nrp **Nutrition Research and Practice**

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Life stress, dietary attitudes, and frequency of snack intake for college students in Seoul and Gyeonggi area: the difference between male and female students

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ABSTRACT

BACKGROUND/OBJECTIVES: This study examines life stress, dietary attitudes, and snacking frequency for college students living in Seoul and Gyeonggi Province. The purpose of this study is to assist college students feeling stressed by offering desirable dietary attitudes and choices of the appropriate snacks by providing educational materials that offer appropriate nutrition education and nutritional information.

SUBJECTS/METHODS: A survey was conducted on a total of 600 college students aged 19–29-year-olds living in Seoul and Gyeonggi Province (234 male students and 366 female students). Collected data were analyzed using SPSS WIN 28.0 program.

RESULTS: Life stress among college students did not differ significantly between the genders. Male students were more stressed about lover ($P < 0.01$), while female students were more stressed about value problems ($P < 0.01$) and future problems ($P < 0.05$). Dietary attitude ratings were 3.1 for both male and female students with no significant difference. The overall snacking frequency was 4.1 times/day—4.2 times/day for male students and 4.0 times/day for female students—thus, there was no significant difference. Male students consumed 'beverage' ($P < 0.01$) more frequently than female students. Life stress and snacking were positively correlated for 'biscuit/cookie,' 'chip,' 'cereal,' 'juice/smoothie,' 'café americano,' 'café latte,' 'tea,' 'jelly,' 'chocolate,' 'rice cake,' 'milk,' 'flavored milk,' and 'ice cream' among male students. Among female students, life stress and snacking were positively correlated with 'cereal,' 'caramel,' and 'soymilk,' and negatively correlated for 'biscuit/cookie' and 'carbonated drink.'

CONCLUSIONS: College students should manage their stress by identifying its causes and learning how to deal with stressful situations. Additionally, providing them with proper nutrition education based on the correct nutritional information is essential for promoting good food attitudes and snacking behaviors.

Keywords: Students; life stress; dietary behavior; snacking

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INTRODUCTION

College students going through early adulthood, transitioning from adolescence to adulthood, are associated with numerous circumstantial changes. They live with numerous stressors and risk factors for anxiety while trying to adjust to college life and needing to prepare for future employment. Effectively coping with stressful situations can be a significant challenge for those experiencing abrupt circumstantial changes [1]. Although a mild level of stress and tension may exert positive influences by facilitating increased concentration and work efficiency [2], excessive stress commonly causes physical and mental problems. As a result, symptoms of anxiety and fatigue may occur alone or together. Physical symptoms include indigestion, headache, and dizziness [3]. Thus, working knowledge of stress management is essential for maintaining physical and mental health [4]. According to Statistics Korea's 2021 adolescent statistics, 19–24-year-olds are troubled by various problems such as (in descending order) jobs 40.3%, studies 16.9%, and physical and mental health 9.4%. These statistics revealed that 49.0% of the subjects consulted their friends and colleagues about their concerns. In addition, academic stress after the coronavirus disease 2019 (COVID-19) pandemic was 'increased' for 47.2%, 'no change' for 45.1%, 'slightly increased' for 38.9%, and 'very increased' for 8.3% [5].

The 2020 General Social Survey investigated stress perception. Their results showed that female (53.4%) were more stressed than male (47.7%). The stress perception for teenagers and those 20–29-year-olds were 30.0% and 44.6%, respectively. Thus, stress perception was seen to increase as people entered their 20s. Adolescents (13–18-year-olds) reported that they worry about their studies the most (46.5%) and then their appearance (12.5%). The 19–24-year-olds worry about jobs (40.3%) and their studies (16.9%). These people consult their friends and colleagues about their concerns (43.4%) the most often, followed by their parents (27.1%) and siblings (6.1%). The 19.1 percent answered that they try to solve problems themselves [6]. Female students reported higher levels of stress finding a job and depression than male students [7].

Moreover, people going through this phase tend to become indifferent to health, nutrition, and proper eating due to their free lifestyle; regular habits can be disturbed easily [8]. These can adversely affect health by increasing the risk of lifestyle diseases. Correct dietary habits and nutritional intake during college are essential for midlife health and beyond. Thus, maintaining good dietary habits is essential, especially for college students [9]. According to the 2019 National Health Statistics, adults in their 20s consumed fewer fruits and vegetables and more beverages than other age groups. The beverage consumption rate revealed an increase of about 30 g compared to the previous year. The proportions of those who skip breakfast were 32.2% in male and 30.4% in female, and this trend is continuously increasing. Among all age groups, these proportions were the highest for the 19–29-year-olds; 51.0% in male and 57.4% in female. The proportions of current smokers were 36.7% in male and 6.7% in female. This was decreased by 1.1% in male compared to the previous year. For female, those in their 20s showed the highest proportion at 10.2% out of all age groups. The rate of drinking in the last month was 73.4% for male and 48.4% for female. Compared to the previous year, there was an increase in male by 2.9% and a decrease in female by 2.8%. When examining age groups, female in their 20s had the highest rate at 44.1% [10].

Numerous studies have reported that stress affects dietary habits, dietary attitudes, and health status [11-13]. The stress of college students causes negative food attitudes such as

drinking [14] and binge eating [15]. It was found that the higher the stress, the more sweet food was in demand [16,17]. Additionally, stress level negatively affects dietary attitudes. The amount of snacking in a day was found to be more in the group with a high stress level than in the group with a low stress level [18].

Most students who only ate 2 meals a day skipped breakfast [19]. It was found that the meaning of having lunch and how they have lunch varied between individuals. Although they tend to consider it positively, many college students have simple meals for lunch [20]. The consumption of processed food is also increasing. College students tend to disregard nutritional factors and choose convenience foods as they are easy and simple to cook [21].

This study investigates life stress, dietary attitudes, and snacking frequency among college students (aged 19–29-year-olds) living in Seoul and Gyeonggi Province to examine the differences between male and female. In addition, this study compared and analyzed the correlation between stress, dietary attitudes, and snacking together. We intend to provide fundamental data and nutritional information that can be used for proper nutrition education to induce correct dietary attitudes and snacking patterns for college students under stress.

SUBJECTS AND METHODS

Subjects and data collection
This study was conducted for college students living in Seoul and Gyeonggi Province, consisting of male and female aged 19–29-year-olds. The survey was conducted from February 21 to April 21, 2021. The questionnaire used in our pilot study in January 2021 with a total of 30 college students was revised for this study. The questionnaire was administered online using KSDC.DB. The study participants responded to the survey by accessing the link to the survey and agreeing to participate by checking a box labeled 'Yes, I agree.' A total of 623 questionnaires were retrieved. After excluding 23 copies with insincere responses, 600 questionnaires (234 male students and 366 female students) were used for the analysis.

General characteristics
Questions about participants' general characteristics were gender, age, academic year, current residence, total monthly household income, monthly allowance, father's education level, mother's education level, drinking status, and daily smoking rate. Body mass index (BMI; weight [kg]/height [m²]) was calculated using the height and weight reported by the participants. In accordance with World Health Organization (2000) guidelines for the Asia-Pacific region, respondents were categorized as underweight (BMI < 18.5 kg/m²), normal weight (18.5 kg/m² ≤ BMI < 23 kg/m²), overweight (23 kg/m² ≤ BMI < 25 kg/m²), and obesity (BMI ≥ 25 kg/m²).

Life stress
Life stress was measured using the revised college life stress scale for college students, which was developed by Chon *et al.* [22]. This scale is largely divided into interpersonal (lover, friend, family, instructor) and task-related stress (grade, economy, future career, value) problems. Each question is measured on a 4-point scale ranging from "not at all" (0 points) to "very much" (3 points), and consists of a total of 50 questions. The higher the score, the higher the level of life stress felt by college students. In this study, the Cronbach's alpha value was 0.94.

Dietary attitudes

Dietary attitudes were modified and supplemented according to the situation of this study by referring to previous studies [23,24]. The questions consisted of a total of 10 questions about the regularity of 3 meals a day, meal speed, snacks, and late-night snacks. Each question was measured on a 5-point scale. The higher the score, the better the eating attitude. In this study, the Cronbach's alpha value was 0.82.

Frequency of snack intake

The frequency of snack intake was modified and supplemented according to the situation of this study by referring to the Korea National Health & Nutrition Examination Survey (2016) [25] and previous studies [16,17]. There are a total of 25 questions, including 3 questions for confectionery, 7 questions for beverage, 4 questions for candy and chocolate, 5 questions for bread and rice cake, and 6 questions for dairy products. Three questions about the frequency of snacking, the time of snacking, and the reason for snacking were also included. Snacking frequencies were calculated by assigning numerical values: rare = 0, once a month = 1/30.4, 2–3 times a month = 2.5/30.4, once a week = 1/7, 2–4 times a week = 3/7, 5–6 times a week = 5.5/7, once a day = 1, twice a day = 2, and 3 times a day = 3 times.

Statistical analysis

The collected data of this study were analyzed using the SPSS WIN 28.0 program. Variables such as age, height, weight, BMI, life stress, dietary attitude, and frequency of snack intake were tested by t-test. For the general characteristics and health-related lifestyles, frequencies and percentages were calculated by χ^2 test. Additionally, multiple regression analysis was performed to investigate the relationship between life stress, dietary attitudes, and snacking frequency. All results were determined the statistical significance at $P < 0.05$.

Research ethics

The explanatory text and consent form were provided to participants. A survey was conducted about whether participants agreed to participate in the study by selecting the checkbox, 'Yes, I agree.' The study participants were informed that they could withdraw from the study even in the middle; this was also clearly stated in the explanatory text and the consent form. It was also explained to the participants that the collected data would not be used for purposes other than this study. The data will be stored at the institution for 3 yrs after the study's termination, after which all data will be discarded. This study was approved by the Institutional Review Board (IRB) of Myongji University IRB (Deliberation No. MJU-2021-01-002-02).

RESULTS

General characteristics

The general characteristics of the subjects are shown in **Table 1**. Male and female students were 23.1 ± 3.0 and 21.6 ± 2.4 year-olds, respectively; thus, there were more male participants in this study ($P < 0.001$). In terms of grade, the '4th' was the most common for both males and females ($P < 0.05$). The most common current residence was 'home' for both male (60.7%) and female students (78.4%), followed by 'self-boarding,' 'dormitory,' and then 'relatives' house' ($P < 0.001$). The monthly income of the household was 'over 6 million won' was the most. And the monthly allowance was 'less than 300 thousand won' was the most. Drinking '1–2 times a week' was the highest at 46.2% (45.7% male, 46.4% female). The average daily smoking was the highest at 81.5% for 'no smoking' (67.5% male, 90.4% female) ($P < 0.001$).

Table 1. General characteristics of subjects by sex

Characteristics	Male (n = 234)	Female (n = 366)	Total (n = 600)	t, χ^2	P
Age (yrs)	23.1 ± 3.0	21.6 ± 2.4	22.4 ± 2.7	6.213[***]	0.000
Grade				10.251[*]	0.036
1st	47 (20.1)	58 (15.8)	105 (17.5)		
2nd	33 (14.1)	73 (19.9)	106 (17.7)		
3rd	45 (19.2)	81 (22.1)	126 (21.0)		
4th	57 (24.4)	101 (27.6)	158 (26.3)		
> 4th	52 (22.2)	53 (14.5)	105 (17.5)		
Type of residence				25.012[***]	0.000
Home	142 (60.7)	287 (78.4)	429 (71.5)		
Dormitory	27 (11.5)	18 (4.9)	45 (7.5)		
Self-boarding	63 (26.9)	61 (16.7)	124 (20.7)		
Relative's house	2 (0.9)	0 (0.0)	2 (0.3)		
Monthly household income (10^4 won/mon)				4.290	0.368
< 300	24 (10.3)	49 (13.4)	73 (12.2)		
300–399	38 (16.2)	62 (16.9)	100 (16.7)		
400–499	43 (18.4)	81 (22.1)	124 (20.7)		
500–599	36 (15.4)	55 (15.0)	91 (15.2)		
≥ 600	93 (39.7)	119 (32.5)	212 (35.3)		
Monthly pocket money (10^4 won/mon)				9.507	0.090
< 30	101 (43.2)	165 (45.1)	266 (44.3)		
30–39	39 (16.7)	78 (21.3)	117 (19.5)		
40–49	32 (13.7)	55 (15.0)	87 (14.5)		
50–59	27 (11.5)	37 (10.1)	64 (10.7)		
60–69	17 (7.3)	10 (2.7)	27 (4.5)		
≥ 70	18 (7.7)	21 (5.7)	39 (6.5)		
Frequency of alcohol drinking (times/wk)				6.223	0.183
Never	100 (42.7)	174 (47.5)	274 (45.7)		
1–2	107 (45.7)	170 (46.4)	277 (46.2)		
3–4	16 (6.8)	12 (3.3)	28 (4.7)		
5–6	7 (3.0)	6 (1.6)	13 (2.2)		
Everyday	4 (1.7)	4 (1.1)	8 (1.3)		
Smoking (cigarettes/day)				54.431[***]	0.000
Never	158 (67.5)	331 (90.4)	489 (81.5)		
I've smoked	27 (11.5)	11 (3.0)	38 (6.3)		
< 10	28 (12.0)	20 (5.5)	48 (8.0)		
11–19	16 (6.8)	3 (0.8)	19 (3.2)		
≥ 20	5 (2.1)	1 (0.3)	6 (1.0)		

Values are presented as mean ± SD or n (%). Significant difference between male and female by independent t-test or χ^2 test.
[*]$P < 0.05$, [***]$P < 0.001$.

The height, weight, and BMI of the subjects are shown in **Table 2**. The average height was 174.3 ± 7.5 cm for male students and 162.0 ± 5.3 cm for female students, with male students significantly taller ($P < 0.001$). The male students were the weight was 73.8 ± 41.6 kg for male and 55.3 ± 8.2 kg for female, showing a significant difference ($P < 0.001$). BMI was significantly higher in male at 24.3 ± 13.8 kg/m² and female at 21.1 ± 2.7 kg/m² ($P < 0.001$). The 57.2% of the total were in the 'normal' category, and female were 65.0%, more in the 'normal' category than male at 44.9%. In terms of 'underweight,' female were 14.2%, more than 5.6% of male and 'overweight' was 24.4% of male more than 10.9% of female ($P < 0.001$).

Life stress
The life stress scores and life stress factors of subjects are shown in **Table 3**. The total life stress scores were 95.1 ± 22.1 and 96.9 ± 21.3 for male and female students, respectively, indicating that female students have more stress than male students, although this difference was not significant. Among the sub-questions, male (9.3 ± 3.8) were found to have higher stress than female (8.4 ± 3.2) in the area of lover ($P < 0.01$). In the future problem area, female (21.5 ± 4.9)

Table 2. Height, weight and BMI of subjects by sex

Characteristics	Male (n = 234)	Female (n = 366)	Total (n = 600)	t, χ^2
Height (cm)	174.3 ± 7.5	162.0 ± 5.3	168.2 ± 6.4	23.412***
Weight (kg)	73.8 ± 41.6	55.3 ± 8.2	64.6 ± 24.9	6.702***
BMI (kg/m²)[1)]	24.3 ± 13.8	21.1 ± 2.7	22.7 ± 8.3	3.535***
Underweight	13 (5.6)	52 (14.2)	65 (10.8)	57.250***
Normal	105 (44.9)	238 (65.0)	343 (57.2)	
Overweight	57 (24.4)	40 (10.9)	97 (16.2)	
Obesity	59 (25.2)	36 (9.8)	95 (15.8)	

Values are presented as mean ± SD or n (%). Significant difference between male and female by independent t-test or χ^2 test.
BMI, body mass index.
[1)]Underweight: < 18.5 kg/m², Normal: 18.5–22.9kg/m², Overweight: 23–24.9kg/m², Obesity: ≥ 25 kg/m².
***$P < 0.001$.

Table 3. Life stress score and life stress factors of subjects by sex

Characteristics	Male (n = 234)	Female (n = 366)	Total (n = 600)	t	P
Interpersonal Erelationship					
Lover	9.3 ± 3.8	8.4 ± 3.2	8.9 ± 3.5	2.960**	0.003
Friend	6.6 ± 2.7	7.0 ± 2.8	6.8 ± 2.7	−1.412	0.159
Family	9.3 ± 3.9	9.6 ± 3.7	9.5 ± 3.8	−0.969	0.333
Instructor	10.0 ± 3.9	10.1 ± 3.8	10.1 ± 3.8	−0.190	0.849
Total	59.9 ± 13.7	61.9 ± 14.1	60.9 ± 13.9	−1.712	0.087
Task-related stress					
Grade	15.9 ± 4.8	16.2 ± 4.7	16.1 ± 4.7	−0.789	0.430
Economy	12.9 ± 5.0	12.7 ± 5.2	12.8 ± 5.1	0.670	0.503
Future career	20.3 ± 5.1	21.5 ± 4.9	20.9 ± 5.0	−2.885**	0.004
Value	10.9 ± 4.0	11.6 ± 3.8	11.3 ± 3.9	−2.360*	0.019
Total	35.2 ± 11.0	35.0 ± 9.7	35.1 ± 10.4	0.217	0.829
Total	95.1 ± 22.1	96.9 ± 21.3	96.0 ± 43.4	−0.998	0.319

Values are presented as mean ± SD. Significant difference between male and female by independent t-test.
*$P < 0.05$, **$P < 0.01$.

were found to have higher stress than male (20.3 ± 5.1) ($P < 0.01$). In the value problem area, female (11.6 ± 3.8) were found to have higher stress than male (10.9 ± 4.0) ($P < 0.05$).

Dietary attitudes

The dietary attitudes of subjects are shown in **Table 4**. Dietary attitudes did not differ significantly between male and female (both 3.1 point). The average score for food attitude was 3.1 for both genders. In descending order, the scores were 'I try to eat fruits, juice, and water rather than snacks/soft drinks' (3.5 ± 1.3 points), 'I try not to eat late-night snacks' (3.5 ± 1.3 points), 'I try to eat at home as much as possible' (3.4 ± 1.2 points), 'I try to cut down on snacks' (3.2 ± 1.2 points), and 'I don't overeat' (3.1 ± 1.2 points). As for 'I try to eat 3 meals a

Table 4. Dietary attitudes score of subjects by sex

Characteristics	Male (n = 234)	Female (n = 366)	Total (n = 600)	t	P
I try to eat 3 meals a day at regular times	2.9 ± 1.3	2.6 ± 1.3	2.7 ± 1.3	3.222**	0.001
I take meals with others	3.0 ± 1.2	3.1 ± 1.1	3.0 ± 1.2	−1.469	0.142
I try to eat blandly	2.7 ± 1.3	3.0 ± 1.2	2.8 ± 1.3	−2.891**	0.004
I try to cut down on snacks	3.2 ± 1.3	3.2 ± 1.2	3.2 ± 1.2	−0.302	0.763
I try to eat food while considering nutritional balance	3.0 ± 1.3	2.9 ± 1.2	2.9 ± 1.2	0.762	0.447
I try to eat fruits, juice, and water rather than snacks/soft drinks	3.4 ± 1.4	3.5 ± 1.2	3.5 ± 1.3	−1.311	0.190
I don't overeat	3.1 ± 1.2	3.1 ± 1.2	3.1 ± 1.2	0.554	0.580
I try to eat at home as much as possible	3.3 ± 1.2	3.4 ± 1.2	3.4 ± 1.2	−1.304	0.193
I try not to eat instant foods	2.9 ± 1.3	2.9 ± 1.2	2.9 ± 1.2	−0.127	0.899
I try not to eat late-night snacks	3.4 ± 1.3	3.6 ± 1.3	3.5 ± 1.3	−2.125*	0.034
Average	3.1 ± 0.8	3.1 ± 0.7	3.1 ± 0.8	−0.809	0.419

Values are presented as mean ± SD. Significant difference between male and female by independent t-test.
*$P < 0.05$, **$P < 0.01$.

day at regular times,' male showed higher scores than female ($P < 0.001$). As for 'I try not to eat late-night snacks,' female showed higher scores than male ($P < 0.05$). As for 'I try to eat blandly,' female showed higher scores than male ($P < 0.001$).

Frequency of snack intake

The frequency of snack intake of subjects are shown in **Table 5**. The total snacking frequency was 4.1 ± 4.1 times/d; 4.2 ± 3.6 times/d for male students and 4.0 ± 4.6 times/d for female students, which was not a significant difference. Overall, 'beverage' was consumed 1.9 ± 1.7 times/d for male students and 1.5 ± 1.7 times/d for female students; this difference was statistically significant ($P < 0.01$). This was followed by 'candy and chocolate,' 'bread and rice cake,' and 'milk and dairy products' that were consumed about 0.1 times/d. In 'confectionery' and 'beverage,' 'biscuit/cookie' and 'cafe americano,' respectively, were consumed the most frequently. 'Carbonated drink' was consumed 0.4 ± 0.5 times/d; 0.4 ± 0.6 times/d for male students and 0.3 ± 0.5 times/d for female students ($P < 0.01$). 'Sports drink' was consumed 0.1 ± 0.3 times/d; 0.2 ± 0.3 times/d for male students and 0.1 ± 0.3 times/d for female students ($P < 0.01$). 'Korean traditional beverage' was consumed 0.1 ± 0.2 times/d; 0.1 ± 0.2

Table 5. Frequency of snack intake of subjects by sex

Characteristics	Male (n = 234)	Female (n = 366)	Total (n = 600)	t	P
Confectionary					
Biscuit/cookie	0.2 ± 0.4	0.3 ± 0.5	0.3 ± 0.4	−1.795	0.075
Chip	0.1 ± 0.2	0.1 ± 0.3	0.1 ± 0.2	0.501	0.617
Cereal	0.2 ± 0.4	0.2 ± 0.3	0.2 ± 0.3	0.181	0.857
Total	0.5 ± 0.7	0.6 ± 0.8	0.6 ± 0.8	−0.732	0.464
Beverage					
Carbonated drink	0.4 ± 0.6	0.3 ± 0.5	0.4 ± 0.5	2.798[**]	0.005
Juice/smoothie	0.2 ± 0.4	0.2 ± 0.5	0.2 ± 0.4	0.115	0.908
Sports drink	0.2 ± 0.3	0.1 ± 0.3	0.1 ± 0.3	2.619[**]	0.009
Korean traditional beverage	0.1 ± 0.2	0.0 ± 0.2	0.1 ± 0.2	2.180[*]	0.030
Cafe americano	0.6 ± 0.8	0.5 ± 0.7	0.6 ± 0.8	1.933	0.054
Cafe latte	0.1 ± 0.3	0.1 ± 0.3	0.1 ± 0.3	−0.891	0.373
Tea	0.1 ± 0.3	0.2 ± 0.2	0.1 ± 0.3	−0.508	0.612
Total	1.9 ± 1.7	1.5 ± 1.7	1.7 ± 1.7	2.605[**]	0.009
Candy and chocolate					
Candy	0.1 ± 0.2	0.1 ± 0.4	0.1 ± 0.3	−1.435	0.152
Caramel	0.1 ± 0.3	0.1 ± 0.3	0.1 ± 0.3	0.581	0.561
Jelly	0.1 ± 0.3	0.1 ± 0.3	0.1 ± 0.3	−1.293	0.197
Chocolate	0.2 ± 0.4	0.2 ± 0.4	0.2 ± 0.4	0.230	0.818
Total	0.5 ± 0.9	0.5 ± 1.2	0.5 ± 1.0	−0.561	0.575
Bread and rice cake					
Plain bread	0.1 ± 0.2	0.1 ± 0.2	0.1 ± 0.2	−1.018	0.309
Bread with filling	0.1 ± 0.2	0.1 ± 0.2	0.1 ± 0.2	−0.056	0.955
Castella, cake, muffin	0.1 ± 0.2	0.1 ± 0.2	0.1 ± 0.2	0.581	0.561
Waffle	0.0 ± 0.1	0.1 ± 0.2	0.1 ± 0.2	−1.466	0.143
Rice cake	0.0 ± 0.1	0.1 ± 0.1	0.1 ± 0.1	−0.441	0.659
Total	0.4 ± 0.6	0.5 ± 0.9	0.5 ± 0.7	−0.561	0.575
Milk and dairy product					
Milk	0.3 ± 0.5	0.3 ± 0.4	0.3 ± 0.5	1.616	0.107
Flavored milk	0.1 ± 0.2	0.1 ± 0.2	0.1 ± 0.2	0.593	0.553
Yogurt (liquid type)	0.1 ± 0.2	0.1 ± 0.2	0.1 ± 0.2	−1.176	0.240
Yogurt (semi-liquid type)	0.1 ± 0.2	0.2 ± 0.3	0.1 ± 0.2	−3.560[***]	0.000
Soymilk	0.1 ± 0.3	0.1 ± 0.4	0.1 ± 0.3	−0.750	0.454
Ice cream	0.1 ± 0.2	0.2 ± 0.3	0.2 ± 0.3	−0.710	0.478
Total	0.9 ± 0.8	0.9 ± 1.1	0.9 ± 1.0	−0.598	0.550
Total	4.2 ± 3.6	4.0 ± 4.6	4.1 ± 4.1	0.510	0.611

Values are presented as mean ± SD. Significant difference between male and female by independent t-test.
[*]$P < 0.05$, [**]$P < 0.01$, [***]$P < 0.001$.

times/d for male students and 0.0 ± 0.2 times/d for female students ($P < 0.05$). In 'candy and chocolate' and 'milk and dairy product,' 'chocolate' and 'milk' were the most frequently consumed, respectively. 'Yogurt (semi-liquid type)' was consumed 0.1 ± 0.2 times/d; 0.2 ± 0.3 times/d for female students and 0.1 ± 0.2 times/d for male students ($P < 0.001$).

Correlations among the life stress, dietary attitudes, and frequency of snack intake

The correlations among life stress, dietary attitudes, and frequency of snack intake are shown in **Table 6**. Life stress and food attitude were negatively correlated among female students ($\beta = -0.196$, $P < 0.001$), whereas there was no significant correlation in male students. Life stress and snacking frequency were positively correlated in male students for 'biscuit, cookie' ($\beta = 0.107$, $P < 0.01$), 'chip' ($\beta = 0.115$, $P < 0.001$), 'cereal' ($\beta = 0.091$, $P < 0.01$), 'juice/ smoothie' ($\beta = 0.115$, $P < 0.001$), 'cafe americano' ($\beta = 0.079$, $P < 0.01$), 'cafe latte' ($\beta = 0.138$, $P < 0.001$), 'tea' ($\beta = 0.068$, $P < 0.05$), 'jelly' ($\beta = 0.080$, $P < 0.05$), 'chocolate' ($\beta = 0.081$, $P < 0.05$), 'rice cake' ($\beta = 0.091$, $P < 0.05$), 'milk' ($\beta = 0.340$, $P < 0.001$), 'flavored milk' ($\beta = 0.083$, $P < 0.05$), 'ice cream' ($\beta = 0.078$, $P < 0.01$). For female students, life stress and snacking frequency had positive correlations for 'cereal' ($\beta = 0.114$, $P < 0.05$), 'caramel' ($\beta = 0.256$, $P < 0.001$), 'soymilk' ($\beta = 0.108$, $P < 0.05$) but negative correlations for 'biscuit, cookie' ($\beta = -0.168$, $P < 0.01$), 'carbonated drink' ($\beta = -0.319$, $P < 0.001$).

Table 6. Correlation among life stress, dietary attitudes and frequency of snack intake

Characteristics	Male (n = 234)				Female (n = 366)			
	B	SE	β	t	B	SE	β	t
Dietary attitude	−0.588	0.704	−0.022	−0.835	−0.007	0.002	−0.196	−3.972***
Confectionary								
Biscuit, cookie	5.247	1.592	0.107	3.297*	−0.067	0.025	−0.168	−2.693**
Chip	13.178	2.757	0.155	4.781***	−0.006	0.029	−0.012	−0.198
Cereal	5.600	1.917	0.091	2.922*	0.047	0.024	0.114	2.001*
Beverage								
Carbonated drink	1.596	1.120	0.041	1.425	−0.119	0.020	−0.319	−5.904***
Juice/smoothie	5.268	1.272	0.115	4.143***	0.021	0.021	0.053	0.966
Sports drink	1.426	2.025	0.022	0.704	−0.039	0.028	−0.081	−1.411
Korean traditional beverage	−3.371	3.700	−0.032	−0.911	0.054	0.039	0.081	1.380
Cafe americano	2.149	0.700	0.079	3.068**	0.006	0.014	0.020	0.396
Cafe latte	10.637	2.036	0.138	5.224***	0.009	0.023	0.022	0.390
Tea	5.472	2.520	0.068	2.171*	−0.054	0.028	−0.112	−1.945
Candy and chocolate								
Candy	3.033	1.635	0.053	1.854	−0.008	0.025	−0.020	−0.335
Caramel	0.262	2.607	0.003	0.100	0.142	0.037	0.256	3.842***
Jelly	5.170	2.209	0.080	2.340*	−0.021	0.029	−0.047	−0.737
Chocolate	3.936	1.696	0.081	2.321*	0.031	0.027	0.072	1.154
Bread and rice cake								
Plain bread	1.080	3.126	0.011	0.346	0.023	0.028	0.046	0.810
Bread with filling	0.792	3.271	0.008	0.242	0.032	0.037	0.057	0.849
Castella, cake, muffin	6.756	2.168	0.083	3.116*	−0.044	0.035	−0.084	−1.269
Waffle	−3.927	3.793	−0.036	−1.035	−0.017	0.034	−0.030	−0.512
Rice cake	14.964	5.771	0.091	2.593*	0.064	0.040	0.098	1.603
Milk and dairy product								
Milk	0.106	0.020	0.340	5.203***	0.007	0.020	0.020	0.371
Flavored milk	8.477	3.523	0.083	2.406*	−0.006	0.032	−0.011	−0.188
Yogurt (liquid type)	9.039	2.612	0.096	3.460	−0.009	0.026	−0.020	−0.362
Yogurt (semi liquid type)	3.758	3.082	0.043	1.219	0.023	0.024	0.051	0.941
Soymilk	2.269	1.785	0.037	1.271	0.046	0.021	0.108	2.156*
Ice cream	6.214	2.178	0.078	2.854**	−0.051	0.027	−0.102	−1.866
	$R^2 = 0.681$, adj.$R^2 = 0.667$				$R^2 = 0.275$, adj.$R^2 = 0.219$			
	F = 47.101 ($P \leq 0.001$)				F = 4.934 ($P \leq 0.001$)			

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$ by multiple regression analysis.

DISCUSSION

This study aims to provide the basic data that can be used as nutritional information for the provision of proper nutrition education for college students living in stressful situations so that they can have appropriate dietary attitudes and snacking patterns. Life stress was higher among female students than male students. Still, there was no significant difference between male and female students. Previous studies with college students [26,27] also reported similar findings to our study, in that life stress was significantly higher for female students than male students. For subdomains of the questionnaire, male students had higher stress levels than female students in the opposite-sex relationship domain. Meanwhile, it showed that female students had higher stress levels than male students in the future problem and value problem domains. In a previous cohort study of college students in the Chungnam region [26], the key domains of stressors—from highest to lowest—were studying and school life, value problem, family and economic problems, relationships, and opposite-sex relationship problems. In a cohort study of nursing college students [28], academic problem was the highest, followed by value problem, economic problem, and future problem.

The average food attitude score was 3.1 for both male and female, with no significant difference between the 2 genders. A study of college students in Wonju [12] and another study of adults in Ulsan [13] reported significantly higher scores for male than for female. For 'I try to eat 3 meals a day regularly at a set time,' male students showed higher awareness than female students. This is similar to the results of a study of high-school students in Wonju [29], in which male students showed higher awareness than female students for 'I eat all 3 meals a day' and 'I eat at a set time.' Regarding 'I try to reduce salt consumption,' female students showed higher awareness than male students, to a statistically significant degree. In a study of college students in a certain area in Pyeongtaek [30], for 'I drink all the soup in my soup bowl,' the scores were higher for male students than for female students; this result indicates that male students tend to have a higher salt intake than female students in their food.

The total snacking frequency for male students was higher than for female students, but the difference was not significant. It was found that they consume 'carbonated drinks,' 'sports drink,' and 'Korean traditional beverage' were more often in male than female. 'Yogurt (semi-liquid)' was consumed more frequently by female students than by male students. The consumption frequency of 'beverage' was found to be the highest for both males and females with an average of 1.7 times a day, which is consistent with the results from the 2019 National Health Statistics [10] that showed a significant increase of about 30 g in beverage consumption compared to the previous year. In 'candy and chocolate' and milk,' 'chocolate' and 'milk and dairy product' were the most frequently consumed, respectively. In 'confectionary' and 'beverage,' 'biscuit/cookie' and 'cafe americano' were the most frequently consumed. In a study about beverage consumption among college students in certain urban areas [31], the most frequently consumed beverages were, in decreasing order, carbonated drinks, coffee, white milk, and ion drinks. In a study of middle-school students in Ulsan [32], female students consumed chocolate and coffee more frequently than male students, whereas in another study of middle- and high-school students in Seoul [33], female students consumed more chocolate and less milk and yogurt than male students. In a study of college students in Chungcheongnam-do [34], students favored confectionery and candies the most. The authors compared their results in terms of gender to find that the preferences of male students, in order, were dairy products, coffee, bread, and then rice cakes, whereas female students preferred confectionery, candies, ice cream, and coffee. They reported the

most frequent consumption of carbonated drinks and coffee. Summarizing the results from previous studies, there is a trend that numerous students often consume beverages such as carbonated drinks and coffee as snacks.

The correlations between life stress, food attitude, and snacking frequency were examined. Between life stress and food attitude, both positive and negative correlations existed for female students. However, no significant correlation existed for male students. For male students, positive correlations existed between life stress and snacking frequency 'biscuit, cookie,' 'chip,' 'cereal,' 'juice/smoothie,' 'cafe americano,' 'cafe latte,' 'tea,' 'jelly,' 'chocolate,' 'rice cake,' 'milk,' 'flavored milk,' 'ice cream.' For female students, positive correlations existed between life stress and snacking frequency for 'cereal,' 'caramel,' and 'soymilk' while negative correlations were found for 'biscuit, cookie,' 'carbonated drink.' In a previous study of college students in Seoul and Gyeonggi Province [16], higher stress scores for male students were negatively correlated with jelly, muffins or cake, waffles or honey bread, yogurt drinks, yogurt, ice cream, soy milk, carbonated drinks, ion drinks, caramel lattes, mocha lattes, frappes, and bubble tea; female students were negatively correlated with yogurt drinks, soy milk, and ion drinks. A study of office workers in their 20s and 30s in the Seoul metropolitan area [17] found worse dietary habits in the high-stress group than in the low-stress group. In a study of high-school students in Jeollanam-do [18], the number of daily meals, the dietary habit tendencies, and salt consumption from foods differed significantly with stress levels; the higher the stress group, the lower the frequency of regular food intake, and the saltier their foods. In a study of adults in Ulsan [13], the dietary habit score was lower for higher stress levels, and there was a significant difference in the scores between male and female. In a study of middle-school students from a certain area of Gyeonggi-do [35], regular diet and life stress were negatively correlated. In a study of college students in Chungcheongnam-do [26], eating behavior and life stress were negatively correlated. In a study of high-school students in Gyeonggi-do [36], changes in food intake amount and life stress were positively correlated. Finally, a study of high-school girls from the Seoul metropolitan area [37] found that stress and depression were positively correlated with eating behavior items such as regularity of meal frequencies and mealtimes.

To summarize, more stress is associated with poorer dietary attitudes, leading to increased snacking frequency. Male students tend to have more stress from opposite-sex relationship problems, whereas female students have more stress from future problems and value problems; meanwhile, when stressed, male students frequently seek confectionery, coffee, and milk, whereas female students seek caramel and soy milk. Efforts should be made to properly cope with stressful situations by identifying stressors and successfully managing stress in college students. Additionally, appropriate nutrition education by providing accurate nutritional information will be essential for inducing the correct dietary attitudes and snacking patterns.

The limitations of this study include that the research was conducted for participants living in certain areas; thus, one should carefully interpret its results, and generalizing our findings to all college students should be avoided. Second, the research data were collected via an online survey related to the COVID-19 pandemic. Thus, biases might have been introduced to the results by using the online survey method. Future studies should use a face-to-face survey method and be conducted with a more diverse population and larger sample. Third, this study was solely based on the subjective data from participants' self-reports; thus, the data might reflect individual preferences. Objective measurements were not available, e.g., changes in bodily hormone levels subject to stress. Despite these limitations, this study

achieved meaningful findings by examining the correlations among life stress, food attitude, and snacking frequency of college students and analyzing for gender differences. We propose using the results from this study to provide basic data to generate accurate nutritional information for proper nutrition education to help college students cope with stress and develop positive dietary attitudes and snacking patterns.

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