Emotional State According to Breakfast Consumption in 62276 South Korean Adolescents

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Abstract

Objectives: Adolescents frequently skip breakfast for a variety of reasons. We investigated associations between lifestyle, emotional state, and breakfast consumption in adolescents.

Methods: Data from 62276 adolescents were derived from the 13th Korean Youth Risk Behavior Web-based Survey (KYRBS), conducting from June 1, 2017 to June 30. The adolescents were drawn by stratified multistage clustered samples from 400 middle schools and 400 high schools. Breakfast skipper was defined as those who ate breakfast less than 2 days per week.

Results: Among 62276 participants, 19658 (31.5%) were breakfast skippers. Compared to those who were steady eaters, those who skipped breakfast were younger and shorter, had a poorer academic performance, poorer parent education status, and lower family economic status. Compared to steady eaters, those who skipped breakfast regularly also tended to be more overweight and obese, participate in exercise less frequently, and report increased stress, depressive mood, suicidal ideation, and suicide attempts. Skipping breakfast was also associated with increased levels of smoking and alcohol consumption compared to steady eaters.

Conclusions: Skipping breakfast is associated with an adverse effect on adolescent health and well-being, especially in regard to suicide attempts. Public and parental education on the benefits of eating breakfast in adolescents is recommended.

Keywords: Breakfast, Adolescent, Depression, Suicide, Korean Youth Risk Behavior Web-Based Survey

1. Background

The incidences of mental health problems such as depression, and obsessive compulsive-, panic-, and anxiety disorder continue to increase year after year for a variety of reasons (1). Previous research has shown that personal factors such as age, sex, alcohol consumption, smoking and social factors (e.g., low socioeconomic status) contribute to the development or triggering of mental health problems (2, 3). Data from adult populations has shown that high-quality diets are associated with better mental health outcomes (4-6). In more recent years, the relationship between unhealthy dietary habits and mental health problems among adolescents has received increased attention (1, 7). With respect to specific dietary habits, adolescents who participate in shared dining experiences with family members report feeling 2.8 times happier than those who do not engage in this behavior, and also have reduced rates of alcohol consumption, smoking, and drug addiction (8, 9).

Although the South Korean (hereafter Korean) government launched the national suicide prevention program from the early 2000s, suicide remains the most common cause of Korean adolescents' death in 2016 (10, 11).

2. Objectives

In this study, we hypothesized that adolescents who skip breakfast may have more chances to engage in problem behaviors such as smoking and consuming alcohol. These behaviors can act as triggers for a depressed mood, suicide ideation, and suicide attempts. Thus, we wanted to explore the relationships between lifestyle, emotional state, and breakfast consumption in adolescents.

3. Methods

3.1. Study Design and Data Collection

The Korean Youth Risk Behavior Web-based Survey (KYRBS) was initiated by The Korean Ministry of Educa-

tion, Ministry of Health and Welfare and Centers for Disease Control and Prevention in 2005 for the purpose of identifying the health-related status of Korean youth. The 13th KYRBS is a cross-sectional on-line self-reported survey consisting of 123 questions for adolescents aged 13 - 18 years. To make sure sample representativeness, the KYRBS uses proportional allocation methods, and the participants are drawn by stratified multistage clustered samples from 400 middle schools and 400 high schools. Adolescents take part in the KYRBS voluntarily and participation is facilitated by an anonymous self-reported questionnaires completed at a school computer laboratory. The aim of the KYRBS is to assess health-risk behaviors composing 15 sections including dietary behaviors such as skipping breakfast, perceived health state, physical activity, obesity and weight control efforts, oral health, hygiene status, injury, violence, drinking alcohol, smoking, sexual relationship, drug, atopy and asthma and internet addiction. Finally, the KYRBS also assesses mental health status by asking about symptoms of depressive mood, suicidal ideation, and suicide attempts. For the present study, we obtained data from the online site of the KYRBS (https://www.cdc.go.kr/yhs/home.jsp) and used publicly available documents for academic purpose from the 13th KYRBS published in 2017. The reasons for nonparticipation were not available, however, among targeted 64991 participants, 62276 included in this study.

3.2. Evaluation Indices

3.2.1. General Characteristics

Data for participants' age, sex, school grade, height and weight, and educational status of parents were recorded. Data regarding scholastic achievements and perceived socioeconomic status were collected and were divided into five categories as follows: high, middle-high, middle, middle-low, and low.

3.2.2. Eating and Dietary Behaviors

Based on convention in the recent literature ([12]), participants engaging in any of the following behaviors are classified as displaying extreme weight control behavior (EWCB): using diet pills, using laxatives or diuretics, and inducing emesis after meals. Likewise, participants who fast for more than 24 hours, skip meals, or eat very little amount of food, or utilize diet food substitutes or smoke in order to lose weight or keep from gaining weight during the past year are considered to have unhealthy weight control behaviors (UWCB). The KYRBS also contains specific questions related to EWCB and UWCB. Frequency of breakfast consumption was assessed by the following question,

"During the past 7 days, how many days did you eat breakfast?" with allowed responses of "never, 1, 2, 3, 4, 5, 6, or 7 days." Those who reported that they ate breakfast less than 2 days per week were called "breakfast skippers." Conversely, participants who ate breakfast more than 2 days per week were defined as steady eaters.

3.2.3. Alcohol and Smoking

Participants who had consumed at least one alcoholic beverage during their lifetime were considered as having drinking experience, while those who had consumed at least one drink of alcohol during the 30 days before the survey were defined as a current drinker. Likewise, subjects who had smoked at least one cigarette within the past 30 days were defined as current smokers.

3.2.4. Depressive Mood, Suicidal Ideation, and Suicide Attempts

Experience of depressive mood was defined when a subject reported they felt sad or desperate to a degree causing them to stop their usual activities for two weeks within recent 12 months. Questions about suicidal ideation and suicide attempts were "Have you ever thought about killing yourself?" and "Have you ever tried to kill yourself?", respectively. Response options were binary such as "No," or "Yes." Repetition of depressive mood, suicidal ideation, and suicide attempts was not assessed.

3.3. Statistical Analysis

KYRBS data were collected through a representative, stratified, and clustered sampling method. To ensure the accuracy of our analysis, we utilized a method for selection of efficient stratification variables by weighting variables. All statistical analyses were performed with the IBM Statistical Package for the Social Sciences (SPSS) version 21.0 software (IBM Inc., Chicago, IL, USA). All P values less than 0.05 were considered statistically significant, and the demographic characteristics were calculated by the descriptive statics such as frequencies and percentages. The chi-squared test for categorical variables and independent *t*-test for continuous variables were used where appropriate to compare general characteristics between breakfast skippers and steady eaters. Following the selection of significant covariates, we performed logistic regression analysis to identify the relationships between breakfast skipping and prevalence of suicide attempts.

3.4. Ethics Statement

The Institutional Review Board (IRB) of the Centers for Disease Control and Prevention approved the on-line statistical research. The study protocol was reviewed and approved by the IRB of Samsung Changwon Hospital (IRB

No. 2018-11-006), who also waived the requirement for informed consent.

4. Results

Among 62276 participants, 19658 were breakfast skippers (31.5%). By sex, 30.1% and 33.0% of men and women were breakfast skippers. A total of 10946 (17.6%) of participants reported never eating breakfast during the week, comprising 17.8% and 17.3% of the men and women analyzed in the study. Table 1 shows the demographic characteristics of breakfast skippers and steady eaters. Among the study subjects, men were more frequently steady eaters while women tended to fall into the breakfast skippers category. Breakfast skippers tended to be younger and shorter, have a poorer academic performance, lower parental education status, and lower family economic status. Table 2 shows the behavior patterns and emotional state of the study participants. With respect to dietary behavior, breakfast skippers reported consuming less fruit and snacks, but more carbonated drinks, highly caffeinated drinks, fast food, instant noodles, and convenience store food compared with steady eaters. Breakfast skippers were more overweight or obese, exercised less frequently, and reported feeling stressed and depressed more frequently compared to steady eaters. Breakfast skippers were also more likely to have experience smoking cigarettes or drinking alcohol, or be a current user of both. In addition, breakfast skippers engaged more frequently in suicidal ideation, suicide planning, and suicide attempts. Regarding weight control methods, contracted eating behavior such as fasting, using weight-loss drugs, laxatives, diuretics, a one-food diet, or diet foods were more likely to regularly skip breakfast. Table 3 shows the associated risk factors for depressive mood and suicide attempts in adolescents who skipped breakfast. Tables 4 and 5 show the demographics, behavior patterns, and emotional state of individuals who reported never eating breakfast compared to routine eaters. The contrast between these two groups with respect to demographics and behavior patterns were similar to those of the breakfast skippers and steady eaters shown in Tables 1 and 2.

5. Discussion

In a study of 62276 Korean adolescents who participated in KYRBS online survey, we found that individuals who regularly ate breakfast exhibited overall better eating behaviors, academic performance, and emotional state compared to those who skipped breakfast. Importantly,

we also found that steady eaters had less suicide ideation and suicide attempts relative to breakfast skippers. Many studies have looked at the relationship between adolescent mental health problems and regularly sharing family meals (8, 9, 12-15). Gender differences play a role in mental health concerns, and it may be surprising that the significant relationship between frequent family meals and prosocial behaviors as well as academic performance is stronger for males than females (14, 16). In the study with 7434 participants, when compared individuals who eat breakfast seldom or never with those who eat every day, the anxiety and depressive mood increased 3 times for boys and 1.6 times for girls in breakfast skippers (16). Traditionally, breakfast is regarded as the most important meal of the day, and there are several reports to suggest that eating breakfast in children provides many health benefits, ranging from improved overall dietary quality to enhanced cognitive abilities, academic performance, attention, and memory (17-20). Specifically, steady breakfast eaters have significantly higher scores in full scale verbal and performance intelligence quotient test than those of breakfast skippers, even after adjusting for gender, current residential situation, degree of parental education, parental employment, and source of the primary child caregiver (17, 21). Irregular consumption of breakfast is associated with a number of unhealthy behaviors, such as smoking, frequent consumption of alcohol, and infrequent exercise (17, 22). Consistent with these findings, the results of our study showed that breakfast skippers had a lower academic performance, were more likely to be overweight or obese, exercised less, and reported more unhealthy mental emotions and behaviors more frequently than steady eaters. Especially, we noted that breakfast skippers reported that they engaged in suicidal ideation, suicide planning, and suicide attempts more frequently than those who regularly ate breakfast. This finding was important in the context of adolescent suicide in Korea, which is the most common cause of Korean adolescents' death in 2016 (10, 11).

Several hypotheses as to why skipping breakfast is a risk factor of suicide attempts have been proposed (4, 6, 17). One suggested mechanism concerns the social aspects of breakfast, suggesting that family meals with breakfast appear to be important to the healthy physical and emotional development of adolescents (17). In this model, breakfast can be viewed as a time for starting the day before school or work, and preparing for these tasks during breakfast allows family members to interactively communicate and socially establish a close relationship with one another (17). A consistent breakfast experience, especially when it includes family interaction, enhances family functioning by

Table 1. Baseline Characteristics of Participants[a, b]

Characteristic	Total (N = 62276)	Breakfast Skipper (N = 19658)	Steady Eater (N = 42618)	P Value
Sex				< 0.001
Male	31624 (52.09)	9532 (49.75)	22092 (53.17)	
Female	30652 (47.91)	10126 (50.25)	20526 (46.83)	
Age, y	15.13 ± 0.02	15.18 ± 0.03	15.12 ± 0.03	0.002
Grade				< 0.001
Middle school 1st grade	10189 (14.83)	3028 (13.74)	7161 (15.33)	
Middle school 2nd grade	10377 (15.38)	3190 (14.96)	7187 (15.57)	
Middle school 3rd grade	10319 (15.06)	3418 (15.73)	6901 (14.76)	
High school 1st grade	10165 (17.12)	3078 (16.60)	7087 (17.35)	
High school 2nd grade	10800 (18.99)	3624 (20.22)	7176 (18.43)	
High school 3rd grade	10426 (18.62)	3320 (18.74)	7106 (18.57)	
Height, cm	165.58 ± 0.18	165.43 ± 0.18	165.65 ± 0.18	0.028
Weight, kg	58.59 ± 0.19	58.71 ± 0.21	58.54 ± 0.20	0.198
Body mass index	21.24 ± 0.03	21.32 ± 0.04	21.20 ± 0.03	< 0.001
Academic performance				< 0.001
Low	6124 (9.95)	2694 (13.81)	3430 (8.18)	
Middle-low	13818 (22.17)	5171 (26.28)	8647 (20.27)	
Middle	17810 (28.71)	5597 (28.55)	12213 (28.79)	
High-middle	15996 (25.57)	4175 (21.09)	11821 (27.63)	
High	8528 (13.60)	2021 (10.27)	6507 (15.13)	
Educational status of father				< 0.001
Middle school	1186 (2.29)	447 (2.93)	739 (2.01)	
High school	15908 (31.74)	5490 (36.96)	10418 (29.52)	
College	31535 (65.97)	8579 (60.10)	22956 (68.47)	
Educational status of mother				< 0.001
Middle school	1009 (1.91)	377 (2.40)	632 (1.71)	
High school	19427 (38.85)	6649 (44.57)	12778 (36.41)	
College	29005 (59.23)	7754 (53.03)	21251 (61.89)	
Economic status				< 0.001
Low	1593 (2.55)	674 (3.43)	919 (2.15)	
Middle-low	7299 (11.50)	2628 (13.32)	4671 (10.66)	
Middle	28582 (45.57)	9256 (46.72)	19326 (45.05)	
High-middle	18089 (29.40)	5121 (26.28)	12968 (30.84)	
High	6713 (10.98)	1979 (10.25)	4734 (11.31)	

[a]Value are expressed as No. (%) or mean ± SE.
[b]The chi-squared test was used for categorical variables and Independent *t*-test was used for continuous variables.

facilitating comfortable communication, sharing of values, identifications and aims in life, parental monitoring of adolescent behaviors, and solving collective problems (17, 22). In an environment where the rate of divorce is rapidly increasing, living either with only one parent or even alone is a risk factor for suicidal attempts; such individuals have a 2.24-fold higher risk of making a suicide attempt compared with those who live with both parents (21). A second hypothesis is that skipping breakfast interacts with specific behaviors such as cigarette smoking and alcohol consumption, which are known risk factors for suicide attempts (9). In support of this hypothesis, engaging in regular family meals is negatively correlated with

the use of these substances (9). A third hypothesis relates to nutritional effects, proposing that the consumption of breakfast affects cognitive development in children (16-18). Eating breakfast after the overnight fast that occurs during sleep supplements low blood glucose levels through the rapid degradation of carbohydrates into glucose, which serves as fuel for physical and cognitive performance (17).

There were several limitations to our study. First, because of cross-sectional retrospective design, we were unable to establish a causal relationship between eating breakfast and adolescent health behaviors. Well-controlled prospective studies are necessary to confirm the results of the present study. Second, although this

Table 2. Comparison of Behavior of Adolescents According to Breakfast Consumption[a, b]

	Breakfast Skipper (N = 19658)	Steady Eater (N = 42618)	P Value
Fruit intake	16608 (84.40)	39424 (92.57)	< 0.001
Carbonated drinks	16019 (81.54)	33215 (78.05)	< 0.001
High-caffeinated drinks	5081 (26.03)	9760 (22.93)	< 0.001
Sweet drink	17181 (87.48)	37285 (87.43)	0.879
Fastfood	15872 (81.35)	33758 (79.81)	< 0.001
Instant noodles	15538 (78.70)	32902 (77.22)	< 0.001
Snacks	16172 (81.85)	35886 (83.99)	< 0.001
Convenience store food	13863 (70.69)	26541 (62.81)	< 0.001
Physical for more than 60 minutes	11884 (60.29)	27995 (62.22)	< 0.001
Vigorous physical	14428 (72.99)	33083 (77.04)	< 0.001
Muscular exercise	9722 (49.11)	22604 (52.47)	< 0.001
Walking exercise	18481 (94.25)	40664 (95.58)	< 0.001
Body mass index			< 0.001
$\geq$ 30	342 (1.87)	670 (1.65)	
25 – 30	2345 (12.23)	5001 (12.19)	
20 – 25	8752 (46.57)	18450 (44.96)	
< 20	7545 (39.32)	17287 (41.20)	
Weight control status	10323 (52.09)	22474 (52.07)	0.972
Weight control method			
Regular exercise	7292 (70.43)	16507 (72.87)	< 0.001
Fast for more than 24 hours	1524 (1461)	1566 (6.79)	< 0.001
Reduction in food intake	7248 (69.99)	14573 (64.99)	< 0.001
Weight reduction drug (with a doctor's prescription)	238 (2.26)	382 (1.72)	0.003
Weight reduction drug (without a doctor's prescription)	359 (3.45)	522 (2.28)	< 0.001
Laxative or diuretic	254 (2.53)	390 (1.70)	< 0.001
Vomiting after meals	403 (3.83)	560 (2.47)	< 0.001
One food diet	1017 (9.66)	1404 (6.07)	< 0.001
Chinese medicine	587 (5.83)	1319 (5.79)	0.901
Diet foods	987 (9.43)	1730 (7.73)	< 0.001
Stress			< 0.001
Very high	2553 (12.83)	3955 (9.14)	
High	5553 (28.22)	11198 (26.27)	
Middle	7917 (40.64)	18354 (43.49)	
Low	2887 (14.54)	7342 (17.02)	
Very low	748 (3.77)	1769 (4.08)	
Depressive mood	5626 (28.68)	9986 (23.45)	< 0.001
Suicidal ideation	2754 (13.83)	4830 (11.30)	< 0.001
Suicide plan	943 (4.71)	1538 (3.57)	< 0.001
Suicidal attempt	654 (3.26)	980 (2.27)	< 0.001
Clinical therapy after suicidal attempt	109 (17.51)	171 (18.19)	0.754
Experience of drinking	8634 (44.94)	15783 (37.99)	< 0.001
Current drinking	3611 (42.51)	5986 (38.61)	< 0.001
Experience of smoking	3139 (16.61)	5011 (12.43)	< 0.001
Current smoking	1570 (50.38)	2199 (44.16)	< 0.001
Drug exposure experience	248 (1.30)	408 (1.02)	0.011
Current drug			0.039
Current	101 (38.94)	206 (50.26)	
Past	72 (29.58)	102 (25.10)	
Never	75 (31.49)	100 (24.64)	

[a]Value are expressed as No. (%).
[b]The chi-squared test was used for categorical variables and Independent *t*-test was used for continuous variables.

Table 3. Associated Risk Factors for Depressive Mood and Suicidal Attempts Using Logistic Regression in Adolescents Who Skip Breakfast[a]

	Depressive Mood, OR (95% CI)	P Value	Suicidal Attempts, OR (95% CI)	P Value
Fruit intake (ref: never)	1.17 (0.93 - 1.33)	0.319	1.13 (0.72 - 2.29)	0.401
Carbonated drinks (ref: never)	1.08 (0.95 - 1.23)	0.220	0.92 (0.68 - 1.24)	0.567
High-caffeinated drinks (ref: never)	1.66 (1.50 - 1.85)	< 0.001	1.50 (1.13 - 1.98)	0.005
Fastfood (ref: never)	1.22 (1.08 - 1.38)	0.001	0.92 (0.68 - 1.23)	0.564
Instant noodles (ref: never)	1.10 (0.98 - 1.24)	0.109	0.97 (0.70 - 1.35)	0.857
Snacks (ref: never)	1.045 (0.92 - 1.19)	0.478	0.70 (0.51 - 0.97)	0.032
Convenience store food (ref: never)	1.64 (1.47 - 1.83)	< 0.001	1.66 (1.22 - 2.25)	0.001
Physical for more than 60 minutes (ref: never)	1.29 (0.73 - 1.43)	0.071	1.60 (0.92 - 2.12)	0.067
Vigorous physical (ref: never)	1.11 (0.99 - 1.24)	0.069	1.20 (0.90 - 1.59)	0.211
Muscular exercise (ref: never)	1.18 (0.96 - 1.31)	0.212	1.35 (0.92 - 1.77)	0.333
Walking exercise (ref: never)	1.03 (0.84 - 1.25)	0.792	0.63 (0.40 - 1.01)	0.056
Stress (ref: very low)	2.82 (2.63 - 3.01)	< 0.001	3.21 (2.70 - 3.82)	< 0.001
Experience of drinking (ref: never)	1.77 (1.59 - 1.98)	< 0.001	2.45 (1.87 - 3.21)	< 0.001
Current drinking (ref: never)	1.45 (1.26 - 1.68)	< 0.001	2.40 (1.70 - 3.38)	< 0.001
Experience of smoking (ref: never)	1.80 (1.55 - 2.09)	< 0.001	3.23 (2.28 - 4.58)	< 0.001
Current smoking (ref: never)	1.45 (1.13 - 1.87)	0.004	2.09 (1.22 - 3.56)	0.007
Drug exposure experience (ref: never)	3.33 (1.94 - 5.71)	< 0.001	5.39 (2.15 - 13.48)	< 0.001

Abbreviations: CI, confidence intervals; OR, odds ratio.
[a]Logistic regression analysis to identify the relationships between breakfast skipping and prevalence of suicidal attempts was used after adjusting sex, age, body mass index, academic performance, educational status of father, educational status of mother, economic status.

study was based on a nation-wide survey, selection or recall bias should be considered. For example, the survey did not include out-of-school adolescents such as those who had dropped out or expelled from school, attended the alternative schools, or had homeschooling. In addition, there were no data available for the 4.2% of students who did not participate in the study. Had such students been included, data on breakfast skipping and suicide ideation may have differed. Another limitation of this study was the self-reported nature of the survey. In this type of format, participants may have misunderstood that their reports would be linked to private and confidential information, resulting in erroneous reporting and thus decreased answer credibility. However, this study had several strengths that improve on the findings of previous reports related to breakfast eating. Especially, this study was based on a nation-wide government-directed survey with a high response rate (95.8%). And to the best of our knowledge, it comprised the largest number of participants (n = 62276) among any previous similar study with an equal division of middle and high school students and it was made up of socioeconomically diverse samples allowing for good generalization of the results.

5.1. Implications

The public health implications of our study can be applied at family, educational, and social levels. Almost a third (31.6%) of adolescents reported skipping breakfast more than five times per week, and 17.6% reported never eating breakfast. By preparing and eating breakfast with their adolescents, parents may be able to develop closer social interactions and observe for overt signs of depression or suicide. In addition, adolescents who engage in substance use or perform poorly in school in either the realms of academic achievement or friendships may avoid eating breakfast with their family to evade uncomfortable communication. Thus, eating breakfast together as a family may act to counter these behaviors. From an educational perspective, schools may consider delaying start class times, providing breakfasts to breakfast skippers through donations, and postponing more intensive aspects of the curriculum that demand a higher level of critical thinking until after lunch (22). Finally, the local community, especially community child centers, should take an active interest in high-risk adolescents that likely skip breakfast, such as orphans and those from either single-parent families, families with grandparents serving as parents, or families in a lower income bracket.

5.2. Conclusions

Our findings suggest that skipping breakfast regularly may adversely affect the health and well-being of adolescents. Especially, skipping breakfast was associated with an increased risk of suicide attempt. Public education on the benefits of eating breakfast is warranted, and the recommendation should be made to parents to encourage their

Table 4. Baseline Characteristics of Never Eaters and Daily Routine Eaters[a, b]

Characteristic	Total (N = 33879)	Never Eater (N = 10946)	Daily Routine Eater (N = 22933)	P Value
Sex				< 0.001
Male	18322 (55.42)	5641 (52.78)	12691 (56.68)	
Female	15547 (44.58)	5305 (47.22)	10242 (43.32)	
Age	15.05 ± 0.03	15.14 ± 0.03	15.01 ± 0.03	< 0.001
Grade				< 0.001
Middle school 1st grade	5942 (16.01)	1736 (14.22)	4206 (16.86)	
Middle school 2nd grade	5910 (16.05)	1838 (15.42)	4072 (16.35)	
Middle school 3rd grade	5678 (15.33)	1932 (16.05)	3746 (14.99)	
High school 1st grade	5471 (17.01)	1706 (16.57)	3765 (17.21)	
High school 2nd grade	5601 (18.20)	1992 (20.08)	3609 (17.30)	
High school 3rd grade	5277 (17.40)	1742 (17.66)	3535 (17.29)	
Height	165.73 ± 0.18	165.58 ± 0.20	165.81 ± 0.19	0.081
Weight	58.54 ± 0.21	58.87 ± 0.23	58.38 ± 0.22	0.005
Body mass index	21.17 ± 0.03	21.34 ± 0.04	21.10 ± 0.04	< 0.001
Academic performance				< 0.001
Low	3208 (9.59)	1589 (14.63)	1619 (7.18)	
Middle low	6911 (20.43)	2874 (26.37)	4037 (17.59)	
Middle	9420 (28.02)	3025 (27.74)	6395 (28.15)	
High-middle	9035 (26.54)	2285 (20.75)	6750 (29.30)	
High	5305 (15.43)	1173 (10.51)	4132 (17.78)	
Educational status of father				< 0.001
Middle school	589 (2.10)	231 (2.78)	358 (1.80)	
High school	8247 (30.05)	3007 (36.65)	5240 (27.21)	
College	17833 (67.85)	4765 (60.58)	13068 (70.99)	
Educational status of mother				< 0.001
Middle school	520 (1.81)	221 (2.53)	299 (1.50)	
High school	10139 (37.10)	3689 (44.74)	6450 (33.78)	
College	16355 (61.09)	4235 (52.73)	12120 (64.72)	
Economic status				< 0.001
Low	814 (2.41)	396 (3.59)	418 (1.85)	
Middle-low	3601 (10.33)	1413 (12.78)	2188 (9.16)	
Middle	15160 (44.43)	5141 (46.66)	10019 (43.37)	
High-middle	10220 (30.60)	2833 (26.13)	7387 (32.73)	
High	4084 (12.23)	1163 (10.85)	2921 (12.90)	

[a]Value are expressed as No. (%) or mean ± SE.
[b]The chi-squared test was used for categorical variables and Independent *t*-test was used for continuous variables.

adolescents to eat breakfast.

Footnotes

Table 5. Comparison of Behavior of Adolescents According to Breakfast Consumption[a, b]

	Never Eater (N = 10946)	Daily Routine Eater (N = 22933)	P Value
Fruit intake	9018 (82.25)	21457 (93.58)	< 0.001
Carbonated drinks	8796 (80.47)	17126 (74.89)	< 0.001
High-caffeinated drinks	2721 (25.03)	4760 (20.78)	< 0.001
Sweet drink	9375 (85.78)	19620 (85.55)	0.608
Fastfood	8624 (79.41)	17611 (77.43)	< 0.001
Instant noodles	8520 (77.36)	17291 (75.53)	0.002
Snacks	8778 (79.67)	19083 (83.04)	< 0.001
Convenience store food	7337 (67.35)	12464 (54.98)	< 0.001
Physical for more than 60 minutes	6394 (58.21)	15040 (65.19)	< 0.001
Vigorous physical	7858 (71.56)	17953 (77.72)	< 0.001
Muscular exercise	5305 (48.06)	12362 (53.38)	< 0.001
Walking exercise	10192 (93.46)	21846 (95.45)	< 0.001
Body mass index			< 0.001
$\geq$ 30	200 (1.90)	361 (1.63)	
25 - 30	1317 (12.41)	2608 (11.82)	
20 - 25	4875 (46.76)	9683 (43.81)	
< 20	4149 (38.93)	9671 (42.73)	
Weight control status	5608 (50.81)	11799 (51.06)	0.717
Weight control method			
Regular exercise	3927 (69.98)	8808 (74.01)	< 0.001
Fast for more than 24 hours	871 (12.24)	577 (4.78)	< 0.001
Reduction in food intake	3879 (69.20)	7158 (61.04)	< 0.001
Weight reduction drug (with a doctor's prescription)	126 (2.24)	172 (1.50)	0.002
Weight reduction drug (without a doctor's prescription)	190 (3.41)	210 (1.85)	< 0.001
Laxative or Diuretic	141 (2.60)	164 (1.46)	< 0.001
Vomiting after meals	225 (3.97)	245 (2.13)	< 0.001
One food diet	535 (9.36)	539 (4.52)	< 0.001
Chinese medicine	329 (5.91)	722 (6.01)	0.806
Diet foods	502 (8.80)	734 (6.40)	< 0.001
Stress			< 0.001
Very high	1461 (13.14)	1964 (8.36)	
High	3048 (27.79)	5568 (24.39)	
Middle	4284 (39.60)	9871 (43.59)	
Low	1667 (15.05)	4380 (18.77)	
Very low	486 (4.44)	1150 (4.89)	
Depressive mood	3055 (28.04)	4784 (20.93)	< 0.001
Suicidal ideation	1532 (13.89)	2315 (10.08)	< 0.001
Suicide plan	538 (4.82)	754 (3.28)	< 0.001
Suicidal attempt	389 (3.44)	464 (2.00)	< 0.001
Clinical therapy after suicidal attempt	65 (18.28)	85 (19.42)	0.696
Experience of drinking	4775 (44.34)	7635 (34.33)	< 0.001
Current drinking	1976 (41.89)	2717 (36.21)	< 0.001
Experience of smoking	1764 (16.61)	2321 (10.78)	< 0.001
Current smoking	891 (50.90)	961 (41.22)	< 0.001
Drug exposure experience	151 (1.42)	208 (0.95)	0.001
Current Drug			0.211
Current	53 (37.28)	59 (28.23)	
Past	37 (25.04)	46 (24.22)	
Never	61 (37.68)	103 (47.55)	

[a]Value are expressed as No. (%).
[b]The chi-squared test was used for categorical variables and Independent *t*-test was used for continuous variables.

References

1. Cho SH, Chun H, Lee HS, Lee SW, Shim KW, Lee JY, et al. The relationship between shared breakfast and skipping breakfast with depression and general health state in Korean adults: The 2014 korea national health and nutrition examination survey. *Korean J Family Pract.* 2018;**8**(3):441–7. doi: 10.21215/kjfp.2018.8.3.441.

2. Palmos AB, Breen G, Goodwin L, Frissa S, Hatch SL, Hotopf M, et al. Genetic risk for psychiatric disorders and telomere length. *Front Genet.* 2018;**9**:468. doi: 10.3389/fgene.2018.00468. [PubMed: 30459805]. [PubMed Central: PMC6232668].

3. Lechner WV, Sidhu NK, Cioe PA, Kahler CW. Effects of time-varying changes in tobacco and alcohol use on depressive symptoms following pharmaco-behavioral treatment for smoking and heavy drinking. *Drug Alcohol Depend.* 2019;**194**:173–7. doi: 10.1016/j.drugalcdep.2018.09.030. [PubMed: 30445275].

4. Kwak Y, Kim Y. Association between mental health and meal patterns among elderly Koreans. *Geriatr Gerontol Int.* 2018;**18**(1):161–8. doi: 10.1111/ggi.13106. [PubMed: 28675623].

5. Milajerdi A, Keshteli AH, Esmaillzadeh A, Roohafza H, Afshar H, Adibi P. Breakfast consumption in relation to lowered risk of psychological disorders among Iranian adults. *Public Health.* 2019;**167**:152–8. doi: 10.1016/j.puhe.2018.05.020. [PubMed: 30309694].

6. Lee SA, Park EC, Ju YJ, Lee TH, Han E, Kim TH. Breakfast consumption and depressive mood: A focus on socioeconomic status. *Appetite.* 2017;**114**:313–9. doi: 10.1016/j.appet.2017.04.007. [PubMed: 28400301].

7. O'Neil A, Quirk SE, Housden S, Brennan SL, Williams LJ, Pasco JA, et al. Relationship between diet and mental health in children and adolescents: A systematic review. *Am J Public Health.* 2014;**104**(10):e31–42. doi: 10.2105/AJPH.2014.302110. [PubMed: 25208008]. [PubMed Central: PMC4167107].

8. Utter J, Denny S, Peiris-John R, Moselen E, Dyson B, Clark T. Family meals and adolescent emotional well-being: Findings from a national study. *J Nutr Educ Behav.* 2017;**49**(1):67–72 e1. doi: 10.1016/j.jneb.2016.09.002. [PubMed: 28341017].

9. Eisenberg ME, Olson RE, Neumark-Sztainer D, Story M, Bearinger LH. Correlations between family meals and psychosocial well-being among adolescents. *Arch Pediatr Adolesc Med.* 2004;**158**(8):792–6. doi: 10.1001/archpedi.158.8.792. [PubMed: 15289253].

10. Lee SU, Park JI, Lee S, Oh IH, Choi JM, Oh CM. Changing trends in suicide rates in South Korea from 1993 to 2016: A descriptive study. *BMJ Open.* 2018;**8**(9). e023144. doi: 10.1136/bmjopen-2018-023144. [PubMed: 30269071]. [PubMed Central: PMC6169778].

11. Statistics Korea. *Cause-of-death statistics 2017.* 2017. Available from: http://kosis.kr/en.

12. Crow S, Eisenberg ME, Story M, Neumark-Sztainer D. Are body dissatisfaction, eating disturbance, and body mass index predictors of suicidal behavior in adolescents? A longitudinal study. *J Consult Clin Psychol.* 2008;**76**(5):887–92. doi: 10.1037/a0012783. [PubMed: 18837605]. [PubMed Central: PMC2575643].

13. Franko DL, Thompson D, Affenito SG, Barton BA, Striegel-Moore RH. What mediates the relationship between family meals and adolescent health issues. *Health Psychol.* 2008;**27**(2S):S109–17. doi: 10.1037/0278-6133.27.2(Suppl.).S109. [PubMed: 18377152].

14. Elgar FJ, Craig W, Trites SJ. Family dinners, communication, and mental health in Canadian adolescents. *J Adolesc Health.* 2013;**52**(4):433–8. doi: 10.1016/j.jadohealth.2012.07.012. [PubMed: 23299005].

15. Lien L. Is breakfast consumption related to mental distress and academic performance in adolescents? *Public Health Nutr.* 2007;**10**(4):422–8. doi: 10.1017/S1368980007258550. [PubMed: 17362539].

16. Liu J, Hwang WT, Dickerman B, Compher C. Regular breakfast consumption is associated with increased IQ in kindergarten children. *Early Hum Dev.* 2013;**89**(4):257–62. doi: 10.1016/j.earlhumdev.2013.01.006. [PubMed: 23395328]. [PubMed Central: PMC3606659].

17. Pollitt E. Does breakfast make a difference in school? *J Am Diet Assoc.* 1995;**95**(10):1134–9. doi: 10.1016/S0002-8223(95)00306-1. [PubMed: 7560685].

18. Widenhorn-Muller K, Hille K, Klenk J, Weiland U. Influence of having breakfast on cognitive performance and mood in 13- to 20-year-old high school students: results of a crossover trial. *Pediatrics.* 2008;**122**(2):279–84. doi: 10.1542/peds.2007-0944. [PubMed: 18676544].

19. Marquez Acosta M, Sutil de Naranjo R, Rivas de Yepez CE, Rincon Silva M, Torres M, Yepez RD, et al. [Influence of breakfast on cognitive functions of children from an urban area in Valencia, Venezuela]. *Arch Latinoam Nutr.* 2001;**51**(1):57–63. Spanish. [PubMed: 11515233].

20. Cooper SB, Bandelow S, Nevill ME. Breakfast consumption and cognitive function in adolescent schoolchildren. *Physiol Behav.* 2011;**103**(5):431–9. doi: 10.1016/j.physbeh.2011.03.018. [PubMed: 21439306].

21. Keski-Rahkonen A, Kaprio J, Rissanen A, Virkkunen M, Rose RJ. Breakfast skipping and health-compromising behaviors in adolescents and adults. *Eur J Clin Nutr.* 2003;**57**(7):842–53. doi: 10.1038/sj.ejcn.1601618. [PubMed: 12821884].

22. Vaisman N, Voet H, Akivis A, Vakil E. Effect of breakfast timing on the cognitive functions of elementary school students. *Arch Pediatr Adolesc Med.* 1996;**150**(10):1089–92. doi: 10.1001/archpedi.1996.02170350091016. [PubMed: 8859144].