

Associations between Dietary Pattern and Depression in Korean Adolescent Girls



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ABSTRACT

Study Objective: Dietary patterns are important for the physical and psychological development of adolescent girls. The purpose of the present study was to evaluate the relationship between dietary patterns and depression in this population.

Design, Setting, and Population: We conducted a case-control study in a tertiary university hospital of 849 girls aged 12 to 18 years.

Methods: The study was conducted from April 2011 to December 2012. Participants were identified as having depression if they had scores greater than 16 on the Korean version of the Beck Depression Inventory. Data were obtained using validated Korean-language questionnaires.

Main Outcome Measures: The subjects' usual dietary patterns during the past 12 months were assessed using the Food Frequency Questionnaire published by the Korean Health and Nutrition Examination Survey.

Results: Among the 849 enrolled volunteers, 116 were identified as having depressive symptoms. The mean age of the participants was 15.0 ± 1.5 years. The prevalence of girls diagnosed with depression was 13.6%. Multivariate adjusted regression analysis demonstrated that the risk of depression was significantly positively associated with the consumption of instant and processed foods and negatively associated with the intake of green vegetables and 1 to 3 servings/day of fruits, after adjusting for energy intake and menstrual regularity. Additionally, depression was negatively associated with intake of fiber, β -carotene, vitamin B₆, vitamin E, vitamin C, potassium, zinc, folate, iron, and copper after adjusting for confounding variables.

Conclusion: Consumption of fast foods including ramen noodles, hamburger, pizza, fried food, and other processed foods was associated with increased risk of depression in adolescent girls. Thus, caution is required regarding dietary choices in this population.

Key Words: Adolescent, Depression, Fast foods, Fruit, Vegetables

Introduction

Adolescence is a sensitive period during which one experiences physical, social, and psychological changes caused by increases in pubertal hormones.¹ Mental health issues became important for adolescents, as the vulnerability to mental illness increases during times of transition from childhood to adolescence and then to adulthood.² Around 50% of all lifetime mental disorders start by the age of 14,³ although most are undiagnosed and are detected later in life.⁴ When psychiatric disorders are not treated with care at an early stage, social problems may result; one such disorder, depression, is associated with suicide.^{5,6} Suicide is the leading cause of death in Korean teenagers, and the rate of death by suicide has steadily increased over the last decade.⁷ Although both boys and girls display a

similar risk of depression prior to adolescence, the prevalence of depression disorders in girls is greater than that in boys after puberty,^{4,8} possibly due to alterations in ovarian hormones.⁹

The importance of the adolescent diet has been the focus of previous studies examining the association between nutrient intake and mental health in adolescence.^{10,11} Consumption of processed foods, take-out and fast foods, vegetables, and fruits was associated with the risk of depression in Australian¹⁰ and Chinese¹¹ adolescents. However, Brook et al¹² reported that a healthy diet was associated with reduced risk of depression in adolescent girls, but not boys, although the study did not define a healthy diet. Another study in American adolescent girls showed no significant association between depressive symptoms and intake of snacks, fast foods, vegetables, and fruits.¹³ Thus, in an effort to reconcile these inconsistent findings, the purpose of the present study was to evaluate correlations between dietary patterns and depression in adolescent girls.

Materials and Methods

This study was a case-control study performed in the physical examination center for adolescents at our university. Adolescent girls 12 to 18 years of age were recruited from January 2011 to December 2012 during visits

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to the center for annual routine health examinations. The study was approved by the Institutional Review Board of University Hospital, and written informed consent was obtained from all participants and their parents.

During the physical examination, height and weight were measured, and body mass index (BMI; kg/m²) was calculated. We included adolescent girls who had secondary sex characteristics. We excluded girls with a history of psychological problems, surgery, chronic disease, medication for depression, or long-term medication. All participants were subjected to abdominal ultrasound (SSD-5000 SVQ, Aloka Co., Ltd., Tokyo, Japan) to exclude gynecologic diseases such as an ovarian or uterine mass. We excluded those with invalid anthropometric data or invalid information on the questionnaire and those who did not want to participate. We did not collect data regarding socioeconomic status, academic achievement, or familial history of depression. The final analysis included 849 participants.

The Korean version of the Beck Depression Inventory (K-BDI) was used to assess depressive symptoms.¹⁴ This is a self-reported survey consisting of 21 questions to which participants respond on a 4-point scale ranging from 0 to 3. The sum of the scores indicates the severity of depression as mild, moderate, or severe. A cutoff score of 16 has been suggested as an effective indicator with high sensitivity and specificity to identify depression in adolescents,¹⁵ and it is considered the most reliable standard for selecting a depressive group among Koreans.¹⁴ All subjects in our study were classified into a depression or nondepression group according to this verified cutoff score.

All participants were asked to complete a questionnaire that provided information on menstrual history, depressive mood, and dietary intake. The subjects' usual dietary patterns during the past 12 months were assessed using the Food Frequency Questionnaire (FFQ) published by the Korean Health and Nutrition Examination Survey.¹⁶ Sixty-three food items were categorized into 6 groups, and the subjects were asked to provide information on their consumption frequency of food items and the usual amount consumed. The food-frequency responses were constructed to include 11 options scored as follows: 0 = never, 1 = less than once a month; 2 = once a month; 3 = 2–3 times a month; 4 = once a week; 5 = 2–3 times a week; 6 = 4–6 times a week; 7 = once a day; 8 = twice a day; 9 = 3 times a day; 99 = uncertain. Nutrient intake was analyzed using the computer-aided nutritional analysis program (CAN-Pro 4.0; Korean Nutrition Society, Seoul, Korea). In this study, subjects who had an energy intake less than 500 kcal/d (8 subjects) or greater than 3,500 kcal/d (13 subjects) were excluded to maintain the reliability and validity of the study.

All analyses were performed using SPSS 18.0 (SPSS, Inc., Chicago, IL, USA). An independent *t*-test was performed to validate continuous variables, expressed as mean values and standard deviations. In conducting the Fisher's exact test, nominal variables were calculated in terms of number of subjects and the percentage distribution between the depression and nondepression groups. The relationship among nutrient intake, food groups, and depression was

tested using partial correlation analysis after adjusting for menstrual regularity and energy intake as confounding factors. Multivariable logistic regression analysis was also conducted to estimate the odds for depression with different dietary intake values, using depression as the outcome variable and dietary intake pattern as the exposure variable. Menstrual regularity and energy intake were added to the confounding factors for the analyses. All values were sorted into 3 levels based on the nondepression group, and the lowest tertile was used as the reference. *P* < .05 indicated statistically significant results.

Results

Characteristics of the depression group and nondepression are shown in Table 1. There were no significant differences between the groups in age, weight, height, BMI, and menstrual history, including the age at menarche and use of analgesics, except for menstrual regularity. Regarding the presence of menstruation, 3 girls in the control group reported only 1 or 2 episodes of vaginal spotting; consequently, these 3 girls could not say whether they had experienced true menstruation. Regarding regular menstruation, 5 girls attained menarche 1 or 2 months earlier, so they could not define their regular menstruation cycle. Including the 3 girls who could not say whether they had experienced true menstruation, the menstruation cycle of 8 girls in the control group was described as unknown.

The prevalence of depression was 13.6% (116/849). Consumption of fast foods including ramen noodles, hamburger, pizza, and fried foods and of processed foods including ham, fish paste, and snacks was significantly higher in the depression group than in the nondepression group. The results of the multivariable adjusted regression analysis, shown in Table 2, indicated that intake of fast foods and processed foods was associated with depression. However, the intake of green vegetables was more prevalent in the nondepression group, after correcting for energy

Table 1
Characteristics of Subjects with (Cases) and without Depression (Controls)

Parameters	Case (n = 116)	Control (n = 733)	P Value*
Age (y)	15.1 ± 1.5	15.0 ± 1.5	.641
Weight (kg)	52.6 ± 8.1	52.0 ± 8.5	.493
Height (cm)	159.6 ± 5.4	158.8 ± 5.5	.152
BMI (kg/m ²)	21.8 ± 13.3	20.5 ± 2.9	.319
K-BDI	21.1 ± 5.2	5.8 ± 4.3	<.001
Menstruation, n (%)			
No	4 (3.4)	59 (8.0)	
Yes	112 (96.6)	671 (91.5)	.165
Other	0 (0)	3 (0.4)	
Age at menarche (y)	12.0 ± 1.2	12.2 ± 1.2	.092
Regular menses, n (%)			
No	76 (67.9)	350 (52.2)	
Yes	36 (32.1)	313 (46.6)	.006
Unknown	0 (0)	8 (1.2)	
Use of analgesics, n (%)			
No	79 (70.5)	517 (77.0)	
Yes	30 (26.8)	139 (20.7)	.324
Unknown	3 (2.7)	15 (2.2)	

K-BDI, Korean version of the Beck Depression Inventory; BMI, body mass index. Values are means ± SD or number of subjects (percentage distribution), as appropriate.

* *P* < .05 was considered statistically significant.

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