

Relationship Among Dietary Taurine Intake, Dietary Attitudes, Dietary Behaviors, and Life Stress by Depression in Korean Female College Students



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Abstract This study was conducted to investigate the correlation between dietary taurine intake, nutrients intake, dietary attitudes, dietary behaviors, and life stress by depression in Korean female college students. Depression was measured by self-reported symptoms of depression on the CES-D (Center for Epidemiologic Studies Depression) scale. The subjects of this cross-sectional study included 56 female college students with depression (depression group, DG) and 122 female students without depression (control group, CG). Self-reported life stress score was determined using the life stress scale developed for Korean college students. Intakes of dietary taurine and nutrients were assessed using 3-day food records (2 weekdays and 1 weekend day) and evaluated using the computer aided nutrition program 4.0 version. Statistical analysis was performed using SPSS 24.0. We observed no significant difference in the average dietary taurine intake between DG (87.6 mg/day) and CG (92.3 mg/day). The average dietary intakes of vitamin A and calcium in DG were significantly lower as compared to CG ($p < 0.05$). The average total scores of dietary attitudes ($p < 0.01$) and dietary behaviors ($p < 0.05$) in DG were significantly lower as compared to CG. The average total life stress score ($p < 0.001$) and all stress categories were significantly higher in DG as compared to CG. No significant correlation was observed between the CES-D scale score and dietary taurine intake. However, there were significant negative correlations between the CES-D scale

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score and vitamin A, folic acid, vitamin C, and calcium intakes ($p < 0.05$), dietary attitudes, and dietary behaviors ($p < 0.01$). Scores of the CES-D scale and life stress showed a significantly positive correlation ($p < 0.01$). Therefore, continuous nutrition education and counseling for good dietary attitudes and behaviors are required. Future studies need to be undertaken to confirm the correlation between dietary taurine intake and depression by intervention with taurine.

Keywords Dietary taurine intake · Dietary behaviors · Life stress · Depression · Korean female college students

Abbreviations

CES-D	center for epidemiologic studies depression
DG	depression group
CG	control group
CAN-Pro	computer aided nutritional analysis program
SE	standard error

1 Introduction

Incessant negative thinking during depression degrades the overall quality of life (Becker 1974). One of the mental health disorders associated with human life, depression consequently leads to changes in food attitudes and eating habits. It was reported that depressed patients had poorer dietary attitudes and dietary habits compared to non-depressed people (Kim et al. 1993; Lee and Kim 2011). Thus, the overall nutritional status and nutrient intake are associated with depression, which may lead to poor dietary quality and eating disorders such as anorexia and bulimia (Bodnar and Wisner 2005; Claudat et al. 2016).

Taurine, an inhibitory neurotransmitter, plays an important role in depression (Mauri et al. 1998; Okamoto et al. 1983). Depression level of Korean female college students was reported to be correlated with a taurine intake (Sung and Chang 2007). Recently, it was reported that taurine levels in depressed rats were significantly decreased in the hippocampus (Cui et al. 2017), and taurine in mild stress-induced depressive rats showed an antidepressant effect (Wu et al. 2017).

Depression level of college students is increasing due to stresses related to employment, study, and social adjustment (Park and Kim 2014). However, few studies are available on the relationship of dietary attitude, dietary habits, a degree of life stress, and dietary taurine with the level of depression in Korean college students. Therefore, this study was conducted to investigate the relationship among dietary taurine intake and nutrients intakes, nutrition knowledge, dietary attitudes, dietary behaviors, and life stress with the level of depression in Korean female college students.

2 Methods

2.1 Subjects

A survey was conducted in September-October 2017 using an anonymous self-administered questionnaire. This cross-sectional study enrolled 200 female college students residing in Gyeonggi, Korea. Except for 22 questionnaires which include incomplete data, vegetarian subjects, and female students doing a fasting cure, 178 questionnaires were included in the final analysis. Depression was measured by the self-reported symptoms of depression based on the Korean version of the CES-D scale (Center for Epidemiologic Studies Depression) (Cho and Kim 1993). As shown in Table 1, the subjects were divided into 56 female college students with depression (depression group, DG) and 122 female students without depression (control group, CG). The CES-D scale is composed of 20 items and scored on a 4-point scale of 0–3 points, with the total score ranging from 0 to 60 points. This study was approved by the institutional review board of Inha University, Korea (170821-3A).

2.2 Dietary Taurine and Nutrient Intakes

Intakes of dietary taurine and nutrients were determined using 3-day food records (2 weekdays and 1 weekend day) and estimated using the Computer Aided Nutritional Analysis Program 4.0 version (CAN-Pro, The Korean Nutrition Society, Seoul, Korea) nutrient analysis software. Dietary taurine intake of the subject was calculated using 361 food items in 17 food groups that were inputted into the CAN-Pro database (Kim and Kim 1998; Park et al. 1998; Yoon et al. 2015).

2.3 Life Stress

Life stress score was determined using the life stress scale developed for Korean college students (Chon et al. 2000). A self-administered questionnaire containing 50 questions regarding the frequency and importance of life stress was evaluated using

Table 1 Depression level of the subjects by a score of the CES-D scale

Variables	Score of the CES-D scale		n (%)	
Depression group	Severe	25 ≤	19 (10.7)	56 (31.5)
	Moderate	21 ≤ – <25	18 (10.1)	
	Mild	16 ≤ – <21	19 (10.7)	
Control group	Normal	>16	122 (68.5)	122 (68.5)

the 4-point scale ranging from 0 to 3. Life stress scale of Korean college students considered eight areas: future, different gender, economic, family, friend, professor, value, and study-related problems.

2.4 Questionnaires

Nutrition knowledge was assessed by considering 20 items related to general health nutrition knowledge (Yoon and Choi 2002). Each question was answered with “Right”, “Wrong”, and “Do not know”; the total score of 20 points was calculated as 1 point for correct answers and 0 points for the wrong answer and unknowingness.

Dietary attitudes and dietary behaviors for healthy dietary life were assessed for 5 and 20 items, respectively (Korean Society of Community Nutrition 2000). The questions were measured using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Total scores of dietary attitudes and dietary behaviors were measured as the summated scales of each question, totaling 25 and 100 points, respectively; a higher score indicated better dietary attitudes and dietary behaviors.

2.5 Statistic Analysis

Statistical analysis was performed using the SPSS 24.0 program (SPSS Inc., IBM corp., NY, USA). All variables were presented as the mean and standard error (SE) or frequency and percentage. Student t-test was conducted to compare the differences between DG and CG. Pearson’s correlation analysis determined the relationship between variables and score of CED-S scale. Statistical significance was set at a level of $p < 0.05$.

3 Result and Discussion

3.1 Age and Anthropometric Data

The average age of the subjects was 22.1 years old and 21.8 years old in DC and CG, respectively (Table 2). There were no significant differences in height, body weight, and body mass index between DG (161.7 cm, 54.9 kg, and 21.0 kg/m², respectively) and CG (162.0 cm, 54.8 kg, and 20.9 kg/m², respectively).

Table 2 Age and anthropometric data of the subjects

Variables	Depression group (n = 56)	Control group (n = 122)	t-value
Age (years)	22.1 ± 0.4	21.8 ± 0.2	-0.737
Height (cm)	161.7 ± 0.6	162.0 ± 0.5	-0.352
Body weight (kg)	54.9 ± 0.9	54.8 ± 0.6	-0.058
Body mass index (kg/m ²)	21.0 ± 0.3	20.9 ± 0.2	-0.275

Mean ± SE, p-value was analyzed by the Student t-test

Table 3 Intake of dietary taurine and nutrients of the subjects

Variables (per day)	Depression group (n = 56)	Control group (n = 122)	t-value
Taurine (mg)	87.6 ± 11.2	92.3 ± 12.6	-0.277
Energy (kcal)	1308.5 ± 70.1	1324.0 ± 37.9	-0.212
Carbohydrates (g)	169.6 ± 9.5	179.6 ± 4.9	-1.033
Total fat (g)	45.4 ± 2.8	43.3 ± 1.6	0.653
Total protein (g)	50.5 ± 3.0	48.6 ± 1.7	0.543
Vitamin A (µg RE)	447.9 ± 32.4	552.5 ± 29.7	-2.378*
Vitamin B ₁ (mg)	1.1 ± 0.1	1.0 ± 0.0	0.941
Vitamin B ₂ (mg)	0.8 ± 0.0	0.9 ± 0.0	-0.782
Vitamin B ₆ (mg)	0.9 ± 0.1	1.0 ± 0.0	-0.962
Folic acid	243.8 ± 18.1	265.3 ± 9.8	-1.047
Vitamin C (mg)	43.4 ± 4.7	49.8 ± 3.1	-1.135
Calcium (mg)	250.1 ± 16.9	295.8 ± 13.7	-2.102*
Iron (mg)	8.6 ± 0.5	9.4 ± 0.4	-1341
Zinc (mg)	6.3 ± 0.4	6.4 ± 0.2	-0.202
Potassium (mg)	1469.7 ± 100.8	1562.8 ± 59.1	-0.797
Sodium (mg)	2574.2 ± 173.8	2625.5 ± 111.5	-0.249

Mean ± SE, p value was analyzed by the Student t-test

*p < 0.05

3.2 Intake of Dietary Taurine and Nutrients

As shown in Table 3, there was no significant difference in average dietary taurine intake between DG (87.6 mg/day) and CG (92.3 mg/day). The average daily taurine intake was 96.9 mg for female college students residing in the Seoul and Incheon areas (Sung and Chang 2009). The daily taurine intakes of health functional taurine-containing food consumer and non-consumer items were 157.3 mg and 166.2 mg, respectively, in 2015 (Na et al. 2015), which were higher than observed in this study.

The average dietary intakes of vitamin A (447.9 µg RE in DG and 552.5 µg RE in CG, p < 0.05) and calcium (250.1 mg in DG and 295.8 mg in CG, p < 0.05) were significantly lower in DG as compared to CG.

3.3 Scores of Nutrition Knowledge, Dietary Attitudes, and Dietary Behaviors

There was no significant difference in the average total scores of nutrition knowledge between DG and CG (13.4 and 12.6 points, Table 4). However, dietary attitudes ($p < 0.01$) and dietary behaviors ($p < 0.05$) in DG (18.6 and 53.2 points, respectively) were significantly lower as compared to CG (20.0 and 56.1 points, respectively).

A previous study has reported similar observations that the depressed group had poor dietary behaviors (Kim et al. 1993).

3.4 Life Stress Level

Table 5 shows the causes of life stress specified by the subjects. Total life stress score was calculated as the sum of the experience frequency multiplied by importance and was converted into out of 100 points. We found that the total score and all variables scores of life stress in DG were significantly higher compared to that observed in CG; future, family, friend, and value problem and total life stress ($p < 0.001$), economy, faculty, and grade problem ($p < 0.01$), and lover problem ($p < 0.05$).

Table 4 Scores of nutrition knowledge, dietary attitudes, and dietary behaviors of the subjects

Variables	Depression group (n = 56)	Control group (n = 122)	t-value
Nutrition knowledge (out of 20 points)	13.4 ± 0.6	12.6 ± 0.3	-1.322
Dietary attitudes (out of 25 points)	18.6 ± 2.2	20.0 ± 0.2	3.418**
Dietary behaviors (out of 100 points)	53.2 ± 1.2	56.1 ± 0.9	2.040*

Mean ± SE, p-value was analyzed by the Student t-test
* $p < 0.05$, ** $p < 0.01$

Table 5 Life stress scores by life stress category

Variables	Depression group (n = 56)	Control group (n = 122)	t-value
Future problem	23.0 ± 3.2	8.3 ± 1.0	-4.459***
Lover problem	6.1 ± 1.8	3.0 ± 0.6	-1.644*
Economy problem	9.5 ± 2.2	4.4 ± 0.7	-2.842**
Family problem	8.9 ± 1.7	3.0 ± 0.6	-3.952***
Friend problem	5.5 ± 1.7	0.8 ± 0.2	-3.855***
Faculty problem	11.1 ± 2.6	3.9 ± 0.8	-3.495**
Value problem	23.1 ± 3.3	6.0 ± 0.9	-6.565***
Grade problem	32.7 ± 3.4	23.3 ± 1.7	-2.762**
Total life stress score	75.5 ± 7.7	37.8 ± 2.7	-5.808***

Mean ± SE, p value was analyzed by Student t-test
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6 Pearson's correlation coefficients between dietary taurine and nutrient intakes, nutrition knowledge, dietary attitudes, dietary behaviors, life stress scores, and a score of the CES-D scale by depression

Variables	Taurine	Energy	Carbohydrate	Total fat	Total protein
Score of the CES-D scale	-0.055	-0.051	-0.142	0.066	-0.004
Variables	Vitamin A	Vitamin B₁	Vitamin B₂	Vitamin B₆	Folic acid
Score of the CES-D scale	-0.161*	0.064	-0.062	-0.141	-0.154*
Variables	Vitamin C	Calcium	Iron	Zinc	Potassium
Score of the CES-D scale	-0.171*	-0.192*	-0.137	-0.061	-0.142
Variables	Sodium	Nutrition knowledge	Dietary attitudes	Dietary behaviors	Life stress
Score of the CES-D scale	-0.089	0.011	-0.233**	-0.233**	0.551**

Pearson's correlation coefficient, * $p < 0.05$, ** $p < 0.01$

3.5 Correlation Between Changes of Dietary Taurine and Nutrient Intakes

There was no significant correlation between dietary taurine intake and scores of the CES-D scale (Table 6). Significantly negative correlations were observed between the CES-D scale score and intake of vitamin A, folic acid, vitamin C, and calcium ($p < 0.05$) whereas significantly negative correlation was found between the CES-D scale score and dietary attitudes and dietary behaviors ($p < 0.01$).

Scores of the CES-D scale and life stress showed a significantly positive correlation ($p < 0.01$). It has previously been reported that higher the level of depression, higher is the life stress (Lee 2004). However, although we observed no significant correlation between dietary taurine intake and life stress (data not shown), a previous study (Sung and Chang 2009) has reported that life stress of female college was negatively correlated with the dietary taurine intake.

4 Conclusions

These results showed that Korean female college students with depression had poor dietary attitudes and behaviors and an unbalanced nutrition status. Therefore, continuous nutrition education and counseling for good dietary attitudes and behaviors are required urgently. Furthermore, future studies are required to confirm the correlation between dietary taurine intake and depression by intervention with dietary taurine supplementation.

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