

Investigation of Nutrition Knowledge, Eating Behaviors, and the Need for Integrated Programs to Improve Eating Behaviors According to the Residential Type of Female College Students

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여대생의 거주 형태에 따른 영양 지식, 식이 행동 및 식이 행동 개선 통합프로그램에 대한 요구도 조사

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Abstract This study was conducted to identify nutrition knowledge, eating behaviors, and the need for an integrated program to improve eating behaviors according to residential type of female college students. Data were collected from March 16 to April 16, 2021, using online self-report questionnaires and the final 217 data were used. To analyze data, frequencies and percentages, means and standard deviations, independent sample t-test, and ANOVA were conducted using SPSS WIN 26.0. The results showed that home residents had better eating behaviors than those living in rented rooms. Moreover, the demand for an integrated eating behavior improvement program for disease and health information topic was higher among home residents and participants in rented rooms than among those living in dormitories. When developing an integrated program for improving eating behaviors among female college students, it is essential to apply a differentiated intervention program that considers residential type.

Key Words : residential type, nutrition knowledge, eating behaviors, need, female college students

요 약 본 연구는 여대생을 대상으로 거주 형태에 따른 영양 지식, 식이 행동 및 식이 행동 개선 통합프로그램에 대한 요구도를 파악하기 위해 실시되었다. 자료는 2021년 3월 16일에서 4월 16일까지 온라인을 통해 자가보고식 설문지를 이용해 수집되었고, 최종 217명의 자료가 이용되었다. 수집된 자료는 SPSS WIN 26.0을 사용해 빈도와 백분율, 평균과 표준편차, 독립표본 t-test와 ANOVA로 분석하였다. 그 결과, 자택 거주자가 자취하는 대상자보다 식이 행동을 더 잘하는 것으로 나타났고, 식이 행동 개선 통합프로그램에 대한 요구는 자택 거주자와 자취하는 대상자가 기숙사에 거주하는 대상자보다 '질병 및 건강 정보'에 대한 요구도가 더 높은 것으로 파악되었다. 그러므로 여대생에 대한 식이 행동 개선 통합프로그램 개발 시 거주 형태를 고려한 차별화 된 중재프로그램의 적용이 필수적일 것이다.

주제어 : 거주 형태, 영양 지식, 식이 행동, 요구도, 여대생

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1. Introduction

1.1 Need for research

Looking at the aerobic physical activity rate of 19~29 years old in 2018 Korea National Health and Nutrition Examination Survey, it was found that 69.7% of men and 57.1% of women were 12% lower for women [1]. It was also reported that women's physical activity was lower in the study results of college students [2]. Although the actual energy intake was similar to the energy requirement in most age groups, the energy intake for women aged 19 to 29 was somewhat lower than the energy requirement [3], and it was confirmed that the daily intake of vegetables was 77% of that of the men [1]. As such, low physical activity and undesirable eating behaviors in early adulthood women, to which most female college students belong, can lead to chronic diseases after adulthood. However, compared to their adolescent years in middle and high school, college students in early adulthood are constantly faced with the difficulty of choosing healthy foods as their independence grows and their extracurricular activities rapidly increase [4,5].

According to the results of a study on dietary behaviors among college students living alone or in dormitories, the rate of skipping breakfast was 63%, not eating three meals a day was 91%, and eating out was 88%, suggesting that their diet was poorly managed [6]. In a study comparing the dietary behaviors of young adults living in single and multi-person households, those living in a single-person household had a lower rate of eating breakfast five or more times a week and a higher rate of rarely eating breakfast than those living in a multi-person household. Furthermore, students living in a single-person household had higher rates of eating out twice or more per day [7]. Combining the results of these previous studies, a large difference in dietary behavior is evident according to the residential type of university students. Moreover, a qualitative study

on the determinants of dietary behaviors of university students also identified residence as a major factor, supporting the above results [4]. The difference in dietary behaviors according to the residential type is caused by the positive and negative effects of parents' dietary behavior and peers' social pressure [8]. Therefore, it is vital to understand the dietary behaviors of college students according to detailed residential types such as dormitories, rented rooms, and homes, in planning a personalized integrated program to improve college students' dietary behaviors.

Nutrition knowledge is a scientific structure developed by nutrition experts to identify information about food and nutrition, as well as an attitude that can be practically applied as a desirable dietary behavior through education [9]. A study that analyzed college students also argued that nutrition knowledge directly impacted dietary behaviors and that dietary behavior was a predictor of adult disease [10]. Additionally, previous studies on dietary behaviors among college students have also emphasized food knowledge and education as factors that enable healthy eating behaviors [8], supporting the argument that the formation of nutrition knowledge among college students has a major influence on their dietary behaviors.

Previous studies on the needs of female college students for dietary improvement programs included analyses of the need for nutritional counseling through focus group interviews [11], for nutrition education according to whether weight control was attempted [12], and for the need for nutrition education according to the desired weight loss of male and female college students [13]. Overseas, there was a focus group study for the development of online nutrition education for college students [14], and a study including nutrition and meal information during the development of a smartphone application for health promotion [15]. However, most of the preceding studies

identified the needs for eating behaviors improvement education including both male and female college students [13–15,16,3]. It was difficult to find a study targeting only female college students [11,12], a study comparing the needs according to residential type [16], and an analysis study of the eating behaviors improvement needs according to the residential type of female college students.

As described above, this study is based on the hypothesis that female college students living alone and in dormitories have less nutrition knowledge, unhealthy eating behaviors, and different demands for eating behavior improvement programs than those who live at home with their families. Therefore, this study aimed to examine the differences in nutrition knowledge, eating behaviors, and the need for an integrated program to improve eating behaviors among female college students according to residence type. Furthermore, it aimed to prepare basic data for the development of an integrated program to improve dietary behaviors tailored to female college students in a sampled population in South Korea.

To this end, this study has the following objectives: First, to identify the participants general, diet-related characteristics and residential type. Second, to identify the characteristics and needs related to the needs of the integrated program to improve the eating behaviors of the participants. Third, to identify the nutrition knowledge and eating behaviors according to the general, diet-related, and need-related characteristics of the participants. Fourth, to identify nutrition knowledge, eating behaviors and the needs of an integrated program for improvement of eating behaviors according to the residential type of the participants.

1.2 Term definition

1.2.1 Integrated Programs to Improve Eating Behaviors

In this study, the integrated program for improving eating behaviors refers to a comprehensive program that includes various types of interventions that can positively affect physical, mental, social, and cognitive aspects to improve the eating behaviors of subjects.

2. Methods

2.1 Study design

This descriptive study aimed to understand the nutrition knowledge, eating behaviors, and need for an integrated program to improve eating behaviors according to the residential type of female college students.

2.2 Participants

The participants were selected by convenience sampling from unmarried female college students among students enrolled in five universities located in the Seoul and Chungcheong areas. In consideration of ethical aspects, this study collected data online from March 16 to April 16, 2021 with approval from the institutional review board (IRB) of Cheongju University (No. 1041107–202006–HR–028–01). After explaining the purpose and method of the study to the subject through a Google survey and confirming the subject's intention to participate, an informed consent form was sent to the subject via e-mail, which was to be collected with the completed questionnaire. In the informed consent form, it was explained that the personal information obtained through this research would not be used for any other purpose, that each subject should participate in the research at her own free will, and that she could withdraw her consent to participation at any time she wanted. A small reward was provided to all study subjects who participated in the survey. The sample size was 180 according to an analysis of

variance (ANOVA) with an effect size of .25, power of .80, four groups, and significance level of .05 using the G*power 3.1.9 program [17]. In this study, data from 220 participants were collected; however, the data of 217 participants were used for analysis, excluding three cases with incomplete responses or data collected from graduate or postgraduate student.

2.3 Scale and measure

2.3.1 Nutrition knowledge

A nutrition knowledge scale developed by Kim et al. [18], with a total of 20 items on the role of nutrients, deficiency symptoms, foods containing nutrients, and others, was used. Based on the original author's opinion, a professor in the Department of Food and Nutrition, the recommended daily caloric intake and desirable weight loss for female and male college students were updated to those as of 2020 for the items on nutrition knowledge. The nutrition knowledge tool was reviewed by one food and nutrition expert and three nursing professors with experience in research on women's health. Each item was answered with "Yes," "No," or "Do not know." One point was given for each correct answer, and it was scored out of a total of 20 points, with higher scores indicating a higher level of nutrition knowledge. According to the SPSS statistics book, Cronbach's α more than .50 is considered reliable [19]; in this study, Cronbach's α was .56.

2.3.2. Eating behaviors

An eating behavior scale with a total of 20 items developed by Kim et al. [18] was used. This scale examines the regularity of meals, proper and even intake, intake of food according to food group, and the status of skipping breakfast or eating out. These concepts were measured on a 5-point Likert scale ranging from one point for "strongly disagree" to five points for "strongly

agree," where a higher score indicated more desirable eating behaviors. In the study by Kim et al. [18], Cronbach's α was .72, and in this study, Cronbach's α was .80.

2.3.3 The need for an integrated program to improve eating behaviors

A total of eight items were created based on a survey of the need for nutrition education developed for college students in previous studies [16,3]. The questionnaire on the need for an integrated program to improve eating behaviors included items on experience and interest in dietary education, the need for an integrated program to improve eating behaviors, sources of information on eating behaviors, topics and implementation methods of the integrated program, and the intention to participate in the integrated program. Prior to its application, the scale was reviewed by one food and nutrition expert and three professors in the Department of Nursing, with extensive experience in research on women's health. The I-CVI (Item-level content validity index) of all items was 1.00. In this study, the Cronbach's α was .83.

2.4 Data analysis

The collected data were analyzed using SPSS WIN 26.0. The general and diet-related characteristics of the participants, including the residence type and the need for an integrated program to improve eating behaviors, were analyzed by computing frequencies and percentages, means, and standard deviations. Furthermore, an independent sample *t*-test and ANOVA were performed for nutrition knowledge, eating behaviors, and the need for integrated programs to improve eating behaviors according to the participants' general, diet-related, and need-related characteristics. After the ANOVA analysis, statistically significant results were post-hoc tested using Scheffe's test.

3. Results

3.1 General, Diet-related Characteristics and Residential Type of Participants

Table 1 shows the general characteristics of the participants. The mean age of the participants was 21.26 years; most students were in the fourth grade (93 participants; 42.9%). A total of 135 participants (62.2%) reported that their health status was at a common level, 124 (57.1%) that their subjective body shape recognition was normal, and 123 (56.7%) that they had been controlling their weight over the past year. Based on the average frequency of eating out three times per week, 59 participants (27.2%) reported eating out four or more times a week. There were 92 participants (42.4%) who drank alcohol, and 10 (4.6%) who smoked. Regarding economic status, 162 participants (74.7%) reported that it was in the "middle" range. Regarding their satisfaction with university life, 106 participants (48.8%) reported that it was "common," and 126 (58.1%) perceived their academic achievement as in the "middle" range. Regarding residential type, the largest number of participants were living at home with 116 participants (53.5%), followed by 70 participants living in a rented room and 31 living in a dormitory.

3.2 Need-related Characteristics and the Need for an Integrated Program to Improve Eating Behaviors

Table 2 shows need-related characteristics and the need for an integrated program to improve the eating behaviors of the participants in this study. There were 152 participants (70.0%) with no experience of dietary education, 76 (35.0%) who were "interested" in diet-related information, and 138 (63.6%) who found that an integrated program to improve eating behaviors was "necessary." Regarding the item on the thoughts on the need for an integrated program, which

allowed multiple responses, 131 participants (60.4%) responded that "continuous information provision through various media" was necessary, and 132 participants (60.8%) reported that they had searched the Internet to obtain information to improve their eating behaviors after starting university. The need for each topic of the integrated program was the highest for "Manage your eating habits right" with 4.36 points, followed by "Disease and health information: adult diseases, etc." with 4.27 points, "Weight control method and diet" with 4.12 points, and "Food and nutrients, calories" with 4.03 points. A total of 181 participants (83.4%) were "willing to participate in the integrated program." For most participants (21.7%), Social Network Services (SNS) such as Facebook and Twitter were the preferred method of operating the integrated program.

3.3 Nutrition knowledge and eating behaviors according to general and diet-related characteristics and the need for an integrated program

Table 3 shows the nutrition knowledge and eating behaviors of participants according to general and diet-related characteristics, as well as the characteristics related to the need for an integrated program. There was a significant difference in nutrition knowledge according to academic achievements ($F=9.535$, $p<.001$). The post-hoc analysis revealed that the participants who answered "high" and "middle" had a higher level of nutrition knowledge than those who answered "low." Eating behaviors showed a statistically significant difference according to health status ($F=9.835$, $p<.001$), eating out frequency ($t=6.590$, $p<.001$), drinking ($t=-2.730$, $p=.007$), smoking ($t=-2.378$, $p=.039$), satisfaction with college life ($F=5.708$, $p=.004$), interest in dietary information ($F=6.123$, $p=.003$), and willingness to participate in the integrated program ($t=2.173$, $p=.034$). In the post-hoc

analysis, participants who answered "good" or "common" for their health status had better eating behaviors than those who answered "bad." Regarding satisfaction with university life, participants who reported it as "satisfactory" had better eating behaviors than those who answered "common" or "unsatisfactory." Moreover, participants who were "interested" in dietary information or had a "common" level of interest had better eating behaviors than those who were "not interested."

Table 1. General, Diet-related Characteristics and Residential Type of Participants (N=217)

Characteristics	Categories	n(%) or M±SD
Age (yr)		21.26±1.66
Grade	1	14(6.5)
	2	46(21.2)
	3	64(29.5)
	4	93(42.9)
Major	Humanities and social sciences	49(22.6)
	Natural engineering	45(20.7)
	Arts and sports	13(6.0)
	Department of health and medical care	86(39.6)
	Etc.	24(11.1)
Health status	Good	42(19.4)
	Common	135(62.2)
	Bad	40(18.4)
Subjective body shape recognition	Skinny	41(18.9)
	Normal	124(57.1)
	Obese	52(24.0)
Weight control over the past year	Yes	123(56.7)
	No	94(43.3)
Eating out frequency	3 or less	158(72.8)
	4 or more times	59(27.2)
Drinking	Yes	92(42.4)
	No	125(57.6)
Smoking	Yes	10(4.6)
	No	207(95.4)
Economic status	Upper	32(14.7)
	Middle	162(74.7)
	Lower	23(10.6)
Satisfaction on university life	Satisfactory	99(45.6)
	Common	106(48.8)
	Unsatisfactory	12(5.5)
Perceptive academic achievements	Upper	75(34.6)
	Middle	126(58.1)
	Lower	16(7.4)
Residential type	Dormitory	31(14.3)
	Home	116(53.5)
	Rented room	70(32.3)

3.4 Level of nutrition knowledge and eating behaviors

Table 3 shows participants' level of nutrition knowledge and eating behaviors. The average nutrition knowledge score was 15.47 out of 20 points, and the average eating behavior score was 2.92 out of 5 points.

3.5 Nutrition knowledge, eating behaviors, and the need for an integrated program to improve eating behaviors according to residential type

Tables 4 and 5 show the nutrition knowledge, eating behaviors, and need for an integrated program to improve eating behaviors according to the residential type of the participants in this study. A statistically significant difference in eating behaviors was identified according to residential type ($F=8.791$, $p<.001$), and the post-hoc analysis revealed that participants living at home had better eating behaviors than those living in rented rooms. The need for an integrated program to improve eating behaviors showed a significant difference according to residential type in "disease and health information" ($F=6.317$, $p=.002$), and the post-hoc analysis revealed that participants living at home and in rented rooms had a higher need for "disease and health information" than those living in dormitories.

4. Discussion

This study aimed to identify the characteristics and needs related to an integrated program to improve participants' eating behaviors, nutrition knowledge, and eating behaviors. Nutrition knowledge and eating behaviors according to the general, diet-related, and need-related characteristics of the participants were identified. Finally, the nutrition knowledge, eating behaviors, and need for an integrated program to improve eating behaviors according to participants' residential type were identified.

Table 2. Need-related Characteristics and Need for Integrated Programs for Improving Eating Behaviors of Participants (N=217)

Characteristics	Categories	n(%) or M±SD		
Dietary education experience	Yes	65(30.0)		
	No	152(70.0)		
Interest in dietary information	Interested	76(35.0)		
	Common	103(47.5)		
	Not interested	38(17.5)		
Necessity of integrated program	Necessary	138(63.6)		
	Common	69(31.8)		
	Not necessary	10(4.6)		
Thoughts on the need for an integrated program (Multiple responses)	Provision of information through university lectures, etc.	43(19.8)		
	University compulsory education	18(8.3)		
	Continuous information provision through various media	131(60.4)		
	Retrieve information when needed	17(7.8)		
	No more needed	7(3.2)		
	Etc	2(0.9)		
Provision of information to improve dietary behavior (Multiple responses)	Mass media (TV, etc.)	54(24.9)		
	Internet search	132(60.8)		
	From parents, seniors, friends, etc.	15(6.9)		
	From experts such as dietitians and doctors	6(2.8)		
	Major and liberal arts books	14(6.5)		
	Menu and nutrition information of the school cafeteria (homepage, etc.)	1(0.5)		
Integrated program topic	Etc	3(1.4)		
	Weight control method and diet	4.12±0.86		
	Food and nutrients, calories	4.03±0.79		
	Disease and health information: adult diseases, etc.	4.27±0.80		
	Manage your eating habits right	4.36±0.76		
	How to read and use the nutrition label	3.99±0.92		
	Cooking method	3.78±0.90		
	Information on food safety and hazards: food hygiene, etc.	3.98±0.86		
	Dining out choices and food purchases	3.76±0.87		
	Dietary management by age	3.99±0.92		
	Dining etiquette	3.39±1.18		
Food culture	3.19±1.02			
Willingness to Participate in the Integrated Program	Yes	181(83.4)		
	No	36(16.6)		
How to operate the integrated program	Categories	Ranking, n(%)		
		1	2	3
	Lecture-style class	32(14.7)	14(6.5)	29(13.4)
	Online education	26(12.0)	30(13.8)	21(9.7)
	Periodic email or text message	20(9.2)	23(10.6)	21(9.7)
	University website	3(1.4)	4(1.8)	10(4.6)
	Consultation with experts such as dietitians	29(13.4)	26(12.0)	21(9.7)
	Cooking practice (demonstration of diet and recipe)	23(10.6)	33(15.2)	24(11.1)
	Smartphone application	32(14.7)	42(19.4)	27(12.4)
	Club activities	2(0.9)	5(2.3)	16(7.4)
	SNS such as Facebook, Twitter, etc.	47(21.7)	29(13.4)	36(16.6)
Pamphlet	3(1.4)	11(5.1)	12(5.5)	

SNS: Social Network Services

Table 3. Nutrition Knowledge and Eating Behaviors According to General, Diet-related, and Need-related Characteristics (N=217)

Characteristics	Categories	Nutrition Knowledge		Eating Behaviors	
		Mean \pm SD	t or F(p)	Mean \pm SD	t or F(p)
Grade	1	15.71 \pm 2.02	0.335 (.800)	2.73 \pm 0.55	1.105 (.348)
	2	15.24 \pm 2.40		2.97 \pm 0.58	
	3	15.44 \pm 2.01		2.88 \pm 0.47	
	4	15.58 \pm 2.05		2.96 \pm 0.51	
Major	Humanities and social sciences	15.33 \pm 2.35	0.498 (.737)	2.92 \pm 0.52	0.993 (.413)
	Natural engineering	15.84 \pm 2.34		2.86 \pm 0.54	
	Arts and sports	15.15 \pm 1.63		3.12 \pm 0.43	
	Department of health and medical care	15.44 \pm 1.99		2.90 \pm 0.52	
	Etc	15.38 \pm 1.79		3.04 \pm 0.47	
Health status	Good ^a	15.69 \pm 1.67	1.000 (.369)	3.11 \pm 0.53	9.835 ($<$.001) a,b $>$ c
	Common ^b	15.32 \pm 2.23		2.95 \pm 0.49	
	Bad ^c	15.78 \pm 2.04		2.64 \pm 0.48	
Subjective body shape recognition	Skinny	15.07 \pm 2.27	1.676 (.190)	3.01 \pm 0.55	1.633 (.198)
	Normal	15.69 \pm 1.96		2.94 \pm 0.53	
	Obese	15.27 \pm 2.27		2.83 \pm 0.44	
Weight control over the past year	Yes	15.58 \pm 2.10	0.821 (.413)	2.92 \pm 0.51	-0.127 (.899)
	No	15.34 \pm 2.11		2.93 \pm 0.53	
Eating out frequency	3 or less	15.43 \pm 2.15	-0.524 (.601)	3.04 \pm 0.51	6.590 ($<$.001)
	4 or more times	15.59 \pm 1.99		2.61 \pm 0.39	
Drinking	Yes	15.39 \pm 2.24	-0.492 (.624)	2.81 \pm 0.44	-2.730 (.007)
	No	15.54 \pm 2.01		3.01 \pm 0.55	
smoking	Yes	14.80 \pm 2.39	-0.917 (.381)	2.54 \pm 0.52	-2.378 (.039)
	No	15.51 \pm 2.09		2.94 \pm 0.51	
Economic status	Upper	15.94 \pm 2.09	1.045 (.354)	2.82 \pm 0.44	0.825 (.439)
	Middle	15.36 \pm 2.11		2.95 \pm 0.52	
	Lower	15.61 \pm 2.06		2.93 \pm 0.60	
Satisfaction on university life	Satisfactory ^a	15.68 \pm 2.09	2.292 (.104)	3.04 \pm 0.57	5.708 (.004) a $>$ b,c
	Common ^b	15.42 \pm 2.08		2.85 \pm 0.44	
	Unsatisfactory ^c	14.33 \pm 2.15		2.65 \pm 0.51	
Perceptive academic achievements	Upper ^a	15.93 \pm 1.92	9.535 ($<$.001) a,b $>$ c	3.01 \pm 0.57	1.805 (.167)
	Middle ^b	15.45 \pm 2.07		2.89 \pm 0.49	
	Lower ^c	13.50 \pm 2.16		2.81 \pm 0.43	
Dietary education experience	Yes	15.72 \pm 2.10	1.138 (.257)	3.00 \pm 0.49	1.394 (.166)
	No	15.37 \pm 2.10		2.89 \pm 0.53	
Interest in dietary information	Interested ^a	15.89 \pm 1.97	2.737 (.067)	3.00 \pm 0.52	6.123 (.003) a,b $>$ c
	Common ^b	15.34 \pm 2.14		2.97 \pm 0.49	
	Not interested ^c	15.00 \pm 2.16		2.67 \pm 0.52	
Necessity of integrated program	Necessary	15.54 \pm 2.04	2.618 (.075)	2.96 \pm 0.48	1.951 (.145)
	Common	15.57 \pm 2.17		2.90 \pm 0.58	
	Not necessary	14.00 \pm 2.16		2.64 \pm 0.51	
Willingness to Participate in the Integrated Program	Yes	15.50 \pm 2.10	0.435 (.665)	2.96 \pm 0.52	2.173 (.034)
	No	15.33 \pm 2.14		2.76 \pm 0.49	
Total		15.47 \pm 2.10		2.92 \pm 0.52	

Table 4. Nutrition Knowledge and Eating Behaviors According to Residential Type of Participants (N=217)

Characteristics	Categories	Nutrition Knowledge		Eating Behaviors	
		Mean \pm SD	F(p)	Mean \pm SD	F(p)
Residential type	Dormitory ^a	15.52 \pm 1.82	3.008 (.051)	2.81 \pm 0.52	8.791 ($<$.001) b $>$ c
	Home ^b	15.76 \pm 1.87		3.06 \pm 0.52	
	Rented room ^c	14.99 \pm 2.49		2.76 \pm 0.45	

Table 5. Need for Integrated Programs to Improve Eating Behaviors according to Residential Type of Subjects (N=217)

Categories	Residential type (Mean \pm SD)			F(p)
	Dormitory ^a	Home ^b	Rented room ^c	
Weight control method and diet	4.03 \pm 0.98	4.13 \pm 0.85	4.13 \pm 0.83	0.167(.847)
Food and nutrients, calories	3.97 \pm 0.75	4.05 \pm 0.77	4.01 \pm 0.84	0.153(.858)
Disease and health information: adult diseases, etc.	3.84 \pm 1.07	4.40 \pm 0.68	4.26 \pm 0.77	6.317(.002) a $<$ b,c
Manage your eating habits right	4.26 \pm 1.03	4.40 \pm 0.70	4.36 \pm 0.72	0.410(.664)
How to read and use the nutrition label	4.10 \pm 0.94	4.00 \pm 0.88	3.93 \pm 0.98	0.367(.693)
Cooking method	3.77 \pm 0.96	3.76 \pm 0.87	3.81 \pm 0.92	0.084(.919)
Information on food safety and hazards: food hygiene, etc.	3.81 \pm 0.95	4.07 \pm 0.85	3.91 \pm 0.83	1.461(.234)
Dining out choices and food purchases	3.84 \pm 0.90	3.78 \pm 0.81	3.69 \pm 0.96	0.426(.654)
Dietary management by age	3.77 \pm 1.09	3.99 \pm 0.95	4.09 \pm 0.79	1.227(.295)
Dining etiquette	3.32 \pm 1.33	3.34 \pm 1.18	3.51 \pm 1.11	0.559(.573)
Food culture	3.32 \pm 1.08	3.09 \pm 0.98	3.30 \pm 1.05	1.179(.310)

There was a significant difference in the nutrition knowledge of participants according to academic achievements among the general characteristics. In the post-hoc analysis, participants who answered "high" or "middle" for their perceptive academic achievements had a higher level of nutrition knowledge than those who answered "low." Although there are no previous studies showing a direct correlation between nutrition knowledge and academic achievements, as good academic achievements are the result of concentration and dedication to study, nutrition-related knowledge may also have been similarly acquired.

Participants' eating behaviors showed a

statistically significant difference according to health status, eating out frequency, drinking, smoking, satisfaction with college life, interest in dietary information, and willingness to participate in the integrated program. Participants who assessed their health status positively as "good" or "common" exhibited good eating behaviors. This was similar to the results of a study demonstrating that nursing students who assessed their health status as good had better eating behaviors compared to those who assessed their health status as bad [20]. Moreover, even with different participants, this was consistent with the results of a previous study conducted with nurses, showing that the

better the perceived health status, the higher the eating behavior score [21]. Thus, the participants' perception of their health status seemed to act as a motive for practicing desirable eating behaviors [21], adjusting their eating behaviors to better maintain and improve their health status.

In this study, participants who deemed their university life as "satisfactory" had better eating behaviors than those who reported their university life as "common" or "unsatisfactory." Similarly, a study found that the eating behaviors of college students were regulated by college-related characteristics such as college life, student council, and exams [4]. This was also consistent with the results that nursing students with high satisfaction with school life demonstrated more desirable eating behaviors than those with low satisfaction with school life [20,22]. Moreover, depression, anxiety, and stress is positively correlated with problem eating behaviors among college students [23], and their self-control is a personal factor that regulates dietary behaviors [4]. Based on these results, a high level of satisfaction with school life suggests improved self-control in managing stress in various aspects [22], which reduced problematic eating behaviors, such as binge eating, through psychological and emotional stability; thereby, leading to desirable eating behaviors.

The eating behavior score of the participants was higher in the groups who ate out less frequently, the non-smoking group, and the non-drinking group. This result was partially consistent with the results of a previous study [20] reporting a difference in the eating behaviors of nursing students depending on whether they smoked. As a social network of college students, parental control and relationships with friends act as determinants of various eating behaviors regarding selecting and consuming food [4,8].

A previous study [22] reported significant

differences in eating behaviors according to the number of overeating, snacking, and late-night meals among college students. The likelihood of exhibiting unhealthy eating behaviors is higher in those who frequently spend time with friends, with an increase in eating out, eating snacks, and late-night meals, than in those who stay alone. Furthermore, they are also more likely to be frequently exposed to drinking and smoking.

To fundamentally improve the eating behaviors of female college students, it is important to understand their interpersonal relationships with friends and other people around them. An integrated program that allows female college students to self-regulate their eating behaviors in their existing human relationships must thus be developed.

The participants who were "interested" in dietary information or had a "common" level of interest had better eating behaviors than those who were "not interested," while the group that was willing to participate in an integrated program to improve eating behaviors had better eating behaviors than those who were not willing to participate. In a study conducted on college students majoring in childcare, there was a significant difference in eating behaviors according to the level of interest in their diet. Specifically, the group interested in their diet demonstrated better eating behaviors than those with no interest in their diet, which was consistent with the results of this study [24]. To illustrate, female students who were interested in diet-related information and willing to participate in an integrated program were more likely to have had more diet-related information and to have been practicing desirable eating behaviors than those unwilling to participate in an integrated program with no interest in diet-related information.

The nutrition knowledge of female college students was scored as 15.47 out of 20 points which was comparable to the score of 15.6

points in a previous study conducted among college students [18], and a score of 15.93 points in a study conducted among nursing students [20]. Nevertheless, the nutrition knowledge of students majoring in childcare was scored as 10.43 out of 20 points [24], showing a great difference in scores compared with the participants in this study.

The participants in this study included those in the Department of Health and Medical Care and the participants of the study conducted in college students [18] included those in their first or second year of a food and nutrition major. This may have caused a difference in the level of basic nutrition-related knowledge in association with the major from the study conducted only in childcare major students [24]. Therefore, to include nutrition education when planning and operating an integrated program to improve eating behaviors for female college students, their level of nutrition knowledge should be identified in advance, while also considering their major, and the education level in the analysis should correspond to that.

The eating behaviors of the participants in this study was scored as 2.92 out of 5 points, showing no significant difference from the score of 2.72 points in the study conducted among nursing students [20] and a score of 2.75 points in the childcare major students [24]. The eating behaviors of female college students in this study and nursing students [20] with a high score on nutrition knowledge was not significantly more desirable than that of the childcare major students [24]. Similarly, there was no significant correlation between nutrition knowledge and eating behaviors of college students and nursing students [18,20,22]. However, previous studies [8,10] argued that nutrition knowledge was a major factor affecting eating behaviors. This suggests that nutrition knowledge was merely information and was not used properly in practicing eating behaviors [22]. Since nutrition

knowledge is known to be associated with the intention and willingness to eat only healthy food in female college students [25], efforts are needed to improve the eating behaviors of female college students through long-term, step-by-step, personalized nutrition knowledge-related education, rather than a single attempt. Moreover, repeated studies to establish the correlation between inconsistent nutrition knowledge and eating behaviors should be conducted in the future.

A statistically significant difference in eating behaviors was identified according to residential type, and participants living at home had better eating behaviors than those living in rented rooms. These results were consistent with those of previous studies [4,16,20] in which residential type was identified as an important factor influencing the eating behaviors of college students. One of the factors enabling healthy eating behaviors is students' participation in food preparation [8]. The living conditions of young adults living on campus reduced the frequency of preparing food by themselves and increased the frequency of eating fast food. Thus, there was a high possibility that they would not consume enough fruits, vegetables, and whole grains to meet the recommended amounts [26]. Furthermore, female college students consumed fewer fruits and vegetables than male students [2], and those who did not live at home were at a greater risk of not eating sufficient fruits and vegetables. Therefore, when planning an integrated program to improve dietary behaviors among female college students, the residence type should be considered as a major factor.

The need for an integrated program to improve eating behaviors showed a significant difference according to residential type in "disease and health information." More specifically, participants living at home or in rented rooms had a higher need for "disease and health information" than those living in

dormitories. As participants living in rented rooms tended to eat more snacks, such as sweets and biscuits, than those living in other types of residences [16], they may have a higher need for "disease and health information." This is supported by prior study results [20,21] that the eating behavior score significantly increased as the level of health concern increased. Therefore, health concerns and eating behaviors cannot be treated independently. Female college students exhibited a clear difference in characteristics and attitudes related to healthy eating compared to male students [27], and they were more willing to eat a healthy diet than male students [5]. Additionally, the factors affecting metabolic syndrome in adolescents are significantly different depending on whether the participants lived in a single-person or a multi-person household [7].

Therefore, a differentiated integrated program including disease and health information, which was highly requested by female college students living at home and in rented rooms, must be applied. This will enable female college students to improve eating behaviors on their own. Furthermore, the study results [28] on changes in food intake, amount of consumption, and increase in snacking habits caused by the restriction of movement of college students during the COVID-19 pandemic should be considered in the application of an integrated program to improve college students' eating behaviors.

This study highlighted that the eating behaviors of Korean female college students and the need for an integrated program to improve eating behaviors are closely influenced by the residential type. Additionally, a strength of this study is that the results can be practically reflected in future eating behavior improvement intervention studies for female college students.

This study had several limitations. First, it is difficult to generalize its results as the participants were recruited by convenience

sampling. Nevertheless, this study is significant in that most of the results were supported by or is consistent with the results of previous studies. Second, since it was conducted only in female college students, a follow-up study is needed to compare differences by sex by identifying differences in eating behaviors and requirements for an integrated program to improve eating behaviors according to residential type in male college students. Third, when comparing the results of this study with those of previous studies, the relationship between nutrition knowledge and eating behaviors was not consistent; thus, repeated attempts for clarification are required in the future.

5. Conclusion

This study was conducted with the aim of examining the nutrition knowledge, eating behaviors, and need for an integrated program to improve eating behaviors according to the residential type of female college students. The results found that eating behaviors were more desirable for the participants living at home compared to those living in rented rooms. As for the need for an integrated program to improve eating behaviors, the demand for "disease and health information" was higher for participants living at home and in rented rooms than those living in dormitories. Therefore, these results provide important insights that can be used in the development, application, and evaluation of a customized integrated eating behavior improvement program that considers female college students' residential type.

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