%)^b$	$n(\%)^b$	$n(\%)^c$	$n(\%)^c$	$n(\%)^d$	$n(\%)^d$	$n(\%)^b$	$n(\%)^b$	$n(\%)^c$	$n(\%)^c$	$n(\%)^d$	$n(\%)^d$	$n(\%)^c$	$n(\%)^c$	$n(\%)^d$	$n(\%)^d$			
Low	94 (13.2)	60 (8.4)	45 (9.9)	34 (7.5)	34 (15.5)	32 (14.6)	11 (4.7)	2 (0.9)	49 (19.0)	26 (10.1)	31 (26.3)	19 (16.1)	18 (12.9)	7 (5.0)							
Normal	554 (77.7)	594 (83.3)	353 (77.6)	374 (82.2)	144 (65.8)	159 (72.6)	209 (88.5)	215 (91.1)	201 (77.9)	220 (85.3)	83 (70.3)	96 (81.4)	118 (84.3)	124 (88.6)							
Over	31 (4.3)	37 (5.2)	25 (5.5)	28 (6.2)	17 (7.8)	15 (6.9)	8 (3.4)	13 (5.5)	6 (2.3)	9 (3.5)	4 (3.4)	3 (2.5)	2 (1.4)	6 (4.3)							
Excess	34 (4.8)	22 (3.1)	32 (7.0)	19 (4.2)	24 (10.9)	13 (5.9)	8 (3.4)	6 (2.5)	2 (0.8)	3 (1.2)	-	-	2 (1.4)	3 (2.1)							
Total	713 (100)	713 (100)	455 (100)	455 (100)	219 (100)	219 (100)	236 (100)	236 (100)	258 (100)	258 (100)	118 (100)	118 (100)	140 (100)	140 (100)							

^a% of total students, ^b% of total class, ^c% of total male in each class, ^d% of total female in each class

Table 4.13 Nutritional status of 713 SW.PY students classified by BMI-for-age and body fat (%bw) during the study

		Body fat														
BMI for age	Total		Low				Normal				Over				Excess	
	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24
	<i>n</i> (%) ^a	<i>n</i> (%) ^a	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b
Under-weight	42(5.9)	32(4.5)	39(92.9)	25(78.1)	3(7.1)	7(21.9)	-	-	-	-	-	-	-	-	-	-
Normal weight	534(74.9)	576(80.8)	55(10.3)	35(6.1)	479(89.7)	540(93.8)	-	1(0.2)	-	-	-	-	-	-	-	-
At risk of overweight	78(10.9)	54(7.6)	-	-	63(80.8)	40(74.1)	11(14.1)	13(24.1)	4(5.1)	1(1.9)						
Overweight	59(8.3)	51(7.2)	-	-	9(15.3)	7(13.7)	20(33.9)	23(45.1)	30(50.8)	21(41.2)						
Total	713(100)	713(100)	94(13.2)	60(8.4)	554(77.7)	594(83.3)	31(4.3)	37(5.2)	34(4.8)	22(3.1)						

^a % of total students, ^b % of total students in each BMI status

Table 4.14 Mean ($\pm$ SD) of serum biochemical parameters of 713 SW.PY students

Parameter	M.1 – M.3			M.4 – M.6		
	Total (n=455)	Male (n= 219)	Female (n= 236)	Total (n=258)	Male (n= 118)	Female (n=140)
Hemoglobin (g/dL)	13.6 $\pm$ 1.1 (8.7-16.6) ^a	14.3 $\pm$ 0.8 (11.9-16.6)	13.0 $\pm$ 0.9 ^{II} (8.7-15.9)	13.6 $\pm$ 1.2 (11.6-16.6)	14.5 $\pm$ 0.9 ^{k3} (12.3-16.6)	12.8 $\pm$ 0.9 ^{k2, II} (11.6-14.9)
FBS (mg/dL)	90.6 $\pm$ 6.7 (71-108)	91.5 $\pm$ 6.6 (71-108)	89.8 $\pm$ 6.7 ^{I2} (72-108)	88.3 $\pm$ 6.5 ^{kI} (71-108)	87.8 $\pm$ 5.9 ^{kI} (71-102)	88.7 $\pm$ 6.9 (71-108)
Uric (mg/dL)	6.0 $\pm$ 1.3 (2.9-10.6)	6.7 $\pm$ 1.3 (3.2-10.6)	5.4 $\pm$ 1.0 ^{II} (2.9-8.2)	5.9 $\pm$ 1.2 (2.9-8.9)	6.5 $\pm$ 1.0 (2.9-8.9)	5.4 $\pm$ 1.1 ^{II} (3.6-8.9)
TG (mg/dL)	68.7 $\pm$ 28.7 (34-283)	71.6 $\pm$ 34.2 (34-283)	66.1 $\pm$ 22.2 ^{I3} (35-184)	67.8 $\pm$ 29.2 (35-265)	71.1 $\pm$ 34.5 (35-265)	65.0 $\pm$ 23.7 (35-189)
HDL (mg/dL)	50.0 $\pm$ 6.7 (32-69)	47.0 $\pm$ 5.4 (32-69)	52.9 $\pm$ 6.5 ^{II} (33-65)	50.1 $\pm$ 7.4 (34-67)	45.4 $\pm$ 5.3 ^{k3} (35-66)	54.0 $\pm$ 6.5 ^{II} (34-67)
LDL (mg/dL)	110.0 $\pm$ 23.5 (48-196)	110.8 $\pm$ 23.2 (48-196)	109.3 $\pm$ 23.7 (60-195)	112.4 $\pm$ 25.4 (46-213)	113.0 $\pm$ 26.1 (73-213)	111.9 $\pm$ 24.8 (46-203)

Significantly different from class, ^{kI}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05Significantly different from sex, ^{II}p < 0.001, ^{I2}p < 0.01, ^{I3}p < 0.05^a (min-max)

Table 4.15 Hemoglobin and uric acid status of 713 SW.PY students

Parameter	Total		M.1 – M.3		M.4 – M.6	
	(n=713)		Total	Male	Female	Total
			(n=455)	(n=219)	(n=236)	(n=258)
	n(%) ^a	n(%) ^b	n(%) ^c	n(%) ^c	n(%) ^c	n(%) ^c
Hb (g/dL)						
Normal (>12 g/dL)	641(89.9)	423(93.0)	218(51.5)	205(48.5)	218(84.5)	100(45.9)
Anemia (<12 g/dL)	72(10.1)	32(7.0)	1(3.1)	31(96.9)	40(15.5)	40(100.0)
Uric acid (mg/dL)						
Normal (≤5.5 mg/dL)	275(38.6)	172(37.8)	34(19.8)	138(80.2)	103(39.9)	86(83.5)
Borderline (5.6-7.0 mg/dL)	332(46.6)	204(44.8)	116(56.9)	88(43.1)	128(49.6)	46(35.9)
High (7.1-9.0 mg/dL)	98(13.7)	71(15.6)	61(85.9)	10(14.1)	27(10.5)	8(29.6)
Very high (>9.0 mg/dL)	8(1.1)	8(1.8)	8(100.0)	-	-	-

^a% of total students, ^b% of total class, ^c% of total in each class

Table 4.16 Serum lipid profile status of 713 SW.PY students

Parameter	Total (n=713)		M.1 – M.3		M.4 – M.6	
	Total (n=455)	Male (n=219)	Female (n=236)	Total (n=258)	Male (n=118)	Female (n=140)
	n(%) ^a	n(%) ^b	n(%) ^c	n(%) ^b	n(%) ^c	n(%) ^c
TG (mg/dL)						
Normal (<150 mg/dL)	698(97.9)	445(97.8)	213(47.9)	232(52.1)	115(45.5)	138(54.5)
Borderline (150-199 mg/dL)	11(1.5)	8(1.8)	4(50.0)	4(50.0)	1(33.3)	2(66.7)
High (200-350mg/dL)	4(0.6)	2(0.4)	2(100.0)	-	2(100)	-
HDL (mg/dL)						
Low (<40 mg/dL)	60(8.4)	35(7.7)	21(60.0)	14(40.0)	19(76.0)	6(24.0)
Normal (≥40 mg/dL)	653(91.6)	420(92.3)	198(47.1)	222(52.9)	99(42.5)	134(57.5)
LDL (mg/dL)						
Normal (<110 mg/dL)	364(51.1)	245(53.8)	105(42.9)	140(57.1)	57(47.9)	62(52.1)
Borderline (110-130 mg/dL)	272(38.1)	163(35.8)	89(54.6)	74(45.4)	43(39.4)	66(60.6)
High (>130 mg/dL)	77(10.8)	47(10.3)	25(53.2)	22(46.8)	18(60.0)	12(40.0)

^a % of total students, ^b% of total class, ^c% of total in each class

Table 4.17 Mean ($\pm$ SD) of serum biochemical parameters of 265 SW.PY students during the study

Parameter	Total (<i>n</i> =265)		Male (<i>n</i> = 146)		Female (<i>n</i> = 119)	
	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24
Hemoglobin (g/dL)	13.6 $\pm$ 1.2 (11.6-16.6) ^a	13.8 $\pm$ 1.2 ^{k3} (8.7-16.4)	14.4 $\pm$ 0.9 (11.9-16.6)	14.3 $\pm$ 1.0 (11.4-16.4)	12.8 $\pm$ 0.9 ^{ll} (11.6-15.3)	13.1 $\pm$ 1.0 ^{kl, ll} (8.7-15.2)
FBS (mg/dL)	90.1 $\pm$ 6.7 (71-108)	97.5 $\pm$ 6.8 ^{kl} (71-109)	90.3 $\pm$ 6.7 (71-108)	97.8 $\pm$ 6.8 ^{kl} (71-109)	89.9 $\pm$ 6.7 (72-108)	97.1 $\pm$ 6.7 ^{kl} (81-109)
Uric (mg/dL)	6.6 $\pm$ 1.2 (2.9-10.6)	5.8 $\pm$ 1.1 ^{kl} (3.0-9.7)	7.1 $\pm$ 0.9 (4.9-10.9)	6.4 $\pm$ 0.9 ^{kl} (4.4-9.7)	6.0 $\pm$ 1.2 ^{ll} (2.9-8.9)	5.2 $\pm$ 1.0 ^{kl, ll} (3.0-7.7)
TG (mg/dL)	69.8 $\pm$ 27.4 (34-199)	92.6 $\pm$ 49.6 ^{kl} (36-323)	70.6 $\pm$ 28.8 (34-199)	90.0 $\pm$ 45.5 ^{kl} (37-281)	68.8 $\pm$ 25.6 (35-187)	95.8 $\pm$ 54.2 ^{kl} (36-323)
HDL (mg/dL)	49.4 $\pm$ 7.4 (33-69)	47.7 $\pm$ 7.7 ^{kl} (29-89)	46.4 $\pm$ 6.0 (35-69)	44.3 $\pm$ 4.7 ^{kl} (30-65)	53.1 $\pm$ 7.2 ^{ll} (33-67)	51.9 $\pm$ 8.5 ^{ll} (29-89)
LDL (mg/dL)	113.6 $\pm$ 26.7 (50-203)	101.3 $\pm$ 23.1 ^{kl} (52-191)	110.8 $\pm$ 24.0 (50-196)	97.1 $\pm$ 22.1 ^{kl} (52-180)	117.0 $\pm$ 29.4 (60-203)	106.3 $\pm$ 23.4 ^{kl, l2} (56-191)

Significantly different from week 0, ^{kl} $p < 0.001$, ^{k2} $p < 0.01$, ^{k3} $p < 0.05$ Significantly different from sex, ^{ll} $p < 0.001$, ^{l2} $p < 0.01$, ^{l3} $p < 0.05$ ^a (min-max)

Table 4.18 Hemoglobin and uric acid status of 265 SW.PY students during the study

Parameter	Total (n=265)		Male (n=146)		Female (n=119)	
	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24
	<i>n</i> (%) ^a	<i>n</i> (%) ^a	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b	<i>n</i> (%) ^b
<u>Hb (g/dL)</u>						
Normal (>12 g/dL)	228(86.0)	249(94.0)	145(63.6)	144(57.8)	83(36.4)	105(42.2)
Anemia (<12 g/dL)	37(14.0)	16(6.0)	1(2.7)	2(12.5)	36(97.3)	14(87.5)
<u>Uric acid (mg/dL)</u>						
Normal (≤5.5 mg/dL)	40(15.1)	105(39.6)	2(5.0)	25(23.8)	38(95.0)	80(76.2)
Borderline (5.6-7.0 mg/dL)	160(60.4)	143(54.0)	94(58.8)	105(73.4)	66(41.3)	38(26.6)
High (7.1-9.0 mg/dL)	59(22.3)	15(5.7)	44(74.6)	14(93.3)	15(25.4)	1(6.7)
Very high (>9.0 mg/dL)	6(2.3)	2(0.8)	6(100)	2(100)	-	-

^a% of total students, ^b% of total in each parameter level

Table 4.19 Serum lipid profile status of 265 SW.PY students during the study

Parameter	Total (n=265)			Male (n=146)			Female (n=119)		
	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24	Week 0	Week 24	Week 0
	n(%) ^a	n(%) ^a	n(%) ^b	n(%) ^b	n(%) ^b	n(%) ^b	n(%) ^b	n(%) ^b	n(%) ^b
<u>TG (mg/dL)</u>									
Normal (<150 mg/dL)	261(98.5)	234(88.3)	144(55.2)	128(54.7)	117(44.8)	106(45.3)			
Borderline (150-199 mg/dL)	4(1.5)	23(8.7)	2(50.0)	16(69.6)	2(50.0)	7(30.4)			
High (200-350mg/dL)	-	8(3.0)	-	2(25.0)	-	6(75.0)			
<u>HDL (mg/dL)</u>									
Low (<40 mg/dL)	23(8.7)	20(7.5)	15(65.2)	14(70.0)	8(34.8)	6(30.0)			
Normal (≥40 mg/dL)	242(91.3)	245(92.5)	131(54.1)	132(53.9)	111(45.9)	113(46.1)			
<u>LDL (mg/dL)</u>									
Normal (<110 mg/dL)	130(49.1)	179(67.5)	75(57.7)	108(60.3)	55(42.3)	71(39.7)			
Borderline (110-130 mg/dL)	94(35.5)	66(24.9)	52(55.3)	29(43.9)	42(44.7)	37(56.1)			
High (>130 mg/dL)	41(15.5)	20(7.5)	19(46.3)	9(45.0)	22(53.7)	11(55.0)			

^a% of total students, ^b% of total in each parameter level

4.3 Nutritional status and self-esteem

Thai FSC consists of 46 items including 5 areas; academic 7 items, body image 5 items, family 9 items, social 7 items, global 8 items, total 5 areas 36 items and Thai FSC had 10 items of questionnaires for screening unintentional students. Answers had 3 choices; almost always, sometime, almost never. For 10 items of questionnaires for screening unintentional students, if the students answered almost always ≥ 4 items, they will be excluded from the study because from the previous study have shown that those results were not derived from their true feelings.

Self-esteem were analyzed by Thai FSC, consist of 5 areas:

1. Academic area, this area is the feeling about themselves as students, satisfaction with the learning outcomes which may be the standard set by parents, teachers, or friends.
2. Body image area, this area is the satisfaction of their physical appearance.
3. Family area, a sense of self-awareness as a member of the family. They are loved and proud of their family.
4. Social area, this area is the acceptable of friends.
5. Global area, this area is perspective about themselves in general such a good person

At the baseline, 554 (77.7%) of 713 questionnaires and at the end of study 477 (66.9%) of 713 questionnaires were selected for self-esteem. Thus self-esteem was assessed in only 477 SW.PY students during this study.

At baseline, the mean self-esteem scores of overweight students were significantly lower than that normal weight students in the area of body image, however, these significant was not observed at the end of study. At the baseline and at the end of study, the mean self-esteem scores did not significant difference between groups (low, normal, over, and excess body fat) (**Tables 4.20-4.21**). At the baseline and at the end of this study, mean self-esteem scores of females were significantly lower than males in the areas of academic and body image. Mean self-esteem scores of females at the end of this study were significantly higher than those females at the baseline in the areas of academic and body image (**Table 4.22**).

Table 4.20 Mean ($\pm$ SD) of self-esteem scores of 477 SW.PY students classified by BMI-for-age

Areas	Self-esteem score (Week 0)				Self-esteem score (Week 24)			
	Under-weight	Normal weight	At risk of overweight	Over-weight	Under-weight	Normal weight	At risk of overweight	Over-weight
	(n=26)	(n=352)	(n=57)	(n=42)	(n=22)	(n=379)	(n=44)	(n=32)
Academic area	8.2 $\pm$ 2.5	7.7 $\pm$ 1.7	8.0 $\pm$ 1.7	7.8 $\pm$ 2.1	7.8 $\pm$ 1.7	7.9 $\pm$ 1.8	8.1 $\pm$ 1.9	8.4 $\pm$ 2.0
Body image area	4.3 $\pm$ 2.3	5.2 $\pm$ 2.0	4.9 $\pm$ 2.4	4.2 $\pm$ 2.0 ^{k3}	5.1 $\pm$ 1.7	5.3 $\pm$ 1.9	4.7 $\pm$ 2.1	4.9 $\pm$ 1.7
Family area	13.2 $\pm$ 3.4	13.4 $\pm$ 2.5	13.6 $\pm$ 3.0	13.6 $\pm$ 2.4	13.0 $\pm$ 3.3	13.2 $\pm$ 2.8	13.5 $\pm$ 2.6	13.7 $\pm$ 2.6
Social area	8.2 $\pm$ 1.8	8.6 $\pm$ 1.9	8.9 $\pm$ 2.2	8.9 $\pm$ 2.1	9.3 $\pm$ 2.2	8.6 $\pm$ 2.0	9.2 $\pm$ 2.3	8.7 $\pm$ 2.2
Global area	9.9 $\pm$ 2.7	9.9 $\pm$ 2.3	10.3 $\pm$ 2.7	10.1 $\pm$ 1.9	9.7 $\pm$ 2.3	9.9 $\pm$ 2.3	10.4 $\pm$ 2.4	10.3 $\pm$ 2.4
Total	43.8 $\pm$ 10.3	44.8 $\pm$ 7.7	45.8 $\pm$ 9.0	44.6 $\pm$ 7.3	44.9 $\pm$ 8.9	44.9 $\pm$ 8.4	45.8 $\pm$ 9.2	46.0 $\pm$ 8.4

Significantly different from normal weight, ^{k3} p < 0.05

Table 4.21 Mean ($\pm$ SD) of self-esteem scores of 477 SW.PY students classified by body fat

Areas	Self-esteem score (Week 0)				Self-esteem score (Week 24)			
	Low body fat	Normal body fat	Over Body fat	Excess body fat	Low body fat	Normal body fat	Over body fat	Excess body fat
	(n=66)	(n=365)	(n=22)	(n=24)	(n=39)	(n=400)	(n=25)	(n=13)
Academic area	8.1 $\pm$ 1.9	7.7 $\pm$ 1.7	7.9 $\pm$ 1.9	8.2 $\pm$ 2.4	8.2 $\pm$ 1.6	7.9 $\pm$ 1.8	8.2 $\pm$ 2.0	8.2 $\pm$ 2.1
Body image area	4.9 $\pm$ 2.1	5.2 $\pm$ 2.1	4.0 $\pm$ 2.2	4.4 $\pm$ 2.2	5.4 $\pm$ 1.5	5.2 $\pm$ 1.9	5.1 $\pm$ 1.7	4.9 $\pm$ 1.7
Family area	13.4 $\pm$ 2.9	13.4 $\pm$ 2.5	12.7 $\pm$ 2.7	14.6 $\pm$ 2.1	12.9 $\pm$ 2.7	13.2 $\pm$ 2.8	13.6 $\pm$ 2.5	13.4 $\pm$ 3.0
Social area	8.6 $\pm$ 1.8	8.6 $\pm$ 2.0	8.5 $\pm$ 2.4	9.0 $\pm$ 1.6	8.8 $\pm$ 2.0	8.7 $\pm$ 2.0	8.8 $\pm$ 2.7	8.5 $\pm$ 2.2
Global area	10.0 $\pm$ 2.2	9.9 $\pm$ 2.3	10.0 $\pm$ 2.3	10.3 $\pm$ 2.3	9.8 $\pm$ 2.2	9.9 $\pm$ 2.3	10.1 $\pm$ 3.0	10.3 $\pm$ 2.2
Total	45.0 $\pm$ 8.5	44.8 $\pm$ 7.9	43.1 $\pm$ 8.1	46.6 $\pm$ 8.3	45.2 $\pm$ 7.9	45.0 $\pm$ 8.4	45.8 $\pm$ 9.9	45.3 $\pm$ 8.3

Table 4.22 Mean ($\pm$ SD) of self-esteem scores of 477 SW.PY students classified by sex

Areas	Self-esteem score (Week 0)		Self-esteem score (Week 24)	
	Male	Female	Male	Female
	(n=232)	(n=245)	(n=232)	(n=245)
Academic area	8.1 $\pm$ 1.8	7.5 $\pm$ 1.8 ^{k1}	8.1 $\pm$ 1.9	7.8 $\pm$ 1.7 ^{k3, l3}
Body image area	5.3 $\pm$ 2.0	4.7 $\pm$ 2.1 ^{k2}	5.4 $\pm$ 1.9	5.0 $\pm$ 1.8 ^{k3, l3}
Family area	13.4 $\pm$ 2.5	13.4 $\pm$ 2.6	13.2 $\pm$ 2.7	13.3 $\pm$ 2.8
Social area	8.8 $\pm$ 1.9	8.5 $\pm$ 2.0	8.8 $\pm$ 2.0	8.7 $\pm$ 2.1
Global area	10.1 $\pm$ 2.2	9.8 $\pm$ 2.4	10.0 $\pm$ 2.2	9.9 $\pm$ 2.4
Total	45.7 $\pm$ 7.7	44.0 $\pm$ 8.2 ^{k3}	45.6 $\pm$ 8.4	44.5 $\pm$ 8.5

Significantly different from male, ^{k1}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05Significantly different from female at week 0, ^{l3}p < 0.05

Because of self-esteem in the area of body image is the satisfaction of their physical appearance, and then this study classified the self-esteem by BMI-for-age, underweight, normal weight, at risk of overweight and overweight students.

4.3.1 Underweight students

Mean ($\pm$ SD) of body composition of 26 underweight students are shown in **Table 4.23**. Mean ($\pm$ SD) of diet-related chronic diseases knowledge score of 26 underweight students were significantly increased from 21.4 ± 10.8 to 31.7 ± 9.8 ($p < 0.001$).

Body composition; the percentage of 26 underweight students had become normal weight at weeks 8, 16 and 24 were 34.6%, 50.0% and 30.8%, respectively (**Table 4.24**).

Self-esteem; self-esteem scores of 24 underweight students who had weight gain at the end of study were increase in the areas of body image, and social but did not reach significant difference (**Table 4.25**).

4.3.2 Normal weight students

Mean ($\pm$ SD) of body composition of 352 normal weight students are shown in **Table 4.26**. Mean ($\pm$ SD) of diet-related chronic diseases knowledge score of 352 normal weight students were significantly increased from 22.3 ± 8.1 to 33.9 ± 9.4 ($p < 0.001$).

Body composition; the percentage of 352 normal weight students can maintain their normal body weight at weeks 8, 16 and 24 were 99.4%, 97.4% and 98.3%, respectively (**Table 4.27**).

Self-esteem; self-esteem scores of 346 normal weight students who had normal weight at the end of study were increase in the areas of academic and body image but did not reach significant difference (**Table 4.28**).

4.3.3 At risk of overweight students

Mean ($\pm$ SD) of body composition, self-esteem score of 57 at risk of overweight students are shown in **Table 4.29**. Mean ($\pm$ SD) of diet-related chronic diseases knowledge score of 57 at risk of overweight students were significantly increased from 20.8 ± 8.7 to 36.0 ± 10.3 ($p < 0.001$).

Body composition; the percentage of 57 at risk of overweight students had become normal weight at weeks 8, 16 and 24 were 15.8%, 14.0% and 40.4%, respectively and they had become overweight at weeks 8, 16 and 24 were 8.8%, 10.5%, and 5.3%, respectively (**Table 4.30**).

Self-esteem; self-esteem scores of 30 at risk of overweight students who weight loss at the end of study were increase in the areas of academic and social but did not reach significant difference and no change of self-esteem score in the area of body image (**Table 4.31**).

4.3.4 Overweight students

Mean ($\pm$ SD) of body composition of 42 overweight students are shown in **Table 4.32**. Mean ($\pm$ SD) of diet-related chronic diseases knowledge score of 42 overweight students were significantly increased from 21.0 ± 7.7 to 32.6 ± 11.5 ($p < 0.001$).

Body composition; the percentage of 42 overweight students had become normal weight at week 24 was 4.8% and they had become at risk of overweight at weeks 8, 16 and 24 were 16.7%, 11.9%, and 26.2%, respectively (**Table 4.33**).

Self-esteem; self-esteem scores of 22 overweight students who had weight loss at the end of study were increase in the areas of academic, body image, family, and global but not reach significant difference (**Table 4.34**).

4.3.5 Blood parameters and self-esteem

Mean self-esteem scores classified by blood parameters shown in **Tables 4.35-4.39**. At baseline, self-esteem scores between students who had normal and abnormal blood parameters did not differ significantly. At the end of this study, self-esteem scores who can improve blood parameters did not differ significantly.

Table 4.23 Mean ($\pm$ SD) of body composition of 26 underweight students during the study

Parameters	Week 0	Week 8	Week 16	Week 24
Age (years)	14.8 $\pm$ 2.3	14.8 $\pm$ 2.3	14.8 $\pm$ 2.3	15.2 $\pm$ 2.2 ^{k2,l2,m2}
Height (cm)	154.6 $\pm$ 9.9	154.6 $\pm$ 9.9	154.6 $\pm$ 9.9	156.5 $\pm$ 9.9 ^{k1,l1,m1}
Weight (kg)	37.3 $\pm$ 6.7	38.1 $\pm$ 7.0 ^{k2}	38.8 $\pm$ 6.8 ^{k1,l2}	39.4 $\pm$ 6.9 ^{k1,l2}
Body fat (%bw)	8.1 $\pm$ 5.8	9.3 $\pm$ 6.2 ^{k1}	9.9 $\pm$ 6.0 ^{k1,l3}	10.1 $\pm$ 6.7 ^{k1}
Fat mass (kg)	3.0 $\pm$ 2.3	3.6 $\pm$ 2.6 ^{k2}	3.9 $\pm$ 2.5 ^{k1,l3}	4.0 $\pm$ 2.8 ^{k1}
Fat free mass (kg)	34.3 $\pm$ 6.5	34.5 $\pm$ 6.7	35.0 $\pm$ 6.6 ^{k3,l2}	35.4 $\pm$ 6.7 ^{k3,l3}
Muscle mass (kg)	32.5 $\pm$ 6.2	32.7 $\pm$ 6.3	33.1 $\pm$ 6.2 ^{k3,l2}	33.5 $\pm$ 6.3 ^{k3,l3}
TBW (kg)	25.1 $\pm$ 4.8	25.3 $\pm$ 4.9	25.3 $\pm$ 4.7	25.4 $\pm$ 4.9
TBW (%bw)	67.3 $\pm$ 4.3	66.4 $\pm$ 4.5 ^{k1}	65.1 $\pm$ 5.3 ^{k1,l2}	64.6 $\pm$ 6.2 ^{k1,l3}
BMI (kg/m ²)	15.5 $\pm$ 0.9	15.8 $\pm$ 1.1 ^{k2}	16.1 $\pm$ 1.0 ^{k1,l2}	16.0 $\pm$ 1.0 ^{k3}

Significantly different from week 0, ^{k1}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05Significantly different from week 8, ^{l1}p < 0.001, ^{l2}p < 0.01, ^{l3}p < 0.05Significantly different from week 16, ^{m1}p < 0.001, ^{m2}p < 0.01, ^{m3}p < 0.05**Table 4.24** Nutritional status of 26 underweight students during the study

BMI-for-age	Week 0	Week 8	Week 16	Week 24
	n(%) ^a	n(%) ^b	n(%) ^b	n(%) ^b
Underweight	26 (5.5)			
Underweight		17 (65.4)	13 (50.0)	18 (69.2)
Normal weight		9 (34.6)	13 (50.0)	8 (30.8)
At risk of overweight		-	-	-
Overweight		-	-	-

^a% of 477 students, ^b% of underweight at week 0

Table 4.25 Mean ($\pm$ SD) self-esteem scores of 24 underweight students who had weight gain at the end of study

Areas	Self-esteem scores	
	Week 0	Week 24
Academic area	8.1 $\pm$ 2.4	7.8 $\pm$ 1.6
Body image area	4.2 $\pm$ 2.4	5.0 $\pm$ 1.7
Family area	13.0 $\pm$ 3.3	12.9 $\pm$ 3.4
Social area	8.1 $\pm$ 1.8	8.5 $\pm$ 1.9
Global area	9.8 $\pm$ 2.7	9.5 $\pm$ 2.6
Total	43.2 $\pm$ 10.0	43.6 $\pm$ 8.9

Table 4.26 Mean ($\pm$ SD) of body composition of 352 normal weight students during the study

Parameters	Week 0	Week 8	Week 16	Week 24
Age (years)	14.8 $\pm$ 1.7	14.8 $\pm$ 1.7	14.8 $\pm$ 1.7	15.3 $\pm$ 1.7 ^{kl,ll,m1}
Height (cm)	160.1 $\pm$ 7.7	160.1 $\pm$ 7.7	160.1 $\pm$ 7.7	161.2 $\pm$ 7.9 ^{kl,ll,m1}
Weight (kg)	49.4 $\pm$ 7.4	49.9 $\pm$ 7.3 ^{kl}	50.6 $\pm$ 7.2 ^{kl,ll}	50.9 $\pm$ 7.1 ^{kl,ll,m1}
Body fat (%bw)	18.2 $\pm$ 7.2	18.3 $\pm$ 7.1	19.1 $\pm$ 7.0 ^{kl,ll}	19.4 $\pm$ 7.7 ^{kl,ll,m3}
Fat mass (kg)	9.0 $\pm$ 3.8	9.1 $\pm$ 3.8	9.6 $\pm$ 3.7 ^{kl,ll}	9.8 $\pm$ 4.0 ^{kl,ll,m1}
Fat free mass (kg)	40.5 $\pm$ 7.3	40.7 $\pm$ 7.2 ^{kl}	41.0 $\pm$ 7.4 ^{kl,ll}	41.0 $\pm$ 7.4 ^{kl,ll}
Muscle mass (kg)	38.2 $\pm$ 6.9	38.5 $\pm$ 6.9 ^{kl}	38.7 $\pm$ 7.0 ^{kl,ll}	38.8 $\pm$ 7.1 ^{kl,ll}
TBW (kg)	29.6 $\pm$ 5.3	29.8 $\pm$ 5.2	29.9 $\pm$ 5.2	29.7 $\pm$ 5.3
TBW (%bw)	59.9 $\pm$ 5.3	59.7 $\pm$ 5.3	59.0 $\pm$ 5.2 ^{kl,ll}	58.4 $\pm$ 5.9 ^{kl,ll,m1}
BMI (kg/m ²)	19.2 $\pm$ 1.9	19.4 $\pm$ 1.8 ^{kl}	19.7 $\pm$ 1.8 ^{kl,ll}	19.5 $\pm$ 1.8 ^{kl,ll,m1}

Significantly different from week 0, ^{kl}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05Significantly different from week 8, ^{ll}p < 0.001, ^{l2}p < 0.01, ^{l3}p < 0.05Significantly different from week 16, ^{m1}p < 0.001, ^{m2}p < 0.01, ^{m3}p < 0.05

Table 4.27 Nutritional status of 352 normal weight students during the study

BMI-for-age	Week 0	Week 8	Week 16	Week 24
	n(%) ^a	n(%) ^b	n(%) ^b	n(%) ^b
Normal weight	352 (73.8)			
Underweight		-	1 (0.3)	4 (1.1)
Normal weight		350 (99.4)	343 (97.4)	346 (98.3)
At risk of overweight		2 (0.6)	8 (2.3)	2 (0.6)
Overweight		-	-	-

^a% of 477 students, ^b% of normal weight at week 0

Table 4.28 Mean ($\pm$ SD) of self-esteem scores of 346 normal weight students who had normal weight at the end of study

Areas	Self-esteem scores	
	Week 0	Week 24
Academic area	7.7 $\pm$ 1.7	7.9 $\pm$ 1.7
Body image area	5.2 $\pm$ 2.0	5.3 $\pm$ 1.9
Family area	13.4 $\pm$ 2.5	13.2 $\pm$ 2.7
Social area	8.6 $\pm$ 1.9	8.6 $\pm$ 2.0
Global area	9.9 $\pm$ 2.3	9.9 $\pm$ 2.2
Total	44.8 $\pm$ 7.8	44.8 $\pm$ 8.2

Table 4.29 Mean ($\pm$ SD) of body composition of 57 at risk of overweight students during the study

Parameters	Week 0	Week 8	Week 16	Week 24
Age (years)	14.8 $\pm$ 1.6	14.8 $\pm$ 1.6	14.8 $\pm$ 1.6	15.3 $\pm$ 1.6 ^{k1,l1,m1}
Height (cm)	162.8 $\pm$ 7.1	162.8 $\pm$ 7.1	162.8 $\pm$ 7.1	164.4 $\pm$ 7.7 ^{k1,l1,m1}
Weight (kg)	63.7 $\pm$ 7.4	63.1 $\pm$ 7.4	63.9 $\pm$ 7.7	64.3 $\pm$ 8.2
Body fat (%bw)	27.5 $\pm$ 6.8	26.6 $\pm$ 7.0 ^{k3}	26.6 $\pm$ 7.8	26.5 $\pm$ 8.3
Fat mass (kg)	17.4 $\pm$ 4.4	16.8 $\pm$ 5.0	17.0 $\pm$ 5.5	17.0 $\pm$ 5.8
Fat free mass (kg)	46.3 $\pm$ 7.5	46.3 $\pm$ 7.0	46.9 $\pm$ 7.6 ^{l3}	47.3 $\pm$ 8.2 ^{k2,l2}
Muscle mass (kg)	43.7 $\pm$ 7.2	43.7 $\pm$ 6.7	44.2 $\pm$ 7.3 ^{l3}	44.6 $\pm$ 7.9 ^{k2,l2}
TBW (kg)	33.9 $\pm$ 5.5	33.9 $\pm$ 5.1	34.2 $\pm$ 5.4	34.5 $\pm$ 5.9 ^{k3,l3}
TBW (%bw)	53.1 $\pm$ 5.0	53.7 $\pm$ 5.2	53.7 $\pm$ 5.6	53.6 $\pm$ 6.0
BMI (kg/m ²)	23.9 $\pm$ 1.4	23.7 $\pm$ 1.7	24.0 $\pm$ 1.8	23.7 $\pm$ 2.0

Significantly different from week 0, ^{k1}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05Significantly different from week 8, ^{l1}p < 0.001, ^{l2}p < 0.01, ^{l3}p < 0.05Significantly different from week 16, ^{m1}p < 0.001, ^{m2}p < 0.01, ^{m3}p < 0.05**Table 4.30** Nutritional status of 57 at risk of overweight students during the study

BMI level	Week 0	Week 8	Week 16	Week 24
	n(%) ^a	n(%) ^b	n(%) ^b	n(%) ^b
At risk of overweight	57 (11.9)			
Underweight		-	-	-
Normal weight		9 (15.8)	8 (14.0)	23 (40.4)
At risk of overweight		43 (75.4)	43 (75.4)	31 (54.4)
Overweight		5 (8.8)	6 (10.5)	3 (5.3)

^a% of 477 students, ^b% of at risk of overweight at week 0

Table 4.31 Mean ($\pm$ SD) of self-esteem scores of 30 at risk of overweight students who had weight loss at the end of study

Areas	Self-esteem scores	
	Week 0	Week 24
Academic area	7.9 $\pm$ 1.5	8.2 $\pm$ 2.2
Body image area	5.1 $\pm$ 2.5	5.1 $\pm$ 1.9
Family area	13.4 $\pm$ 3.3	13.1 $\pm$ 3.3
Social area	8.7 $\pm$ 2.5	9.0 $\pm$ 2.3
Global area	10.3 $\pm$ 2.9	10.3 $\pm$ 3.1
Total	45.3 $\pm$ 9.5	45.7 $\pm$ 10.6

Table 4.32 Mean ($\pm$ SD) of body composition of 42 overweight students during the study

Parameters	Week 0	Week 8	Week 16	Week 24
Age (years)	14.0 $\pm$ 1.6	14.0 $\pm$ 1.6	14.0 $\pm$ 1.6	14.6 $\pm$ 1.7 ^{k1,l1,m1}
Height (cm)	162.3 $\pm$ 7.9	162.3 $\pm$ 7.9	162.3 $\pm$ 7.9	164.6 $\pm$ 7.9 ^{k1,l1,m1}
Weight (kg)	71.1 $\pm$ 11.3	69.8 $\pm$ 11.4	71.4 $\pm$ 11.7	71.7 $\pm$ 12.7
Body fat (%bw)	32.9 $\pm$ 6.9	30.7 $\pm$ 7.3 ^{k1}	32.9 $\pm$ 8.0 ^{l1}	30.6 $\pm$ 8.5 ^{k2,m2}
Fat mass (kg)	23.6 $\pm$ 6.9	21.8 $\pm$ 7.6	23.8 $\pm$ 8.5	22.3 $\pm$ 8.7
Fat free mass (kg)	47.6 $\pm$ 8.4	48.0 $\pm$ 7.6	47.6 $\pm$ 8.0	49.4 $\pm$ 8.7 ^{k2,l2,m2}
Muscle mass (kg)	44.9 $\pm$ 8.0	45.3 $\pm$ 7.3	44.9 $\pm$ 7.6	46.6 $\pm$ 8.3 ^{k2,l2,m2}
TBW (kg)	34.8 $\pm$ 6.1	35.1 $\pm$ 5.6	34.8 $\pm$ 5.7	36.1 $\pm$ 6.3 ^{k2,l2,m2}
TBW (%bw)	49.1 $\pm$ 5.0	50.7 $\pm$ 5.3 ^{k1}	49.1 $\pm$ 5.8 ^{l1}	50.8 $\pm$ 6.2 ^{k2,m2}
BMI (kg/m ²)	26.8 $\pm$ 2.5	26.3 $\pm$ 2.7	26.9 $\pm$ 2.8	26.3 $\pm$ 3.3

Significantly different from week 0, ^{k1}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

Significantly different from week 8, ^{l1}p < 0.001, ^{l2}p < 0.01, ^{l3}p < 0.05

Significantly different from week 16, ^{m1}p < 0.001, ^{m2}p < 0.01, ^{m3}p < 0.05

Table 4.33 Nutritional status of 42 overweight students during the study

BMI level	Week 0	Week 8	Week 16	Week 24
	n(%) ^a	n(%) ^b	n(%) ^b	n(%) ^b
Overweight	42 (8.8)			
Underweight		-	-	-
Normal weight		-	-	2 (4.8)
At risk of overweight		7 (16.7)	5 (11.9)	11 (26.2)
Overweight		35 (83.3)	37 (88.1)	29 (69.0)

^a% of 477 students, ^b% of overweight at week 0**Table 4.34** Mean ($\pm$ SD) self-esteem scores of 22 overweight students who had weight loss at the end of study

Areas	Self-esteem scores	
	Week 0	Week 24
Academic area	7.9 $\pm$ 2.2	8.5 $\pm$ 1.9
Body image area	4.5 $\pm$ 2.1	4.6 $\pm$ 1.9
Family area	13.7 $\pm$ 2.3	13.9 $\pm$ 2.1
Social area	9.2 $\pm$ 2.2	9.4 $\pm$ 1.8
Global area	10.2 $\pm$ 1.8	10.3 $\pm$ 2.0
Total	45.4$\pm$7.4	46.6$\pm$7.5

Table 4.35 Mean ($\pm$ SD) self-esteem scores of 477 SW.PY students classified by hemoglobin status

Areas	Self-esteem scores	
	Low Hb	Normal Hb
	(n=48)	(n=429)
Academic area	8.0 $\pm$ 1.9	7.8 $\pm$ 1.8
Body image area	5.4 $\pm$ 2.0	5.0 $\pm$ 2.1
Family area	13.4 $\pm$ 2.8	13.4 $\pm$ 2.6
Social area	9.1 $\pm$ 2.0	8.6 $\pm$ 2.0
Global area	10.2 $\pm$ 2.5	10.0 $\pm$ 2.3
Total	46.0 $\pm$ 8.7	44.7 $\pm$ 7.9

Table 4.36 Mean ($\pm$ SD) self-esteem scores of 477 SW.PY students classified by uric acid status

Areas	Self-esteem scores	
	Normal uric acid	High uric acid
	(n=184)	(n=293)
Academic area	7.5 $\pm$ 1.9	8.0 $\pm$ 1.7
Body image area	4.9 $\pm$ 2.2	5.2 $\pm$ 2.1
Family area	13.3 $\pm$ 2.8	13.5 $\pm$ 2.4
Social area	8.4 $\pm$ 2.0	8.8 $\pm$ 1.9
Global area	9.8 $\pm$ 2.4	10.1 $\pm$ 2.2
Total	43.9 $\pm$ 8.3	45.4 $\pm$ 7.7

Table 4.37 Mean ($\pm$ SD) self-esteem scores of 477 SW.PY students classified by triglyceride status

Areas	Self-esteem scores	
	Normal TG	High TG
	(n=471)	(n=6)
Academic area	7.8 $\pm$ 1.8	8.2 $\pm$ 1.5
Body image area	5.0 $\pm$ 2.1	4.8 $\pm$ 2.6
Family area	13.4 $\pm$ 2.6	14.5 $\pm$ 2.1
Social area	8.6 $\pm$ 2.0	9.3 $\pm$ 2.3
Global area	10.0 $\pm$ 2.3	11.0 $\pm$ 1.1
Total	44.8 $\pm$ 8.0	47.8 $\pm$ 4.6

Table 4.38 Mean ($\pm$ SD) self-esteem scores of 477 SW.PY students classified by HDL status

Areas	Self-esteem scores	
	Low HDL	Normal HDL
	(n=30)	(n=447)
Academic area	7.7 $\pm$ 1.7	7.8 $\pm$ 1.8
Body image area	4.5 $\pm$ 2.1	5.1 $\pm$ 2.1
Family area	13.2 $\pm$ 2.5	13.4 $\pm$ 2.6
Social area	8.7 $\pm$ 2.1	8.7 $\pm$ 1.9
Global area	10.3 $\pm$ 1.9	10.0 $\pm$ 2.3
Total	44.4 $\pm$ 7.8	44.9 $\pm$ 8.0

Table 4.39 Mean ($\pm$ SD) of self-esteem scores of 477 SW.PY students classified by LDL status

Areas	Self-esteem scores	
	Normal LDL	High LDL
	(n=421)	(n=56)
Academic area	7.8 $\pm$ 1.8	7.6 $\pm$ 2.0
Body image area	5.1 $\pm$ 2.1	5.0 $\pm$ 2.5
Family area	13.4 $\pm$ 2.6	13.5 $\pm$ 2.7
Social area	8.6 $\pm$ 2.0	8.8 $\pm$ 1.7
Global area	10.0 $\pm$ 2.3	9.9 $\pm$ 2.6
Total	44.9 $\pm$ 7.8	44.7 $\pm$ 9.2

4.4 Relationship among self-esteem, perception, academic performance, and nutritional status

4.4.1 Self-esteem in the area of body image and perception of body shape

At baseline, mean self-esteem scores of students who reported “Thin” (4.8 ± 2.0), “Slightly fat” (4.4 ± 1.9), and “Fat” (4.3 ± 2.3) were significantly lower than those who reported “Normal body shape” (5.6 ± 2.1) in the area of body image.

At the end of this study, mean self-esteem scores of students who reported “Slightly fat” (4.9 ± 2.0) and “Fat” (4.3 ± 1.7) were significantly lower than those who reported “Normal body shape” (5.6 ± 1.8) in the area of body image.

Students who reported “Thin” at week 0 and week 24 were 16.1% and 18.2% of 477 SW.PY students, however at week 0 and week 24, 31.2% and 25.3% of students who reported “Thin” were underweight the rest were normal weight. Students who reported “Normal body shape” at week 0 and week 24 were 50.3% and 45.7% of 477 SW.PY students, however at week 0 and week 24, 92.5% and 96.3% of students who reported “Normal body shape” were normal weight, only at week 0, 0.8% and 0.8% of students who reported “Normal body shape” were underweight and overweight. At week 0 and week 24, 5.8% and 3.7% of students who reported “Normal body shape” were at risk of overweight. Students who reported “Slightly fat” at week 0 and week 24 were 18.4% and 20.8% of 477 SW.PY students, however at week 0 and week 24, 26.1% and 20.2% of students who reported “Slightly fat” were at risk of overweight. At week 0 and week 24, 60.2% and 73.7% of students who reported “Slightly fat” were normal weight. At week 0 and week 24, 13.6% and 6.1% of students who reported “Slightly fat” were overweight. Students who reported “Fat” at week 0 and week 24 were 15.1% and 15.3% of 477 SW.PY students, however at week 0 and week 24, 38.9% and 35.6% of students who reported “Fat” were overweight. At week 0 and week 24, 33.3% and 42.5% of students who reported “Fat” were normal weight. At week 0 and week 24, 27.8% and 21.9% of students who reported “Fat” were overweight (**Table 4.40**).

At the baseline, 88.3% and 11.7% of students who reported “Thin” really want to gain weight and maintain weight, respectively. Students who reported “Normal shape” want to maintain weight, lose weight, and gain weight 42.9%, 39.2%, and 17.9%, respectively. Students who reported “Slightly fat” want to loss weight, maintain weight, and gain weight 94.3%, 4.5%, and 1.1%, respectively. Students who reported “Fat” want to lose weight, maintain weight, and gain weight 95.8%, 2.8%, and 1.4%, respectively.

At the end of this study, 87.4% and 12.6% of students who reported “Thin” want to gain weight and maintain weight, respectively. Students who reported “Normal shape” want to maintain weight, lose weight, and gain weight 41.3%, 41.3%, and 17.4%, respectively. Students who reported “Slightly fat” want to lose weight, maintain weight and gain weight 93.9%, 4.0%, and 2.0%, respectively. 98.6% and 4.8% of students who reported “Fat” want to lose weight and maintain weight.

At the baseline, the most of the students chose exercise to lose weight (76.3%), to control diet (21.0%), and to see doctors (2.7%). At the end of this study, the most of the students chose exercise to lose weight (73.8%), to control diet (24.7%), and to see doctor (1.5%). No one needs to use weight loss drugs at week 0 and week 24.

4.4.2 Self-esteem in the area of body image and perception of height

At baseline, mean self-esteem scores of students who reported “Tall” (5.7 ± 2.1) were significantly higher than those who reported “Short” (4.7 ± 2.3) in the area of body image.

At the end of this study, mean self-esteem scores of students who reported “Short” (4.8 ± 1.9) were significantly lower than students who reported “Normal height” (5.4 ± 1.8) in the area of body image. Mean self-esteem scores of students who reported “Tall” (5.6 ± 2.0) were significantly higher than students who reported “Short” (4.8 ± 1.9) in the area of body image.

Students who reported “Short” at week 0 and week 24 were 36.9% and 35.8% of 477 SW.PY students, however at week 0 and week 24, 95.5% and 93.0% of students who reported “Short” had normal height. Students who reported “Normal height” at week 0 and week 24 were 49.7% and 52.4% of 477 SW.PY students,

however at week 0 and week 24, 99.6% and 99.2% of students who reported “Normal height” had normal height. Students who reported “Tall” at week 0 and week 24 were 13.4% and 11.7% of 477 SW.PY students, however at week 0 and week 24, 96.9% and 96.4% of students who reported “Tall” were normal height (**Table 4.41**).

4.4.3 Self-esteem in the area of academic and perception of academic performance

At the baseline, students who reported “Fair” (50.7%), “Good” (37.5%), “Poor” (8.6%), and “Very good” (3.1%) academic performance. Mean self-esteem scores of students who reported “Good” academic performance (8.3 ± 1.6) were significantly higher than those who reported “Poor” (6.8 ± 2.1), and “Fair” (7.5 ± 1.6) in the area of academic. Mean self-esteem scores of students who reported “Very Good” academic performance (10.6 ± 2.0) were significantly higher than those who reported “Good, Fair and Poor” in the area of academic. At the end of this study, mean self-esteem scores of students who reported “Fair” academic performance (7.4 ± 1.4) were significantly higher than those who reported “Poor” (6.4 ± 1.5) in the area of academic. Mean self-esteem scores of students who reported “Good” academic performance (8.7 ± 1.7) were significantly higher than those who reported “Poor and Fair” in the area of academic. Mean self-esteem scores of students who reported “Very Good” academic performance (10.1 ± 2.1) were significantly higher than those who reported “Poor, Fair, and Good” in the area of academic.

Students who reported “Poor” academic performance at week 0 and week 24 were 8.6% and 5.7% of 477 SW.PY students, however at week 0 and week 24, 51.2% and 55.6% of students who reported “Poor” had “Fair” academic performance. Students who reported “Fair” academic performance at week 0 and week 24 were 50.7% and 53.7% of 477 SW.PY students, however at week 0 and week 24, 58.7% and 53.5% of students who reported “Fair” had “Good” academic performance. Students who reported “Good” academic performance at week 0 and week 24 were 37.5% and 36.1% of 477 SW.PY students, however at week 0 and week 24, 71.5% and 74.4% of students who reported “Good” had “Good” academic performance. Students who reported “Very Good” academic performance at week 0 and week 24 were 3.1% and 4.6% of 477 SW.PY students, however at week 0 and week 24, 80.0%

and 72.7% of students who reported “Very Good” had “Good” academic performance (Table 4.42).

4.4.4 Self-esteem in the area of academic and academic performance

At the baseline and at the end of this study, mean self-esteem scores in the area of academic did not differ significantly among groups (“Poor, Fair, Good, and Very Good”).

4.4.5 Nutritional status, perception of health, and perception of blood parameters

At baseline, 27.2% of 713 SW.PY students who reported “Weakness”, 36.1% of them had underweight, at risk of overweight, and overweight whereas 72.8% of 713 SW.PY students who reported “Healthy”, 21.0% of them had underweight, at risk of overweight, and overweight. At the end of this study, students who reported “Weakness” had reported “Healthy” 43.8% and had still reported “Weakness” 56.2% whereas students who reported “Healthy” had still reported “Healthy” 88.6%, and had reported “Weakness” 11.4%. However, normal weight students in students who reported “Weakness” and in students who reported “Healthy” increased from 63.9% to 72.7%, and 79.0% to 83.8%.

Moreover, in 27.2% of 713 SW.PY students who reported “Weakness”, 71.6% of them had anemia, hyperuricemia, and hyperlipidemia whereas 72.8% of 713 SW.PY students who reported “Healthy”, 71.9% of them had anemia, hyperuricemia, and hyperlipidemia.

This study follow-up the above students with abnormal blood chemistry by blood examination, only 265 students participated at the end of study. At baseline, 27.2% of 265 SW.PY students who reported “Weakness”, 95.8% of them had anemia, hyperuricemia, and hyperlipidemia whereas 72.8% of 265 SW.PY students who reported “Healthy”, 97.4% of them had anemia, hyperuricemia, and hyperlipidemia. At the end of this study, students who reported “Weakness” had reported “Healthy” 48.6%, and had still reported “Weakness” 51.4% whereas students who reported “Healthy” had still reported “Healthy” 87.0%, and had reported “Weakness” 12.9%.

However, normal blood parameters in students who reported “Weakness and in students who reported “Healthy” increased from 4.2% to 36.1%, and 2.6% to 20.2%.

At baseline, 64.4% of 713 SW.PY students who reported “Normal” blood parameters, 63.8% of them had anemia, hyperuricemia, and hyperlipidemia whereas 35.6% of 713 SW.PY students who reported “Abnormal” blood parameters, 86.2% of them had anemia, hyperuricemia, and hyperlipidemia.

This study follow-up the above students with abnormal blood chemistry by blood examination, only 265 SW.PY students participated at the end of study. At the baseline, 55.1% of 265 SW.PY students had wrong perception of blood parameters due to this study found 54.3% of students who reported “Normal” blood parameters, 97.9% of them had anemia, hyperuricemia, and hyperlipidemia and 45.7% of students who reported “Abnormal” blood parameters, 4.1% of them had normal blood parameters whereas 44.9% of 265 SW.PY students had right perception of blood parameters due to this study found 45.7% of students who reported “Abnormal” blood parameters, 95.7% of them had anemia, hyperuricemia, and hyperlipidemia and 54.3% of students who reported “Normal” blood parameters, 2.1% of them had normal blood parameters. After receiving nutritional therapy at the end of this study, wrong perception of blood parameters decreased to 37.0%, these students were aware of the results of blood parameters.

4.4.6 Perception of skin color

At the baseline, most of the students reported “Brown” skin (56.4%), “Yellow” (26.2%), “White” (12.6%), and “Dark Brown” (4.8%). At the end of this study, most of the students reported “Brown” skin (53.2%), “Yellow” (27.3%), “White” (15.5%), and “Dark Brown” (4.0%).

4.4.7 Self-esteem and relationship with social environment

Mean self-esteem scores of students who reported “Good and Fair” family’s relationship were significantly lower than those who reported “Very Good” in the area of family as well as mean self-esteem scores of students who reported “Good” family’s relationship were significantly lower than those who reported “Very Good” in the area of global (**Table 4.43**). Mean self-esteem scores of students who reported

“Fair” teacher’s relationship were significantly lower than those who reported “Good” in the areas of academic and family (**Table 4.44**). Mean self-esteem scores of students who reported “Less intimate/less quarrel” friend’s relationship were significantly lower than those who reported “Intimate/not quarrel” in the areas of family, social, and global (**Table 4.45**).

4.4.8 Self-esteem, age groups, and family characteristic

Mean self-esteem scores of middle adolescents (16-19 years) was significantly lower than early adolescence (10-15 years) in the area of academic, whereas mean self-esteem scores of middle adolescents was significantly higher than early adolescents in the area of social (**Table 4.46**).

This study did not find significantly different of self-esteem scores when classified self-esteem by parent age (**Tables 4.47-4.48**). Mean self-esteem scores of students who had divorced-parents were significantly lower than those who had married-parents in the areas of family and social (**Table 4.49**). This study did not find significantly different when classified self-esteem by person who live with, number of sibling, and birth order (**Tables 4.50-4.52**).

4.4.9 Academic performance

At baseline, mean Thai language, English language, Chinese language, mathematic, art scores, and GPA of M.1-M.3 and M.4-M.6 females were significantly higher than those of males in the same class. Mean science score of M.1-M.3 females was significantly higher than that of M.1-M.3 males. Mean chemistry and biology scores of M.4-M.6 females were significantly higher than those of M.4-M.6 males (**Table 4.53**).

At the end of study, means Thai language, English language, Chinese language, mathematic, physical education, art scores, and GPA of M.1-M.3 and M.4-M.6 females were significantly higher than those of males in the same class. Mean science score of M.1-M.3 females was significantly higher than that of M.1-M.3 males. Mean chemistry and biology scores of M.4-M.6 females were significantly higher than those of M.4-M.6 males (**Table 4.54**).

Academic performance and nutritional status classified by BMI-for-age

At baseline, means Thai language, English language, Chinese language, art score, and GPA of at risk of overweight and overweight students were significantly lower than normal weight students. Mean of mathematic score of at risk of overweight students was significantly lower than normal weight students. Mean of science score of overweight students was significant lower than normal weight students (**Table 4.55**).

At the end of this study, means Thai language, English language, Chinese language and GPA score of at risk of overweight were significantly lower than normal weight students. Mean GPA score of underweight students was significantly lower than normal weight students (**Table 4.56**)

Table 4.40 Number and percentage of perception of body shape of 477 SW.PY students classified by BMI-for-age

BMI-for-age	Perception of body shape (week 0)				Perception of body shape (week 24)			
	Thin	Normal	Slightly fat	Fat	Thin	Normal	Slightly fat	Fat
	(n=77)	(n=240)	(n=88)	(n=72)	(n=87)	(n=218)	(n=99)	(n=73)
	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a
Underweight	24(31.2)	2(0.8)	-	-	22(25.3)	-	-	-
Normal weight	53(68.8)	222(92.5)	53(60.2)	24(33.3)	65(74.7)	210(96.3)	73(73.7)	31(42.5)
At risk of overweight	-	14(5.8)	23(26.1)	20(27.8)	-	8(3.7)	20(20.2)	16(21.9)
Overweight	-	2(0.8)	12(13.6)	28(38.9)	-	-	6(6.1)	26(35.6)

^a% of perception of body shape level

Table 4.41 Number and percentage of perception of height of 477 SW.PY students classified by height status

Height	Perception of height (week 0)			Perception of height (week 24)		
	Short	Normal	Tall	Short	Normal	Tall
	(n=176)	(n=237)	(n=64)	(n=171)	(n=250)	(n=56)
	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a
Short	8 (4.5)	-	-	12 (7.0)	1 (0.4)	-
Normal	168 (95.5)	236 (99.6)	62 (96.9)	159 (93.0)	248 (99.2)	54 (96.4)
Tall	-	1 (0.4)	2 (3.1)	-	1 (0.4)	2 (3.6)

^a% of perception of height level

Table 4.42 Number and percentage of perception of academic performance of 477 SW.PY students classified by academic performance

Academic performance	Perception of academic performance (week 0)				Perception of academic performance (week 24)			
	Poor	Fair	Good	Very good	Poor	Fair	Good	Very good
	(n=41)	(n=242)	(n=179)	(n=15)	(n=27)	(n=256)	(n=172)	(n=22)
	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a	n(%) ^a
Poor (1.00-1.99)	1 (2.4)	7 (2.9)	-	-	-	11 (4.3)	1 (0.6)	-
Fair (2.00-2.99)	21 (51.2)	92 (38.0)	45 (25.1)	3 (20.0)	15 (55.6)	106 (41.4)	39 (22.7)	6 (27.3)
Good (3.00-3.99)	19 (46.3)	142 (58.7)	128 (71.5)	12 (80.0)	12 (44.4)	137 (53.5)	128 (74.4)	16 (72.7)
Very good (4.00)	-	1 (0.4)	6 (3.4)	-	-	2 (0.8)	4 (2.3)	-

^a% of perception of academic performance level

Table 4.43 Mean ($\pm$ SD) of self-esteem scores of 477 SW.PY students classified by relationship with family

Self-esteem scores	Family's relationship			
	Very Good	Good	Fair	Poor
	(n=219)	(n=243)	(n=11)	(n=4)
Academic area	8.0 $\pm$ 1.7	7.7 $\pm$ 1.9	7.1 $\pm$ 1.9	7.8 $\pm$ 1.7
Body image area	5.3 $\pm$ 2.0	4.9 $\pm$ 2.2	5.2 $\pm$ 2.6	3.3 $\pm$ 2.5
Family area	14.4 $\pm$ 2.2	12.8 $\pm$ 2.4 ^{kl}	9.7 $\pm$ 3.6 ^{k2}	7.8 $\pm$ 3.6
Social area	8.8 $\pm$ 2.0	8.5 $\pm$ 1.9	8.5 $\pm$ 1.9	8.5 $\pm$ 2.9
Global area	10.4 $\pm$ 2.1	9.7 $\pm$ 2.3 ^{k2}	8.9 $\pm$ 3.3	6.8 $\pm$ 4.6
Total	46.8 $\pm$ 6.9	43.5 $\pm$ 8.1 ^{kl}	39.4 $\pm$ 11.5	34.0 $\pm$ 14.4

Significantly different from very good, ^{kl}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

Very Good = You feel *happy* when you are with your family and you consult with them *every time* when you have problems.

Good = You feel *happy* when you are with your family and you consult with them *sometime* when you have problems.

Fair = You feel *uncomfortable* when you are with your family and you consult with them *sometime* when you have problems.

Poor = You feel *uncomfortable* when you are with your family and you *never* consult with them when you have problems.

Table 4.44 Mean (±SD) of self-esteem scores of 477 SW.PY students classified by relationship with teachers

Self-esteem scores	Teacher's relationship (n=477)	
	Good (n=448)	Fair (n=29)
Academic area	7.9±1.8	6.6±2.0 ^{k1}
Body image area	5.1±2.1	4.7±2.1
Family area	13.5±2.5	12.0±2.9 ^{k3}
Social area	8.7±1.9	8.0±2.1
Global area	10.0±2.3	8.9±2.6
Total	45.2±7.9	40.1±8.2^{k2}

Significantly different from good, ^{k1}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

Good = You feel free to consult with your teachers, **Fair** = You feel uncomfortable to consult with your teachers

Table 4.45 Mean (±SD) of self-esteem scores of 476 SW.PY students classified by relationship with friends

Self-esteem scores	Friend's relationship (n=476)	
	Intimate/not quarrel (n=226)	Less intimate/less quarrel (n=250)
Academic area	7.8±1.7	7.8±1.9
Body image area	5.1±2.0	5.0±2.2
Family area	13.8±2.7	13.1±2.5 ^{k2}
Social area	9.2±1.9	8.2±1.9 ^{k1}
Global area	10.2±2.3	9.7±2.3 ^{k3}
Total	46.1±7.8	43.8±8.1^{k2}

Significantly different from intimate/not quarrel, ^{k1}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

Table 4.46 Mean ($\pm$ SD) of self-esteem scores of 477 SW.PY students classified by age

Self-esteem scores	Age	
	Early adolescence	Middle adolescence
	(10-15 years)	(16-19 years)
	(n=324)	(n=154)
Academic area	7.9 $\pm$ 1.8	7.6 $\pm$ 1.8 ^{k3}
Body image area	5.1 $\pm$ 2.1	4.9 $\pm$ 2.1
Family area	13.3 $\pm$ 2.6	13.5 $\pm$ 2.6
Social area	8.5 $\pm$ 1.8	8.9 $\pm$ 2.1 ^{k3}
Global area	9.9 $\pm$ 2.3	10.1 $\pm$ 2.3
Total	44.7 $\pm$ 7.8	45.0 $\pm$ 8.4

Significantly different from early adolescence, ^{k3} p < 0.05

Table 4.47 Mean ($\pm$ SD) of self-esteem scores of 453 SW.PY students classified by father age

Self-esteem scores	Father age (n=453)		
	Young adulthood	Middle adulthood	Older adulthood
	(25-44 years)	(45-64 years)	(≥ 65 years)
	(n=203)	(n=245)	(n=5)
Academic area	7.9 $\pm$ 1.8	7.7 $\pm$ 1.8	7.2 $\pm$ 1.8
Body image area	5.1 $\pm$ 2.1	5.0 $\pm$ 2.1	4.6 $\pm$ 3.2
Family area	13.5 $\pm$ 2.3	13.3 $\pm$ 2.7	14.6 $\pm$ 1.5
Social area	8.6 $\pm$ 1.8	8.7 $\pm$ 2.1	7.6 $\pm$ 2.3
Global area	10.0 $\pm$ 2.2	10.0 $\pm$ 2.4	9.8 $\pm$ 3.0
Total	45.1 $\pm$ 7.6	44.7 $\pm$ 8.3	43.8 $\pm$ 8.2

Table 4.48 Mean ($\pm$ SD) of self-esteem scores of 470 SW.PY students classified by mother age

Self-esteem scores	Mother age (n=470)	
	Young adulthood (25-44 years)	Middle adulthood (45-64 years)
	(n=286)	(n=184)
Academic area	7.9 $\pm$ 1.9	7.6 $\pm$ 1.7
Body image area	5.1 $\pm$ 2.1	5.0 $\pm$ 2.1
Family area	13.6 $\pm$ 2.5	13.2 $\pm$ 2.7
Social area	8.6 $\pm$ 2.0	8.7 $\pm$ 2.0
Global area	10.0 $\pm$ 2.2	9.9 $\pm$ 2.4
Total	45.2 $\pm$ 7.9	44.3 $\pm$ 8.2

Significantly different from married, ^{k1}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

Table 4.49 Mean ($\pm$ SD) of self-esteem scores of 448 SW.PY students classified by parents marital status

Self-esteem scores	Parents marital status (n=448)	
	Married	Divorced
	(n=370)	(n=78)
Academic area	7.8 $\pm$ 1.8	7.8 $\pm$ 1.6
Body image area	5.1 $\pm$ 2.1	5.0 $\pm$ 2.2
Family area	13.5 $\pm$ 2.5	12.8 $\pm$ 2.6 ^{k3}
Social area	8.7 $\pm$ 1.0	8.2 $\pm$ 2.0 ^{k3}
Global area	10.4 $\pm$ 2.3	9.6 $\pm$ 2.2
Total		43.4 $\pm$ 7.7

Significantly different from married, ^{k1}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

Table 4.50 Mean ($\pm$ SD) of self-esteem scores of 477 SW.PY students classified by person who live with

Self-esteem scores	Person who live with			
	Father & Mother	Father	Mother	Relative
	(n=321)	(n=19)	(n=68)	(n=69)
Academic area	7.8±1.9	7.8±1.0	7.5±1.7	8.0±1.8
Body image area	5.1±2.0	5.0±1.6	5.1±2.2	4.9±2.5
Family area	13.6±2.6	12.7±1.8	12.8±2.7	13.1±2.3
Social area	8.8±2.0	8.5±2.0	8.1±1.9	8.7±1.7
Global area	10.1±2.4	9.5±2.1	9.6±2.1	10.1±2.0
Total	45.3±8.3	43.5±5.6	43.1±8.0	44.8±7.1

Table 4.51 Mean ($\pm$ SD) of self-esteem scores of 477 SW.PY students classified by number of sibling

Self-esteem scores	Number of sibling		
	1 (n=111)	2 (n=246)	≥ 3 (n=120)
Academic area	7.8 $\pm$ 1.7	7.7 $\pm$ 1.8	8.0 $\pm$ 1.9
Body image area	4.9 $\pm$ 2.0	4.9 $\pm$ 2.2	5.5 $\pm$ 2.1
Family area	13.4 $\pm$ 2.7	13.4 $\pm$ 2.6	13.5 $\pm$ 2.5
Social area	8.6 $\pm$ 1.9	8.7 $\pm$ 2.0	8.6 $\pm$ 1.9
Global area	9.8 $\pm$ 2.3	10.0 $\pm$ 2.4	10.1 $\pm$ 2.3
Total	44.5 $\pm$ 7.8	44.7 $\pm$ 8.3	45.5 $\pm$ 7.6

Table 4.52 Mean ($\pm$ SD) of self-esteem scores of 477 SW.PY students classified by birth order

Self-esteem scores	Birth order		
	1 st (n=272)	2 nd (n=180)	$\geq 3^{\text{rd}}$ (n=25)
Academic area	7.8 $\pm$ 1.7	7.7 $\pm$ 1.9	8.3 $\pm$ 1.5
Body image area	4.9 $\pm$ 2.1	5.2 $\pm$ 2.2	5.6 $\pm$ 1.8
Family area	13.4 $\pm$ 2.5	13.4 $\pm$ 2.8	13.6 $\pm$ 2.6
Social area	8.6 $\pm$ 1.9	8.7 $\pm$ 2.0	8.5 $\pm$ 1.9
Global area	9.9 $\pm$ 2.3	10.0 $\pm$ 2.4	10.4 $\pm$ 2.1
Total	44.6 $\pm$ 7.7	45.0 $\pm$ 8.5	46.4 $\pm$ 7.3

Table 4.53 Mean ($\pm$ SD) of each course score (semester 1/2012) of 477 SW.PY students

Course*	M.1-M.3 (n=301)		M.4-M.6 (n=176)	
	Male (n=147)	Female (n=154)	Male (n=85)	Female (n=91)
Thai language	69.5 $\pm$ 10.7	79.7 $\pm$ 9.3 ^{k1}	69.9 $\pm$ 7.3	76.1 $\pm$ 6.0 ^{k1}
(Range)	(50-93)	(50-97)	(50-87)	(62-90)
English language	62.8 $\pm$ 9.2	71.7 $\pm$ 8.6 ^{k1}	69.3 $\pm$ 8.7	77.1 $\pm$ 8.2 ^{k1}
(Range)	(50-93)	(50-90)	(55-88)	(60-93)
Chinese language	69.8 $\pm$ 13.3	84.6 $\pm$ 10.5 ^{k1}	73.1 $\pm$ 14.4	86.0 $\pm$ 11.1 ^{k1}
(Range)	(50-99)	(50-100)	(50-97)	(56-100)
Mathematic	76.6 $\pm$ 7.5	78.7 $\pm$ 5.9 ^{k2}	75.5 $\pm$ 9.1	78.6 $\pm$ 8.9 ^{k3}
(Range)	(60-96)	(60-93)	(50-98)	(60-98)
Science	68.5 $\pm$ 8.0	74.5 $\pm$ 6.5 ^{k1}		
(Range)	(50-93)	(50-89)		
Physics¹			69.2 $\pm$ 8.9	70.8 $\pm$ 8.9
(Range)			(50-90)	(60-90)
Chemistry²			70.2 $\pm$ 10.4	77.7 $\pm$ 7.7 ^{k1}
(Range)			(53-89)	(58-94)
Biology³			69.5 $\pm$ 8.0	75.0 $\pm$ 6.5 ^{k1}
(Range)			(64-81)	(66-91)
Physical education⁴	87.2 $\pm$ 7.9	88.2 $\pm$ 7.4	83.5 $\pm$ 7.8	85.0 $\pm$ 6.0
(Range)	(64-98)	(67-99)	(66-92)	(72-92)
Art	73.1 $\pm$ 12.1	84.1 $\pm$ 10.2 ^{k1}	85.3 $\pm$ 8.7	89.5 $\pm$ 6.8 ^{k1}
(Range)	(50-98)	(51-99)	(60-100)	(70-100)
GPA**	2.84 $\pm$ 0.56	3.44 $\pm$ 0.39 ^{k1}	3.05 $\pm$ 0.48	3.46 $\pm$ 0.37 ^{k1}
(Range)	(1.78-3.98)	(2.00-4.00)	(2.06-4.00)	(2.78-4.00)

¹From M.4-M.6 (n=158, Male=74, Female=84), ²From M.4-M.6 (n=150, Male=71, Female=79)³From M.4-M.6 (n=98, Male=45, Female=53), ⁴From M.4-M.6 (n=128, Male=62, Female=66)Significantly different from male, ^{k1}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

*Full score = 100, **Full GPA = 4.0

Table 4.54 Mean ($\pm$ SD) of each course score (semester 2/2012) of 477 SW.PY students

Course	M.1-M.3 (n=301)		M.4-M.6 (n=176)	
	Male (n=147)	Female (n=154)	Male (n=85)	Female (n=91)
Thai language	72.2 $\pm$ 10.9	80.3 $\pm$ 8.5 ^{k1}	75.6 $\pm$ 10.2	79.0 $\pm$ 11.3 ^{k3}
(Range)	(50-91)	(55-94)	(50-95)	(50-97)
English language	66.4 $\pm$ 12.6	74.3 $\pm$ 10.4 ^{k1}	65.7 $\pm$ 8.4	72.9 $\pm$ 9.6 ^{k1}
(Range)	(50-91)	(50-96)	(50-83)	(55-91)
Chinese language	64.5 $\pm$ 15.2	79.4 $\pm$ 15.6 ^{k1}	82.1 $\pm$ 16.0	90.9 $\pm$ 10.0 ^{k1}
(Range)	(50-99)	(50-100)	(50-100)	(50-100)
Mathematic	77.7 $\pm$ 9.8	79.7 $\pm$ 7.9 ^{k1}	78.3 $\pm$ 7.6	78.8 $\pm$ 7.1
(Range)	(50-95)	(60-98)	(56-99)	(55-98)
Science	68.4 $\pm$ 10.9	74.3 $\pm$ 11.1 ^{k1}		
(Range)	(50-92)	(50-95)		
Physics¹			70.3 $\pm$ 8.2	71.8 $\pm$ 8.2
(Range)			(50-95)	(55-86)
Chemistry²			69.7 $\pm$ 11.0	78.8 $\pm$ 10.0 ^{k1}
(Range)			(50-93)	(65-95)
Biology³			73.5 $\pm$ 5.7	77.4 $\pm$ 4.9 ^{k1}
(Range)			(59-88)	(65-89)
Physical education⁴	77.6 $\pm$ 8.8	79.9 $\pm$ 7.4 ^{k3}	77.8 $\pm$ 5.7	81.2 $\pm$ 7.0 ^{k2}
(Range)	(51-96)	(52-96)	(64-89)	(70-90)
Art	70.8 $\pm$ 9.8	77.3 $\pm$ 9.5 ^{k1}	83.5 $\pm$ 7.2	85.8 $\pm$ 8.8
(Range)	(51-95)	(52-96)	(55-92)	(31-99)
GPA**	2.82 $\pm$ 0.55	3.34 $\pm$ 0.50 ^{k1}	3.13 $\pm$ 0.45	3.49 $\pm$ 0.38 ^{k1}
(Range)	(1.72-4.00)	(1.96-4.00)	(2.06-3.93)	(2.73-4.00)

¹From M.5-M.6 (n=158, Male=74, Female=84), ²From M.5-M.6 (n=158, Male=74, Female=84)³From M.5-M.6 (n=158, Male=74, Female=84), ⁴From M.5-M.6 (n=128, Male=62, Female=66)Significantly different from male, ^{k1}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

*Full score = 100, **Full GPA = 4.00

Table 4.55 Mean ($\pm$ SD) of each course score (semester 1/2012) of 477 SW.PY students classified by BMI-for-age

Course	BMI for age	n	Score	Range
Thai language	Underweight	n=26	74.0 $\pm$ 9.0	(57-89)
	Normal weight	n=352	75.2 $\pm$ 9.7	(50-97)
	At risk of overweight	n=57	72.0 $\pm$ 10.3 ^{k3}	(50-91)
	Overweight	n=42	68.4 $\pm$ 10.1 ^{k1}	(50-86)
English language	Underweight	n=26	66.9 $\pm$ 9.2	(54-88)
	Normal weight	n=352	70.6 $\pm$ 9.9	(50-93)
	At risk of overweight	n=57	67.3 $\pm$ 10.2 ^{k3}	(50-91)
	Overweight	n=42	65.7 $\pm$ 10.8 ^{k2}	(50-93)
Chinese language	Underweight	n=26	80.0 $\pm$ 13.0	(56-100)
	Normal weight	n=352	79.6 $\pm$ 13.8	(50-100)
	At risk of overweight	n=57	73.9 $\pm$ 14.4 ^{k2}	(50-96)
	Overweight	n=42	72.0 $\pm$ 14.8 ^{k2}	(50-99)
Mathematic	Underweight	n=26	77.5 $\pm$ 6.9	(61-93)
	Normal weight	n=352	77.9 $\pm$ 7.9	(50-98)
	At risk of overweight	n=57	75.6 $\pm$ 7.5 ^{k3}	(60-91)
	Overweight	n=42	76.2 $\pm$ 6.7	(60-90)
Science	Underweight	n=14	71.1 $\pm$ 10.2	(50-83)
	Normal weight	n=216	72.2 $\pm$ 7.5	(50-93)
	At risk of overweight	n=36	70.4 $\pm$ 7.8	(50-85)
	Overweight	n=35	69.1 $\pm$ 8.9 ^{k3}	(51-86)
Physical education	Underweight	n=22	88.2 $\pm$ 7.0	(75-98)
	Normal weight	n=316	86.9 $\pm$ 7.2	(65-99)
	At risk of overweight	n=51	84.9 $\pm$ 8.6	(67-99)
	Overweight	n=40	86.6 $\pm$ 9.2	(64-98)
Art	Underweight	n=26	84.1 $\pm$ 9.1	(59-98)
	Normal weight	n=352	83.6 $\pm$ 11.0	(50-100)
	At risk of overweight	n=57	75.8 $\pm$ 13.3 ^{k3}	(50-96)
	Overweight	n=42	75.8 $\pm$ 13.2 ^{k1}	(50-99)
Physic	Underweight	n=7	65.0 $\pm$ 9.7	(50-80)
	Normal weight	n=125	70.5 $\pm$ 8.7	(57-90)
	At risk of overweight	n=19	69.0 $\pm$ 9.2	(60-87)
	Overweight	n=7	70.1 $\pm$ 10.9	(55-85)
Chemistry	Underweight	n=7	74.0 $\pm$ 8.5	(60-84)
	Normal weight	n=120	74.7 $\pm$ 9.8	(53-94)
	At risk of overweight	n=17	70.8 $\pm$ 10.0	(58-88)
	Overweight	n=6	72.5 $\pm$ 11.8	(53-85)
Biology	Underweight	n=3	71.8 $\pm$ 3.5	(60-80)
	Normal weight	n=79	70.0 $\pm$ 10.0	(64-90)
	At risk of overweight	n=13	69.7 $\pm$ 9.6	(52-86)
	Overweight	n=3	65.3 $\pm$ 13.6	(70-86)
GPA**	Underweight	n=26	3.15 $\pm$ 0.48	(2.43-4.00)
	Normal weight	n=352	3.25 $\pm$ 0.51	(1.81-4.00)
	At risk of overweight	n=57	3.01 $\pm$ 0.56 ^{k2}	(1.78-3.97)
	Overweight	n=42	2.91 $\pm$ 0.59 ^{k1}	(1.90-3.91)

Significantly different from normal weight, ^{k1}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

*Full score = 100, **Full GPA = 4.00

Table 4.56 Mean ($\pm$ SD) of each course score (semester 2/2012) of 477 SW.PY students classified by BMI-for-age

Course	BMI for age	n	Score	Range
Thai language	Underweight	n=22	75.3 $\pm$ 10.1	(55-88)
	Normal weight	n=379	77.3 $\pm$ 10.5	(50-97)
	At risk of overweight	n=44	71.8 $\pm$ 11.8 ^{k2}	(50-91)
	Overweight	n=32	77.8 $\pm$ 10.3	(56-91)
English language	Underweight	n=22	66.6 $\pm$ 9.0	(51-82)
	Normal weight	n=379	70.8 $\pm$ 11.1	(50-93)
	At risk of overweight	n=44	67.1 $\pm$ 13.7 ^{k3}	(50-96)
	Overweight	n=32	68.5 $\pm$ 11.2	(50-88)
Chinese language	Underweight	n=22	82.1 $\pm$ 13.1	(55-100)
	Normal weight	n=379	78.6 $\pm$ 17.3	(50-100)
	At risk of overweight	n=44	67.8 $\pm$ 17.1 ^{kl}	(50-100)
	Overweight	n=32	74.6 $\pm$ 18.5	(50-100)
Mathematic	Underweight	n=22	75.8 $\pm$ 6.7	(65-90)
	Normal weight	n=379	79.0 $\pm$ 8.3	(50-99)
	At risk of overweight	n=44	78.0 $\pm$ 8.1	(60-96)
	Overweight	n=32	77.9 $\pm$ 9.6	(53-95)
Science	Underweight	n=9	72.4 $\pm$ 13.7	(50-95)
	Normal weight	n=236	72.0 $\pm$ 11.1	(50-94)
	At risk of overweight	n=32	68.2 $\pm$ 12.5	(50-89)
	Overweight	n=24	70.0 $\pm$ 11.6	(51-86)
Physical education	Underweight	n=18	79.3 $\pm$ 7.9	(66-96)
	Normal weight	n=341	79.2 $\pm$ 7.4	(51-96)
	At risk of overweight	n=41	77.0 $\pm$ 8.9	(52-93)
	Overweight	n=29	79.0 $\pm$ 9.4	(52-94)
Art	Underweight	n=22	81.7 $\pm$ 8.7	(62-91)
	Normal weight	n=379	78.1 $\pm$ 10.8	(31-99)
	At risk of overweight	n=44	77.2 $\pm$ 11.1	(52-96)
	Overweight	n=32	75.8 $\pm$ 9.9	(52-92)
Physic	Underweight	n=8	66.6 $\pm$ 6.1	(58-75)
	Normal weight	n=131	71.6 $\pm$ 8.0	(55-86)
	At risk of overweight	n=12	67.0 $\pm$ 8.1	(60-82)
	Overweight	n=7	73.0 $\pm$ 12.5	(55-86)
Chemistry	Underweight	n=8	69.0 $\pm$ 7.2	(60-81)
	Normal weight	n=131	75.4 $\pm$ 11.6	(50-95)
	At risk of overweight	n=12	69.4 $\pm$ 7.4	(55-82)
	Overweight	n=7	73.6 $\pm$ 14.9	(55-92)
Biology	Underweight	n=8	71.4 $\pm$ 4.2 ^{k3}	(66-77)
	Normal weight	n=131	75.8 $\pm$ 5.6	(59-89)
	At risk of overweight	n=12	78.0 $\pm$ 5.2	(69-86)
	Overweight	n=7	71.7 $\pm$ 5.4	(66-81)
GPA	Underweight	n=22	3.13 $\pm$ 0.5 ^{k3}	(2.14-3.96)
	Normal weight	n=379	3.21 $\pm$ 0.5	(1.72-4.00)
	At risk of overweight	n=44	2.91 $\pm$ 0.6 ^{kl}	(1.87-3.87)
	Overweight	n=32	3.09 $\pm$ 0.6	(1.93-3.93)

Significantly different from normal weight, ^{kl}p < 0.001, ^{k2}p < 0.01, ^{k3}p < 0.05

*Full score = 100, **Full GPA = 4.0

CHAPTER V

DISCUSSION

Srinagarindra the Princess Mother School, Phayao (SW.PY) is a public secondary school in Royal Honour. SW.PY was one of twelve schools all over Thailand, which established in recognition of the royal concern of Somdet Phra Srinagarindra Borommarajachonnani, or The Princess Mother for children's education. The twelve schools are named depending to the province that the school is located, i.e. Yala, Nakhon Si Thammarat, Phuket, Rayong, Samut Sakorn, Kanchanaburi, Lop Buri, Si Sa ket, Roi Et, Nong Bua Lam Phu, Kamphaeng Phet, and Phayao.

SW.PY is a boarding school where all students study and live during the school year with their fellow students and teachers. The word "boarding" is used in the sense of "bed and board" that is, food and lodging.

This was prospective study aimed to assess the relationships of nutritional status and self-esteem, and study the effect of nutritional therapy on self-esteem in SW.PY students.

5.1 Nutritional therapy

Some research showed that there is a growing global childhood obesity epidemic with a large variation in secular trend across countries (44-45). Effective interventions are needed at various levels to reduce this problem among children.

When we classified nutritional status by BMI-for-age (37) we found 8.3% of 713 SW.PY students were overweight, by percentage of body fat (38) we found 4.8% had excess body fat. In 2010 Rattanayosee et al (46) studied in Thailand at Princess Chulabhorn's College Chiangrai (PCCCR) which is a boarding science high school of the northern part of Thailand, different from SW.PY which is a boarding science and

art high school, they found 9.6% of 820 PCCCR students were overweight, 12.4% had excess body fat. PCCCR had obese students more than SW.PY, this may be due to PCCCR is science high school thus they need to spent most time in their class and their assigned homework while SW.PY is science and art high school thus they have more free time to do some outstanding activities such as unicycle, glider, wushu, marching band, symphony orchestra, and rugby.

This study found that parents who graduated bachelor degree or higher had more obese children than lower educational level. Skipping meals did not affect body weight status. Most of overweight students always have fatty meat.

When compare these obese prevalences with other Asian countries: in 2007 Rampal et al., (47) studied in 2,152 Malaysian aged 15-19 years, used WHO criteria ($\text{BMI} \geq 30 \text{ kg/m}^2$ = obese) found that the prevalence of obesity was 6.5% lower than our study may be due to using different WHO criteria (37), eg. in 15 year-female ($\text{BMI} \geq 26.3 \text{ kg/m}^2$ = overweight) and 15 year-male ($\text{BMI} \geq 25.2 \text{ kg/m}^2$ = overweight).

In 2008 Bhardwaj et al., (48) studied in 941 government schools in New Delhi, aged 14-17 years used cut-offs for overweight based on 85th percentile of age and gender specific found that the prevalence of overweight was 11.3%, it is higher than our study due to the different criteria, socio-economic, and lack of play area and limited open space around their home.

Obesity increases risk factor of chronic diseases such as diabetes mellitus, hypertension, dyslipidemia, cardiovascular disease. Moreover, obesity also leads to risk of psychosocial problem such as negative body image, low self-esteem (49). Therefore, prevention and treatment of this problem is important especially in adolescence for entering to healthy adults and wellbeing.

Several strategies for weight loss from clinical guideline for treatment of overweight and obesity (50-51) such as dietary therapy, physical activity, behavior therapy, pharmacotherapy, and surgery. In this study we used nutritional therapy for obesity, anemia, hyperuricemia, and hyperlipidemia because this therapy is cost saving and long-term outcome. The long-term impact of medications that have central nervous system effects or that interfere with absorption of nutrients are particularly concerning when used in growing children and adolescents (52).

According to Verstraeten et al studies (53), a systemic review about effectiveness of preventive school-based obesity interventions, students age 6-18 years, found that 8 of 12 studies can reduce BMI, 3 of 8 used physical activity program alone and 5 of 8 used nutrition education program combined with physical activity intervention.

The nutritional therapy in this study was performed at weeks 0, 8, 16, and 24 for obesity, anemia, hyperuricemia, and hyperlipidemia. This study gave group nutritional education for all students and individual for students who had a problem. Various medias used for counseling and nutritional education eg. brochures, poster, power point, and video. Food demonstrated to control such conditions as low calorie foods, low cholesterol foods, seasoning, drinks, and snacks. Role-play about diet-related chronic disease shown by students. After receiving the nutritional therapy for 24 weeks, the nutritional therapy was an effective to improve body weight status, which 95.2% (40 of 42), 55.1% (43 of 78), and 49.1% (29 of 59) in underweight, at risk of overweight, and overweight students, respectively.

NIH (50) suggested that the effective nutritional therapy for weight reduction, one who receiving this therapy should reduce body weight at least 10% of initial weight, especially in adult obese. The adolescent growth spurt is the rapid and intense increase in the rate of growth in height and weight, thus when we follow-up weight reduction in obese adolescents, we assessed by body weight status classified by BMI-for-age and percentage of body fat, excess of total body fat is the best parameter for obese diagnosis.

In this study, based on percentage of body fat and BMI-for age, 52.6% of at risk of overweight and overweight students had normal body fat, this possibly due to their large frame size. When follow-up by percentage of body fat 29.2% of over and excess body fat students had become normal body fat, 53.8% of them had body fat reduction.

Twenty-five overweight and at risk of overweight students completed 3-day 24-hour dietary records. When comparison energy intake from 3-day 24-hour dietary records, range 1048-2730 kcal/d, with energy requirement (54), for their current body weight (obese weight), range 1785-2806 kcal/d, their recorded energy

intakes were lower than their energy requirement. Thus this evidence may be due to the students try to reduce their energy intake for weight reduction.

However, 13 of 25 overweight and at risk of overweight students had weight gain, thus their actual energy intake should be higher than their energy requirement and their 3-day 24-hour dietary records were underreports. Twelve of 25 overweight and at risk of overweight students had weight loss, 9 of them had their energy intake from 3-day 24-hour dietary records lower than their energy requirement for maintain their current weight. However, 3 of them had unreliable dietary records.

Fourteen of over and excess body fat students completed 3-day 24-hour dietary records. When comparison energy intake from 3-day 24-hour dietary records, range 1048-2730 kcal/d, with energy requirement (54), for their current body weight (obese weight), range 1785-2806 kcal/d, their recorded energy intakes were lower than energy requirement. Thus this evidence may be due to the students try to reduce their energy intake for body fat reduction.

Thirteen of 14 over and excess body fat students had decrease body fat, 8 of them had their energy intake from 3-day 24-hour dietary records lower than their energy requirement for maintain their current weight. However, 5 of them and 1 of increase body fat students had unreliable dietary records.

According to Santos et al (55) studied in 36 obese adolescents (BMI 34.5 ± 3.5 kg/m²) for 9 month nutritional intervention for weight reduction by deficit 500 kcal/person/day from total energy expenditure of each participant and increase physical activity at least 3 hour/week, found that 20 of 36 (55.6%) adolescents had mean weight loss 6.2 kg from baseline (4.2%) (min-max = 0.24-15.6%). However in our study, 24 weeks of nutritional therapy for weight reduction by nutritional education, in 72 of 137 (52.6%) at risk of overweight and overweight students (BMI = 24.9 ± 3.3 kg/m²) showed mean weight loss 3.2 kg from baseline (4.5%) (min-max= 0.4-16.7%).

From health questionnaire, 15.3% of overweight students did not have extra exercise from their class, which two times higher than that in underweight students. Thus we encouraged them for exercise through physical education teacher.

From dietary behavior questionnaire, 13.6% of overweight students skipped dinner meal and then they replaced with high fat and high carbohydrate

snacks, that are important cause of their overweight. However, after receiving nutritional therapy, only 6.8% of these overweight students still skipped their dinner meal.

According to Mika et al (56) studied in 21 anorexia nervosa female adolescents ($BMI = 15.5 \pm 1.1 \text{ kg/m}^2$) for 15 week dietary treatment by set menu starting with 1,864 kcal/d to 2,223 kcal/d with normal caloric distribution (carbohydrate:protein:fat = 50:20:30), thus their mean BMI increased significantly ($BMI = 17.4 \pm 0.7 \text{ kg/m}^2$). Compared with our study, 42 underweight students ($BMI = 15.0 \pm 1.0 \text{ kg/m}^2$) for 24 week nutritional therapy by nutritional education, the data at the end of study showed mean BMI increased significantly ($BMI = 16.0 \pm 1.1 \text{ kg/m}^2$), mean weight gain 2.4 kg from baseline (6.6% of mean weight at baseline).

Four of underweight students completed 3-day 24-hour dietary records. When comparison energy intake from 3-day 24-hour dietary records, range 1049-2089 kcal/d, with energy requirement (54), for their current body weight (thin weight), range 1482-1895 kcal/d, their recorded energy intakes were higher than energy requirement. This evidence may be due to the students try to increase their energy intake for gain weight.

However, 4 of underweight students had weight gain, 3 of them had their recorded energy intake lower than their energy requirement, thus their 3-day 24-hour dietary records were underreports. One of them had their energy intake from 3-day 24-hour dietary records higher than their energy requirement for maintain their current weight, thus she had weight gain.

Twelve of low body fat students completed 3-day 24-hour dietary records. When comparison energy intake from 3-day 24-hour dietary records, range 1049-2089 kcal/d, with energy requirement (54), for their current body weight (thin weight), range 1510-2183 kcal/d, their recorded energy intakes were lower than energy requirement. Thus these students may have lower body fat at the end of study.

However, 9 of 12 low body fat students had increase body fat, thus their energy intakes from 3-day 24-hour dietary records were unreliable dietary records. Two of 12 low body fat students had decrease body fat, 1 of them had their energy intake from 3-day 24-hour dietary records lower than their energy requirement for maintain their current weight. One of 12 low body fat students had no change body fat

and their energy intake from 3-day 24-hour dietary record was unreliable dietary record.

From Socio-economic questionnaire, 66.7% of underweight students had family income less than 30,000 baht/month.

Prevalences of anemia, hyperuricemia, hypertriglyceridemia, low HDL-cholesterol level, and hypercholesterolemia were 10.1%, 61.4%, 2.1%, 8.4%, and 10.8% of 713 SW.PY students close to the study in 813 PCCCR students in 2012 by Puengputtho et al (57), found that anemia, hyperuricemia, hypertriglyceridemia, low HDL-cholesterol level, and hypercholesterolemia were 13.5%, 46.1%, 1.4%, 10.7%, and 15.4%, respectively.

Although, first five order of family medical history related to diet-related chronic disease were diabetes, hypertension, obesity, hypercholesterolemia, and gout, however from blood examination and body composition assessment the study observed only three of first five order diseases were hyperuricemia, hypercholesterolemia, and obesity.

Anemia

In 713 SW.PY students, aged 12-18 years, this study found that most of anemic students (98.6%) were females similar to Puengputtho et al (57) studied in 813 PCCCR students aged 12-18 years, most of anemic students (99.1%) were female. According to Balci et al (58) studied in 1,120 Turkey adolescents aged 12-16 years based on cut-offs for anemia, hb < 12 g/dl for females and hb < 13 g/dl for males found that 5.6% of them were anemia, 88.9% and 11.1% of anemic were females and males. This finding possibly due to their irregular eating habits of animal food, which are high heme iron source and blood loss during menstruation period (59). In our study, major cause of anemia may be due to menstrual blood loss more than inadequate intake of iron from animal food because SW.PY is boarding school which concern about the nutritious and delicious meals, those menus and recipes are developed by teachers and students.

On the contrary, Singh et al (60) studied in Far western part of Nepal, 2,027 adolescents aged 10-19 years based on cut-offs for anemia, hb < 12 g/dl found that 52.0 % of them were anemia, 57.0% and 43.0% were females and males, this

prevalence was slightly different between females and males may be due to their lower iron intake from animal food and high blood loss from parasitic infections at rural area of far western part of Nepal.

After giving nutritional therapy, 37 (51.4%) anemic students completed at the end of study. The nutritional therapy, we suggested the local menu is “Khanomjean Nam-ngeaw” for anemia students because in “Khanomjean Nam-ngeaw” consists of ferric from pork blood and vitamin C from tomatoes and lemons as well as recommend school canteen serve fruits after lunch, and recommend students drink low fat milk as snack. Thus 67.6% of this anemic students has become normal hemoglobin level, and 8.1% of them had increased hemoglobin level but did not reach normal. However, 16.2% of them had stable slightly anemia, Hb range 11.6-11.9 g/dL throughout the study. 3 of them had decreased hemoglobin level because 1 was thalassemia, and the other 2 were chronic anemia which we encouraged their family to consult hematologist for further investigation.

Hyperuricemia

The final breakdown product of purine catabolism in humans is uric acid. Purines are found in some foods and drinks. These include liver, anchovies, mackerel, dried beans and peas, and beer. The liver and intestinal mucosa produce most of the uric acid. The kidneys eliminate two thirds of the uric acid, with the GI tract excreting the other one third. Serum urate concentrations in most children range from 3-4 mg/dL. During male puberty, levels begin to rise. Female levels remain low until menopause (61).

In Shatat et al (62) studied in 973 female and 939 male adolescents aged 13-18 years (NHANES 2005-2008) found that uric acid level vary with age and sex, the ranges being 2.5–6.6 mg/dl and 3.3–9.5 mg/dl in females and males, respectively. In our study at SW.PY studied in 376 female and 337 male students aged 12-18 years found that uric acid level ranges being 2.9-8.9 mg/dl and 2.9–10.6 mg/dl in females and males, respectively. From the above study the difference of uric acid levels between sex due to estrogen enhances uric acid excretion (63-64), average age of menarche is about 13 year in Thai populations (65).

Hyperuricemia are associated with gouty arthritis, which has been reported in several well-known studies to increase risk of cardiovascular disease. The risk of hyperuricemia in males was higher than that in females (66). In this study also found that the prevalences of hyperuricemia in male students (65.3%) were higher than those in female students (34.7%) similar to Puengputtho et al (57) found that 66.4% of male and 33.6% of female were hyperuricemia. This high prevalence of hyperuricemia at the beginning of study may be due to food menu of SW.PY school had organ meats (average 6 meals/week). In addition from dietary behavior questionnaire, 7.9% of hyperuricemia students had protein supplement eg. chicken essence and 71.3% of them had low water intake, <8 glass/d. Most of hyperuricemia students have all kind of organ meats.

After giving nutritional therapy, 225 (51.4%) hyperuricemia students completed at the end of study. Due to food menu of SW.PY school had organ meats, thus we suggested for decrease organ meats because in organ meats have high purine. In addition from dietary behavior questionnaire, the students had protein supplement eg. chicken essence, thus we suggested to avoid protein supplements in hyperuricemia students and drink a lot of water for increase urinary uric acid excretion. Thus 29.8% of hyperuricemia students have become normal uric acid level and 50.2% of them had decrease uric acid level but did not reach normal. However, 20.0% of them had stable mild hyperuricemia (uric acid range 5.8-9.7 mg/dl).

Dyslipidemia

Dyslipidemia is a condition of abnormal amount of lipids in blood e.g. excess of LDL-cholesterol or triglyceride or deficiency HDL-cholesterol. Several factors can lead to dyslipidemia e.g. high fat diet, sedentary lifestyle, obesity, smoking, some disease like diabetes and genetic. Dyslipidemia is a major risk factor of coronary heart disease and atherosclerosis (67-68).

Hypercholesterolemia

Most of hypercholesterolemia students always have fatty meat, skin meat, egg yolk, and 9-15 eggs/week.

After giving nutritional therapy, 41 (38.3%) hypercholesterolemia students completed at the end of study. The nutritional therapy, we suggested them to avoid egg yolk, organ meat, some seafood (shrimp, squid, oyster), fatty meat and meat with skin. From dietary behavior questionnaire, at the end of study we confirmed that they had followed our above suggestions. Thus 63.4% of hypercholesterolemia students has become normal LDL-cholesterol level and 26.8% of them had decrease LDL-cholesterol level but did not reach normal. However, throughout the study, 1 had low level of hypercholesterolemia (LDL-cholesterol 132-133 mg/dl), 2 had high level of hypercholesterolemia (LDL-cholesterol 171-191 mg/dl), and 1 had increase LDL-cholesterol 20 mg/dl may be due to she had weight gain 5.4 kg and body fat increase 4.8 %bw from baseline. The study still followed up; she had decrease LDL-cholesterol 32 mg/dl (135 mg/dl).

Hypertriglyceridemia

After giving nutritional therapy, 4 (26.7%) hypertriglyceridemia students completed at the end of study. The nutritional therapy, we suggested them to reduce fatty meals, sweet dessert, table sugar, and sweetened soft drinks. 1 had decrease triglyceride level but did not reach normal and 3 had increase triglyceride level, however, this study found that 27 new cases of hypertriglyceridemia. This evidence possibly due to nature of teenagers who living together in the boarding school, they have a chance to have snack together, so they had over consumption of high caloric snacks during the end of class, various festivals at that time, eg. Birthday party, Christmas, New year. The study still followed-up hypertriglyceridemic students and found that 83.9% (26 of 31) has become normal triglyceride level, 6.1% (2 of 31) transfer to another school and 9.7% (3 of 31) still be hypertriglyceridemia.

Efficacy of 24 weeks of nutritional therapy

Twenty-four weeks of nutritional therapy showed that improvement of body weight 62.6%, body fat 78.0%, anemia 75.7%, hyperuriceamia 80.0%, and hypercholesterolemia 90.2%. This study achieved by properly nutrition education, regular follow-up, and modifying school menu to reduction fat content, sweetened snacks, high sugar soft drinks, and high caloric bakeries.

From diet-related chronic disease questionnaire (total score=67), the students had range score of diet-related chronic disease knowledge from 0 to 46, mean 22.0 ± 8.3 . After 24 weeks nutritional education, their knowledge increase to higher score range 8 to 64, mean 34.0 ± 9.7 . Moreover, we found positive correlation between age and diet-related chronic disease knowledge ($r=0.184, p=0.0005$).

5.2 Self-esteem

5.2.1 Self-esteem in the area of body image

According to the many studies reported obesity affects on self-esteem (4-6). Result of self-esteem classified by BMI-for-age demonstrated that self-esteem scores of normal weight students were significantly higher than overweight students in the area of body image. However, at the end of study, self-esteem score in the area of body image did not significant difference, but self-esteem score in the area of body image of normal weight students tended to higher than other groups similar to Paxton (7) studied self-esteem by the Piers-Harris Children's Self-Concept Scale (Western Psychological Services) in middle school grade 6-8 found that self-esteem of overweight students ($BMI \geq 26 \text{ kg/m}^2$) were significantly lower than normal weight students. Renman et al., (29) studied in adolescents aged 14-18 years from public Swedish school for compare self-esteem, social background and academic competence, behavioral problems and lifestyle between obese group ($BMI = 33.9 \pm 3.2 \text{ kg/m}^2$) and non-obese group ($20.5 \pm 2.0 \text{ kg/m}^2$). This research studied self-esteem by using I Think I Am (ITIA), which developed in Sweden and the result showed that significantly different between obese and non-obese group in physical characteristics subscale ($P < 0.0001$).

Result of perception of body shape demonstrated that self-esteem scores of students who reported "Normal shape" were significantly higher than those other groups ("Thin, Slightly fat and Fat") in the area of body image, students reported right on current body weight at baseline higher than at the end of study possibly due to students was awareness about their body weight. Most of male students wish to have

more smart body shape than current body shape and most of female students wish to have more slim body shape than current body shape. At the end of this study, there are percentages of students who reported “Normal shape” felt right on current body weight higher than at the baseline.

Result of perception of height demonstrated that self-esteem scores of students who reported “Tall” were higher than those other groups (“Short and Normal height”) in the area of body image. Most of female students wish to have taller than current height.

Similar to Putthisri and Silpakit (36) studied in 408 senior high school students found that self-esteem scores of students who reported “Fat” were significantly lower than other groups (“Normal and Thin”) in the area of body image. Moreover, self-esteem scores of students who reported “Short” were significantly lower than other groups (“Normal height and Tall”) in the area of body image.

Result of self-esteem classified by body fat demonstrated that self-esteem scores did not differ significantly among groups, due to self-esteem in the area of body image is satisfaction of physical appearance such as height, short, obese, and thin.

Result of self-esteem classified by sex demonstrated that self-esteem scores of females were significantly lower than males at baseline and at the end of this study in the areas of academic and body image similar to Mendelson et al, (69) studied self-esteem and body esteem by self-perception profile for adolescents in adolescence age 13-15 years found that body esteem appearance in females were significantly lower than those in males as well as Franklin et al., (8) studied self-esteem by self-perception profile for children with global self-worth in children age 9-14 years found that self-esteem of physical appearance in females were significantly lower than those in males.

Self-esteem scores of overweight males were significantly lower than those normal weight males in the area of body image ($p < 0.05$) as well as self-esteem scores of underweight and overweight females were significantly lower than those normal weight females ($p < 0.05$) similar to Franklin et al., (8) found that self-esteem scores of obese and overweight males were significantly lower than those normal weight males, and self-esteem score of obese females were significantly lower than those normal weight females in physical appearance.

Self-esteem scores of overweight females were significantly lower than those overweight males in the area of body image similar to Franklin et al., (8) found that self-esteem scores of obese females were significantly lower than those obese males in physical appearance.

This study found that self-esteem score in the area of body image significantly negative correlation with BMI ($r = -0.104$, $p = 0.001$) similar to Mendelson et al (69) studied self-esteem and body esteem by self-perception profile for adolescents in adolescence aged 13-15 years found that increasing weight in adolescents had lower score of body esteem appearance ($r = -0.31$, $p < 0.01$).

This study found that self-esteem score in the area of body image was significantly negative correlation with percentage of body fat ($r = -0.154$, $p = 0.0005$) similar to Kimm et al (70) studied in 2,205 black and white girls aged 9-10 years found that self-esteem in physical appearance were significantly and negatively associated with adiposity. Moreover, this study found that self-esteem score in the area of social was significantly positive correlation with age ($r = 0.128$, $p = 0.0005$).

5.2.2 Self-esteem in the area of academic

This study did not find significant difference of self-esteem score in the area of academic when classified by academic performance. However, this study found that self-esteem score in the area of academic was significant difference when observed in perception of academic performance, students who reported “Poor” academic performance had self-esteem score in the area of academic lower than students who reported “Fair, Good, and Very Good” similar to Putthisri and Silpakit (36) studied in 408 senior high school students found that self-esteem score of students who reported “Good” academic performance were significantly higher than students who reported “Poor” as well as they did not find significant difference when observed in academic performance.

More than 60% of our students satisfied their current academic performance, which not depends on level of performance. This evidence may be due to their family and social acceptance.

5.2.3 Effect of body weight change on self-esteem

The effect of nutritional therapy can improved body weight status, 92.3%, 52.6%, and 52.4% in underweight, at risk of overweight, and overweight students. In at risk of overweight and overweight students can improve their body weight at week 8 (first semester), however, at week 16 (at the beginning of second semester) some of overweight students had weight gain. This was due to students' over consumption during the 3 weeks school holiday. At week 24, the end of study, those weight gain students had weight loss during stay at school. Thus providing nutritional therapy to parents at least once a year may also benefit them in supervising their children during the holidays.

Self-esteem scores of students who had improved their body weight were increase but not reach significant difference. According to the Walker study (30) reported obese adolescent (mean BMI 32.6 kg/m^2) who body weight lost 5.6 kg can improve self-esteem scores in athletic competence, physical appearance, and global self-worth. This study did not observe this evidence because the degree of obesity in our study (mean BMI $24.9 \pm 3.3 \text{ kg/m}^2$) less than Walker study, and our self-esteem scores of overweight students were not low (mean self-esteem score 44.6 ± 7.3 , min-max = 28-58) thus mean self-esteem scores was increased slightly, at the end of this study mean self-esteem score of the overweight students were 46.1 ± 7.8 , min-max= 32-62. However, this study found mean self-esteem score in the area of body image was significant increased in this group at the end of study. In Sintu (71) studied the effect of group counseling based on ohlsen on self-esteem in abused girls age 12-18 years found that mean self-esteem scores of abused girls were 36.1 ± 5.8 (min-max=26-48), after experiment mean self-esteem scores of abused girls were increase to 42.0 ± 6.0 (min-max=34-57).

In one overweight student who had lowest self-esteem scores, at the end of study she had weight loss 7.4 kg and her self-esteem scores increased from 28 to 44. In one underweight student who had lowest self-esteem scores, at the end of study he had weight gain 4.6 kg and his self-esteem scores increased from 16 to 31.

5.2.4 Nutritional status, perception of health, and perception of blood parameters

The study found that students who reported “Weakness” had underweight, at risk of overweight, and overweight more than those who reported “Healthy.” This finding showed that actual body weight affected their perception of health. However, percentage of students right perception of health according to actual body weight less than 50.0% thus nutrition education about body weight and health should be implemented. Students can improve their body weight after receiving nutritional therapy, they had increase right perception of health on their health in students who reported “Weakness”, and they had increase awareness on their health in students who reported “Healthy.”

Moreover, both of students who reported “Weakness” and “Healthy”, almost of them had anemia, hyperuricemia, and hyperlipidemia. This finding showed that abnormal blood parameters did not effect on their perception of health possibly due to their abnormal blood parameters were not critical or severe at time of assessment and therefore these diet-related chronic diseases may not manifest any clinical signs and symptoms at the early stage for developing the diseases. After receiving nutritional therapy normal blood parameters in students who reported “Weakness” and “Healthy” increased, these results confirmed that those students can practice on our advice of nutrition therapy to reduce the severity of their abnormal blood parameters.

Nutritional therapy and education can improve their diet-related chronic diseases and perception of health in students who reported “Weakness and Healthy.” However, some of students who reported “Healthy” had increase awareness on their health.

At baseline, 55.1% of students had wrong perception of blood parameters, possibly due to their abnormal blood parameters were not critical or severe at time of assessment and therefore these diet-related chronic diseases may not manifest any clinical signs and symptoms at the early stage for developing the diseases whereas 44.9% of students had right perception of blood parameters, possibly due to these students had known their blood examination from previous check-up.

After receiving nutritional therapy at the end of this study, wrong perception of blood parameters decreased from 55.1% to 37.0%, these students were aware of the results of blood parameters.

5.2.5 Perception of skin color

Nowadays, most people wish to have bright tone skin. In this study found that most of the students thought they had brown skin but most of northern people have white or yellow skin, this finding showed that students dissatisfaction about their skin color, thus we advised the students consider about their genetic rather than find food supplement for improve their skin color, especially regular healthy foods, eg., fresh vegetable, fruits, a lot of drinking fresh water, and hygiene should improve healthy skin.

5.2.6 Self-esteem and relationship with social environment

Students who had higher self-esteem score felt positive relationship with their family, teachers, and friends more than ones who had lower self-esteem score. This finding showed that self-esteem test can assess the feeling.

CHAPTER VI

CONCLUSION

This was prospective study conducted among adolescents aged 12-18 years at Srinagarindra the Princess Mother School, Phayao (SW.PY) a coeducational high school boarding school located in Phayao province, Northern Thailand during 2012 academic year. This study included 713 students consisting of 337 males and 376 females. Nutritional status and self-esteem were assessed during the 24 week-study period. The Thai FSC questionnaire was used to assess self-esteem scores among students. Thai FSC questionnaire consisted of 5 areas: academic, body image, family, social, and global areas. This study provided nutritional therapy on diet-related chronic diseases (obesity, anemia, hyperuricemia, hypercholesterolemia and hypertriglyceridemia) to all students based on nutritional education, food behavior, food menu modification, and exercise at baseline and every 8th week for 24 weeks.

6.1 Nutritional status

During 2012 academic year at SW.PY high school, 5.9% of 713 students were underweight, 10.9% at risk of overweight, and 8.3% were overweight based on BMI-for age, whereas based on percentage of body fat, 13.2%, 4.3%, and 4.8% had low, over, and excess body fat, respectively. This study showed the difference in prevalence of obesity when using different criteria (BMI-for age vs. percentage of body fat)--- prevalence of excess body fat was less than prevalence of overweight.

When assessed for other diet-related chronic diseases that affect health status of adolescents, prevalence of anemia, hyperuricemia, hypertriglyceridemia, and hypercholesterolemia in students were 10.1%, 61.4%, 2.1%, and 10.8%, respectively. Most females were anemic (98.6%), whereas males had a higher prevalence for the above-mentioned diet-related chronic diseases.

6.2 Nutritional therapy

Providing nutritional therapy for 24 weeks can improve nutritional status in SW.PY students (prevalence of overweight, excess body fat, anemia, hyperuricemia and hypercholesterolemia were reduced by 22.0%, 50.0%, 67.6%, 29.8%, and 63.4% respectively). However, during the long school holiday, obese students had mild weight gain and an increase in hypertriglyceridemia level once assessments were made when they return to class. This was due to students' over consumption of sweetened snacks during the long school holiday and various festivals. Thus providing nutritional therapy to parents at least once a year may also benefit them in supervising their children during the holidays.

In conclusion, nutritional therapy had the potential to improve nutritional status at SW.PY. This study was able to improve nutritional status of students by providing nutrition education, regular follow-ups, and modifying school menus to reducing fat content, sweetened snacks, high sugar soft drinks, and high caloric bakery products as well as to encourage for exercise. Moreover, nutrition education can improve knowledge about diet-related chronic diseases. Nutrition education is suitable for obese adolescents because it is a safe and noninvasive procedure in comparison to pharmacotherapy and surgical procedures and the knowledge received from nutrition education can help guide the individual to lead a healthy lifestyle in the long term, as well as to contribute this knowledge to their family, social groups, and communities, and in addition, it can help prevent them from believing nutritional fallacies.

6.3 Self-esteem

Self-esteem score of body image area in males were significantly higher than in females. Self-esteem score of body image area in normal weight students were significantly higher than in overweight students. This finding demonstrated that normal weight students had the highest self-esteem score that will help them build self-confidence at school and at home. Although students can improve their body weight, self-esteem score did not reach significant difference. This may be due to mild degree of obesity among students and their self-esteem scores were not low.

Results of body image perception of physical appearance (body shape and height) demonstrated that self-esteem of body image area were higher for those who reported “Normal body shape” and “Normal height.”

Result of academic performance perception demonstrated that self-esteem of academic area were higher for those who reported “Very Good” academic performance than “Good, Fair, and Poor.” This finding showed that self-esteem test can assess their perception.

Self-esteem scores between students who had normal and abnormal blood parameters were not significantly different. Although students showed improvement in their blood parameters at the end of the study, self-esteem scores were not significantly different from baseline.

Actual body weight affected perception of health possibly due to the fact that the student can visually observe their current body weight from their overall physical appearance whereas abnormal blood parameters did not affect perception of health possibly due to their abnormal blood parameters were not critical or severe at time of assessment and therefore these diet-related chronic diseases may not manifest any clinical signs and symptoms at the early stage for developing the diseases. Nutritional therapy can therefore improve their nutritional status and their health perception.

Finally, diet-related chronic diseases such as cardiovascular diseases, a leading cause of morbidity and mortality, takes a long time to develop and its prevention in adulthood should be implemented in adolescence.

6.4 Recommendation

The study showed normal weight students had higher self-esteem than others that will help them build self-confidence at school and at home. Students with good physical health along with good mental health can solve their problems better than students who had poor physical and mental health. Thus providing appropriate nutritional therapy and nutritional education and regularly implemented throughout the academic year and implemented to their families and communities.

Although nutritional therapy had potential to improve nutritional status in SW.PY students, during the three weeks school holiday, some students were not able to control their body weight. Thus providing nutritional therapy to parents at least once a year may also benefit them in supervising their children during the holidays. Moreover, nutritional education should be added to their class of students and teachers for efficient nutritional therapy.

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APPENDICES

APPENDIX A

INFORMED CONSENT FORM



หนังสือยินยอมโดยได้รับการบอกกล่าวและเต็มใจ

(Informed Consent Form)

ชื่อโครงการ ภาวะโภชนาการกับความรู้สึกลึกซึ้งภายในตนเองของนักเรียนระดับมัธยมศึกษา
โรงเรียนเฉลิมพระเกียรติสมเด็จพระศรีนครินทร์ พะเยา

ผู้ทำการวิจัย รศ.ดร. ปรียา ลิพกุล
หลักสูตรโภชนาการศาสตร์ คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี

***ชื่อผู้เข้าร่วมการวิจัย**.....อายุ.....

คำยินยอมของผู้เข้าร่วมการวิจัย

ข้าพเจ้า นาย/นางสาว/ค.ช./ค.ญ. ได้ทราบรายละเอียด
ของโครงการวิจัยตลอดจนประโยชน์ และข้อเสี่ยงที่จะเกิดขึ้นต่อข้าพเจ้าจากผู้วิจัยแล้วอย่างชัดเจน
ไม่มีสิ่งใดปิดบังซ่อนเร้นและยินยอมให้ทำการวิจัยในโครงการที่มีชื่อข้างต้น และข้าพเจ้ารู้ว่าถ้ามี
ปัญหาหรือข้อสงสัยเกิดขึ้น ข้าพเจ้าสามารถสอบถามผู้วิจัยได้ และข้าพเจ้าสามารถไม่เข้าร่วมโครง
การวิจัยนี้เมื่อใดก็ได้ โดยไม่มีผลกระทบต่อการรักษาที่ข้าพเจ้าพึงได้รับ นอกจากนี้ผู้วิจัยจะเก็บข้อมูล
เฉพาะเกี่ยวกับตัวข้าพเจ้า เป็นความลับและจะเปิดเผยเฉพาะในรูปที่เป็นสรุปผลการวิจัย การเปิดเผย
ข้อมูลเกี่ยวกับตัวข้าพเจ้าต่อหน่วยงานต่างๆที่เกี่ยวข้อง กระทำได้เฉพาะกรณีจำเป็นด้วยเหตุผลทาง
วิชาการเท่านั้น

ลงชื่อ.....(ผู้เข้าร่วมการวิจัย)

.....(พยาน)

วันที่.....

คำอธิบายของผู้วิจัย

ข้าพเจ้าได้อธิบายรายละเอียดโครงการตลอดจนประโยชน์ของการวิจัย รวมทั้งข้อเสี่ยงที่อาจ
เกิดขึ้นแก่ผู้เข้าร่วมการวิจัย ทราบแล้วอย่างชัดเจน โดยไม่มีสิ่งใดปิดบังซ่อนเร้น

ลงชื่อ.....(ผู้วิจัย)

วันที่.....



หนังสือยินยอมโดยได้รับการบอกกล่าวและเต็มใจ

สำหรับผู้เข้าร่วมการวิจัยที่ไม่สามารถแสดงความยินยอมได้ด้วยตนเอง

ชื่อโครงการ ภาวะโภชนาการกับความรู้สึกลึกๆภายในตนเองของนักเรียนระดับมัธยมศึกษา
โรงเรียนเฉลิมพระเกียรติสมเด็จพระศรีนครินทร์ พะเยา

ผู้ทำการวิจัย รศ.ดร. ปรียา ลิพกุล
หลักสูตรโภชนาการศาสตร์ คณะแพทยศาสตร์โรงพยาบาลรามาธิบดี

*ชื่อผู้เข้าร่วมการวิจัย.....อายุ.....

คำยินยอมของผู้มีอำนาจกระทำการแทนผู้เข้าร่วมการวิจัย

ข้าพเจ้า นาย/นาง/นางสาว.....ได้ทราบรายละเอียด ซึ่งเป็นผู้มี
อำนาจกระทำการแทน นาย/นางสาว/ค.ช./ค.ญ. ในฐานะ ได้รับทราบ
รายละเอียดของโครงการวิจัยตลอดจนประโยชน์ และข้อเสี่ยงที่จะเกิดขึ้นต่อผู้เข้าร่วมการวิจัยจากผู้
วิจัยแล้วอย่างชัดเจนไม่มีสิ่งใดปิดบังซ่อนเร้นและยินยอมให้ทำการวิจัยในโครงการที่มีข้อขัดแย้งและ
ข้าพเจ้ารู้ว่าถ้ามีปัญหาหรือข้อสงสัยเกิดขึ้น ข้าพเจ้าสามารถสอบถามผู้วิจัยได้ และข้าพเจ้าสามารถไม่
ให้ผู้เข้าร่วมการวิจัยเข้าร่วมโครงการวิจัยนี้เมื่อใดก็ได้ โดยไม่มีผลกระทบต่อการรักษาที่ผู้เข้าร่วมการ
วิจัยพึงได้รับ นอกจากนี้ผู้วิจัยจะเก็บข้อมูลเฉพาะเกี่ยวกับตัวผู้เข้าร่วมการวิจัยเป็นความลับ และจะ
เปิดเผยได้เฉพาะในรูปแบบที่เป็นสรุปผลการวิจัย การเปิดเผยข้อมูลเกี่ยวกับตัวผู้เข้าร่วมการวิจัยต่อหน่วย
งานต่างๆที่เกี่ยวข้องกระทำได้เฉพาะกรณีจำเป็นด้วยเหตุผลทางวิชาการเท่านั้น

ลงชื่อ.....(ผู้มีอำนาจกระทำการแทน)

.....(พยาน)

.....(พยาน)

วันที่.....

คำอธิบายของผู้วิจัย

ข้าพเจ้าได้อธิบายรายละเอียดโครงการตลอดจนประโยชน์ของการวิจัย รวมทั้งข้อเสี่ยงที่อาจ
จะเกิดขึ้นแก่ผู้เข้าร่วมการวิจัย ทราบแล้วอย่างชัดเจน โดยไม่มีสิ่งใดปิดบังซ่อนเร้น

ลงชื่อ.....(ผู้วิจัย)

วันที่.....

APPENDIX B

QUESTIONNAIRE FORM

Waisaihealth Project Questionnaires by Assoc. Prof. Dr. Preeya Leelahagul
Postgraduate Program in Nutrition,
Faculty of Medicine Ramathibodi Hospital, Mahidol University

“Dietary related chronic disease and self-esteem”

Waisaihealth School

Explanation

1. This questionnaire is designed to assess the understanding and knowledge of diet-related chronic diseases, health, dietary behavior, perception, and self-esteem.
2. This information will be used for developing the nutritional therapy.
3. Please read the explanation before answer the questions and answer truthfully.
4. The questionnaires are divided into six sections, 10 pages and 119 questions.

Section 1 General information	(5 Questions)
Section 2 Socio-economic information	(10 Questions)
Section 3 Health information	(10 Questions)
Section 4 Dietary behavior information	(26 Questions)
Section 5 Understanding and knowledge of diet-related chronic diseases information	(14 Questions)
Section 6 Perception and self-esteem information	(54 Questions)

Thank you very much for your cooperation.

Assoc. Prof. Dr. Preeya Leelahagul, Advisor
Sri La Satoh, Graduate Students in Nutrition
Faculty of Medicine Ramathibodi Hospital
Mahidol University

Jul 8-12, 2012

Name..... Surname..... Class.....
 Student ID..... Email..... Date.....

HN (for researcher)	S	W				
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Explanation In sections 1, 2 and 3, please check ✓ in the appropriate box □ and answer truthfully.

Section 1 General information

For researcher

1.1 Sex	☐ 1. Male	☐ 2. Female	A1	
1.2 Date of birth	Date.....	Month.....	Year.....	A2
1.3 Religion	☐ 1. Buddhism	☐ 2. Christian	A3	
	☐ 3. Islam	☐ 4. Other	A4	
1.4 Number of sibling.....	(include yourself) Birth order.....		A4a	
1.5 Father's age.....	year	Mother's age.....	year	A5
				A5a

Section 2 Socio-economic information

2.1 Person who live with	☐ 1. Father and mother	☐ 2. Father	B1
	☐ 3. Mother	☐ 4. Other, <i>identify</i> _____	
2.2 Parent's marital status	☐ 1. Married	☐ 2. Divorced	B2
	☐ 3. Father passed away	☐ 4. Mother passed away	
2.3 Family's income	☐ 1. < 10,000 Baht/month	☐ 2. 10,000-20,000 Baht/month	B3
	☐ 3. 20,001-30,000 Baht/month	☐ 4. 30,001-40,000 Baht/month	
	☐ 5. 40,001-50,000 Baht/month	☐ 6. > 50,000 Baht/month	
2.4 Money expense.....	Baht/month		B4
2.5 The most of expense (Choose only one answer, please)	☐ 1. Stationery	☐ 2. Snack	B5
	☐ 3. Personal	☐ 4. Other, <i>identify</i> _____	

2.6 Parent's occupation

Father	Mother	Guardian**	B6a
☐ 1. Government official/ State enterprise	☐ 1. Government official/ State enterprise	☐ 1. Government official/ State enterprise	B6b
☐ 2. Business/Trade	☐ 2. Business/Trade	☐ 2. Business/Trade	B6c
☐ 3. Personal	☐ 3. Personal	☐ 3. Personal	
☐ 4. Employee	☐ 4. Employee	☐ 4. Employee	
☐ 5. Househusband	☐ 5. Housewife	☐ 5. Househusband/wife	
☐ 6. Other, <i>identify</i> __	☐ 6. Other, <i>identify</i> __	☐ 6. Other, <i>identify</i> __	

2.7 Parent's educational level

Father	Mother
☐ 1. Less than primary school	☐ 1. Less than primary school
☐ 2. Primary school	☐ 2. Primary school
☐ 3. Junior high school	☐ 3. Junior high school
☐ 4. Senior high school	☐ 4. Senior high school
☐ 5. Vocational certificate	☐ 5. Vocational certificate
☐ 6. High vocational certificate	☐ 6. High vocational certificate
☐ 7. Bachelor's degree	☐ 7. Bachelor's degree
☐ 8. Master's degree	☐ 8. Master's degree
☐ 9. Doctorate degree	☐ 9. Doctorate degree

B7a

B7b

2.8 How is your relationship with your family?

- ☐1. You feel happy when you are with your family and you consult with them *every time* when you have problems.
- ☐2. You feel happy when you are with your family and you consult with them *sometime* when you have problems.
- ☐3. You feel uncomfortable when you are with your family and you consult with them *sometime* when you have problems.
- ☐4. You feel uncomfortable when you are with your family and you *never* consult with them when you have problems.

B8

2.9 How is your relationship with your teachers?

- ☐1. You feel free to consult with your teachers.
- ☐2. You feel uncomfortable to consult with your teachers.

B9

2.10 How is your relationship with your friends?

- ☐1. Intimate/ not quarrel ☐2. Less intimate / less quarrel
- ☐3. Quarrel regularly ☐4. Like being alone

B10

Section 3 Health information

3.1 Do you have underlying diseases?

- ☐ 1. No (go to answer 3.3) ☐ 2. Yes

C1

3.2 What are your underlying diseases?

- ☐ 1. Gastritis/peptic ulcer ☐ 2. Allergy
- ☐ 3. Skin disease ☐ 4. Thalassemia
- ☐ 5. Others, *identify* _____

C2

3.3 Family medical history related to diet-related chronic diseases, please check the disease and identify the relationship of that person such as father, mother, grandmother, grandfather etc.)

- ☐ 1. Obesity, *identify* _____ ☐ 2. Diabetes, *identify* _____
- ☐ 3. Hypertension, *identify* _____ ☐ 4. Hypercholesterolemia, *identify* _____
- ☐ 5. High triglyceride, *identify* _____ ☐ 6. Nothing
- ☐ 7. Don't know ☐ 8. Other _____, *identify* _____

C3a

C3b

C3c

C3d

C3e

C3f

C3g

C3h

3.4 Except physical education, do you exercise?	☐ 1. No (go to answer 3.8)	☐ 2. Yes	C4
3.5 How many times do you exercise a week?	☐ 1. <3 times/week	☐ 2. 3-5 times/week	C5
	☐ 3. >5 times/week		C6
3.6 How long do you exercise?	☐ 1. <30 minutes	☐ 2. 30-60 minutes	
	☐ 3. >60 minutes		
3.7 What kind of exercise do you like most? (Choose one answer only)			C7
	☐ 1. Sports	☐ 2. Cardio exercise such as Aerobic	
	☐ 3. Jogging	☐ 4. Walking	
	☐ 5. Housework such as sweeping and mopping the floor		
	☐ 6. Other, <i>identify</i> _____		
3.8 How often do you spend for watching TV and play on the computer in a week?	☐ 1. < 3 times/week	☐ 2. ≥3 times/week	C8
3.9 How much time do you spend for watching TV and play on the computer in each time?			C9
	☐ 1. <30 minutes	☐ 2. ≥30 minutes	C10
3.10 How many hours of sleep a night?			
	☐ 1. <6 hours	☐ 2. 6-8 hours	

Section 4 Dietary behavior information

Explanation In questions 4.1 -4.21, please check ✓ in the appropriate box ☐ and answer truthfully.

4.1 Do you eat three meals a day?	☐ 1. No	☐ 2. Yes (go to answer 4.4)	D1
4.2 Which meal you skip?			D2
	☐ 1. Breakfast How long you skip? _____ (Days/months)		D2a
	☐ 2. Lunch How long you skip? _____ (Days/months)		D2b
	☐ 3. Dinner How long you skip? _____ (Days/months)		D2c
4.3 If you don't have the main meal at school, you choose _____ instead of main meal.			D3
4.4 After meal, you always have snack or dessert?			D4
	☐ 1. No	☐ 2. Yes	
4.5 Which snack do you prefer? (Choose one answer only)			D5
	☐ 1. Desert (Bakery, Cake, Bread)	☐ 2. Snack (eg. Potato chips)	
	☐ 3. Other, <i>identify</i> _____		

4.6 Do you add seasoning to your meal?	☐ 1. No	☐ 2. Taste before add	D6
	☐ 3. Always add before eating		
4.7 Which seasoning do you add? (Such as noodle)	☐ 1. Don't add seasoning		D7
	☐ 2. Sometime	☐ 1. Sugar <i>amount: _____ (tea spoon/cup)</i>	D7a
		☐ 2. Fish sauce <i>amount: _____ (tea spoon/cup)</i>	D7b
		☐ 3. Other, _____ <i>amount: _____ (tea spoon/cup)</i>	D7c
	☐ 3. Always	☐ 1. Sugar <i>amount: _____ (tea spoon/cup)</i>	
		☐ 2. Fish sauce <i>amount: _____ (tea spoon/cup)</i>	
		☐ 3. Other, _____ <i>amount: _____ (tea spoon/cup)</i>	
4.8 Do you eat fatty meat?	☐ 1. Always	☐ 2. Sometime	D8
		☐ 3. Never	
4.9 Do you eat meat with skin?	☐ 1. Always	☐ 2. Sometime	D9
		☐ 3. Never	
4.10 How many eggs do you eat a week? <i>amount: _____ eggs</i>			
4.11 Which part of egg do you eat?	☐ 1. Whole egg	☐ 2. Only egg white	D10
	☐ 3. Only egg yolk		D11
4.12 Do you eat organ meats?	☐ 1. No	☐ 2. Eat all kinds of organ meats	
	☐ 3. Eat some kind of organ meats		D12
4.13 How many times do you have seafood?	☐ 1. 1-2 times/week	☐ 2. 3-5 times/week	
	☐ 3. 1-2 times/month	☐ 2. No	D13
4.14 Are you allergic to some food?	☐ 1. No	☐ 2. Yes <i>identify</i> _____	D14
4.15 Do you take food supplements? (Such as Vitamin, protein concentrates)	☐ 1. No	☐ 2. Yes <i>identify</i> _____	D14a
			D15
			D15a
4.16 If there are vegetables in your food, what will you do?	☐ 1. Not eat	☐ 2. Eat all kinds of them	D16
	☐ 3. Eat some kinds of them (<i>identify your favorite vegetables</i> _____)		D16a
4.17 If there are fruits served as dessert after meal, what will you do?	☐ 1. No	☐ 2. Yes (<i>identify your favorite fruits</i> _____)	D17
4.18 Do you dip fruits with sugar, salt and chili?	☐ 1. Always	☐ 2. Sometime	D17a
		☐ 3. Never	D18

4.19 How much water do you drink a day?

☐ 1. 1-2 glasses☐ 2. 3-4 glasses☐ 3. 5-7 glasses☐ 4. ≥ 8 glasses

4.20 Do you drink soft drinks?

☐ 1. No☐ 2. Yes (_____ *cans or**bottles a week*)

4.21 Do you drink milk?

☐ 1. No (Not answer 4.26)☐ 2. Yes (_____ *boxes or**bags a week*)

D19

D20

D20a

D21

D21a

Explanation Please fill the number in the boxes by prioritizing following statement.**(1→10 = Most→less)**

4.22 Staple food

☐ Rice☐ Glutinous rice☐ Mungbean noodle☐ Rice noodles fermented☐ Rice noodles, wheat noodles☐ Bread

4.23 Cooking

☐ Boiling☐ Steaming☐ Frying☐ Grill☐ Baked☐ Curry☐ Stir fry☐ Salad

4.24 Taste

☐ Sweet☐ Salty☐ Spicy☐ Sour☐ Bland

4.25 Meat

☐ Fish☐ Chicken☐ Duck☐ Beef☐ Pork☐ Seafood

4.26 Milk

☐ Whole milk☐ Low fat milk☐ Skim milk☐ Yogurt beverage☐ Flavored milk☐ Yogurt cream

D22

a

b

c

d

e

f

D23

a

b

c

d

e

f

g

h

D24

a

b

c

d

e

D25

a

b

c

d

e

f

D26

a

b

c

d

e

f

Section 5 Understanding and knowledge about diet-related chronic disease information

Explanation Please choose the number from the following food lists fill in the blank of 5.1- 5.7 (Each food list can be chosen more than one time).

For answer 5.1-5.7

1. Egg yolk	2. Organ meats	3. Seafood	4. Beef
5. Pork	6. Chicken	7. Duck	8. Fish
9. Skin	10. Fat	11. Blood	12. Rice
13. Bakery	14. Bread	15. Fruits	16. Fruits paste
17. Fruit juice	18. Green vegetables	19. Bud vegetables	20. Dry beans
21. Dessert	22. Curry	23. Dessert with coconut and sugar	24. Milk
25. Tea	26. Protein supplement	27. Alcohol	28. Coffee
29. Exercise	eg. chicken essence	31. Daily weigh	32. Drinking a lot of water
	30. No smoking		

5.1 Foods to skip while having high LDL-cholesterol _____

5.2 If you have low HDL-cholesterol, how to increase? _____

5.3 Foods to skip while having high serum triglyceride _____

5.4 Foods to avoid while having high blood sugar _____

5.5 Foods to skip while having high serum uric acid _____

Foods to avoid while having high serum uric acid _____

5.6 Foods to increase while having anemia _____

Foods to avoid while having anemia _____

5.7 If you are obese, some foods are omitted _____

How do you do to lose weight? _____

Explanation Please choose the number from the following disease lists fill in the blank of 5.8 - 5.14 (Each food list can be chosen more than one time).

For answer 5.8-5.14

1. Atherosclerosis	2. Hypertension	3. Cardiovascular disease
4. Stroke	5. Gout	6. Anemia
7. Diabetes mellitus	8. Kidney stone	9. Kidney disease

5.8 What are the diseases caused by high LDL-cholesterol? _____

5.9 What are the diseases caused by high triglyceride? _____

5.10 What are the diseases caused by high blood sugar? _____

5.11 What are the diseases caused by high uric acid? _____

5.12 What are the diseases caused by low hemoglobin? _____

5.13 What are the health consequences of obesity? _____

5.14 What are the diseases caused by high salty food consumption? _____

For researcher	E
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Section 6 Perception and self-esteem information

6.1 How do you perceive about your body shape?

- ☐ 1. Thin ☐ 2. Normal
☐ 3. Slightly fat ☐ 4. Fat

F1

6.2 You will.....

- ☐ 1. Lose weight ☐ 2. Gain weight
☐ 1. Maintain weight

F2

6.3 If you are obese, you will control your weight by.....

- ☐ 1. Exercise ☐ 2. Control diet
☐ 3. Use weight loss drug ☐ 4. See doctor

F3

6.4 How do you perceive about your height?

- ☐ 1. Short ☐ 2. Normal height
☐ 3. Tall

F4

6.5 How do you perceive about your color skin?

- ☐ 1. White ☐ 2. Yellow
☐ 3. Brown ☐ 4. Dark brown

F5

6.6 How do you perceive about your health?

- ☐ 1. Weakness ☐ 2. Healthy

F6

6.7 How do you perceive about your blood examination?

- ☐ 1. Normal ☐ 2. Slightly abnormal
☐ 1. Abnormal

F7

6.8 How do you perceive about your academic performance?

- ☐ 1. Poor ☐ 2. Fair
☐ 3. Good ☐ 4. Very good

F8

The Five-Scale Test of Self-Esteem for Children (Thai FSC)

Explanation Please check ✓ in the box which close to your feeling

(Your answer is not right or wrong, please answered with your truly feelings)

	I feel.....		
	Almost always	Some- time	Almost never
1. I'm disappointed with my academic performance			
2. I'm a prominent member of my family			
3. I do my homework everyday			
4. I'm an important person			
5. I'm smart in reading			
6. I like my own style			
7. I'm happy when I stay with my family			
8. There is someone always making me unhappy			
9. I always lied			
10. I want to be someone			
11. I always feel lonely			
12. My friend listened to my opinion			
13. Every time I lose, I don't worry			
14. I'm proud of my work at school			
15. I'm beautiful			
16. I make my parents unhappy			
17. I'm happy when I am with my friends			
18. Although I'm angry with my friends but I still talked with them			
19. I'm interesting person			
20. I'm a good child			
21. I'm lonely			
22. I make my bed every morning without reminder			
23. I'm a good person			
24. I'm happy when I am at school			
25. I have pretty smile			
26. My parents always have good reason to proud of me			
27. Whenever I wish to win, I will be stubborn			
28. I'm happy as the way I am			
29. I have poor learning			
30. My appearance look so bad			

	I feel.....		
	Almost always	Some- time	Almost never
31. I am one who have the best family			
32. At bedtime, I will go to bed without complains			
33. I don't matter			
34. I though my academic performance is good enough			
35. My family is disappointed with me			
36. Whenever I need friends I can find someone			
37. I am angry to my parents who didn't allow me to do something			
38. I feel I'm not successful			
39. I have enough friends			
40. I always brush my teeth after meals			
41. I'm not proud of myself			
42. I'm smart in mathematics			
43. I'm in good body shape			
44. I feel unhappy when I have some activities with my family			
45. I'm a good friend			
46. I allow someone to blame me about my mistake			

For researcher
GA
GB
GF
GG
GS
TT

APPENDIX C

NUTRITION EDUCATION



ซีมิทอลบีนต่ำ

ก้าน้อยกว่า 12 ก./ดล.

คุณจะเป็น.... **โวลิตาฟ**

เพิ่มอาหารกลุ่มนี้

- เลือด นม ไข่ เป็ด
- เนื้อนม วัว
- เนื้อไก่ เป็ด ปลา
- ไข่ นม
- ผลไม้ ผักใบเขียว



หลีกเลี่ยง



โครงการวิจัยโภชนาการภาพ นส.ศรัล ณะเตชะ

บูร์กลุ

ก้านเกิน 5.5 มก./ดล.

คุณจะเป็น....

- ความดันโลหิตสูง
- โรคหัวใจโต
- โรคเกาต์

งดอาหารกลุ่มนี้

- เครื่องดื่มรสหวาน
- เครื่องดื่มโปรตีนสกัด
- เครื่องดื่มแอลกอฮอล์



ลดอาหารกลุ่มนี้ด้วย

- เนื้อนม เนื้อวัว
- ผักขมดอง



โครงการวิจัยโภชนาการภาพ นส.ศรัล ณะเตชะ

ไตรกลีเซอไรด์สูง

ก้านเกิน 150 มก./ดล.

คุณจะเป็น....

- ไกลโคไลต์ในเส้นเลือด
- ความดันโลหิตสูง
- โรคหลอดเลือดหัวใจ
- โรคหลอดเลือดสมอง

งดอาหารกลุ่มนี้

- มันฝรั่ง นมรสหวาน
- นมหวาน
- แอปเปิ้ล
- เครื่องดื่มแอลกอฮอล์



โครงการวิจัยโภชนาการภาพ นส.ศรัล ณะเตชะ

แอลดีแอล

โคเลสเตอรอลสูง

ก้านเกิน 130 มก./ดล.

คุณจะเป็น....

- ไกลโคไลต์ในเส้นเลือด
- ความดันโลหิตสูง
- โรคหลอดเลือดหัวใจ
- โรคหลอดเลือดสมอง

งดอาหารกลุ่มนี้

- ไข่แดง
- เครื่องดื่มรสหวาน
- ปู นมวัว
- มันฝรั่ง
- นมรสหวาน



ลดเบเกอรี่ด้วย



โครงการวิจัยโภชนาการภาพ นส.ศรัล ณะเตชะ



BIOGRAPHY

NAME	Miss Srila Satoh
DATE OF BIRTH	17 May 1984
PLACE OF BIRTH	Yala, Thailand
INSTITUTIONS ATTENDED	Rangsit University, 2003-2007: Bachelor of Science (Oriental Medicine) Mahidol University, 2010-2014: Master of Science (Nutrition)
HOME ADDRESS	174/50 M.3 T. Yarang Yarang District Pattani Province, Thailand Tel. 08 1733 6490 Email : satoh.srila@gmail.com