

The nutritional knowledge, food habits and health
attitude of Chinese university students: body image
concept and diet experience among Chinese students
-a cross sectional study-

Ruka Sakamaki^{1*}, Kenji Toyama², Rie Amamoto², Chuanjun Liu³, Naotaka
Shinfuku¹

¹International Center for Medical Research. Kobe University Graduate School
of Medicine, Kobe, Japan

²Seinan Jo Gakuin University Faculty of Health and Welfare, Department of
Nutritional Sciences, Fukuoka, Japan

³Department of Plastic Surgery, Kobe University Graduate School of Medicine,
Kobe, Japan

*Corresponding Author:

Email addresses:

RS:sakamaki@seinan-jo.ac.jp

KT:toyama@seinan-jo.ac.jp

RA:tanaka_r@seinan-jo.ac.jp

CJ L:liu_jim@yahoo.com

Abstract

Background: We have demonstrated that irregular lifestyle was significantly related to an indefinite complaint in a young Japanese female student having a desire to be thinner in the previous study. In the present study, we examined the nutritional knowledge and practices concerning food habits among Chinese students as to compare the health behaviors among Asian countries.

Methods: A convenient sample of 540 students aged 19 - 24 years completed a self-reported questionnaire. Medical students from Beijing University (120 men and 150 women) in Northern China and Kunming Medical University in southern China (92 men and 150 women) participated in this study. The parametric variables were analyzed using the Student's *t* -test. Chi-square analyses were conducted for non-parametric variables

Results and Discussion: Our results showed that the 71.2% of students were classified into normal BMI group, and 13 % of students were underweight with the prevalence of BMI >30 obesity being very low in this study sample. However, young Chinese female students still had a greater desire to be thinner (62.0%) than male (47.4%). Habits involving regular eating patterns and vegetable intake were reported, and represent practices that ought to be encouraged.

Conclusions: The university and college arenas represent the final opportunity for the nutritional education of the student and the educator's perspective. Our findings suggest the need for education strategies designed to improve competence in the area of nutrition in not only in Japan but also in China.

Background

The increasing problem of obesity has been observed in many lower-income countries during the last decades. China has adopted an open-market policy and experienced explosive economic growth, which has led to an improvement concerning the problem of food scarcity at the national level and to a remarkable transition in the structure of the diet of Chinese [1]. The composition of the Chinese diet has been shifting towards a diet higher in fat and meat, and lower in carbohydrates and fiber [2]. Additionally, decreased levels of physical activity and leisure are linked to increases in the prevalence of an overweight condition, obesity and diet-related non-communicable diseases [3].

Recent WHO findings reveal that Body Mass Index (BMI) in Asian populations is related to disease at a lower level [4]. A national collegiate Health Risk survey revealed that 1 in 5 college students is overweight in the U.S [5]. Asians tend to have a mean or median BMI value that is lower than that observed in non-Asian populations [4]. WHO (2003) reported a substantial increase in the prevalence of an overweight condition and obesity in China [6]. However, little is known concerning the nutritional and health-related behavior, and BMI distribution, of Chinese university students. In previous reports, we examined eating habits and dietary knowledge of female students in Japan. Our study showed that irregular lifestyle was significantly related to an indefinite complaint, with the majority of students having a desire to be thinner [7]. The purpose of this study was to obtain a preliminary understanding of the relative level of BMI distribution of Chinese

university students, and to determine the nutritional knowledge and body-shape perceptions among Chinese students.

Material and Methods

This study was carried out between February 2001 and April 2002. Medical students from Beijing University (120 men and 150 women) in Northern China and Kunming Medical University in southern China (92 men and 150 women) participated in this study. A convenient sample of 540 students aged 19 - 24 years completed a self-reported questionnaire. The questionnaire consisted of 21 questions regarding eating, drinking and smoking habits (19 questions), with 2 questions related to dieting (tried to lose weight). The questionnaire was designed by the authors and based on a national dietary survey held by the health and labor ministry in Japan. Some of the authors also traveled to China to investigate the dietary life of Chinese to facilitate questionnaire design. The questionnaire was first written in Japanese and then translated to Chinese utilizing fluent bilingual linguistic services at Kobe University. The translated Chinese version was back-translated to insure the original meaning was not lost. We obtained consent from the department chairman of each university, and all participants were informed of the purpose of the study according to the Declaration of Helsinki. Only subjects who accepted the research purpose were invited to participate in this study. The statistical software package SPSS 10.0 was used for the analysis of data [8]. In this study, parametric variables were analyzed using the Student's t -test.

Chi-square analyses were conducted for non-parametric variables. All analyses were two-tailed, and a 'p' value less than 0.05 was considered statistically significant.

Results

Characteristics of the sample and BMI categories. The response rate was 96% (512 / 540). The characteristics of the subjects are shown in Table 1. A total of 212 men and 300 women, with a mean age of 20 ± 1.9 years, participated in this study. The average height was 165.8 ± 7.8 cm, while the average weight was 56.9 ± 9.2 kg. Mean BMI was 20.6 ± 2.2 , calculated as weight in kilograms divided by height in meters squared (kg/m^2). To analyze the distribution of BMI and health-related behavior, BMI was categorized into 4 groups according to mean BMI of ± 1 standard deviation (SD) (Figure 1). The average BMI for male students was 21.4 ± 2.5 , and was highest in the categories 18.9- 21.4 (37.7%) and 21.4-23.9 (32.5%). The average BMI for female students was 20.0 ± 1.8 , with the categories 18.2-20.0 (37.5%) and 20.0- 21.8 (31.4%) displaying high values. According to Garrow's BMI classifications [9], 90% of students were classified into the underweight and normal weight categories. BMI values of deviations from the average sample show the presence of few extreme values.

Eating habit. The majority of students (83.6 %) reported taking meals regularly, with 79.0% eating meals 3 times per day; there were no gender differences. However, a significant gender difference was found in the

response relating to breakfast intake, with 66.8% of males and 82.3% of females reported taking breakfast regularly. 31.1% of females snacked daily, while the proportion of male students snacking daily was one-third of this value (11.5%). Furthermore, the frequency of snacking rate was higher in females (31.1%) than in males (11.5%). The present sample demonstrated high consumption of vegetable and fruits. A total of 47.9% of students reported the consumption of colored vegetables such as spinach and carrots, and 32.5% of subjects reported eating fruit daily. Female students tend to eat more fruit than males. In addition, female students tend to eat with friends and family more frequently than males. Few subjects smoke or drink alcohol. When the students eat out, female students are more likely to consider the calorie content of the menu than males. Although 85.6% of students are aware of the concept of nutritionally balanced food, only a small number of students (7%) apply this concept when selecting food from a menu. Moreover, only 51% of students showed a desire to learn about healthy diets.

Body image and health consciousness. When subjects were asked about their history of dieting, 24% of respondents reported having an experience of dieting (Table 4). The percentage of students with an experience of dieting among genders was 16.5% for male students and 31.3% for female students. More than 60% of the students selected 'thin or slim as beauty'; however, we found 84.2 % of subjects within the underweight and normal weight range.

The question concerning diet history revealed that the proportion of female

students having a dieting experience (29.7%) was more than twice as great as that of male subjects (12.7%). According to BMI categories of the present sample, both male and female students displayed a significant difference between groups. For the male students, 55.6% belong to the BMI ≥ 23.9 category, while 70.8% female students belong to the 18.2 \leq BMI < 21.8 and 20.0 \leq BMI < 21.8 categories. According to Bray's BMI classifications, 90% of students belong in the underweight to normal weight categories. Although more than half of the respondents reported a desire to adopt healthier dietary habits, there was a significant difference between male and female subjects regarding the degree of consciousness pertaining to health and diet. Only 3.8% of male students wish to learn about health and diet, in contrast to 48.1% of female students. When they eat out at a restaurant, female students reported that 'calories' were second in priority to taste, while 'calories' were the second-lowest priority for male students.

Discussion

This study aimed to determine the health, nutritional knowledge and dietary behavior of university students in China. As a result, we recorded the distribution of BMI among Chinese students and found a low prevalence of obesity, a finding that is consistent with a study of Japanese female students [7].

In China, the prevalence of overweight individuals increased from

1991 to 1997, with the increasing rate changing from 6.4 to 7.7 [10]. It is notable that the proportion of energy derived from the fat of both vegetable and animal sources increased each year. A recent study revealed that energy derived from dietary fat accounted for more than 30% of the total energy [11]. A WHO expert consultation reported that BMI in Asian populations is related to disease at a lower level [4].

Our data shows that the majority of students regularly eat 3 times per day, and almost 80% of students eat vegetables and fruit twice per day. These eating habits ought to be encouraged. The traditional Chinese diet contains plenty of vegetables and is rice-based. The present study showed a high proportion of Chinese students take breakfast daily. In contrast, a dietary survey of young Japanese subjects revealed a low rate of individuals engaged in regular eating patterns [12]. The skipping of breakfast has been associated with the lower nutritional status and the risk of cardiovascular diseases [13]. It has also been reported that less adequate breakfast habits may contribute to the appearance and further development of obesity [14]. Therefore the importance of regular eating patterns cannot be overemphasized in nutritional education.

Our results showed that body figure perception was significantly different between female and male students. A number of researchers have investigated the relationship of body image and gender role. Women tend to desire a thinner figure, express more anxiety about becoming fat, and are more likely to diet than men [15, 16]. Moreover, men reported a desire for a heavier physique and muscularity [17]. In recent years, eating disorders have been increasing dramatically among young women. The results of our study did not

confirm this suggestion to the level of statistical significance, but it is worth pointing out that in BMI categories <20 , which are considered the under to normal weight range, 100 out of 78 female students still indicated a desire for slimness. Dissatisfaction with body figure and eating disorders are closely related [18, 19, 20]. Therefore, the distribution of BMI for the present sample was within, or below, the normal weight range for the age and height of sampled individuals; additionally, the existence of a small number of students who still desire to lose weight cannot be ignored. In the previous study, we found that unhealthy dieting behaviors are related to an indefinite complaint. Furthermore, our finding of the existence of a high prevalence of dieting and desire to be thinner among female students suggests that dietary education may need to begin at the elementary school levels.

Conclusions

In conclusion, our findings reveal that the majority of students were classified into normal BMI group, with the prevalence of BMI >30 obesity being very low in this study sample. However, young female students still had a greater desire to be thinner than male students. Habits involving regular eating patterns and vegetable intake were reported, and represent practices that ought to be encouraged. The meal and snack patterns in Chinese students were very similar to the traditional eating pattern model, although diets and activity patterns are changing rapidly in China and other low-income countries. The university and college arenas represent the final opportunity for

the nutritional education of the student from the educator's perspective. Our findings suggest the need for education strategies designed to improve competence in the area of nutrition, especially with respect to information relating to sources of nutrition. Furthermore, public demand for health and nutritional information should be taken into consideration when implementing strategies aimed at improving the nutritional well-being of individuals.

Authors contributions: R.S carried out questionnaire design, manuscript drafting and total coordination of the study. K.T has been involved in drafting and revision of the article. R.T contributed the data entry and its analysis. CJ.L contributed to the questionnaire design, data collection and language translations. S.N contributed to final approval of the manuscript.

References

1. Popkin BM, Keyou G, Zhai F, Guo X, Ma H, Zohoori N: **The nutrition transition in China: a cross-sectional analysis.** Eur J Clin Nutr. 1993, **47**:333-46.
2. Du S, Mroz TA, Zhai F, Popkin BM: **Rapid income growth adversely affects diet quality in China--particularly for the poor!** Soc Sci Med. 2004 **59**:1505-15
3. Du S, Lu B, Zhai F, Popkin BM: **A new stage of the nutrition transition in China.** Public Health Nutr. 2002 ,**5**:169-74.
4. WHO Expert Consultation: **Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies.** Lancet. 2004, **363** :157-63.
5. Lowry R, Galuska DA, Fulton JE, Wechsler H, Kann L, Collins JL Jan: **Physical activity, food choice, and weight management goals and practices among US college students.** Am J Prev Med. 2000,**18**:18-27.
6. Waxman A: **Prevention of chronic diseases: WHO global strategy on diet, physical activity and health.** Food Nutr Bull. 2003, **24**:281-4.
7. Rie Amamoto, Mina Dozono, Kenji Toyama; **The relationship between dietary life and indefinite complaint in female Nutrition department students.** Seinan Jo Gakuin Bulluten. **2004**, 75-85.
8. SPSS Inc: **SPSS Base 7.5 Application guide Chicago, IL: SPSS,** 1997:53-56

9. Garrow JS, Webster J: **Quetelet's index (W/H²) as a measure of fatness.**
Int J Obes. 1985, **9**:147-53.
10. Wang Y, Monteiro C, Popkin BM: **Trends of obesity and underweight in older children and adolescents in the United States, Brazil, China, and Russia.** Am J Clin Nutr. 2002, **75**:971-7.
11. Xiao-Shu Chen, MD and Ke-You Ge: **Nutrition transition in China: the growth of affluent diseases with the alleviation of undernutrition**
Asia Pacific Journal of Clinical Nutrition 1995, **4**: 287-293.
12. Ministry of Health, Labour and Welfare, Japan: **The National Nutrition Survey in Japan, 2002.** Daiichi publisher; 2004.
13. Sakata K, Matumura Y, Yoshimura N, Tamaki J, Hashimoto T, Oguri S, Okayama A, Yanagawa: **Relationship between skipping breakfast and cardiovascular disease risk factors in the national nutrition survey data .**Nippon Kosho Eisei Zasshi. 2001,**48**:837-41
14. Ortega RM, Redondo MR, Lopez-Sobaler AM, Quintas ME, Zamora MJ, Andres P, Encinas-Sotillos A. **Associations between obesity, breakfast-time food habits and intake of energy and nutrients in a group of elderly Madrid residents.**J Am Coll Nutr. 1996,**15**:65-72.
15. Cash TF, Brown TA. **Body image in anorexia nervosa and bulimia nervosa.**Behav Modif. 1987, **11**:487-521.
16. Smith BL, Handley P, Eldredge DA. **Sex differences in exercise motivation and body-image satisfaction among college students.**
Percept Mot Skills. 1998, **86**:723-32.
17. Andres P, Encinas-Sotillos A: **Associations between obesity,**

- breakfast-time food habits and intake of energy and nutrients in a group of elderly Madrid residents.** J Am Coll Nutr. 1996, **15**:65-72
18. Solenberger SE Exercise and eating disorders: **a 3-year inpatient hospital record analysis.** Eat Behav. 2001, **2**:151-68;
 19. Williamson DA, Cubic BA, Gleaves DH. **Equivalence of body image disturbances in anorexia and bulimia nervosa.** J Abnorm Psychol. 1993, **102**:177-80.
 20. Waller G, Hodgson S. **Body image distortion in anorexia and bulimia nervosa: the role of perceived and actual control.** J Nerv Ment Dis. 1996, **184**:213-9.

Figures

Figure 1-BMI distribution of Chinese university students

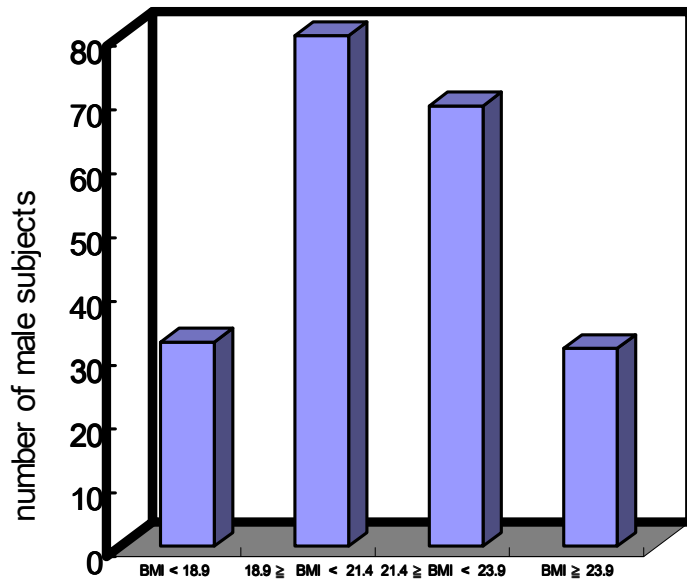
Tables

Table 1- Characteristics of Participants

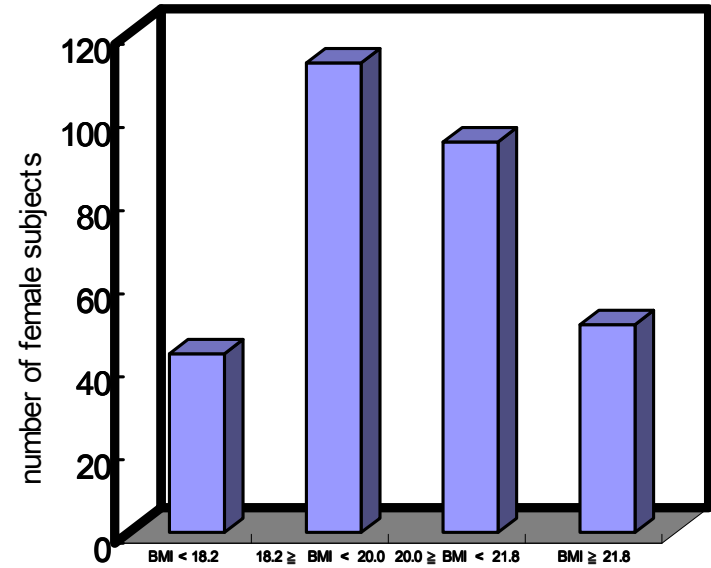
Table 2- Life style practices

Table 3 - Body shape perception and health conscious of Chinese students.

Figure 1. BMI distribution of Chinese university students.



Male



Female

Table 1. Characteristics of Participants.

Variable	Total n = 512	Male n = 212	Female n = 300
Age (y)	20.4 ± 1.9	20.3 ± 1.7	20.4 ± 2.0
weight (kg)	56.9 ± 9.2	63.7 ± 8.8	52.1 ± 5.9
height (cm)	165.8 ± 7.8	172.3 ± 5.5	161.2 ± 5.6
BMI (kg/m ²)	20.6 ± 2.2	21.4 ± 2.5	20.0 ± 1.8

Table 2. Lifestyle practices.

Questions	Levels	Total (%)	Male (%)	Female(%)	p values
Do you take your meals regularly	always regular	428 (83. 6)	173 (81. 6)	255 (85. 0)	n. s
	irregular	84 (16. 4)	39 (18. 4)	45 (15. 0)	
Do you always take breakfast	daily	387 (75. 9)	149 (66. 8)	246 (82. 3)	p<0. 0006
	three or four times per week	56 (11)	29 (13. 7)	27 (9)	
	once or twice per week	29 (5. 7)	18 (8. 5)	11 (3. 7)	
	rarely	38 (7. 4)	23 (10. 9)	15 (5)	
How many times do you eat meals except snacks	one time	4 (0. 8)	1 (0. 5)	3 (1. 0)	n. s
	two times	80 (16)	38 (18. 8)	42 (14)	
	three times	395 (79. 0)	150 (74. 3)	245 (82. 3)	
	four times	21 (4. 2)	13 (6. 4)	8 (2. 7)	
How often do you take snacks apart from regular meals	daily	117 (23. 1)	24 (11. 5)	93 (31. 3)	p<0. 0001
	three or four times per week	80 (15. 8)	19 (9. 1)	61 (20. 5)	
	once or twice per week	148 (29. 2)	58 (27. 8)	90 (30. 3)	
	rarely	161 (31. 8)	108 (51. 7)	53 (17. 8)	
How often do you eat green, red or yellow color vegetables	daily	244 (47. 9)	93 (43. 9)	151 (50. 8)	n. s
	three or four times per week	190 (37. 2)	84 (39. 6)	106 (35. 5)	
	once or twice per week	65 (12. 7)	29 (13. 7)	35 (12. 0)	
	rarely	11 (2. 2)	6 (2. 8)	5 (1. 7)	
How often do you eat fruits	daily	166 (32. 5)	56 (26. 4)	110 (36. 8)	p<0. 0001
	three or four times per week	86 (16. 8)	15 (7. 1)	71 (23. 7)	
	once or twice per week	138 (27. 0)	54 (25. 5)	84 (28. 1)	
	rarely	120 (23. 5)	87 (41. 0)	33 (11. 1)	
How often do you eat fried food	daily	160 (31. 6)	69 (32. 5)	91 (30. 9)	n. s
	three or four times per week	55 (10. 8)	25 (11. 8)	30 (10. 1)	
	once or twice per week	131 (25. 7)	46 (21. 7)	85 (28. 5)	
	rarely	163 (32. 0)	72 (34. 0)	91 (30. 5)	
How often do you take alcohol	daily	4 (0. 8)	2 (1. 0)	2 (0. 7)	p<0. 006
	two or three times per week	23 (4. 6)	17 (8. 1)	6 (2. 1)	
	rarely	473 (94. 6)	191 (91. 0)	282 (97. 3)	
How often do you eat with friends and family	daily	86 (17)	25 (12)	61 (20. 6)	p<0. 01
	three or four times per week	92 (18. 2)	41 (19. 6)	51 (17. 2)	
	once or twice per week	165 (32. 7)	63 (30. 1)	102 (34. 5)	
	always alone	161 (31. 9)	80 (38. 3)	81 (27. 7)	
Please state your smoking history	current smoker	36 (7. 0)	29 (10. 3)	7 (0. 7)	p<0. 0001
	ex- smoker	16 (3. 1)	14 (4. 5)	2 (2. 3)	
	never smoke	459 (89. 8)	169 (85. 2)	290 (97. 0)	
What type of food do you think you should eat to have a balanced nutrition	mainly meat	14 (2. 8)	10 (4. 8)	4 (1. 4)	n.s
	mainly vegetable	40 (7. 9)	13 (6. 3)	27 (9. 1)	
	meat, vegetable and other variety of food	438 (86. 9)	178 (85. 6)	260 (87. 8)	
	others	12 (2. 4)	7 (3. 4)	5 (1. 7)	

Table 3. Body shape perception and health conscious of Chinese students.

Male		BMI categories					p values
Questions	Levels	Total (%)	BMI < 18.9%	18.9 > BMI < 21.4%	21.4 > BMI < 23.9%	BMI > 23.9%	
Have you ever tried to be on a diet	Yes	27 (12.7)	1 (3.1)	3 (3.8)	8 (11.6)	15 (48.4)	p<0.0001
	No	185 (87.3)	31 (96.9)	77 (96.3)	61 (88.4)	16 (51.6)	
Do you wish to be more skinny than now	Yes	100 (47.4)	15 (46.9)	41 (51.9)	33 (47.8)	11 (35.5)	n.s
	No	111 (52.6)	17 (53.1)	38 (48.1)	36 (52.2)	20 (64.5)	
How often do you take snacks apart from regular meals	daily	24 (11.5)	4 (12.9)	12 (15.2)	7 (10.3)	1 (3.2)	n.s
	three or four times per week	19 (9.1)	3 (9.7)	9 (11.4)	5 (7.4)	2 (6.5)	
	once or twice per week	58 (27.8)	10 (32.3)	21 (26.6)	19 (27.9)	8 (25.8)	
	rarely	108 (51.7)	14 (45.2)	37 (46.8)	37 (54.4)	20 (64.5)	
In general, how conscious are you of the association between health and diet	I want to learn more	95 (45.2)	14 (43.8)	35 (43.8)	31 (45.6)	15 (50.0)	n.s
	I want to learn in the future	85 (40.5)	14 (43.8)	33 (41.3)	24 (35.3)	14 (46.7)	
	I am not interested in but better to learn	21 (10.0)	2 (6.3)	9 (11.3)	9 (13.2)	1 (3.3)	
	I am not interested in this	9 (4.3)	2 (6.3)	3 (3.8)	4 (5.9)	0 (0.0)	
Do you consider you should change your dietary habit	I want to improve my dietary habits	111 (52.4)	14 (43.6)	40 (50.0)	34 (49.3)	23 (74.2)	n.s
	I do not want to change	69 (32.5)	11 (34.4)	30 (37.5)	25 (36.2)	3 (9.7)	
	I do not care	32 (15.1)	7 (21.9)	10 (12.5)	10 (14.5)	5 (16.1)	

Female		BMI categories					p < 0.05
Questions	Levels	Total (%)	BMI < 18.2%	18.2 > BMI < 20.0%	20.0 > BMI < 21.8%	BMI > 21.8%	
Have you ever tried to be on a diet	Yes	89 (29.8)	4 (9.3)	28 (25.0)	35 (37.2)	22 (44.0)	p < 0.0006
	No	210 (70.2)	39 (90.7)	84 (75.0)	59 (62.8)	28 (56.0)	
Do you wish to be more skinny than now	Yes	186 (62.0)	25 (58.1)	74 (65.5)	55 (58.5)	32 (64.0)	n.s
	No	114 (38.0)	18 (41.9)	39 (34.5)	39 (41.5)	18 (36.0)	
How often do you take snacks apart from regular meals	daily	93 (31.3)	14 (32.6)	32 (28.6)	26 (28.0)	21 (42.9)	n.s
	three or four times per week	61 (20.5)	6 (14.0)	30 (26.8)	18 (19.4)	7 (14.3)	
	once or twice per week	90 (30.3)	13 (30.2)	30 (26.8)	33 (35.5)	14 (28.6)	
	rarely	53 (17.8)	10 (23.3)	20 (17.9)	16 (17.2)	7 (14.3)	
In general, how conscious are you of the association between health and diet	I want to learn more	143 (48.3)	29 (69.0)	46 (41.1)	41 (44.6)	27 (54.0)	p<0.03
	I want to learn in the future	118 (39.9)	8 (19.0)	53 (47.3)	39 (42.4)	18 (36.0)	
	I am not interested in but better to learn	28 (9.5)	5 (11.9)	11 (9.8)	7 (7.6)	5 (10.0)	
	I am not interested in this	7 (2.4)	0 (0.0)	2 (1.8)	5 (5.4)	0 (0.0)	
Do you consider you should change your dietary habit	I want to improve my dietary habits	167 (55.9)	28 (65.1)	64 (56.6)	48 (51.6)	27 (54.0)	n.s
	I do not want to change	77 (25.8)	10 (23.3)	31 (27.4)	22 (23.7)	14 (28.0)	
	I do not care	55 (18.4)	5 (11.6)	18 (15.9)	23 (24.7)	9 (18.0)	