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The effect of nutrition education at school
on dietary behavior and body image
misperception in adolescents

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Directed by Professor Lee Ji Won

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Lee Jun Hyuk

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This certifies that the Master's Thesis
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ABSTRACT

The effect of nutrition education at school on dietary behavior and body image misperception in adolescents

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Adequate nutrition education is essential for making decisions regarding healthy eating habits in adolescents. We aimed to investigate differences in dietary habits and body image misperception according to nutrition education status. We analyzed 60,389 adolescents aged 12–18 years old, using the 2017 Korea Youth Risk Behavior Web-based Survey data. Participants were divided into nutrition-educated (EDU) and uneducated (un-EDU) groups, according to nutrition education status at school within the past year. Compared to the un-EDU group, the ORs and 95% CIs for desirable dietary behaviors in the EDU group were 1.08 (1.04–1.13), 1.14 (1.09–1.19), and 1.16 (1.12–1.20) for the intake of fruits, milk, and vegetables, respectively, for more than 1 time per day. The EDU group was less associated with skipping breakfast than the un-EDU group (OR=0.91,

95% CI=0.87–0.95, $p < 0.001$). The ORs and 95% CIs of body image misperception in the EDU group were lower than in the un-EDU group (OR=0.92, 95% CI=0.87–0.97, $p < 0.001$). Nutrition education had positive effects on healthy dietary behaviors. It also showed a negative association with body image misperception, confirming the importance of nutrition education in school.

Key words: nutrition education; dietary intake; skipping breakfast; body image misperception

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I. INTRODUCTION

Adolescence is related to higher nutritional demands, due to rapid growth and development. Therefore, inappropriate nutrition could negatively affect physical and mental development in adolescents. Because eating habits during adolescence are the foundation of lifelong health^{1,2}, adequate nutrition education at that time is essential for the development of healthy eating habits. However, adolescents are prone to having undesirable food, such as refined carbohydrates (snacks and sugar-sweetened beverages), caffeine, and junk food, instead of fruits, milk, and vegetables³.

Teenagers are exposed to the risk of nutritional imbalance. Milk has an excellent balance of nutrients for growth and development, including whey protein, casein, and calcium⁴. Previous studies have reported that milk consumption is associated with decrease in body fat percentage and increase in body weight, lean mass, and bone mineral contents^{4, 5}. Although the Korean Nutrition Society recommends that Korean adolescents consume two cups of milk daily (400 ml/day)⁶, the average amount of milk consumed by Korean adolescents was only 114.2 ml/day⁷. The World Health Organization (WHO)

recommends people to maintain their free sugar consumption as low as possible, as there is no evidence of harmful effects related to the intake of free sugars to less than 5% of the total calorie intake⁸. However, the daily average sugar intake for Korean adolescents aged 12 to 18 years is 69.5 g, which is 13.9% of the total energy intake⁹; and this exceeds the WHO's recommended amount of free sugar intake⁸. In addition, 14.3g (20.5%) of sugar intake is consumed as a beverage and 53.9% of which consists of added sugar drink⁹. The average daily caffeine intake of high school students is 78.98 mg in boys and 61.23 mg in girls, both of which are lower than the recommended daily caffeine intake of less than 2.5 mg/kg¹⁰. However, 12.5% of high school students consume up to 1,346.22 mg of caffeine per day, which is more than their recommended daily caffeine intake¹⁰. The prevalence of obesity in adolescents has increased from 12.2% in 2011 to 17.3% in 2016¹¹. Obese adolescents are known to inappropriately assess diet quality compared to normal-weighted adolescents³. The skipping breakfast rate, which is defined as skipping breakfast for more than 5 days a week, has been reported to be 31.5% in adolescents¹². In addition, adolescents are easily affected by the media and social prejudice and are susceptible to having distorted body image. A previous study showed that 24.2% of middle and high school students have body image misperception, in which they consider themselves obese regardless of normal BMI¹³. For these reasons, nutrition education is important for building proper dietary habits and correcting wrong dietary awareness³.

In the past, adolescents have received nutritional information from home education¹⁴. However, as the numbers of nuclear families and working women have increased, schools have started offering nutrition education. Thus, schools are considered as important places to provide nutrition information for school-aged children in many countries¹⁵. After the enforcement decree of the school meals act was established in 2003, Korean school nutrition programs included not only providing school meal service, but also providing adequate nutritional information in elementary, middle, and high schools^{16, 17}. However, only 619 out

of 3,238 middle schools (18.9%) and 622 out of 2,386 high schools (26.3%) employed nutrition teachers in 2017¹⁸. Moreover, several healthy diet programs for children and adolescents have shown limited success^{19, 20}, although, some studies have confirmed a relationship between nutrition education and dietary change^{21, 22}. This suggests that the effectiveness of school-based nutrition education needs to be verified.

In the current study, we aimed to investigate differences in dietary habits and body image misperception according to nutrition education, using nationally representative data.

II. METHODS

1. Study population

We used data from the 2017 Korea Youth Risk Behavior Web-based Survey (KYRBS). KYRBS was a national, school-based survey that was conducted by the Korea Centers for Disease Control and Prevention (KCDC). The KYRBS had a cross-sectional design that employed a stratified, multistage, probability sampling design based on geographical area. Sample weights were assigned to participants to represent the general Korean population²³.

Students completed the survey in the classroom, and all responses were anonymous. The questionnaires included anthropometric variables (height, and weight), demographic variables (age, school grade, gender, physical activity, residential area, and socioeconomic status), variables related to diet (dietary behaviors, frequency of having breakfast), and variables associated with subjective status (subjective body image perception).

The 2017 KYRBS consisted of data on 62,276 students from 400 middle schools and 400 high schools. Students were in the first grade of middle school

up to the third grade of high school. Of these participants, we excluded those without height or weight data ($n = 1,884$) and dietary behavior data ($n=3$). A total of 60,389 adolescents (30,659 boys and 29,730 girls) were included in the analysis.

2. Data collection

The variables included in the model were sex, level of school (middle school, high school), socioeconomic status (very high, high, medium, low, very low), residential area (large city, small city, county), BMI Z-score, and regular physical activity (physical activity that lasted more than 60 minutes for 5 days or more per week).

The Korean Ministry of Food and Drug Safety has published electronic books (e-books) on nutrition education as a guide for standardized nutrition education. The e-books emphasized nutritional practice and discussion during class to recognize factors hindering healthy diets in teenagers and to encourage them to change their diet. Based on the e-books, teachers at each school carried out nutrition education aimed at providing knowledge for the implementation of healthy eating habits for students and promoting a positive attitude for healthy dietary behaviors. The nutrition education curriculum for middle and high school students in Korea were classified as food safety and nutrition information²⁴. First, the food safety education curriculum included caffeine (caffeine content in foods, the health hazards of excess caffeine intake, and ways to reduce caffeine intake) and food additives (types, uses, and safety of processed foods). Second, in the nutritional information class, students received information on obesity and eating disorders and discussed ways to prevent obesity and eating disorders with proper body image training. Also, students learned how to read nutritional labels and to select proper food when eating out. After nutrition education, students were able to determine proper diets and calculate the recommended daily caloric intake according to their BMI. More

detailed information about nutrition education is available through the Ministry of Food and Drug Safety website²⁵.

Participants responded "yes" or "no" to the following question about their experience of nutrition education at school: "During the last 12 months, have you participated in a nutrition and dietary habits class at school?". Participants were then divided into the nutrition-educated (EDU) group or the nutrition-uneducated (un-EDU) group.

Desirable dietary behaviors included fruit, vegetable, and milk consumption, whereas undesirable dietary behaviors included instant food (fast food, instant noodles, and snack), added-sugar drink (soda and sweet drinks), and caffeinated drink consumption. These were based on food-based dietary guidelines for Korean adolescents²⁶. The consumption of the desirable and undesirable items was assessed in the survey. Each item was classified as a dichotomized variable based on whether the intake was once or more per day. The frequency of breakfast was determined by the number of day participants had breakfast in the last week. Drinking milk or juice in the morning was not considered breakfast. Those who skipped breakfast for five or more times in the last week were placed in the skipping breakfast group; the remaining participants were assigned to the non-skipping breakfast group²⁶.

Heights and weights were self-reported to the nearest 0.1 cm and 0.1 kg, respectively. BMI was calculated as body weight divided by height squared (kg/m^2). The BMI Z-score was calculated using the 2017 Korea national growth chart for children and adolescents²⁷. Subjective perceptions of body image were surveyed with a question ("What body shape do you think you have?") using a 5-point Likert-type scale: very thin, slightly thin, normal, slightly fat, and very fat. Non-overweight adolescents who had a BMI Z-score less than the 85th percentile²⁸ and responded that they were slight fat or very fat were defined as having body image misperception. In contrast, non-overweight adolescents who reported a slim or normal body shape were defined as having proper body image

recognition. We did not include those who are overweight but think of themselves as normal weight in the analysis for body image misperception, since their sample size was too small ($n = 670$).

3. Statistical analysis

We applied sampling weights to participants in KYRBS by accounting for the complex survey design to represent Korean adolescents. The weights were allocated after stratification in this study, after considering the nonresponse rate. All data are represented by means or percentages (%) \pm standard errors (SEs). We used the weighted independent t test to compare differences in continuous variables, such as height Z-score, weight Z-score, and BMI Z-score. For categorical variables (i.e., sex, level of school, socioeconomic status, residential area, regular physical activity, skipping breakfast status, and dietary behaviors), weighted chi-square tests were used to compare differences between groups. In addition, milk consumption frequency (MCF) was divided into three categories (MCF <1 time/day, $1 \leq$ MCF <2 times/day, and MCF \geq 2 times/day), and the proportion of both EDU and un-EDU subjects to each MCF category was calculated. Odds ratio (OR) with 95% confidence interval (CI) were calculated by using a weighted multivariate logistic regression analysis to evaluate the relationship between nutrition education and dietary behaviors, skipping breakfast, or body image misperception. We also performed subgroup analyses for sex and school grade. All statistical analyses were conducted using the SPSS statistical software (version 25.0; SPSS Inc., Chicago, IL, USA). p less than 0.05 was considered statistically significant.

4. Ethic statement

Written informed consent was obtained from each participant prior to the survey based on the Declaration of Helsinki. Because this web-based survey was performed at the school with huge participants, the informed consent from their

parents was exempted. This consent procedure was approved by the Institutional Review Board (IRB) of KCDC (approval number 117058).

III. RESULTS

Table 1 represents the general characteristics of the study population. Overall, 47.7% participants experienced nutrition education at school within the past year. When classified by sex, 43.4% of girls experienced nutrition education, whereas 49.4% of boys experienced nutrition education. Similarly, when classified according to school level, 58.7% of middle school students received nutrition education, and 35.9% of high school students received nutrition education. In the EDU group, the proportion of boys was higher than that of girls ($55.1 \pm 1.3\%$ vs. $44.9 \pm 1.3\%$, $p < 0.001$). Middle school students comprised $57.5 \pm 0.9\%$ of the group, and the remaining $42.5 \pm 0.9\%$ were high school students. In contrast, the proportion of middle school students in the un-EDU group was $34.7 \pm 0.9\%$, and the proportion of high school students was $65.3 \pm 0.9\%$. Most participants in both groups resided in small and medium-sized cities, followed by big cities and counties. The skipping breakfast rate was significantly lower in the EDU group than in the un-EDU group ($30.0 \pm 0.4\%$ vs. $32.8 \pm 0.4\%$, $p < 0.001$). Among the dietary behaviors, fruit, milk, and vegetable intake was significantly higher in the EDU group. The consumption of undesirable foods, such as instant foods, added sugar drinks, and caffeinated drinks, for more than once a day was similar in both groups.

Table 1. Demographics and health characteristics of the study population

| | EDU | un-EDU | <i>p</i> |
|--------------------------|---------------|---------------|----------|
| Unweighted number, n (%) | 29,684 (47.7) | 32,592 (52.3) | |
| Sex, % (SE) | | | <0.001 |

| | | | |
|--------------------------------------|----------------|----------------|--------|
| Females | 44.9 (1.3) | 50.5 (1.6) | |
| Males | 55.1 (1.3) | 49.5 (1.6) | |
| School level, % (SE) | | | <0.001 |
| Middle school | 57.5 (0.9) | 34.7 (0.9) | |
| High school | 42.5 (0.9) | 65.3 (0.9) | |
| Residential area, % (SE) | | | 0.003 |
| Big cities | 41.5 (0.9) | 45.0 (0.9) | |
| Small and medium-sized cities | 52.0 (1.0) | 49.3 (1.0) | |
| Counties | 6.5 (0.7) | 5.7 (0.5) | |
| Regular physical activity, % (SE) | 15.8 (0.3) | 12.0 (0.3) | <0.001 |
| Height Z-score | 0.304 ± 0.008 | 0.232 ± 0.008 | <0.001 |
| Weight Z-score | 0.133 ± 0.009 | 0.117 ± 0.009 | 0.178 |
| BMI Z-score | -0.031 ± 0.010 | -0.005 ± 0.010 | 0.029 |
| Skipping breakfast, % (SE) | 30.0 (0.4) | 32.8 (0.4) | <0.001 |
| Desirable dietary behavior, % (SE) | | | |
| Fruit ≥1 time/day | 24.2 (0.4) | 20.5 (0.3) | <0.001 |
| Milk ≥1 time/day | 27.5 (0.4) | 22.8 (0.4) | <0.001 |
| Vegetable ≥1 time/day | 44.7 (0.4) | 39.7 (0.3) | <0.001 |
| Undesirable dietary behavior, % (SE) | | | |
| Instant foods ≥1 time/day | 6.6 (0.2) | 6.9 (0.2) | 0.233 |
| Added sugar drinks ≥1 time/day | 10.9 (0.2) | 11.1 (0.2) | 0.419 |
| Caffeine ≥1 time/day | 1.8 (0.1) | 1.8 (0.1) | 0.608 |

Data are expressed as the weighted mean ± SE or weighted percentage ± SE. *p* were calculated by weighted two-sample t-test or weighted chi-squared test. Abbreviations: EDU, educated group; un-EDU, uneducated group; BMI, body mass index; SE, standard error.

Table 2 shows the independent association between nutrition education and

desirable dietary behaviors. Compared to the un-EDU group, the ORs and 95% CIs for desirable dietary behaviors in the EDU group were 1.08 (1.04–1.13) for fruits, 1.14 (1.09–1.19) for milk, and 1.16 (1.12–1.20) for vegetables, after adjusting for sex, school level, residence area, socioeconomic status, BMI-Z score, and regular physical activity.

Table 2. Weighted multivariate logistic regression analysis of the association between nutrition education and desirable dietary behaviors in the total population and in the age- and school grade- specific subgroups

| | Fruits ≥ 1 time/day | Milk ≥ 1 time/day | Vegetables ≥ 1 time/day |
|----------------------------|--------------------------|------------------------|------------------------------|
| | OR (95% CI) | OR (95% CI) | OR (95% CI) |
| Total [†] | | | |
| un-EDU | 1 (reference) | 1 (reference) | 1 (reference) |
| EDU | 1.08 (1.04–1.13)** | 1.14 (1.09–1.19)** | 1.16 (1.12–1.20)** |
| Female [‡] | | | |
| un-EDU | 1 (reference) | 1 (reference) | 1 (reference) |
| EDU | 1.10 (1.03–1.17)* | 1.17 (1.10–1.25)** | 1.18 (1.11–1.24)** |
| Male [‡] | | | |
| un-EDU | 1 (reference) | 1 (reference) | 1 (reference) |
| EDU | 1.07 (1.01–1.14)* | 1.11 (1.05–1.18)** | 1.14 (1.09–1.20)** |
| Middle School [§] | | | |
| un-EDU | 1 (reference) | 1 (reference) | 1 (reference) |
| EDU | 1.07 (1.01–1.13)* | 1.11 (1.05–1.17)** | 1.15 (1.10–1.21)** |
| High School [§] | | | |
| un-EDU | 1 (reference) | 1 (reference) | 1 (reference) |

| | | | |
|-----|--------------------|---------------------|---------------------|
| EDU | 1.10 (1.02–1.18) * | 1.17 (1.10–1.25) ** | 1.16 (1.10–1.23) ** |
|-----|--------------------|---------------------|---------------------|

Data are presented as odds ratio (OR) and 95% confidence interval (CI).

† Adjusted for all confounders (sex, school grade, residential area, socioeconomic status, body mass index - Z score, and regular physical activity); ‡ Adjusted for all confounding variables except sex;

§ Adjusted for all confounding variables except school grade; * $p < 0.05$; ** $p < 0.001$; p derived from weighted multivariate logistic regression analysis.

Unlike desirable dietary behaviors, undesirable dietary behaviors were not significantly associated with the nutrition education groups. The same trend was shown in subgroup analyses by sex and school level, except for added-sugar drinks for middle school students (OR = 0.91; 95% CI: 0.84–0.99) in the EDU group (Table 3).

Table 3. Weighted multivariate logistic regression analysis of the association between nutrition education and undesirable dietary behaviors in the total population and in the age- and school grade- specific subgroups

| | Instant foods ≥ 1 time/day | Added sugar drinks ≥ 1 time/day | Drinking caffeine ≥ 1 time/day |
|-----------------|---------------------------------|--------------------------------------|-------------------------------------|
| | OR (95% CI) | OR (95% CI) | OR (95% CI) |
| Total † | | | |
| un-EDU | 1 (reference) | 1 (reference) | 1 (reference) |
| EDU | 0.95 (0.89–1.03) | 0.98 (0.96–1.04) | 1.00 (0.87–1.14) |
| Female ‡ | | | |
| un-EDU | 1 (reference) | 1 (reference) | 1 (reference) |
| EDU | 0.94 (0.85–1.03) | 1.00 (0.91–1.09) | 1.00 (0.80–1.25) |
| Male ‡ | | | |
| un-EDU | 1 (reference) | 1 (reference) | 1 (reference) |
| EDU | 0.98 (0.88–1.09) | 0.974 (0.90–1.05) | 0.99 (0.84–1.17) |
| Middle | | | |

| School [§] | | | |
|--------------------------|------------------|--------------------|-------------------|
| un-EDU | 1 (reference) | 1 (reference) | 1 (reference) |
| EDU | 0.92 (0.83–1.02) | 0.91 (0.84–0.99) * | 1.04 (0.85–1.28) |
| High School [§] | | | |
| un-EDU | 1 (reference) | 1 (reference) | 1 (reference) |
| EDU | 0.99 (0.90–1.10) | 1.05 (0.96–1.14) | 0.97 (0.810–1.16) |

Data are presented as odds ratio (OR) and 95% confidence interval (CI).

† Adjusted for all confounders (sex, school grade, residential area, socioeconomic status, body mass index - Z score, and regular physical activity); ‡ Adjusted for all confounding variables except sex;

§ Adjusted for all confounding variables except school grade; * $p < 0.05$; ** $p < 0.001$; p derived from weighted multivariate logistic regression analysis.

Figure 1 shows the percentage of adolescents who consume milk at least one time per day in the in the EDU group or un-EDU group. The proportion of EDU group with $MCF \geq 1$ time/day was significantly higher than that on un-EDU group. ($27.5 \pm 0.3\%$ vs. $22.8 \pm 0.3\%$, $p < 0.001$).

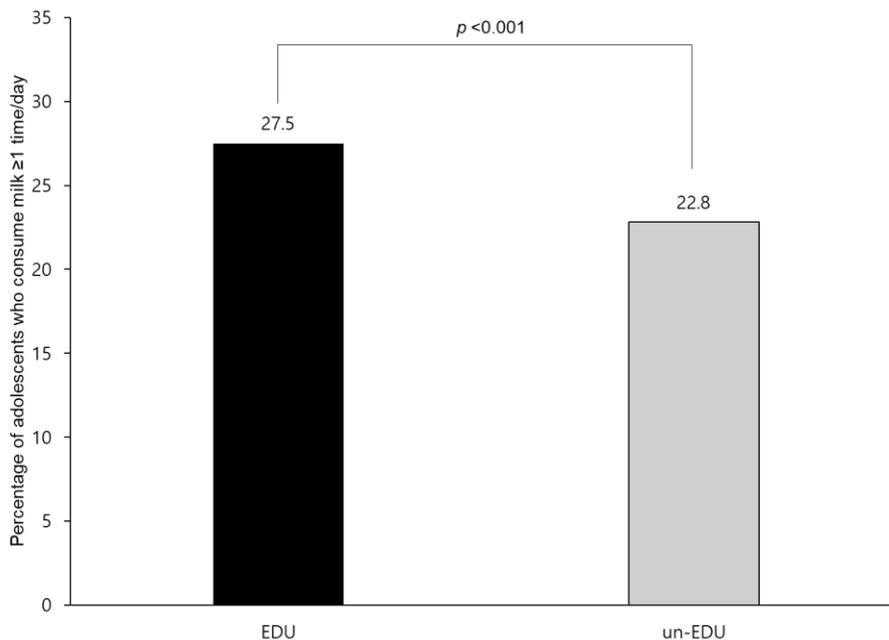


Figure 1. the percentage of adolescents who consume milk at least one time per day in the nutrition educated (EDU) group or nutrition uneducated (un-EDU) group

The relationship between nutrition education and skipping breakfast is presented in Table 4. Compared with the un-EDU group, the EDU group was less associated with skipping breakfast after adjusting for all potential confounders (OR = 0.91; 95% CI: 0.87–0.95, $p < 0.001$). The same significant trends were also observed in the sex- and school level- specific subgroup analyses.

Table 4. Odds ratio and 95% confidence interval of skipping breakfast status in the nutrition-educated group compared to the uneducated group, according to sex and school grade

| | Skipping Breakfast | | |
|----------------------------|--------------------|-----------|----------|
| | OR | 95% CI | <i>p</i> |
| Total [†] | | | |
| un-EDU | 1 | reference | |
| EDU | 0.91 | 0.87–0.95 | <0.001 |
| Female [‡] | | | |
| un-EDU | 1 | reference | |
| EDU | 0.90 | 0.85–0.96 | 0.001 |
| Male [‡] | | | |
| un-EDU | 1 | reference | |
| EDU | 0.91 | 0.86–0.97 | 0.003 |
| Middle school [§] | | | |
| un-EDU | 1 | reference | |
| EDU | 0.88 | 0.83–0.93 | <0.001 |
| High school [§] | | | |
| un-EDU | 1 | reference | |
| EDU | 0.93 | 0.87–0.99 | 0.030 |

[†]Adjusted for all confounders (sex, school grade, residential area, socioeconomic status, body mass index - Z score, and regular physical activity); [‡] Adjusted for all confounding variables

except sex; § Adjusted for all confounding variables except school grade; *p* derived from weighted multivariate logistic regression analysis. Abbreviations: OR, odds ratio; CI, confidence interval.

Table 5 shows the association between nutrition education and body image misperception. After adjusting for all potential confounders, the OR (95% CI) of body image misperception in the EDU group was 0.92 (0.87–0.97, *p* = 0.002) compared with the un-EDU group. In the subgroup analyses, the ORs and 95% CIs of body image misperception in the EDU group were significantly low only in girls and middle school students.

Table 5. Odds ratio and 95% confidence interval of body image misperception in the nutrition-educated group compared with the uneducated group, according to sex and school grade

| | Body image misperception | | |
|----------------------------|--------------------------|-----------|----------|
| | OR | 95% CI | <i>p</i> |
| Total [†] | | | |
| un-EDU | 1 | reference | |
| EDU | 0.92 | 0.87–0.97 | 0.002 |
| Females [‡] | | | |
| un-EDU | 1 | reference | |
| EDU | 0.87 | 0.81–0.94 | <0.001 |
| Male | | | |
| un-EDU | 1 | reference | |
| EDU | 0.99 | 0.91–1.08 | 0.896 |
| Middle school [§] | | | |
| un-EDU | 1 | reference | |
| EDU | 0.90 | 0.83–0.97 | 0.004 |
| High school [§] | | | |
| un-EDU | 1 | reference | |
| EDU | 0.95 | 0.88–1.02 | 0.117 |

[†]Adjusted for all confounders (sex, school grade, residential area, socioeconomic status, body mass index - Z score, and regular physical activity); [‡] Adjusted for all confounding variables except sex; [§] Adjusted for all confounding variables except school grade; *p* derived from weighted multivariate logistic regression analysis. Abbreviations: OR, odds ratio; CI, confidence interval.

IV. DISCUSSION

Dietary habits are established during adolescence and young adulthood, and healthy nutrition during adolescence contributes to optimal growth and long-term physical balance²⁹. In this context, nutrition education is essential for adolescents, as it could change current nutrition-related behaviors or facilitate the adoption of new behaviors³⁰.

Using the data collected from a nationwide school-based survey in Korea, we showed that nutrition education had positive effects on dietary behaviors and body image misperception in adolescents.

A recent study suggested that the most effective method of delivering nutrition education is through classroom lectures³¹. In addition, school-based nutrition education programs have shown some success at increasing the consumption of healthy food³¹. The Special Act on Children's Dietary Life Safety Management (enacted in 2008) and the Dietary Life Education Support Act (enacted in 2009) intended to promote health by regulating nutritious food and proper eating habits of children and adolescents¹⁶. However, there is currently an insufficient number of nutrition teachers, and less than half of the students who participated in the KYRBS received nutrition education at school. More nutrition teachers should be assigned to nutrition education program in schools.

In our study, the EDU group had a higher frequency of desirable dietary behaviors, such as fruit, milk, and vegetable intake, compared to the un-EDU group. These findings corroborated a previous systematic review which demonstrated that the nutrition education of school children can bring about a change in their dietary behavior toward healthy eating³². One thing worth noting in our study is that the EDU group was more likely to demonstrate desirable dietary behaviors than the un-EDU group, whereas no differences in choosing

undesirable food were observed between groups. This suggests that nutrition education needs to focus on reducing undesirable dietary behaviors.

Many countries, including Korea, are facing persistent childhood underweight and stunting. There is also an increase in demand for early interventions of obesity, due to increases in obesity rates and its related comorbidities²⁷. Interestingly, the EDU group were less likely to skip breakfast compared to the un-EDU group. Breakfast eating has a positive effect on cognitive function and is associated with the facilitation of tasks requiring attention, executive function, and memory in adolescents^{33, 34}. A breakfast rich in fruits, dairy products, whole grains, and vegetables can help to reduce the risk of obesity by providing a balanced diet^{35, 36}. It may also prevent malnutrition by reducing the risk of inadequate calorie intake³⁷. Furthermore, eating breakfast is related to better metabolic profiles, including lipid profile, insulin resistance, blood pressure levels, and metabolic syndrome³⁸, thus reducing the risk of becoming overweight or obese although breakfast eaters consume more total calories compared with breakfast skippers^{33, 39}.

With rapid physical growth, it is important for adolescents to adapt to body changes and to form an ideal body image⁴⁰. However, body image misperception has increased among adolescents. Along with increased obesity, distorted body images can cause body dissatisfaction,⁴¹ unhealthy weight control behavior⁴², and depressive symptoms⁴³. In particular, approximately two-thirds of adolescent girls are dissatisfied with their body weight and body shape. In this study, nutrition education was negatively associated with body image misperception, which suggests that nutrition education may influence correct weight perception. Further well-designed studies are needed to confirm the positive effects of nutrition education on body image and healthy dietary behavior.

Some limitations should be considered in this study. First, caution should be used in causal and temporal interpretations of our findings, because of the cross-sectional nature of the study. Therefore, long-term clinical interventional studies

based on nutrition education are needed. Second, people tend to respond positively to questions that ask positive things. Moreover, self-reported weights tended to be lower than actual weights^{44,45}. Therefore, these should be considered when interpreting the effects of nutrition education on desirable dietary behavior and body image misperception in this study. Third, the quality of education could not be evaluated in KYRBS, and there has been no published validation data on whether nutrition education was equally performed by all teachers. In addition, there was a lack of data regarding the quantity of food consumed or the number of servings in KYRBS. To further verify the effectiveness of nutrition education, large-scale studies considering the amount of macronutrients and micronutrients for each food consumed by adolescents will be required. Finally, although a significant positive effect of nutrition education was observed, it was not much higher in EDU than in un-EDU subjects. Nevertheless, we analyzed the association between nutrition education and dietary behavior using nationally representative, school-based data. In addition, this was the first study to verify the relationship between nutrition education and body image misperception.

V. CONCLUSION

Nutrition education had positive effects on healthy dietary behaviors. Nutrition education also showed a negative association with body image misperception, confirming its importance in school. It is necessary to establish a social infrastructure for more appropriate application and activation of nutrition education. Also, personalized nutrition education programs should be developed in the future.

Further prospective research is warranted to identify the causal relationship between nutrition education and dietary habits or perceived body image in students. Longitudinal studies will also be needed to verify whether nutrition education during adolescence can be helpful for good eating habits and health

in adulthood. The development and validation of educational material are also needed.

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ABSTRACT (IN KOREAN)

청소년에서 영양 교육과 식생활 및 신체 이미지 왜곡의 연관성

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이 준 혁

이 연구는 청소년에서 영양 교육과 식생활 및 신체 이미지 왜곡과의 연관 관계를 분석하였다. 2017년 수행된 청소년건강행태 온라인조사에 참여한 만 12세에서 만 18세까지의 청소년 60,389명의 자료를 분석하였다. 연구대상자는 1년 이내 학교에서 영양교육을 받은 군과 영양교육을 받지 않은 군으로 분류되었다. 식생활은 식품군(과일, 채소, 우유, 인스턴트 식품, 과당 음료, 카페인 음료)과, 아침 식사 결식률로 구분하였다. 신체 이미지 왜곡은 체질량지수 Z 점수 85 미만이나 본인이 살이 찌는 편이라고 응답한 경우로 정의하였다. 식생활 및 신체 이미지 왜곡의 승산 비 (OR) 및 95 % 신뢰 구간(CI)은 다중 로지스틱 회귀 분석을 사용하여 계산하였다. 영양 교육은 과일, 채소, 우유와 같은 바람직한 식품 섭취와 양의 연관성을 보이고, 아침 결식과 신체 이미지 왜곡에는 음의 연관성을 보여, 청소년을 대상으로 한 학교에서의 영양 교육이 확대되어야 할 필요가 있음을 시사한다.

핵심되는 말: 영양 교육; 식품 섭취; 아침 결식; 신체 이미지 왜곡