

## A Study of the Anthropometric Indices and Eating Habits of Female College Students

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### ABSTRACT

A study was conducted to investigate the anthropometric indices, fat distribution, eating habits and levels of daily physical activity based on the body mass index (BMI ; kg/m<sup>2</sup>) of 180 female college students. This study was based on survey 2001 using a questionnaire. The results are as follow ; The mean age, height, weight and BMI were 20.41 ± 1.82 years, 161.86 ± 4.51cm, 53.49 ± 7.02kg, and 20.43 ± 2.65kg/m<sup>2</sup>, respectively. The group with BMI of under 20 (the lean group) comprised 48.9% ; the group with BMI of 20 to 25 (the normal group) comprised 44.4% and the group with BMI of over 25 (the obese group) comprised 6.7% of the subjects. Even though the lean and the normal groups were determined according to BMI. 12.5% of the lean group and 31.3% of the normal group had more than 25% body fat. Of the students, 11.5% of the lean group, 25.0% of the normal group and 58.3% of the obese group had of more than 0.8 waist/Hip Ratio (WHR). The medical problems suffered by the subjects were constipation (24.4%), gastroenteritis (20.6%), anemia (15.0%) and edema (13.3%), which was a result of their eating habits. Out of all the subjects, 27.2% ingested their meals irregularly, 74.4% skipped breakfast, and 92.4% of the lean group, 89.2% of the normal group and 81.8% of the obese group ingested snacks on a daily basis. Their favorite types of snacks were cookies breads and cakes (33.7%), spicy sliced rice cakes pork sausage and boiled fish cakes (18.5%), fruits (15.2%), juices and sodas (13.5%) and hamburgers and pizzas (3.9%). Their consumption of high calorie and processed foods was high, Of the subjects, 38.9% ate out daily. 45.1% had tried weight loss. Those with large upper bodies comprised 11.5%, large intermediate bodies 18.5% and large lower bodies 69.0%. Most of the students were dissatisfied with their body snaps. Of the subjects, 95.1% exercised irregularly. Daily physical activity tended to increase significantly with an increase in BMI ; the lean group's average energy consumption was 1509.40kcal the normal group's was 1792.21kcal and the obese group's was 2334.63kcal, which were below the recommended value. This study suggests that the maintenance of an ideal weight, the improvement of eating habits and adequate exercise are needed for female college students to improve their health and nutritional status. (*J Community Nutrition* 5(1) : 21~28, 2003)

**KEY WORDS :** Body Mass Index (BMI) · Waist/Hip Ratio (WHR) · body fat distribution · eating habits · ideal weight.

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### Introduction

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Balanced nutritional intake, essential for human development and healthy life, should be practiced with every meal (Choi, Cho 1999 ; Lee, Moon 1983). Meal contents and dietary habits play important roles in nutritional intake.

The period when young people attend colleges is a critical step towards living a healthy life in later years and requires a

balanced nutrient intake through dietary practices (Choi, Cho 1999 ; Lee, Park 2000 ; Park, Kim 1998). During this period, dietary habits are established. For example, a prolonged practice of inadequate dietary intake can contribute to various health issues later in life (Huh 1990 ; Kim 1989 ; Lee, Choi 1994 ; Park 1981).

Female college students, in particular, must pay close attention to their diet due to their ability to bear children. Their nutritional and health status are important factors in pregnancy and childbirth (Kim et al. 1999 ; Lee 1996 ; Sookmyung cyber lecture 2002). Poor dietary habits can cause deficiencies of some essential nutrients and unbalances in nutritional intake (Kwon et al. 2002). Increase in snacking, the intake of instant or fast foods, limited food intake due to economic

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constraints, and irregular frequency of meals can augment nutrient deficiency (Kim 1995 ; Kim, Yoon 1993 ; Lee et al. 1998).

College students do not recognize the importance of maintaining good health based on sound dietary practices and tend to have a poor understanding of the value in a balanced diet. Furthermore, both male and female are overly concerned on the perception of body image, which can have a huge impact on their dietary behaviors. A fantasy of having an extremely skinny body figure can cause both normal and already skinny females to excessively control body weight (Ahn et al. 1996 ; Kim 1998 ; Kim, Sohn 1988 ; Park 1997). Extremely low body weight can lead to serious health problems such as the lack of appetite, poor digestion, osteoporosis, decrease in resistance to disease due to immune deficiency and extreme fatigue (Paik et al. 1991).

It has been reported that irregular food habits, frequent skipping of meals, inappropriate snacking, frequent intake of processed foods, excessive drinking of alcoholic beverages and smoking, stress, unbalanced intake of nutrients, and misunderstanding on normal weight can cause a variety of health problems (Choi 1999 ; Hong 1993 ; Lee 1998 ; Lee 1999). Nutritional education should help college students to recognize that good dietary practices and adequate amounts of exercise are essential for better health and the prevention of various adulthood and digestive diseases.

This study, based on a survey of female college students, was intended to examine eating habits and the potential health and nutrition issues and to provide suggestions for improved nutrition education for female college students.

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## Study Subjects and Protocols

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### 1. Study subjects

A survey was conducted on 180 female students of Kyungwon college (Sunnam, Korea) in August 2001.

### 2. Study protocols

#### 1) Questionnaire

General profile, diet habit and daily physical activity were surveyed. Students themselves answered the questionnaire after the orientation.

#### 2) Body Mass Index(BMI) :

Based on weight and height of the subjects, BMI was

calculated. Based on BMI( $\text{wt}/\text{ht}^2$  ;  $\text{kg}/\text{m}^2$ ) subjects were categorized as lean group ( $<20$ ), normal ( $20 - 25$ ), or obese group ( $>25$ ).

### 3) Anthropometric indices

#### (1) Body composition :

Body water, lean body mass & body fat were determined with Body Composition Analyzer (Biodynamics Model 310, Seattle, WA, USA).

#### (2) Waist/Hip ratio :

WHR (Waist/Hip circumference ratio) was determined based on measurements on waist and hip.

### 4) Energy consumption(daily physical activity)

Daily energy expenditure was calculated based on activity records provided by the subjects.

### 3. Statistical Analysis

Mean values and standard deviation of collected data were calculated using a program called SPSS program. Body type, health problem, and snack intake were evaluated based their frequency. One-Way ANOVA analysis and Duncan's multiple range tests were used to determine statistical significance of the data on body type and dietary practice, nutrient intake. P values of  $<0.05$  were considered significant.

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## Results and Discussions

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### 1. Physical characteristics of study subjects

Average age, height and weight of the subjects were  $20.41 \pm 1.82$ ,  $161.86\text{cm}$ , and  $53.49\text{kg}$ , respectively, which were  $1.26\text{cm}$  taller and  $0.81\text{kg}$  lighter than the Korean physical standards (recommended dietary allowances for Koreans, 7<sup>th</sup> rev., 2000) (Table 1). These results were similar to previous reports by Lee (1999).

### 2. BMI

Female college students with a BMI of  $>20\text{kg}/\text{m}^2$ ,  $20 - 25\text{kg}/\text{m}^2$ ,  $>25\text{kg}/\text{m}^2$  were grouped as lean, normal, and obese, respectively. The average BMI of the study subjects was

**Table 1.** General characteristics of the subjects

	N	Mean $\pm$ SD
Age (yr)	180	$20.41 \pm 1.82$
Height (cm)	180	$161.86 \pm 4.51$
Weight (kg)	180	$53.49 \pm 7.02$

**Table 2.** Distribution and means of BMI

BMI(kg/m <sup>2</sup> )	N	%	Mean ± SD
Lean <20	88	48.9	18.31 ± 0.97
Normal 20 - 25	80	44.4	21.88 ± 1.19
Obese >25	12	6.7	26.85 ± 1.98
Total	180	100.0	20.43 ± 2.65

BMI: body mass index

20.43kg/m<sup>2</sup>, which was lower than Korean Physical Standard(21.6kg/m<sup>2</sup>) (Table 2), and similar to Lee’s study(19.7 kg/m<sup>2</sup>, 1999), but slightly higher than Kim’s study(18.73 kg/m<sup>2</sup>, 1998).

This study showed that 6.7% of the subjects were overweight, 44.4% normal weight, and 48.9% underweight, which indicated an increase in underweight population amongst female students.

1998 National Health & Nutrition Survey(1999) reported that BMI of <20 was 34.6%, and BMI of >25 18.4% of women in urban areas. Recent studies suggested that 33.6 - 58.3% of female college students belonged to the underweight group based on BMI, suggesting that the underweight problem is a more serious issue than the overweight. The great interest in physical appearance and inappropriate weight control contributed to the increase in the underweight population, which led to health and nutritional problems(Hong 1993 ; Kwon 2002 ; Lee 1998 ; Park 1997).

A Japanese study(Tsugane 2002) reported that groups with lower or higher than BMI of 23 - 24.9 had increased risks of premature death. Lee(1996), Huh(1990) reported that the underweight could cause abnormalities in the immune system, menstrual irregularities, depressions of the pituitary, thyroid, adrenal glands, genital glands. Furthermore, a BMI of <20 can cause secondary health problems and an increase in mortality rate(McCrory 1998). College students need to maintain normal weight to live a healthy life.

**3. Anthropometric indices by BMI**

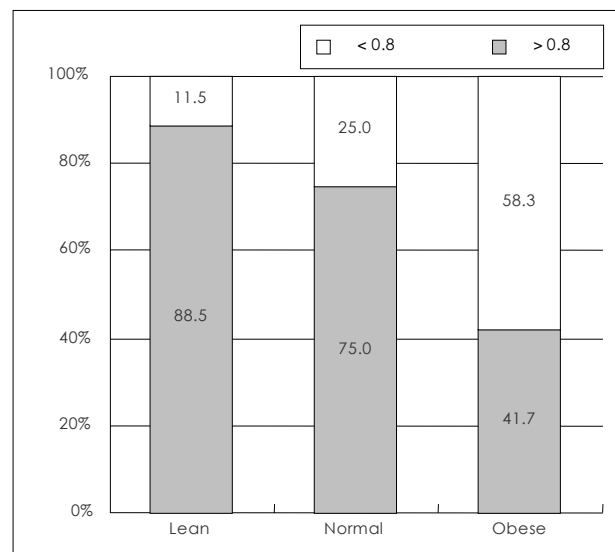
Height was not significantly different among the 3 groups, although weight tended to increase in the obese group(p < 0.000)(Table 3). Height tended to be lower in the obese group. The lean group tended to be taller and skinnier than the normal group, while the obese group was shorter and fuller, which is similar to results reported by Ahn et al.(1996).

The waist/hip ratio is an indicator of disease related to obesity and useful in predicting adulthood diseases such as diabetes, cardiovascular disease, and liver disease(Lee 1996).

**Table 3.** Anthropometric indexes by BMI

	N	Mean ± SD
Height(cm) <sup>ns</sup>	Lean	162.53 ± 4.22
	Normal	161.43 ± 4.60
	Obese	159.83 ± 5.41
Weight(kg) <sup>**</sup>	Lean	48.41 ± 3.61 <sup>c</sup>
	Normal	57.04 ± 4.04 <sup>b</sup>
	Obese	68.36 ± 7.97 <sup>a</sup>
Waist <sup>**</sup>	Lean	68.40 ± 4.12 <sup>c</sup>
	Normal	75.83 ± 5.20 <sup>b</sup>
	Obese	85.03 ± 8.02 <sup>a</sup>
Hip <sup>**</sup>	Lean	91.57 ± 3.44 <sup>c</sup>
	Normal	98.25 ± 4.22 <sup>b</sup>
	Obese	104.36 ± 3.92 <sup>a</sup>
WHR <sup>**</sup>	Lean	0.75 ± 0.04 <sup>c</sup>
	Normal	0.77 ± 0.05 <sup>b</sup>
	Obese	0.81 ± 0.06 <sup>a</sup>

\*\* : Significantly different between three groups at p <0.01  
ns: not significant



**Fig. 1.** Distribution of waist hip ratio by BMI.

A large upper body is more closely related to metabolic disorders such as diabetes, arteriosclerosis, arthritis, and uric calculous(Ahn 1993 ; Kim 1998). Large intermediate body types can have a high risk of myocardial infraction, angina pectoris, stroke, and insulin independent diabetes. It can also increase the risk of premature death in men and women (Kim 1992 ; Lee 1996). There is more of an increased health risk in women than in men(Lee 1991). Measurements of waist and hip increased significantly with the degree of obesity(p < 0.000). WHR also significantly increased with BMI(p < 0.000) and the degree of obesity. Both normal and lean groups

had a normal range of WHR. Lee(1996) reported that in women with large intermediate type and WHR of >0.8, the risks of cardiovascular disease, diabetes, fatty liver, cholelithiasis, and high blood triglyceride would increase by >50%, 4.6-fold, 2-fold, 4.8-fold, and 8.3-fold, respectively. Our study showed that 11.5% of the lean group, 25.0% of the normal group, and 58.3% of the obese group had a higher than standard WHR of 0.8(Fig. 1).

Studies on the relationship between WHR and disease showed that the higher the WHR, the higher the rate of illness (Lee 1991 ; Oppert et al. 2002 ; Seidell 2001 ; Song, Lee 1993). It has been reported(Lee 1991) that people with normal BMI and high WHR ratio due to high intestinal fat accumulation can result in a higher rate of cardiovascular diseases. All three BMI groups in our study had high WHR's which suggests that the distribution of body fat should be focused on more rather than excessive control of body weight.

#### 4. Body composition by BMI

Body fat contents in the lean, normal, and obese groups were 20.44 + 3.87%, 23.54 + 3.07%, and 29.14 + 2.79%, respectively, which suggested a significant body fat increase with higher BMI. Lean body contents decreased from 79.85 + 4.47% in the lean group to 70.91 + 2.80 in the obese group ( $p < 0.000$ ). Body water contents also decreased with higher BMI's ; 55.83 + 3.72% in the lean group, 52.29 + 4.81% in the normal group and 48.53 + 2.34% in the obese group( $p < 0.000$ ) (Table 4).

Body fat contents in the BMI groups were re-classified by groups of <20%, 20 - 25%, and >25%. 12.5% in the lean group and 31.3% in the normal group had greater than 25% body fat, which suggested that non-obese groups had relatively high contents of body fat(Jang 2001). Allison(2002) reported mortality rate is proportional to body fat content. In

**Table 4.** Body compositions by BMI

		N	Mean ± SD
% of fat**	Lean	88	20.44 ± 3.87 <sup>c</sup>
	Normal	80	23.54 ± 3.07 <sup>b</sup>
	Obese	12	29.14 ± 2.79 <sup>a</sup>
% of lean body**	Lean	88	79.85 ± 4.47 <sup>a</sup>
	Normal	80	76.49 ± 3.13 <sup>b</sup>
	Obese	12	70.91 ± 2.80 <sup>c</sup>
% of water**	Lean	88	55.83 ± 3.72 <sup>a</sup>
	Normal	80	52.29 ± 4.81 <sup>b</sup>
	Obese	12	48.53 ± 2.34 <sup>c</sup>

\*\* : Significantly different between three groups at  $p < 0.01$

his study, lean body content was inversely proportional to the mortality rate and high lean body content in the lean group had beneficial health effects. Kirchengast(2001) reported that the lean group women with cystoma in the ovary had a significantly higher fat content and lower lean body content. These results support that high fat content in the lean group increased health risks.

Other studies showed that increase in the body fat content and decrease in the lean body content are due to aging (Willmore 1999) and decrease in fat content and WHR and increase in the lean body content improved overall health conditions(Guo 1999 ; Lazarus 1998 ; Spiengelman 1992).

Relatively high fat content, in the female college students of the lean group reported by this study, could be a factor for early onset and higher risks of adulthood diseases.

## 5. Results of survey

### 1) Health problems

Constipation(24.4%), gastrointestinal disease(20.6%), anemia(15.0%) and edema(13.3%) were found to be the most problematic to female college students, and closely related to their dietary habits(Table 5).

In the lean and normal groups, respectively, constipation (23.9%, 25.0%), gastrointestinal disorder(25.0%, 15.0%), edema(10.2%, 17.5%) and anemia(19.8%, 11.3%) were most common. In the obese group, the frequency of constipation (25.0%) and gastrointestinal disease(25.0%) was high based on a small number of subjects.

Gastrointestinal disease, frequent in all 3 groups, can cause

**Table 5.** Distribution of disease

	Total		Lean		Normal		Obese	
	N	%	N	%	N	%	N	%
Edema	24	13.3	9	10.2	14	17.5	1	8.3
Constipation	44	24.4	21	23.9	20	25.0	3	25.0
Liver disorder	1	0.6	1	1.1	-	-	-	-
Diabetes	4	2.2	2	2.3	2	2.5	-	-
Hypertension	2	1.1	-	-	1	1.3	1	8.3
Arteriosclerosis	2	1.1	1	1.1	-	-	1	8.3
Heart disease	4	2.2	2	2.3	2	2.5	-	-
Hypotension	3	1.7	2	2.3	1	1.3	-	-
Gastrointestinal disorder	37	20.6	22	25.0	12	15.0	3	25.0
Anemia	27	15.0	17	19.3	9	11.3	1	8.3
Others	13	7.2	6	6.8	5	6.3	2	16.7
No answer	19	10.6	5	5.7	14	17.5	-	-
Total	180	100.0	88	100.0	80	100.0	12	100.0

**Table 6.** Eating habits: Regularity of meals, breakfast intake status and eating out intake status

		Total		Lean		Normal		Obese	
		N	%	N	%	N	%	N	%
Regularity of meals	Irregular eating	49	27.2	23	26.1	23	28.8	3	25.0
	Regular eating	131	72.8	65	73.9	57	71.3	9	75.0
	Total	188	100.0	88	100.0	80	100.0	12	100.0
Breakfast intake status	Rarely eating	76	42.2	37	42.0	32	40.0	7	58.3
	Frequently eating	58	32.2	29	33.0	27	33.8	2	16.7
	Daily eating	46	25.6	22	25.0	21	26.3	3	25.0
	Total	188	100.0	88	100.0	80	100.0	12	100.0
Eating out	daily	70	38.9	29	33.3	33	41.3	8	66.7
	3 - 5times/week	58	32.2	31	35.6	24	30.0	3	25.0
	<2times/week	50	27.8	27	31.0	22	27.5	1	8.3
	Total	188	100.0	88	100.0	80	100.0	12	100.0

weight loss, loss of appetite, digestive problems, osteoporosis, and anemia. Constipation and anemia can contribute to why 49.5% of female college students were underweight. Therefore, maintaining normal weight with good nutritional status during the college period is important for good health.

## 2) Eating behavior

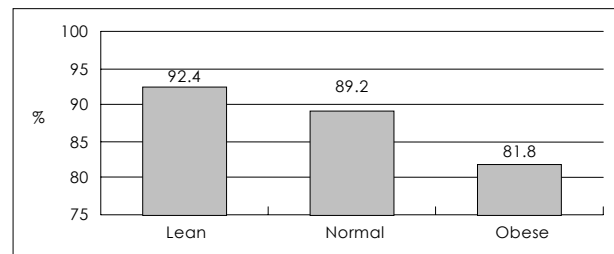
### (1) Regularity of meals

Of the subjects, 72.8% answered that their eating was regular. Irregular meals were frequent in all 3 groups (25.0 - 28.8%) (Table 6).

### (2) Status of breakfast intake

Out of the subjects surveyed, 25.6% had breakfast every day, which indicated a high frequency of irregularity in meal intake among female college students (Table 6). This trend was consistent in all 3 BMI groups. Improvement in dietary practice must be emphasized since lunch and dinner cannot compensate for the loss of nutritional intake when breakfast is skipped.

In 1998 report on the National Health & Nutrition Survey (1999) showed that 51.5% of the subject skipped at least one meal and the breakfast was most frequently missed (35.1%). Amongst age groups, teenagers (13 - 19 year old) in middle and high schools and young adults in their 20's had the highest rate of skipping breakfast (46.3% and 59.4%, respectively). Among young adults in their 20's, only 24.2% regularly had all 3 meals. Reasons for skipping meals were contributed to over-sleeping (25.3%), lack of appetite (18.3%), lack of time (22.1%), habit (20.2%), weight loss (5.8%), digestive problem (2.6%), and snacking (3.4%).

**Fig. 2.** Daily snack intake status.

## 3) Snacking

### (1) Status of snack intake

It should be noted that all 3 groups had a high frequency of daily snack intake (81.8 - 92.4%). Results suggested that snack intake was on the rise and becoming a substitute for a regular meal (Fig. 2).

A 1998 report on the National Health & Nutrition Survey (1999) showed that 40% of young adults in their 20's had snacked 1 to 2 times a day while 22.1% had no snack. Amongst the women in their 20's, 45.8% had snacked 1 to 2 times, 30.4% had snacked less than once a day, 5% more than three times a day, and 18.3% had no snack, which suggested a high frequency of daily snacking. Kim (1995) showed that average frequency of snack intake was 1.9 times a day and snacking was an important part of meals.

### (2) Types of favorite snacks

Some of their favorite snacks included cookies, bread and cake (33.7%), spicy & sliced rice cake, pork sausage, and boiled fish cake (18.5%), Juice and soda (13.5%), fruit (15.2%), and hamburger and pizza (3.9%), which suggested frequent intake of high caloric and processed foods (Table 7).

Kim's study (1995) also showed similar results suggesting

**Table 7.** The type of favorite snacks

	Total		Lean		Normal		Obese	
	N	%	N	%	N	%	N	%
Soda or juice	24	13.5	14	15.9	8	10.3	2	16.7
Tea	2	1.1	1	1.1	1	1.3	-	-
Bread, cake	60	33.7	28	31.8	29	37.2	3	25.0
A broiled dish of sliced riccd, sundae	33	18.5	18	20.5	14	17.9	1	8.3
Hamburger, pizza	7	3.9	-	-	6	7.7	1	8.3
Noodle, dumplings, ramyon	21	11.8	15	17.0	4	5.1	2	16.7
Fruit	27	15.2	10	11.4	14	17.9	3	25.0
Dairy product	1	.6	1	1.1	-	-	-	-
Popcorn	3	1.7	1	1.1	2	2.6	-	-
Total	180	100.0	88	100.0	80	100.0	12	100.0

that female college student frequently consumed processed foods due to their irregular daily activity and out of convenience. Increase in snacking and transformation of snacks into a meal, a frequent intake of high caloric and process foods can contribute to nutritional unbalance among female college students(No, Yoo 1989 ; Park 1981). Therefore, nutritional education on adequate snacking can turn snacking into an opportunity to supplement required nutrients which may not be obtained from regular meals.

**4) Frequency of eating out**

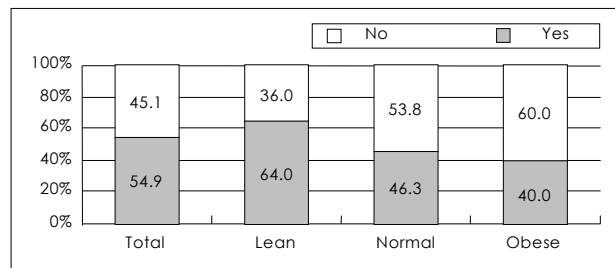
This study showed frequent eating out among female college students : 32.2% reported eating out 3 - 5 times, and 27.8% less than twice a week. In the lean group, 33.3% reported eating out every day, 35.6% 3 - 5 times a week, and 31.0% less than twice a week. In the normal group, 41.8% reported eating out every day, 30.0% 3 - 5 times a week, and 27.5% less than twice a week. In the obese group, 67.7% reported eating out every day, 25.0% 3 - 5 times a week and 8.3% less than twice a week. Interestingly, the obese group had frequent eating outs (Table 6).

A 1998 report on the National Health & Nutrition Survey (1999) reported that 6.8% woman in their 20's had eaten out more than twice a day, 21.1% more than once a day, 31.5% more than once a week, 21.3% more than once a month, and 19.3% rarely eating out, which suggested an increasing trend of eating out.

Increasing frequency of eating out in the meal pattern can have a close relation with increasing health issues among female college students.

**5) Weight control experience**

Overall 45.1% of female college students had tried to lose



**Fig. 3.** Weight reduction trial.

weight. Within the lean, normal, and obese groups, 36.0%, 53.8%, and 60.0% of female students tried to lose weight indicating a high rate of weight loss trial with higher BMI (Fig. 3).

In our study, 31.0% of the lean group has tried weight loss, which suggests that significant efforts toward losing weight were found even in the lean group. Weight reduction efforts that are based on misdiagnosis of their body types can cause failure in weight control and other health related problems. Adequate weight control in the normal group can help prevent adulthood diseases and maintain overall health (Wadden, Bartlett 1992).

Excessive weight loss among women can cause severe health issues including extreme underweight, loss of appetite, digestive failure, osteoporosis, a weak immune system, bulimia, no menstruation, anemia, developmental issues, nutrient deficiency, character change, fatigue, degenerative disease, and adverse effect toward a fetus in the pregnant women (Park 1997).

Education on ideal body type is important to prevent adverse health consequences caused by weight loss attempt in the lean group.

**Table 8.** Practice about exercise

	Total		Lean		Normal		Obese	
	N	%	N	%	N	%	N	%
Rarely(1time/week)	64	52.5	34	63.0	24	41.4	6	60
Frequently(2 - 5times/week)	52	42.6	17	31.5	33	56.9	2	20
Regularly(6times/week)	6	4.9	3	5.6	1	1.7	2	20
No answer	58	-	34	-	22	-	2	-
Total	180	100	88	100	80	100	12	100

### 6) Body types

Among female college students, 69.0%, 19.5%, and 11.5% reported lower body type, intermediate body type, and upper body type, respectively. Within the lean and normal group, 67.18% and 73.8%, respectively considered their body types as the lower body type, and within the obese group, 50.0% and 33.3% considered their body types to be lower body type and intermediate body type, respectively.

Kim's study (1998) reported that 47.4% of the study subjects considered themselves extremely obese and 3.5% obese suggesting that more than half the subjects appeared to misdiagnose their bodies to be obese, which made them want to lose weight. This observation is relevant with our study showing a high rate of dieting experience due to misdiagnosis of their body types within the lean and the normal groups. Many students were interested in their body shapes, and had tried weight loss based on misdiagnosis of their body types. Some underwent extreme dieting resulting in inadequate dietary intakes or practices. Therefore, good awareness of body type for female college students is important.

### 7) Exercise

Only 4.9% of the subjects exercised on a regular basis (Table 8). Within the lean, normal and obese groups, 63.0%, 41.4%, and 60%, respectively rarely exercised. Lack of exercise can contribute to many health issues. It can cause pain in shoulders and waist (for people in their 30's), obesity, diabetes, and other adulthood disease. Therefore, adequate exercise is important for good mental and physical health (Willmore et al. 1999 ; Ryan et al. 2000).

### 8) Daily physical activity

Energy consumption of BMI group was calculated based on the nature and duration of physical activity in individuals. Energy consumption increased with increase in obesity ; 1509.40kcal for the lean group, 1792.21kcal for the normal group, 2334.63kcal for the obese group ( $p < 0.000$ ) (Table 9). Based on recommended dietary allowances for Koreans

**Table 9.** Daily physical activity

	Daily physical activity(kcal)**		
	N	Weight(kg)	Mean $\pm$ SD
Lean	69	48.41	1509.40 $\pm$ 264.44 <sup>c</sup>
Normal	62	57.04	1792.21 $\pm$ 378.04 <sup>b</sup>
Obese	7	68.36	2334.63 $\pm$ 601.25 <sup>a</sup>
Total	138	53.49	1678.32 $\pm$ 395.51

\*\* : Significantly different between three groups at  $p < 0.01$

(2000) of 39kcal/kg, 1885.65kcal for the lean group, 2230.02 kcal for the normal group, and 2666.04kcal for the obese group are recommended. In our study, all 3 BMI groups showed lower than recommended energy consumption.

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