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Self-Perception of Health and Body Image, Blood Lipid Profiles and Nutrient Intake of Adolescents in Incheon Area

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ABSTRACT

The purpose of this study was to investigate self-perception of health and body image, blood lipid profiles and nutrient intake of adolescents. The subjects were 686 adolescent boys (379 middle school students, 307 high school students) and 613 adolescent girls (272 middle school students, 341 high school students) in Incheon. This cross-sectional survey was conducted by a self-administered questionnaire. Fasting blood samples were obtained and analyzed for triglyceride, total cholesterol and LDL- and HDL-cholesterol. Nutrient intakes collected from 3 day-recalls were analyzed by the Computer Aided Nutritional Analysis Program. Statistical analysis was conducted using SPSS 10.0 program. Average age, height and weight of male middle school students were 13.8 years, 163.5cm, 56.0kg and those of male high school students were 16.5 years, 171.7cm, 64.3kg. In female, average age, height and weight of middle school students were 13.7 years, 157.1cm, 51.5kg and those of high school students were 16.6 years, 159.7cm, 56.8kg. Female middle school students perceived their health status significantly better compared to female high school students (p < 0.001). Female high school students perceived themselves significantly fatter compared to female middle school students (p < 0.05). Average TG level of female middle school students was significantly higher compared to female high school students (p < 0.01). Nutrient intakes of the male and female students except phosphorus were lower than the Korean RDA. Especially, calcium and iron intakes of male and female students were under the 65% of the Korean RDA. Therefore, proper nutrition education is required for Korean adolescents to encourage desirable food habits and maintain nutritional lipids status. (*J Community Nutrition* 5(1) : 3~12, 2003)

KEY WORDS : adolescents · body image · blood lipid profile · nutrient intake.

Introduction

The nutritional status has improved rapidly as a result of the socioeconomic growth since 1960's in Korea. It is assumed an aspect of the two poles, that is both overnutrition and undernutrition according to extreme weight control, is in adolescent female students (Lee et al. 2000).

In adolescents, there are rapid changes of body and physiological functions. Therefore, more balanced nutrition and desirable dietary behavior are important for health of adolescents and to a later life (Jin 2002 ; Lee, Yoo 1997 ; Lee et al. 2000 ; Sung et al. 2000 ; Yim, Kim 1986). However, the

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Korean adolescents surveyed did not recognize the importance of proper nutrient intake and showed inappropriate food intake, skipped meals, monotonous diets, frequent use of fast foods inappropriately chosen and binge eating or excessive use of dietary supplements (Han, Kim 1999 ; Jung 2002 ; Lee, Yoon 1998 ; Sim, Kim 1993 ; Yim, Kim 1986) It has been reported that alcohol abuse and tobacco use also can affect nutritional status in adolescent male students (Jung 2002 ; Kim et al. 1998 ; Kim et al. 2000). In addition, the diets of adolescents in Korea often fail to meet current dietary recommendations, both in terms of specific nutrient intake and on the more basic level of food consumption (Chang et al. 2000 ; Lee, Yoo 1997). Especially, diets of Korean adolescent girls are deficient in nutrients such as energy, vitamin A, calcium and iron (Chang 2001 ; Kim, Choi 2001). Recently weight control behaviors were reported prevalent especially among adolescent girls most of whom are preoccupied with their appearance, describe themselves as fat and

have a strong desire for thinness, and show a greater interest in body image (Lee et al. 2000 ; Ryu 1997 ; Ryu, Yoon 1998). However, extreme attempt for weight control may incur a loss of calcium and iron, which are very important in young women of child-bearing age.

On the other hand, it was reported that the proportion of the preschool, school-age, and adolescent population classified as overweight and obese have increased dramatically since 1970's in Korea (Moon et al. 1992 ; Sung et al. 2000 ; Yoon 2001). The major cause for obesity has been acquainted overeating according to stress of study, lack of exercise as well as increasing in number of fat cell and changing of hormone (Lee et al. 2000). Overweight and obesity in childhood is associated with increased blood lipids, blood pressure, as well as psychosocial difficulties and increased risk of persistence of obesity and its related risks into adulthood (Troiano et al. 2000). Therefore, the purpose of this study was to investigate dietary behaviors, nutrient intake, prevalence of obesity in Korean adolescent students.

Subjects and Methods

1. Subjects

The subjects were 1,299 healthy adolescent students (male : n = 686, 379 middle school students, 307 high school students, female : n = 613, 272 middle school students, 341 high school students) from middle and high schools in Incheon. This cross-sectional survey was carried out using a self-administered questionnaire under the direction of trained investigators in April of 2001.

2. Methods

1) Questionnaire

The questionnaire included items about demographic characteristics, socioeconomic factors, self-perception of health and appearance, health-related attitude and nutrient intake. Items about demographic characteristics included age, sex and residence. Items about socioeconomic factors included household income, pocket money and ratio of food expense to pocket money. Items about self-perception of health and appearance included health status, body image and weight control. Items of health-related attitude included exercise, smoking and drinking, and number of cigarettes per day.

2) Anthropometric measurements

The height and weight of the subjects were measured.

BMI was calculated by dividing body weight in kilograms by height in meters and squaring the total. Triceps and subscapular skinfold thickness were measured using a caliper. Mid upper arm circumference, waist and hip circumference were measured using a tapeline and calculated WHR (waist to hip ratio) by dividing waist circumference in centimeters by hip circumference in centimeters.

3) Biochemical analyses

Subjects underwent blood sampling after an overnight fast Blood was gathered for biochemical measurements. Venous blood samples were collected and serum TG and TC were analyzed by spectrophotometer using a commercial kit (Youngdong Pharmaceutical Co., Korea). HDL-C was analyzed by the same commercial kit, using the dextran sulfate-$MgCl_2$ coagulation methods. LDL-C was calculated by the formula of Friedewald et al. (1972), which assumes that the concentration of TG approximates 400mg/dl of the serum.

Friedewald et al. (1972) ; LDL-cholesterol = total cholesterol-[HDL-cholesterol + (triglyceride/5)]

4) Dietary assessment

The three-day recall method (2 weekdays and 1 weekend day) was used in-person interview for usual dietary assessment. Nutrient intake was analyzed using the Computer Aided Nutritional Analysis Program for professionals (CAN-Pro, Korean Nutrition Society, 1997) and results were compared with the Korean RDA (Korean Nutrition Society, 7th revision, 2000).

5) Statistical analysis

The statistical analysis was conducted using the SPSS 10.0 program. Frequency count (%), mean and standard deviation were calculated for all variables. Student's t-test and χ^2-test were used to determine statistical significance. The correlation between anthropometric measurements and nutrient intake were analyzed using Pearson's correlation coefficient.

Results and Discussion

1. General characteristics of the subjects

General characteristics of the subjects are shown in Table 1. Average ages of male middle and high school students were 13.8 and 16.5 years, respectively. Those of female middle and high school students were 13.7 and 16.6 years, respectively. As for the father's education level, it was

Table 1. General characteristics of the subjects

Variables	Male (n = 686)		t- or χ^2-test	Female (n = 613)		t- or χ^2-test
	Middle (n = 379)	High (n = 307)		Middle (n = 272)	High (n = 341)	
Age (years)	13.8 ± 1.1[1]	16.5 ± 0.6	$p < 0.001$[***][2]	13.7 ± 1.0	16.6 ± 0.6	$p < 0.001$[***]
Father's education level						
Elementary	$10(2.6)$[3]	$36(11.7)$	$p < 0.001$[***][4]	$7(2.6)$	$40(11.7)$	$p < 0.001$[***]
Middle school	$33(8.7)$	$58(18.9)$		$33(12.1)$	$76(22.3)$	
High school	$231(60.9)$	$169(55.0)$		$151(55.5)$	$189(55.4)$	
University	$91(24.0)$	$39(12.7)$		$74(27.2)$	$31(9.1)$	
Graduate school	$14(3.7)$	$5(1.6)$		$7(2.6)$	$5(1.5)$	
Mother's education level						
Elementary	$11(2.9)$	$46(15.0)$	$p < 0.001$[***]	$13(4.8)$	$59(17.3)$	$p < 0.001$[***]
Middle school	$59(15.6)$	$81(26.4)$		$51(18.8)$	$105(30.8)$	
High school	$252(66.5)$	$165(53.7)$		$170(62.5)$	$165(48.4)$	
University	$52(13.7)$	$14(4.6)$		$34(12.5)$	$10(2.9)$	
Graduate school	$5(1.3)$	$1(0.3)$		$4(1.5)$	$2(0.6)$	
Household income (10,000 won/month)						
<50	$7(1.8)$	$19(6.2)$	$p < 0.001$[***]	$10(3.7)$	$28(8.2)$	$p < 0.001$[***]
50-100	$61(16.1)$	$67(21.8)$		$37(13.6)$	$81(23.8)$	
100-200	$178(47.0)$	$150(48.9)$		$127(46.7)$	$140(41.1)$	
200-250	$82(21.6)$	$36(11.7)$		$43(15.8)$	$61(17.9)$	
250-300	$26(6.9)$	$25(8.1)$		$41(15.1)$	$25(7.3)$	
≥ 300	$25(6.6)$	$10(3.3)$		$14(5.1)$	$6(1.8)$	
Pocket money (10,000 won/month)	3.6 ± 4.6	4.8 ± 4.0	$p < 0.001$[***]	3.2 ± 4.6	4.2 ± 2.7	$p < 0.001$[***]
Food cost rate in pocket money (%)	31.4 ± 23.5	42.7 ± 23.4	$p < 0.001$[***]	40.8 ± 22.1	50.2 ± 22.7	$p < 0.001$[***]

1) Mean $\pm$ S.D   2) *** : $p < 0.001$ by student's t-test   3) N(%)   4) *** : $p < 0.001$ by χ^2-test

shown that 88.6% of male middle school students received a high school education or higher, and 69.3% of high school students received a high school education or higher, respectively (p < 0.001). In female students, it was shown that 85.3% of middle school students received a high school education or higher, and 69.3% of high school students received a high school education or higher, respectively (p < 0.001), which was higher compared to the previous result conducted in Seoul (Kim et al. 1998). As for the mother's education level, it was shown that 81.5% of male middle school students received a high school education or higher, and 58.6% of high school students received a high school education or higher, respectively (p < 0.001), which was higher compared to the previous result conducted in Seoul and Kyunggi-do area (Lee et al. 2000). In female students, it was shown that 76.5% of middle school students received a high school education or higher, and 51.9% of high school students received a high school education or higher, respectively (p < 0.001). As for household income, 35.1% of male middle school

students answered more than 2.0 million won and 23.1% of high school students answered more than 2.0 million won, which showed a significant difference (p < 0.001). In female students, 36.0% of middle school students answered more than 2.0 million won and 27.0% of high school students answered more than 2.0 million won, which showed a significant difference (p < 0.001). It was reported previously that more than 50% of middle school students in islands of south Kyungnam answered 1.0 – 2.0 million won, which was lower compared to that of middle school students in this study (An, Shin 2001). Also, in this study, household income of male and female students was similar compared to data in previous study (Ryu 1997). In male, the pocket money and the food cost rate in pocket money of high school students was significantly higher compared to that of middle school students (p < 0.001, p < 0.01, respectively). Also, the pocket money and the food cost rate in pocket money of female high school students was significantly higher compared to that of middle school students (p < 0.001, p < 0.01, respectively).

Table 2. Anthropometric measurements of the subjects

	Male		Female	
	Middle school (N = 379)	High school (N = 307)	Middle school (N = 272)	High school (N = 341)
Height (cm)	163.5 ± 9.5[***1)]	171.7 ± 6.4	157.1 ± 12.1[**2)]	159.7 ± 9.8
Weight (kg)	56.0 ± 12.9[***]	64.3 ± 11.6	51.5 ± 8.6[***]	56.8 ± 8.4
BMI (kg/m^2)[4)]	20.8 ± 3.5[***]	21.8 ± 3.5	20.6 ± 2.8[***]	22.1 ± 3.0
RBW[5)]	34.0 ± 6.6[***]	37.4 ± 6.2	32.6 ± 4.8[***]	35.4 ± 4.8
Triceps skinfold thickness (cm)	18.4 ± 12.6[NS3)]	17.1 ± 8.0	23.7 ± 7.8[*]	24.8 ± 6.7
Mid-upper arm circumference (cm)	25.4 ± 19.2[NS]	25.8 ± 3.5	23.1 ± 3.0[**]	25.1 ± 13.3
Subscapular skinfold thickness (cm)	12.3 ± 6.9[*]	13.3 ± 6.2	17.2 ± 7.1[***]	20.0 ± 7.3
Waist (cm)	71.7 ± 33.7[NS]	74.1 ± 8.3	66.8 ± 7.2[***]	69.3 ± 8.3
Hip (cm)	89.0 ± 8.2[***]	95.5 ± 6.8	91.3 ± 47.0[NS]	92.4 ± 6.2
Waist-to-hip ratio	0.77 ± 0.1[NS]	0.77 ± 0.4	0.75 ± 0.6[NS]	0.74 ± 1.0
Systolic blood pressure (mmHg)	129.0 ± 15.5[NS]	130.3 ± 12.7	122.2 ± 10.6[NS]	123.1 ± 11.7
Diastolic blood pressure (mmHg)	73.6 ± 11.0[NS]	73.3 ± 10.8	74.1 ± 10.1[NS]	73.1 ± 12.5

1) Mean ± S.D
3) NS : Not significant
5) RBW : relative body weight
2) * : p < 0.05, ** : p < 0.01, *** : p < 0.001 by Student's t-test
4) BMI (body mass index) : body weight in kilometers divided by height in meters squared

2. Anthropometric measurements of the subjects

Anthropometric measurements of the subjects are shown in Table 2. The average height and weight of the male middle and high school students were 163.5cm, 56.0kg and 171.7cm, 64.3kg, respectively. The average height and weight of the female middle and high school students were 157.1cm, 51.5kg and 159.7cm, 56.8kg, respectively. The average height and weight of male and female students were compared with the Korean Standard for age (male middle school students : height 162cm, weight 54kg, male high school students : height 172cm, weight 64kg, female middle school students : height 158cm, weight 51kg, female high school students : height 160cm, weight 54kg) (Korean Nutrition Society 7th revision, 2000). The average height of male and female students was similar compared to the Korean standard for age. Also the average weight of male high school students and female middle school students was similar compared to the Korean standard for age. However, the average weight of male middle school students and female high school students was higher compared to the Korean standard for age. The average BMI of male middle and high school students were 20.8kg/m^2, 21.8kg/m^2 and that of female middle and high school students were 20.6kg/m^2, 22.1kg/m^2, respectively, which were in normal range by following classification of BMI, which is less than 18.5 underweight, 18.5 − 22.9 normal, 23.0 − 24.9 overweight, 25.0 − 29.9 obese I, 30.0 − 34.9 obese II, more than 35.0 obese III (Korean Society of Obesity 1999). In male students, most anthropometric measurements

except triceps skinfold thickness, mid-upper arm circumference and waist circumference of middle school students were significantly lower than those of high school students. In female students, most anthropometric measurements except hip circumference of middle school students were significantly lower than those of high school students. Average values of systolic blood pressure (SBP)/diastolic blood pressure (DBP) of male middle and high school students were 129.0 ± 15.5/73.6 ± 11.0mmHg and 129.0 ± 15.5/73.6 ± 11.0mmHg, respectively. Average values of SBP/DBP of female middle and high school students were 122.2 ± 10.6/74.1 ± 10.1mmHg and 123.1 ± 11.7/73.1 ± 12.5mmHg, respectively, which were in normal range.

3. Health-related attitude and lifestyle of the subjects

Health-related attitude and lifestyle of the subjects is shown in Table 3. As for self-perception of health status, female high school students were perceived significantly unhealthy compared to middle school students (p < 0.001). In a previous study conducted in Kyungnam, the purpose of counseling was 'for diet' (41.5%) and 'for health problem' (30.2%), and satisfaction degree of counseling result was very low. Also, the subjects wanted to get the dietary information about 'growth in status' (41.4%), 'diet related skin beauty' (14.6%) (Lee et al. 2002). As for exercise, female middle school students exercised "rarely" (26.8%), "once/week" (26.1%), "twice/week" (23.2%), "once/month" (15.1%) "everyday" (8.8%), and female high school students exer-

Table 3. Health-related attitude and lifestyle of the subjects

Variables	Male (n = 686)		χ^2-test	Female (n = 613)		χ^2-test
	Middle (n = 379)	High (n = 307)		Middle (n = 272)	High (n = 341)	
Self-reported health status						
Poor	50(13.2)[1]	45(14.7)	p = 0.460[NS2]	26(9.6)	45(13.2)	p <0.001[***3]
Fair	253(66.8)	191(62.2)		168(61.8)	241(70.7)	
Good	76(20.1)	71(23.1)		78(28.7)	55(16.1)	
Exercise						
Rarely	29(7.7)	36(11.7)	p = 0.477[NS]	73(26.8)	126(37.0)	p <0.05[*]
Once/month	29(7.7)	23(7.5)		41(15.1)	55(16.1)	
Once/week	75(19.8)	54(17.6)		71(26.1)	68(19.9)	
Twice/week	105(27.7)	84(27.4)		63(23.2)	73(21.4)	
Everyday	141(37.2)	110(35.8)		24(8.8)	19(5.6)	
Smoking & Alcohol						
None	345(91.0)	164(53.4)	p <0.001[***]	254(93.4)	266(78.0)	p <0.001[***]
Smoking only	5(1.3)	27(8.8)		1(0.4)	4(1.2)	
Alcohol	14(3.7)	48(15.6)		9(3.3)	51(15.0)	
Smoking and alcohol	15(4.0)	68(22.1)		8(2.9)	20(5.9)	
Number of cigarettes (/day)						
None	360(95.0)	212(69.1)	p <0.001[***]	264(97.1)	317(93.0)	p <0.001[***]
≤ 1/2 packet	9(2.4)	82(26.7)		1(0.4)	8(2.3)	
≤ 1 packet	9(2.4)	8(2.6)		7(1.1)	16(4.7)	
≤ 2 packet	1(0.3)	3(1.0)		0(0.0)	0(0.0)	
≥ 2 packet	0(0.0)	2(0.7)		0(0.0)	0(0.0)	
Alcohol drinking						
None	350(92.3)	191(62.2)	p <0.001[***]	253(93.0)	270(79.2)	p <0.001[***]
1–2 times/month	14(3.7)	76(24.8)		14(5.1)	53(15.5)	
Once/week	10(2.6)	31(10.1)		1(0.4)	11(3.2)	
2–3 times/week	4(1.1)	6(2.0)		2(0.7)	7(2.1)	
4–5 times/week	1(0.3)	2(0.7)		1(0.4)	0(0.0)	
≥ 6 times/week	0(0.0)	1(0.3)		1(0.4)	0(0.0)	

1) N(%)   2) NS : Not significant   3) * : p <0.05, *** : p <0.001 by χ^2-test

cised "rarely" (37.0%), "twice/week" (21.4%), "once/week" (19.9%), "once/month" (16.1%), "everyday" (5.6%), which showed a significant difference (p <0.05). However, the rate of female students who exercised was very low. It was reported previously that the rate of male middle students who exercised regularly was 53.9% and that of female middle school students who exercised regularly was only 15.8% (Kim et al. 1998). As for smoking and alcohol-drinking, statuses, male high school students reported significantly more smoking and drinking of alcohol compared to middle school students (p <0.001). Also, female high school students reported significantly more smoking and drinking of alcohol compared to middle school students (p < 0.001). As for the

number of cigarettes smoked, male middle school students answered none (95.0%), less than 1/2 packet (2.4%), less than 1 packet (2.4%), less than 2 packet (0.3%), and male high school students answered none (69.1%), less than 1/2 packet (26.7%), less than 1 packet (2.6%), less than 2 packet (1.0%), more than 2 packet (0.7%). In female students, middle school students answered none (97.1%), less than 1 packet (1.1%), less than 1/2 packet (0.4%), and high school students answered none (93.0%), less than 1 packet (4.7%), less than 1/2 packet (2.3%). There was a significant difference in number of cigarettes smoked between middle and high school students in male and female (p <0.001, p <0.001 respectively). In a previous study conducted in Cheongju,

92.0% of male and female middle school students had experienced smoking, and 62.0% of them began in primary school. The most plausible reasons for smoking were 'boredom' and/or 'stress reduction'. Also, it was reported that compared with the non-smoking group, the smoking group paid attention to a balanced diet, more skipped breakfast, more had irregular meal times and fewer snacked (Jung 2002). In a previous study conducted in Seoul, intakes of energy, protein and niacin in male high school students smokers were significantly higher than those of nonsmokers although other nutrient intakes were not significantly different (Kim et al. 1998). In a previous study conducted in Seoul, vitamin B_2 and C intakes of smoking education group, vitamin C supplement group, smoking education + vitamin C supplement group and control group were increased, but only calcium intake was increased in the smoking education group. Plasma vitamin C concentration and ratio (plasma vitamin C/vitamin C intakes) were increased in the vitamin C supplement group and smoking education + vitamin C supplement group (Kim et al. 2000). On the other hand, it was reported that smoking among Navajo adolescents was associated with increasing risk factor for prevalence of overweight or obese and serum TC and TG and blood pressure (Freedman et al. 1997). As for alcohol drinking, male middle school students answered none (92.3%), 1 − 2 times/ month (3.7%), once/week (2.6%), 2 − 3 times/week (1.1%), 4 − 5 times/week (0.3%) and high school students answered none (62.2%), 1 − 2 times/month (24.8%), once/week (10.1%), 2 − 3 times/week (2.0%), 4 − 5 times/week (0.7%), more than 6 times/week (0.3%). In female students, middle school students answered none (93.0%), 1 − 2 times/month (5.1%), 2 − 3 times/week (0.7%), once/week, 4 − 5 times/ week, more than 6 times/week (0.4%, 0.4%, 0.4%, respectively) and high school students answered none (79.2%), 1 − 2 times/month (15.5%), once/week (3.2%), 2 − 3 times/ week (2.1%). There was a significant difference in alcohol drinking between middle and high school students in male and female (p < 0.001, p < 0.001, respectively).

4. Prevalence of obesity according to Body Mass Index

Prevalence of obesity according to Body Mass Index is shown in Table 4. BMI was classified as less than 18.5 underweight, 18.5 − 22.9 normal, 23.0 − 24.9 overweigh and more than 25.0 obese (Korean Society of Obesity 1999). In male students, there was a significant difference in preval-

Table 4. Prevalence of obesity according to the Body Mass Index

	Underweight	Normal	Overweight	Obese
	< 18.5	18.5 – 22.9	23.0 – 24.9	> 25.0
Male				
Middle school[***2]	108 (28.6)[1]	224 (59.4)	36 (9.5)	9 (2.4)
High school	41 (13.4)	217 (70.9)	38 (12.4)	10 (3.3)
Female				
Middle school[***]	62 (22.8)	192 (70.6)	17 (6.3)	1 (0.4)
High school	31 (9.1)	258 (75.9)	46 (13.5)	5 (1.5)

1) N(%)   2) *** : $p < 0.001$ by x^2-test

ence of obesity between middle and high school students (p < 0.001). Most male students were in the normal range, but the rate of overweight and obese in male high school students were higher compared to male middle school students. In female students, there was a significant difference in prevalence of obesity between middle and high school students (p < 0.001). The rate of overweight and obese in female high school students were 13.5% and 1.5%, respectively, which were higher compared to female middle school students. On the other hand, the rate of underweight in female middle school students was 22.8%, which was higher compared to that of female high school students. This result was similar to the result of a previous study conducted at Milyang city, which showed that the rate of overweight and obese in high school students were only 9.2% and 2.3%, respectively. And the rate of underweight and normal were 25.3% and 67.0%, respectively (Ryu 1997). Also, this result was similar to the result of a previous study conducted in Taejon, which showed that the rate of overweight and obese in male middle school students was higher than that of female middle school students (Lee, Kim 1996). However, this result was different from the result of previous study conducted in rural area, average BMIs for male and female middle school students were 19.1 ± 2.5 and 19.3 ± 2.4, respectively. 71.7% of male students and 72.0% of female students were underweight by the BMI index (Ro 2000). It may be due to the difference of region as well as a standard for BMI judgement. It was reported previously that the prevalence of obesity in male and female middle school students was 9.5%, which was higher compared to the result in this study (Choi, Kim 1999). Also, it was reported that prevalence of upper body obesity was higher in male students than in female students. On the other hand, prevalence of lower

body obesity was higher in female students, and the risk factor for upper body obesity was sexual maturity rather than dietary factors (Choi, Kim 1999).

5. Perception of body image and weight control

Perception of body image and weight control of the subjects are shown in Table 5. There was a significant difference in self-perception of body image between middle school and high school students (p < 0.05). In male students, 18.2% of middle school students perceived their body image as fatty, and 14.0% of high school students perceived their body image as fatty, respectively (p < 0.05). Among female students, 23.2% of middle school students perceived their body image as fatty, and 32.0% of high school students perceived their body image as fatty, respectively, which showed a significant difference (p < 0.05). It was reported previously that female middle school students were more significantly concerned with body image, diet, and body weight, and they were not satisfied with their weight (Ro 2000). Therefore, proper nutrition education is necessary for female students to maintain desirable food habits. There was a significant difference in weigh oneself once a week between male middle and high school students (p < 0.001). In female students, the rate of middle school students' weigh oneself once a week was significantly higher compared to that of high school students (p < 0.001). As for willing to show dietary change, there was a significant difference between middle and high school students in male and female (p < 0.001, p < 0.001, respectively). As for willing to weight control, 2.1% of male middle school students wanted to weight control, and 17.6% of high school students wanted to weight control, which showed a significant difference (p < 0.001). Among female students, 99.6% of middle school students wanted to weight control, and 78.9% of high school students wanted to weight control, which showed a significant difference (p < 0.01). As for weight control attempt, 6.1% of male middle school students attempt weight control, and 26.4% of high school students attempt weight control, which showed a significant difference (p < 0.001). Among female students, 94.1% of middle school students attempt weight control, and 84.5% of

Table 5. Perception of body image and weight control

Variables	Male (n = 686)		χ^2-test	Female (n = 613)		χ^2-test
	Middle (n = 379)	High (n = 307)		Middle (n = 272)	High (n = 341)	
Perception of body image						
Fatty	69(18.2)[1]	43(14.0)	p<0.05[2]	63(23.2)	109(32.0)	p<0.05[*]
Moderate	150(39.6)	121(39.4)		104(38.2)	97(28.4)	
Slim	80(21.1)	85(27.7)		26(9.6)	27(7.9)	
Want to be a little thin	33(8.7)	20(6.5)		76(27.9)	103(30.2)	
No change	22(5.8)	8(2.6)		3(1.1)	5(1.5)	
Want to be a little fat	25(6.6)	30(9.8)		0(0.0)	0(0.0)	
Weigh oneself once a week						
Yes	17(4.5)	69(22.5)	p<0.001[***]	253(93.0)	262(76.8)	p<0.001[***]
No	362(95.5)	238(77.5)		19(7.0)	79(23.2)	
Willing to show dietary change						
Yes	11(2.9)	53(17.3)	p<0.001[***]	260(95.6)	269(78.9)	p<0.001[***]
No	368(97.1)	254(82.7)		12(4.4)	72(21.1)	
Willing to weight control						
Yes	8(2.1)	54(17.6)	p<0.001[***]	271(99.6)	329(96.5)	p<0.01[**]
No	371(97.9)	253(82.4)		1(0.4)	12(3.5)	
Weight control attempt						
Yes	23(6.1)	81(26.4)	p<0.001[***]	256(94.1)	288(84.5)	p<0.001[***]
No	356(93.9)	226(73.6)		16(5.9)	53(15.5)	
Calculate the food energy						
Yes	24(6.3)	79(25.7)	p<0.001[***]	253(93.0)	261(76.5)	p<0.001[***]
No	355(93.7)	228(74.3)		19(7.0)	80(23.5)	

1) N(%)   2) * : p<0.05, ** : p<0.01, *** : p<0.001 by χ^2-test

high school students attempt weight control, which showed a significant difference (p < 0.001). However in view of the results so far achieved, unlike male students, most female students wanted to weight loss and experience weight control. This result was similar to the previous results conducted in Milyang city showing that only 11.5% of subjects were overweight or obese, however 42.5% of subjects had experienced weight control, and the main reason for weight control was to loss weight (80.6%) (Ryu 1997 ; Ryu, Yoon 1998 ; Lee et al. 2000). As for calculate the food energy, there was a significant difference between middle and high school students in male and female (p < 0.001, p < 0.001, respectively).

6. Daily nutrient intake and % RDA of the subjects

Daily dietary intake of energy and other nutrients are presented in Table 6. Nutrient Intake by male and female students except phosphorus were lower than the Korean RDA. In male students, energy, niacin, vitamin A, B_2 and C were under the 80% of the Korean RDA and calcium and iron intakes were under the 65% of the Korean RDA. In female students, energy, vitamin A and B_2 were under the 80% of the Korean RDA and calcium and iron intakes were under the 60% of the Korean RDA. Especially calcium intake both male and female students was under the 50% of the Korean RDA. On the other hand, average daily intake of phosphorus was above 110% of the Korean RDA in male middle and high school students. It was reported previously that average energy intake of Kangwha male middle school

students was 2,848kcal and that of Nepal male middle school students was 2,720kcal. The similar result showed in the case of female middle school students in Kangwha and Nepal. However, Nepal subjects showed significantly lower intake in other nutrients than that of Kangwha subjects whose consumption level was close to the Korean RDA (Kim, Lee 1997). In a previous study conducted in urban areas and islands in south Kyungnam, most male and female middle school students consumed more protein, niacin, vitamin B_1, B_2 and C than the Korean RDA but the intake of calcium, iron, vitamin A was less. And as to the sources of animal fat, the urban male students consumed much more (An, Shim 2001). This result may be due to the regional difference. In a previous study conducted in Spain, inadequate intakes (below two-thirds of the RDA values) were notable in children for vitamin A, C and E and in girls, iron. In adolescents, low intakes were especially marked for vitamin A and E and in girls, calcium, folate and iron, which was similar to the results in this study (Serra-Majem et al. 2001). Also, this result was similar to the result of previous study conducted in rural area, most nutrient intakes of the male and female middle school students were below the Korean RDA. In particular calcium and iron intakes were extremely lower compared to the result in this study (Ro 2000). Calcium and iron intake is very important in young women of child-bearing age. Also, it was considered that higher calcium intake than the Korean RDA level is recommended for adolescents to meet peak bone mineral accretion and attain a

Table 6. Daily nutrient intake of the subjects

	Male		Female	
	Middle school (n = 379)	High school (n = 307)	Middle school (n = 272)	High school (n = 341)
	Mean ± SD		Mean ± SD	
Energy (kcal)[NS1]	1875.1 ± 694.1	1964.8 ± 743.4	1592.5 ± 512.4	1549.3 ± 445.4
Protein (g)[NS]	66.3 ± 23.4	69.6 ± 26.7	62.0 ± 55.8	58.5 ± 21.0
Fat (g)[NS]	52.2 ± 23.7	54.4 ± 29.9	45.3 ± 20.8	43.4 ± 17.2
Carbohydrate (g)[NS]	287.9 ± 107.5	301.4 ± 114.0	242.0 ± 76.1	234.2 ± 66.8
Vitamin A (R.E.)[NS]	532.4 ± 280.0	558.5 ± 307.2	491.8 ± 243.2	481.7 ± 267.2
Vitamin B1 (mg)[NS]	1.2 ± 0.6	1.2 ± 0.5	1.0 ± 0.4	1.0 ± 0.3
Vitamin B2 (mg)[NS]	1.0 ± 0.6	1.0 ± 0.5	0.9 ± 0.5	0.9 ± 0.5
Vitamin C (mg)[NS]	55.4 ± 36.5	52.5 ± 30.3	58.5 ± 50.7	60.5 ± 40.1
Niacin (mg)[NS]	13.1 ± 5.8	13.7 ± 5.6	11.3 ± 4.7	11.6 ± 4.3
Calcium (mg)[NS]	416.6 ± 230.6	417.5 ± 234.0	395.7 ± 210.0	381.2 ± 176.9
Phosphorus (mg)[NS]	991.1 ± 386.7	1013.3 ± 384.7	849.7 ± 344.8	835.2 ± 303.8
Iron (mg)[NS]	9.9 ± 5.7	9.8 ± 4.7	8.9 ± 6.3	9.4 ± 9.1
Cholesterol (mg)[NS]	317.5 ± 183.3	326.1 ± 181.6	269.1 ± 150.5	250.2 ± 139.6

1) NS : Not significant

Table 7. Blood lipid profiles

	Male		Female	
	Middle school (n = 379)	High school (n = 307)	Middle school (n = 272)	High school (n = 341)
Triglyceride (mg/dl)	94.7 ± 52.1[1)NS2)]	97.4 ± 53.4	92.1 ± 44.5[**5)]	82.1 ± 42.7
Total cholesterol (mg/dl)	143.4 ± 22.1[NS]	144.1 ± 22.5	162.5 ± 25.7[NS]	158.4 ± 27.0
HDL-cholesterol (mg/dl)	47.7 ± 10.3[NS]	48.5 ± 10.2	56.5 ± 12.2[NS]	56.8 ± 12.3
LDL-cholesterol (mg/dl)	76.7 ± 18.8[NS]	76.2 ± 19.3	87.8 ± 22.4[NS]	87.2 ± 33.4
HDL-C/TC[3)]	0.34 ± 0.1[NS]	0.34 ± 0.1	0.35 ± 0.1[NS]	0.36 ± 0.1
HDL-C/LDL-C[4)]	0.66 ± 0.2[NS]	0.67 ± 0.2	0.69 ± 0.2[NS]	0.71 ± 0.3

1) Mean ± S.D
2) NS : Not significant
3) HDL-C/TC : HDL-cholesterol/total cholesterol
4) HDL-C/LDL-C : HDL-cholesterol/LDL-cholesterol
5) ** : p < 0.01 by Student's t-test

desirable level of calcium retention (Kim, Choi 2001 ; Maggiolini et al. 1999 ; Monge-Rojas, Nunez 2001 ; Rogol et al. 2000). Therefore, nutrition education for proper intake of nutrients, especially calcium and iron, is necessary for male and female students.

7. Blood lipid profile

Blood lipid profile are shown in Table 7. In female students, there was significant difference in serum TG between middle and high school students (p < 0.01). In a previous study conducted in Kangwha, average serum TC, TG and LDL-C level in male middle school students were 152.4mg/dl, 106.2mg/dl and 86.7mg/dl, respectively, which were higher compared to the result in this study, but serum HDL-C level was 44.5mg/dl, which was lower compared to the result in this study. In female middle school students, average serum TC, TG, LDL-C and HDL-C level in Kangwha were 165.4mg/dl, 110.1mg/dl, 95.8mg/dl and 47.6mg/dl, which were similar result in case of male middle school students (Choi, Kim 1999). In a previous study conducted in Costa Rica, TC and HDL-C levels were significantly higher in urban adolescents than in rural youngsters. As for sex, TC, HDL-C and LDL-C levels were higher in females than in males (Monge-Rojas 2001).

Summary and Conclusion

In order to investigate self-perception of health and body image, blood lipid profile and nutrient intake of adolescents, the cross-sectional survey was carried out using a self-administered questionnaire in April of 2001. The subjects were 686 boys (379 middle school students, 307 high school students) and 613 girls (272 middle school students, 341 high

school students) in Incheon.

1) Average ages of male middle and high school students were 13.8 and 16.5 years, respectively. And those of female middle and high school students were 13.7 and 16.6 years, respectively.

2) The average BMI of male middle and high school students were $20.8kg/m^2$, $21.8kg/m^2$ and that of female middle and high school students were $20.6kg/m^2$, $22.1kg/m^2$, respectively, which were in normal range.

3) Female high school students were perceived significantly unhealthy compared to middle school students.

4) As for self-perception of body image, female high school students perceived themselves significantly fatter compared to middle school students.

5) Both male and female students, energy, vitamin A and B_2 were under the 80% of the Korean RDA and calcium and iron intakes were under the 60% of the Korean RDA.

6) In female students, there was significant difference in serum TG between middle and high school students.

Therefore, it may be suggested that male and female adolescents students need proper nutrition education program so that they maintain nutritional serum lipids status.

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