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ORIGINAL STUDY

Inverse association between dietary fiber intake and depression in premenopausal women: a nationwide population-based survey

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Abstract

Objective: Depression is among the most common neuropsychiatric disorders, and its prevalence is twofold higher in women than in men. This study aimed to investigate the relationship between dietary fiber intake and depression in women by menopause status using data from a nationwide population-based survey conducted in Korea.

Methods: We utilized the Korea National Health and Nutritional Examination Survey data for 2014, 2016, and 2018 with a complex sampling design. Dietary fiber intake was calculated according to the 24-hour recall method, and we used Patient Health Questionnaire-9 scores to assess depression. A *t* test based on the general linear model was used to compare mean dietary fiber intake according to the presence of depression by menopause status. A logistic regression analysis was conducted to compute the odds ratio for depression according to the gradually adjusted model.

Results: This study included 5,807 women. Among the premenopausal women, dietary fiber intake was higher in the nondepression group than in the depression group ($P < 0.001$), while there was no significant difference among postmenopausal women. Accordingly, among the premenopausal women, a significantly inverse relationship was observed between a change in daily dietary fiber intake as 1 g/1,000 kcal and the prevalence of depression in the fully adjusted model with an odds ratio of 0.949 (95% confidence interval, 0.906-0.993; $P = 0.03$). However, among the postmenopausal women, this significant association was not observed.

Conclusions: Dietary fiber intake was inversely associated with depression in premenopausal but not postmenopausal women.

Key Words: Depression – Dietary fiber – KNHANES – PHQ-9 – Premenopausal women.

Depression, among the most common mental disorders worldwide, contributes to the global burden of disease and negatively affects society.[1] Moreover, it causes patients' prolonged distress, thus decreasing their ability to perform daily activities and sometimes leading to suicide attempts.[1] More than 264 million people worldwide have depression, an estimated 14.9% increase in 2015 compared with 2005.[1-3] Correspondingly, in Korea, the number of patients diagnosed with depression increased notably from 591,000 in 2012 to 643,000 in 2016 for an increase of approximately 8%.[4]

While depression is preferentially treated with antidepressants and psychotherapy, the relationship between depression and lifestyle interventions including diet, exercise, and mindfulness has been investigated.[5,6] Regarding dietary modifications, the consumption of several foods such as fruits, vegetables, fish, whole grains, olive oil, and low-fat dairy products is inversely correlated with depressive symptoms.[7-11] Previous studies suggested that dietary fiber intake has a significant negative association with depression.[12,13] Thus, dietary fiber intake from fruits and vegetables was proposed to play a modulatory role in the gut microbiota that is mainly explained by the ''gut–brain axis,'' and it was also proposed that changes in the gut microbiota composition affect neurotransmission and various neuropsychiatric phenomena.[14-19]

It is well known that the prevalence of depression is twofold higher in women than in men during their lifetime. This gender gap is attributed to several biological and psychological factors such as hormonal effects and genetic differences as

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well as several environmental factors such as exposure/susceptibility to stress and social gender inequities.[20,21] In particular, reproductive hormone levels change during menstruation and menopause, making women vulnerable to depression.[22,23] One study reported that dietary fiber intake is inversely related to depression in midlife premenopausal but not perimenopausal women[24]; however, there still is a paucity of data regarding the association between dietary fiber intake and depression in women according to menopause status. Because depression provokes public health issues, it is important to determine modifiable factors involved in the development of depression, especially in women who are more susceptible to depression. Hence, this study aimed to examine the relationship between dietary fiber intake and depression in women according to menopause status using 2014, 2016, and 2018 Korea National Health and Nutrition Examination Survey (KNHANES) data.

METHODS

Data source and study population

The KNHANES is a nationwide cross-sectional survey that collects data on health-related behaviors, chronic disease status, and food and nutrient intakes and is representative of the Korean population. The KNHANES is conducted annually by the Korea Centers for Disease Control and Prevention. The Patient Health Questionnaire-9 (PHQ-9), which has been included in the KNHANES every other year since 2014, was used to evaluate depression in this study. Therefore, we utilized the KNHANES VI-2 (2014), VII-1 (2016), and VII-3 (2018) data.

Among the total women (N = 13,002), those younger than 19 years (n = 2,344) were excluded. Those who were treated for depression at the time of the survey were also excluded (n = 242). Moreover, women who were pregnant or lactating (n = 183) were excluded due to unexpected hormonal effects on moods. Participants who were diagnosed with stroke or cardiovascular disease (n = 372) and those who were diagnosed and treated for cancer at the time of the survey (n = 208) were also excluded considering paraneoplastic syndrome and chemotherapy-induced mood disorders as well as poststroke depression and vascular depression. Furthermore, we excluded participants who had extreme daily energy intakes ($\geq$ mean + 2 standard deviations or $\leq$ mean − 2 standard deviations) (n = 105) or for whom data were missing (n = 3,741). Finally, 5,807 women met the inclusion criteria. This survey was approved by the Institutional Review Board of the Korea Centers for Disease Control and Prevention, and all participants provided written consent.

Dietary intake evaluation

We adopted the 24-hour dietary recall method for the dietary intake analysis. The survey was conducted by educated dietitians through face-to-face interviews. The 24-hour dietary recall method involves collecting data on dietary intake for 24 hours the day before the interview. The interview was conducted in each district by considering the proportion of weekdays and weekends to minimize inter-individual variations. Daily intakes of energy and dietary fiber were computed from the foods consumed as reported by the participants. According to the Dietary Reference Intakes for Koreans, a sufficient intake of dietary fiber was defined as 12 g/1,000 kcal.[25] Therefore, we calculated dietary fiber intake as g/1,000 kcal.

Patient health questionnaire-9

Depression was assessed using the PHQ-9, the most commonly used depression screening tool.[26] The PHQ-9 is a self-reported questionnaire comprising nine questions about depressive symptoms experienced in the past 2 weeks. The participants responded to each question on a four-point scale of 0 to 3, with a higher score correlating with a greater severity of depression.[26,27] Previous studies indicated that a PHQ-9 cut-off score of 10 maximizes sensitivity and specificity for depression.[26,27] Hence, in this study, a PHQ-9 score of 10 or higher was defined as depression. We also tested the stability of the relationship between dietary fiber intake and depression using the cut-off values of PHQ-9 scores of 8 and 5.

Assessment of confounding variables

Information regarding health-related covariates and chronic disease status was obtained through face-to-face interviews and self-reported questionnaires. Participants who were smokers during the survey period and those who had smoked more than 100 cigarettes in their lifetime were identified as current smokers. Furthermore, participants were considered current alcohol users when they consumed alcoholic beverages more than once in a month. Adequate physical activity was defined as moderate-intensity activities performed for more than 150 minutes or vigorous-intensity activities performed for more than 75 minutes in a week or an equivalent of the total amount of activities.

Information on participants' menopause status was obtained through face-to-face interviews. Menopause was categorized as artificial or natural. Artificial menopause was defined as menopause that occurred due to oophorectomy, while natural menopause was defined as cessation of the normal menstrual cycle for more than 1 year due to a decline in ovarian function. Participants who had a menstrual cycle regardless of irregularity and experienced amenorrhea for up to 11 months were regarded as having an ''on menstruation'' status and identified as premenopausal. Chronic diseases included hypertension, diabetes, and dyslipidemia. Hypertension status was defined as systolic blood pressure $\geq$ 140 mm Hg, diastolic blood pressure $\geq$ 90 mm Hg, or the use of hypertensive medication. Diabetes was defined as a fasting blood glucose $\geq$ 126 mg/dL, the use of antidiabetic medication including insulin, or having been diagnosed with diabetes by a physician. Finally, dyslipidemia status was defined as levels of fasting triglyceride $\geq$ 200 mg/dL or total cholesterol $\geq$ 240 mg/dL or the use of dyslipidemia medications. Other confounding variables included age, marital status, household income, education level, and body mass index (BMI). BMI was calculated as weight in kilograms divided by the square of the height in meters.

Statistical analysis

We conducted a complex sample analysis throughout this study. For baseline characteristics, continuous variables were analyzed using a *t* test (general linear model), and the data are expressed as mean $\pm$ standard error with 95% confidence interval (CI). Categorical variables were analyzed using Pearson chi-square test, and the data are expressed as unweighted number and weighted percentages.

A *t* test based on the general linear model was performed to compare mean dietary fiber intakes (g/1,000 kcal/day) depending on the presence of depression and menopause status, and the data are expressed as mean $\pm$ standard error, with 95% CI depicted as error bars. Moreover, we used a logistic regression model to compute the odds ratio (OR) of the prevalence of depression, which was related to the change in daily dietary fiber intake by 1 g/1,000 kcal according to the following gradually adjusted models: Model 1, adjusted for age; Model 2, additionally adjusted for BMI, education level, marital status, and household income; and Model 3, additionally adjusted for smoking status, alcohol use, adequate physical activity, and chronic disease status. When selecting variables for inclusion in this statistical model, we considered well-known risk factors for depression such as education level and household income and included variables that maximize Cox and Snell R^2. Values of $P < 0.05$ were considered statistically significant. All statistical analyses were conducted using SPSS Statistics 25 (IBM Corp., Armonk, NY).

RESULTS

Baseline characteristics

The participants' characteristics by menopause status are summarized in Table 1. There were significant intergroup differences in marital status ($P < 0.001$), household income ($P < 0.001$), and education level ($P < 0.001$). Premenopausal women were younger (36.23 ± 0.25 y vs 62.73 ± 0.23 y, $P < 0.001$), had a lower BMI (22.68 ± 0.08 kg/m^2 vs 24.00 ± 0.08 kg/m^2, $P < 0.001$), were more likely to be current alcohol users (56.46% vs 30.00%, $P < 0.001$), were more likely to be current smokers (6.51% vs 3.37%, $P < 0.001$), had less chronic diseases (17.05% vs 67.25%, $P < 0.001$), had a lower energy-adjusted daily dietary fiber intake (12.35 ± 0.13 g/1,000 kcal/d vs 16.36 ± 0.17 g/1,000 kcal/d, $P < 0.001$), and had greater energy intake ($1{,}722.19 \pm 14.15$ kcal/d vs $1{,}593.76 \pm 13.07$ kcal/d, $P < 0.001$) than the postmenopausal women. There were no significant inter-group differences in PHQ-9 scores.

TABLE 1. *Baseline characteristics of the participants according to menopause status*

Variable[a]	Total (N = 5,807)	Premenopausal (n = 2,949)	Postmenopausal[b] (n = 2,858)	*P* value[c]
Age, y[d]	47.11 ± 0.30	36.23 ± 0.25	62.73 ± 0.23	< 0.001
Marital status				< 0.001
Unmarried	740 (18.04)	712 (29.90)	28 (1.00)	
Married	5,067 (81.96)	2,237 (70.10)	2,830 (99.00)	
Household income (quartile)				< 0.001
Low	1,072 (15.59)	202 (7.77)	870 (26.81)	
Middle low	1,446 (24.57)	693 (24.02)	753 (25.36)	
Middle high	1,647 (29.78)	1,040 (34.37)	607 (23.18)	
High	1,642 (30.06)	1,014 (33.83)	628 (24.64)	
Education level				< 0.001
Primary school and below	1,360 (17.52)	51 (1.86)	1,309 (40.00)	
Middle school	569 (8.78)	94 (3.15)	475 (16.86)	
High school	1,867 (35.75)	1,153 (40.56)	714 (28.83)	
Undergraduate or above	2,011 (37.95)	1,651 (54.43)	360 (14.31)	
BMI (kg/m^2)[e]	23.22 ± 0.06	22.68 ± 0.08	24.00 ± 0.08	< 0.001
Current alcohol user	2,427 (45.59)	1,629 (56.46)	798 (30.00)	< 0.001
Current smoker	252 (5.22)	170 (6.51)	82 (3.37)	< 0.001
Adequate physical activity	2,607 (48.18)	1,499 (53.17)	1,108 (41.01)	< 0.001
Chronic disease status	2,505 (37.66)	540 (17.05)	1,965 (67.25)	< 0.001
Hypertension	1,584 (22.39)	224 (6.89)	1,360 (44.63)	
Diabetes	545 (7.53)	85 (2.47)	460 (14.79)	
Dyslipidemia	1,589 (24.42)	357 (11.30)	1,232 (43.26)	
PHQ-9 score $\geq$10	319 (5.47)	140 (4.90)	179 (6.29)	0.054
Dietary fiber intake (g/1,000 kcal/d)[f]	13.99 ± 0.11	12.35 ± 0.13	16.36 ± 0.17	< 0.001
Energy intake (kcal/d)[g]	$1{,}669.44 \pm 10.23$	$1{,}722.19 \pm 14.15$	$1{,}593.76 \pm 13.07$	< 0.001

BMI, body mass index; CI, confidence interval; PHQ-9, Patient Health Questionnaire-9.

[a]Categorical variables are shown as unweighted N (weighted %), while continuous variables are shown as mean $\pm$ standard error.

[b]Menopause included artificial (oophorectomy) and natural (menstrual cycle stopped since more than 1 y) menopause.

[c]*P* values were calculated using Pearson chi-square test (categorical variables) and the *t* test (general linear model; continuous variables); values of $P < 0.05$ were considered statistically significant. All statistical analyses were conducted on the basis of a complex sampling design.

[d]95% CI: 46.52-47.70 (total); 35.74-36.72 (premenopausal); 62.28-63.17 (postmenopausal).

[e]95% CI: 23.10-23.34 (total); 22.52-22.84 (premenopausal); 23.84-24.16 (postmenopausal).

[f]95% CI: 13.78-14.20 (total); 12.10-12.59 (premenopausal); 16.03-16.69 (postmenopausal).

[g]95% CI: 1649.35-1689.54 (total); 1694.39-1749.98 (premenopausal); 1568.07-1619.44 (postmenopausal).

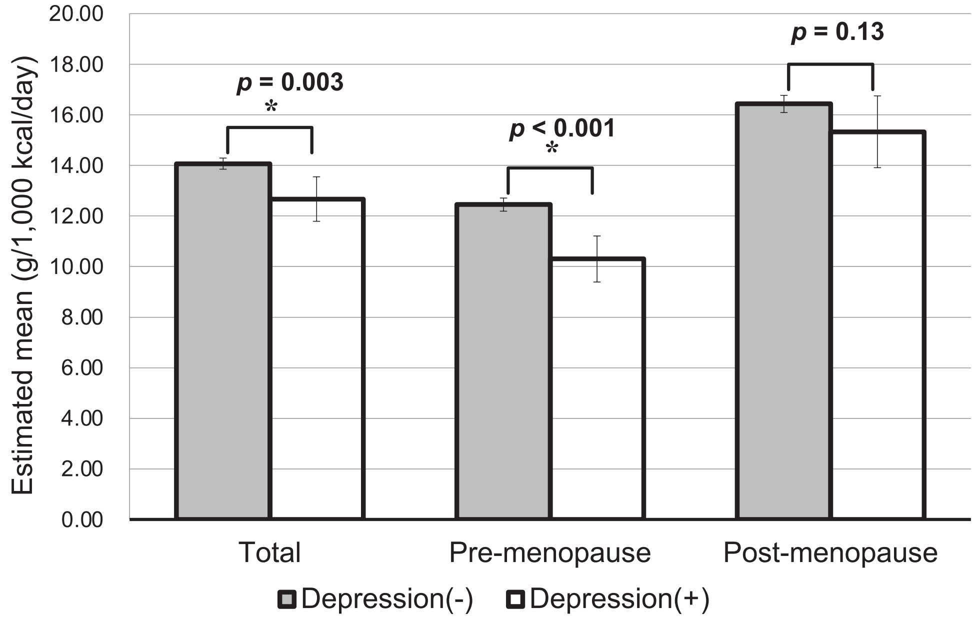

FIG. 1. Differences in the estimated mean value of dietary fiber intake according to menopause status. The estimated mean value of dietary fiber intake is expressed as mean $\pm$ standard error. Error bars indicate 95% CI. There was a significantly higher dietary fiber intake in the nondepression group among the total participants (14.07 $\pm$ 0.11 g/1,000 kcal/d; 95% CI, 13.85-14.29 vs 12.67 $\pm$ 0.45 g/1,000 kcal/d; 95% CI, 11.79-13.55, $P = 0.003$) and premenopausal women (12.45 $\pm$ 0.13 g/1,000 kcal/d; 95% CI, 12.19-12.71 vs 10.30 $\pm$ 0.46 g/1,000 kcal/d; 95% CI, 9.39-11.20, $P < 0.001$). However, there was no significant difference in dietary fiber intake among postmenopausal women according to the presence of depression (16.43 $\pm$ 0.17 g/1,000 kcal/d; 95% CI, 16.09-16.77 vs 15.33 $\pm$ 0.72 g/1,000 kcal/d; 95% CI, 13.91-16.75, $P = 0.13$). CI, confidence interval.

Dietary fiber intake and depression according to menopause status

We calculated the mean dietary fiber intake among the participants with versus without depression to determine the relationship between dietary fiber intake and depression based on the unadjusted model (Fig. 1). Among the total participants, the estimated mean dietary fiber intake was significantly higher in the nondepression group than in the depression group (14.07 $\pm$ 0.11 g/1,000 kcal/d; 95% CI, 13.85-14.29 vs 12.67 $\pm$ 0.45 g/1,000 kcal/d; 95% CI, 11.79-13.55, $P = 0.003$). This relationship remained significant in premenopausal women (12.45 $\pm$ 0.13 g/1,000 kcal/d; 95% CI, 12.19-12.71 vs 10.30 $\pm$ 0.46 g/1,000 kcal/d; 95% CI, 9.39-11.20, $P < 0.001$), while it was insignificant in postmenopausal women (16.43 $\pm$ 0.17 g/1,000 kcal/d; 95% CI, 16.09-16.77 vs 15.33 $\pm$ 0.72 g/1,000 kcal/d; 95% CI, 13.91-16.75, $P = 0.13$).

The OR values for depression according to daily dietary fiber intake with the scale of 1 g/1,000 kcal are summarized in Table 2. In the unadjusted model, increased dietary fiber

TABLE 2. *Odds ratio for depression according to dietary fiber intake and menopause status*

	OR	95% CI	*P* value
Total			
Unadjusted model	0.962	0.935-0.990	0.009
Model 1[a]	0.957	0.929-0.986	0.004
Model 2[b]	0.967	0.940-0.995	0.02
Model 3[c]	0.970	0.944-0.997	0.03
Premenopausal			
Unadjusted model	0.914	0.870-0.960	<0.001
Model 1	0.935	0.890-0.982	0.008
Model 2	0.939	0.894-0.987	0.01
Model 3	0.949	0.906-0.993	0.03
Postmenopausal			
Unadjusted model	0.975	0.939-1.012	0.18
Model 1	0.975	0.939-1.012	0.19
Model 2	0.983	0.948-1.019	0.34
Model 3	0.984	0.949-1.020	0.37

OR (95% CI) and *P* values were significant in the unadjusted model and the gradually adjusted models among total and premenopausal women but were insignificant in the unadjusted model and the gradually adjusted models (Model 1, Model 2, and Model 3) in postmenopausal women.
BMI, body mass index; CI, confidence interval; OR, odds ratio.
[a]Adjusted for age.
[b]Adjusted for Model 1+ BMI, education level, marital status, and household income.
[c]Adjusted for Model 2 + smoking status, alcohol use, adequate physical activity, and chronic disease status.

intake was related with a decreased prevalence of depression in the total population (OR, 0.962; 95% CI, 0.935-0.990; $P = 0.009$) and in premenopausal women (OR, 0.914; 95% CI, 0.870-0.960; $P < 0.001$). After further adjustment for confounding variables, we found a significant inverse relationship between dietary fiber intake and depression in the total population (OR, 0.970; 95% CI, 0.944-0.997; $P = 0.03$ in Model 3) and premenopausal women (OR, 0.949; 95% CI, 0.906-0.993; $P = 0.03$ in Model 3). However, we did not observe any significant association between dietary fiber intake and depression in postmenopausal women in the unadjusted model or the gradually adjusted models (Model 1, Model 2, and Model 3). Regarding testing the stability of the relationship between dietary fiber intake and depression with the cut-off values of PHQ-9 score as 8 and 5, the cut-off value of PHQ-9 did not affect our findings.

DISCUSSION

Our study findings suggested that dietary fiber intake is inversely associated with depression. This relationship was significant in premenopausal but not postmenopausal women. We also observed that a 5% decrease in the prevalence of depression was related to an increased intake of dietary fiber, i.e., 1-g increase for every 1,000 kcal of daily energy intake, after the adjustment for potential confounders in premenopausal but not postmenopausal women.

We believe that our findings are clinically significant because when we converted the scale of daily dietary fiber intake as 3 g/1,000 kcal, ie, 3-g increase for every 1,000 kcal of daily energy intake, it was equivalent to a 15% decrease in the prevalence of depression (OR, 0.853; 95% CI, 0.743-0.980; $P = 0.03$ in premenopausal women in Model 3) and dietary fiber intake would be modifiable for the general population. Moreover, the effect size of our study was not markedly smaller than that of the previous study[10] that reported an OR of 0.67 (95% CI, 0.503-0.806; $P = 0.037$) for depression and fruit and vegetable consumption as quartiles. The gap in energy-adjusted dietary fiber intake between the lowest and the highest quartile was 3-4 g/1,000 kcal.

Previous studies demonstrated that dietary fiber intake from fruits and vegetables is inversely related to depressive symptoms.[12,13] However, there is an inadequacy of data regarding the relationship between dietary fiber intake and depression based on menopause status. Nevertheless, a recent report published by the Study of Women's Health Across the Nation cohort study indicated that dietary fiber intake is inversely associated with depressive symptoms in 42 to 52-year-old premenopausal women but not in perimenopausal women.[24] Although it is difficult to compare this result with ours because the KNHANES data did not provide information about perimenopausal status, our study is distinguishable in that we included a wider range of adults aged 19 and older to enable a more significant comparison between pre- and postmenopausal women. Furthermore, our study included women with natural menopause as well as those with artificial (surgical) menopause; therefore, it was plausible to more comprehensively explain the relationship between dietary fiber intake and depression in each menopause status.

The inverse relationship between dietary fiber intake and depression could be explained by the gut-brain interactions: changes in the gut microbiota composition may affect neurotransmission and various neuropsychiatric phenomena in the brain through neural, endocrine, metabolic, and immunological pathways.[14-19] Previous studies indicated that dietary intake may play the most potent role in modulating the gut microbiota.[28-30] Additionally, dietary fiber intake reportedly improves the richness and diversity of the gut microbiota.[29-32] The diversity and richness of the gut microbiota are assumed to promote brain health.[18] Furthermore, another hypothesis that explains the relationship between microbiota dysfunction and depression is the ''leaky gut hypothesis,'' according to which an unhealthy diet may cause dysbiosis of the microbiota, reducing gut membrane integrity. Furthermore, this may provoke inflammatory reactions and alter neurotransmitter levels, leading to the development of depression.[33,34] Short-chain fatty acids (SCFA), which are produced by the fermentation of dietary fiber by gut microbes, may help maintain gut permeability and exert anti-inflammatory properties.[35-38] Therefore, SCFA from dietary fiber fermentation may play a protective role against the development of depression.

Our study findings suggested that dietary fiber intake is inversely related to depression in premenopausal but not postmenopausal women. We believe that this may not be a result of insufficient statistical power of our study. We conducted the post hoc analysis using G*Power[39]; the statistical power ($1 - \beta$) was 0.885 in postmenopausal women when we designated the OR as 1.3 and the α error as 0.05. Preferably, the insignificant relationship between dietary fiber intake and depression in postmenopausal women may be due to variations in the composition of the gut microbiota according to menopause status. Santos-Marcos et al[40] demonstrated a relative abundance of SCFA-producing microorganisms in premenopausal versus postmenopausal women and a control group of men. In premenopausal women, the consumed dietary fiber may be more likely to be fermented due to the relative richness of SCFA-producing microorganisms in the gut. Furthermore, previous studies investigated the interaction between estrogen and the change in the composition of the gut microbiota, and estrogen deficiency may alter the equilibrium of the gut microbiota, causing a wide range of diseases including depression.[41,42] Because postmenopausal women experience estrogen depletion, the decreased interaction between estrogen and the gut microbiota may be related to the insignificant association between dietary fiber intake and depression in postmenopausal women.

Additionally, the insignificant relationship between dietary fiber intake and depression in postmenopausal women may be due to the nonlinear relationship between dietary fiber intake and the risk of depression. A previous study reported a nonlinear relationship between total fiber intake and the risk of depression, and it stated that the risk of depressive symptoms was relatively low when the daily total dietary fiber intake exceeded 21 g.[43] Similarly, we may not be able to interpret the relationship between dietary fiber intake and depression in postmenopausal women because the dietary fiber intakes of the depression and nondepression groups exceeded the reference intake of dietary fiber (12 g/1,000 kcal).[25] This might confound the effort to demonstrate the significant association between dietary fiber intake and depression observed in premenopausal women.

This study has some limitations. Because it used a cross-sectional design, we could not confirm the causal relationship between dietary fiber intake and depression. Furthermore, as KNHANES data do not provide information about perimenopausal status, perimenopausal women were considered premenopausal. Therefore, the presence of perimenopausal women in the sample might have confounded the relationship between dietary fiber intake and depression. Additionally, there would be unmeasured confounding variables that we might have overlooked because pre- and postmenopausal women had heterogeneous demographic and health-related covariates. For example, we were unable to consider medical comorbidities that could affect the women's dietary choices, such as thyroid diseases and gastrointestinal diseases, because the KNHANES did not provide reliable and sufficient data on these diseases. Moreover, since we adjusted the confounding variables within each group, intergroup differences that might have affected dietary choices, such as household income and education level, may not have been adequately adjusted for. Use of the 24-hours dietary recall method could have led to recall bias, and the results obtained with this method may not reflect the participants' regular dietary habits. However, these were alleviated by accumulating the data of the past 3 years (2014, 2016, and 2018) representing a total of 5,807 women; this increased the statistical power of our study.

Despite these limitations, our study has strengths in that we demonstrated differences in depression according to menopause status. To the best of our knowledge, this is the first study to indicate an inverse association between dietary fiber intake and depression based on menopause status using data from a nationwide survey. Furthermore, our sample is representative of the Korean general population because we conducted a population-based study through a complex sample analysis.

Potential clinical value

With an increasing prevalence of depression, which contributes to the global disease burden, the findings of this study could form the basis of future investigations to determine the causal relationship between dietary fiber intake and depression. Our findings may also enable the development of preventive strategies for depression based on nutritional modifications with a specific focus on premenopausal women.

CONCLUSIONS

We found that an increased consumption of dietary fiber may have a risk-reducing effect on depression among premenopausal women even after the adjustment for confounding variables. Further knowledge of the underlying mechanisms is needed to clarify the relationship between dietary fiber intake and depression according to menopause status.

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