Original Communication

Higher vitamin B_6 intake is associated with lower depression and anxiety risk in women but not in men: A large cross-sectional study

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Abstract: *Objective:* The prevalence of depression and anxiety is increasing worldwide. Diet as a modifiable factor for mental health has received great attention. The aim of the present study was to evaluate the association of vitamin B6 intake with depression and anxiety. *Methods:* This cross-sectional study was performed among 3362 adults in 2011. Anxiety and depression were evaluated using an Iranian validated version of the Hospital Anxiety and Depression Scale (HADS) questionnaire. Dietary intakes were evaluated by a validated 106 item self-administered Willett-format dish-based semi quantitative food-frequency questionnaire (DFQ). *Results:* The mean intake of vitamin B6 (mg/day) was significantly lower in anxious (1.93 ± 0.74 vs. 2.0 ± 0.74; P = 0.02) and depressed (1.86 ± 0.72 vs. 1.99 ± 0.74; P = 0.001) people than healthy participants. The lower level of vitamin B6 intake (tertile 1), after adjustment for the impacts of various confounding variables, in total population and women was associated with the higher odds of depression (OR = 1.41; 95% CI: 1.19, 2.31; P < 0.001. OR = 1.33; 95% CI: 1.08, 2. 21; P = 0.02, respectively). Also, the lower level of vitamin B6 intake (tertile 1) in total population and women was associated with the higher odds of anxiety (OR = 2.30; 95% CI: 1.31, 4.04; P < 0. 001, OR = 2.30; 95% CI: 1.19, 4.46; P = 0.04). *Conclusion:* The association of lower intakes vitamin B6 intake with increased risk of depression and anxiety was clearly supported by current study. A reasonable approach to tackle these disorders could be the improvement of nutritional status, accordingly large randomized controlled trials are suggested for providing more evidence.

Keywords: Vitamin B6, depression, anxiety, psychological disorders

Introduction

Depression and anxiety are common mental disorders. Depression is characterized by change in appetite, sleeping, concentration, daily activity, and feeling [1]. Anxiety is a horrible emotional state with experiencing nervousness, uneasiness, enthusiasm, and phobia [2–4]. The prevalence of these diseases is increasing worldwide. According to World Health Organization (WHO) estimation, mental disorders affect about 10% of the world's population and comprised 30% of the global non-fatal illness load [5]. It was revealed that about 21 and 20.8% of the Iranian adult population are anxious and depressed, respectively [6]. Mental disorders are associated with the risk of developing serious physical disorders, such as cardiovascular diseases, stroke, Alzheimer, epilepsy, diabetes, and cancer [1]. Mental disorders are caused by a complicated interaction of psychological, social, and biological factors [7]. In this regard in the framework of environmental risk factors, diet has received great attention as a modifiable factor, while a cause-effect association has not been recognized [8]. Recent studies suggest that major biological factors related

to the occurrence of depression modify by diet. Investigations have detected associations between the consumption of dietary nutrients such as zinc, B-group vitamins, magnesium, fat (such as olive oil), and special food such as seafood intake and reduced risk of depression [9]. Vitamin B6 (pyridoxine, pyridoxal, pyridoxamine) is a water-soluble vitamin necessary for many functions in the body [10]. The Recommended Dietary Allowance (RDA) for vitamin B6 is 1.3 mg/day for men and women aged 18 to 49 years [11]. Dietary sources of vitamin B6 include fortified cereals, dairy products, meat, organ, poultry, fish, yeast, and certain seeds. Vitamin B6 acts as a cofactor for decarboxylase that is the main enzyme for synthesis of some neurotransmitters; in addition vitamin B6 is a key factor in 1-carbon pathway and metabolism of homocysteine which its accumulation, may contribute to the occurrence of depression and anxiety [10, 12, 13]. So, it might theoretically relate to psychological disorders. However, the research about the association of vitamin B6 intake with depression and anxiety as common psychological disorders is rare. Therefore, the aim of the present survey was to explore the relationship between intake vitamin B6 with depression, and anxiety in a large sample of Iranian adults.

Materials and methods

Study design and participants

The current investigation was performed in the framework of the study on the Epidemiology of Psychological-Alimentary Health and Nutrition (SEPAHAN), a cross-sectional project that conducted to assess the epidemiological concepts of functional gastrointestinal disorders (FGID) and their association with lifestyle and psychological variables among Isfahan University of Medical Sciences' non-academic and not involved in medical and health care setting staffs in 50 health centers [14]. The inclusion criteria were adults aged 18–69 years who were working for at least one year in health centers and willing to participate in our study. The exclusion criteria were as follows: participants with energy intake outside the range 3347–17 573 kJ (800–4200 kcal), participants with lack of answer to large fraction of questions (more than 10% of the questionnaires' pages). At the starting of the study participants had offered informed written consent. This study was approved by the Regional Bioethics Committee of Isfahan University of Medical Sciences and organized in two phases. During first phase 8691 individuals of a 10087 (response rate: 86.16%) completed a comprehensive self-administered questionnaire on sociodemographic and dietary factors. In the second phase, validated questionnaires were used to gather the relevant information on gastrointestinal and psychological and mental health problems (response rate: 64.64%). Data of 3362 persons who had complete information on the used related variables in current study were analyzed (Figure 1).

Assessment of psychological health

Anxiety and depression were evaluated by employing an Iranian validated form of the Hospital Anxiety and Depression Scale (HADS)(14). HADS is a fourteen items psychological scale to determine the levels of anxiety and depression. Seven items relate to anxiety and seven relate to depression. Each item includes a four-point scale; higher scores reveal an elevated degree of depression and anxiety. The possible minimum and maximum marks for both disorders are 0 and 21 respectively. Scores equal or more than 8 on either section indicated the existence of anxiety or depression and scores equal or less than 7 were considered normal [15].

Assessment of vitamin B6 intake

The dietary intakes of the individuals were evaluated by utilizing a 106-item self-administered Willett-format dish-based semi quantitative food-frequency questionnaire (DFQ). This questionnaire was designed to gather information on dietary intakes in Iranian adults over one year. DFQ was including Iranian mixed dishes instead of their ingredients. Details of the design, validity, reliability, and food items of this questionnaire were illustrated elsewhere [16]. In brief, the DFQ included five categories: 1) mixed dishes (cooked or canned; n = 29), 2) all grain-based foods and potatoes (n = 10), 3) dairy products (milk and dairy products, including butter and cream; n = 9), 4) fruit and vegetables (n = 22), and 5) miscellaneous food items and beverages (including sweets, fast foods, nuts, desserts, and beverages; (n = 36). Daily value for each item of food was estimated based on the average of reported frequency, specified portion size, and food composition. Then food items were converted to g/d in accordance with the household amount [17]. Daily vitamin B6 intake (mg/day) of each participant was estimated according to the US Department of Agriculture (USDA) food-composition database by Nutritionist 4 software (First Databank Inc., Hearst Corp., San Bruno, CA, USA).

Assessment of other variables

Self-administered questionnaires were used to gather information on age, sex, weight, height, marital status (married, single), education levels ($\leq$12 yrs, 12–16 yrs, >16 yrs), smoking habits (non-smoker/former smoker/current

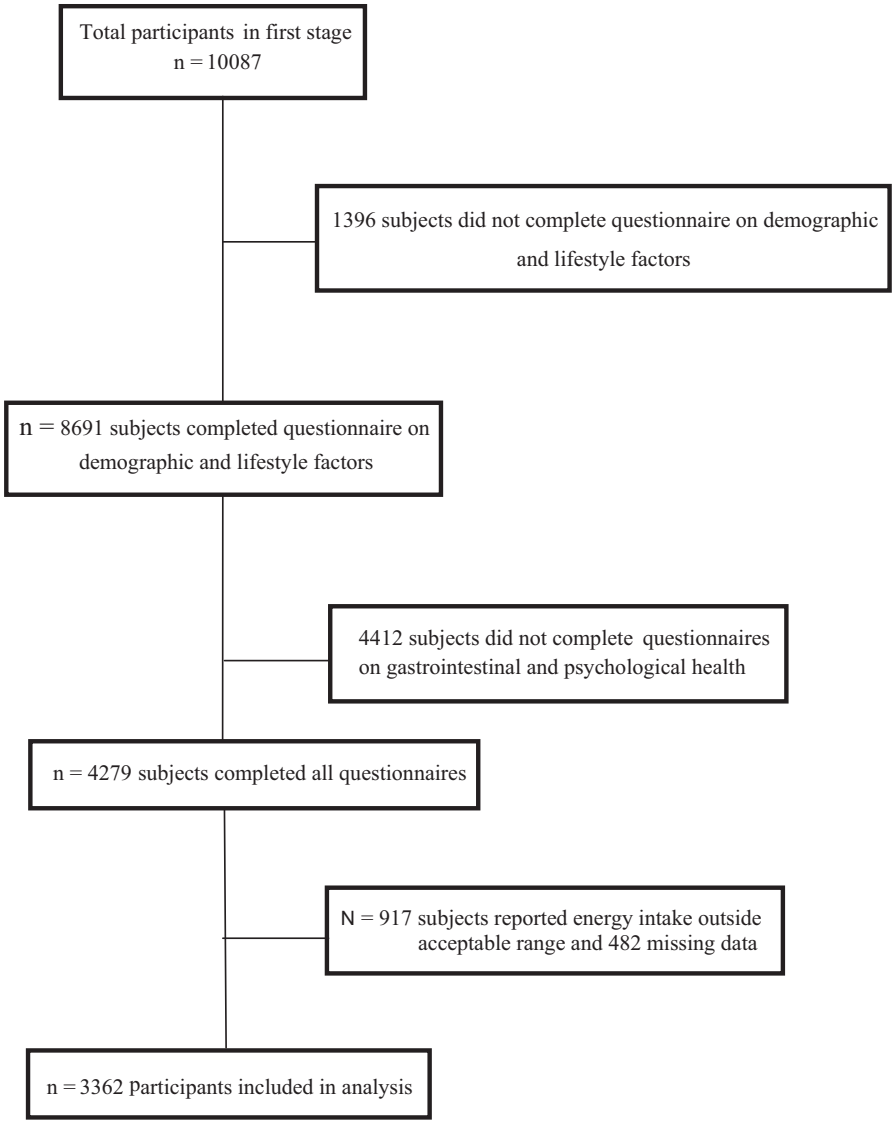

Figure 1. Flow diagram presenting the selected study samples.

smoker), current use of anti-psychotropic medications and dietary supplements. Body mass index (BMI) was computed as weight (kg) divided by height (m^2). The general practice physical activity questionnaire (GPAQ) was used to assess their physical activity [18]. Physical activity levels of participants were categorized as less than 1 hour and more than 1 hour per week. The functional gastrointestinal disorders (FGIDs) were identified using a modified Persian version of the Rome III questionnaire [19].

Statistical analysis

Continuous quantitative data were reported as mean ± sd and categorical ones as frequency (percentage). Normality of continuous data and homogeneity of variances were evaluated using Kolmogorov-Smirnov/Q-Q plot and Leven tests, respectively. Independent samples t-test and chi-square test were used for comparing continuous and categorical variables between affected and non-affected people with studied mental disorders. To determine significant differences in demographic characteristics, lifestyle variables, gastrointestinal disorders, depression and anxiety across tertiles of vitamin B6 intake we used analysis of variance (ANOVA) and chi-square test for continuous and categorical variables. Odds ratio (OR) and 95% confidence intervals (CIs) for the association of depression and anxiety as dependent variable and vitamin B6 intake were calculated using logistic regression in crude and adjusted models. Model 1 was adjusted for age, sex, marital status,

educational level. Additional adjustments for BMI, smoking and physical activity were made in model 2. Model 3 was additionally adjusted for FGIDs and use of antipsychotic drugs. Additional adjustments for macronutrients and micronutrients intakes were made in model 4. P for linear trends was determined by considering vitamin B6 as continuous variables in the logistic regression model. $P < 0.05$ (2-sided) was considered as statistical significance level. All statistical analyses were done using the Statistical Package for Social Sciences (SPSS, version 16.0 for Windows, 2006, SPSS, Inc, Chicago, IL).

Results

A total of 3362 participants with mean age 36.58 ± 8.09 years were included in the study; 58.5% were female; 61.2% were university graduates; 71.6% were married and 13.8% were smoker. The majority of individuals had physical activity less than 1 hour per week (87%), 28.6% and 13.6% of participants were depressed and anxious respectively. The prevalence of depression and anxiety was respectively 20.8% and 8.60% in men and it was 34.10% and 17.10% in women ($p < 0.001$). The vitamin B6 intake in nondepressed and non-anxious was significantly higher than depressed and anxious individuals ($p < 0.05$). Physical activity level in nondepressed was significantly higher than depressed persons ($p = 0.02$), but it was not significantly different between anxious and non-anxious people. The prevalence of functional gastrointestinal disorders (FGIDs) was 51.2% and in depressed and anxious was significantly higher than nondepressed and non-anxious people ($p < 0.001$) (Table 1).

Respectively 7% and 4.4% of participants in the lowest and the highest tertiles of vitamin B6 intake used antipsychotics drugs and this difference was statistically significant ($p = 0.03$). The prevalence of depression was significantly different across the tertiles of vitamin B6 intake so that 30.8% and 25.8% of participants in the lowest and the highest tertiles of vitamin B6 intake were depressed, respectively ($p = 0.03$). Also, 16.2% and 9.9% of participants in the lowest and the highest tertiles of vitamin B6 intake were anxious and the difference was statistically significant, respectively (<0.001). The mean intake of vitamin B6 was higher in women than men ($p < 0.001$). The prevalence of FGIDs and physical activity level were different significantly across the tertiles of vitamin B6 intake ($p < 0.05$), but BMI, marital status, educational levels, and smoking habits were not significantly different (Table 2).

Crude and multivariable-adjusted ORs (95% CIs) for depression and anxiety across the tertiles of vitamin B6 intake are presented respectively in Table 3 and 4. In the crude model, the lower level of vitamin B6 intake (tertile 1) in total population and women was associated with the higher risk of depression (OR = 1.28; 95% CI: 1.06, 1.54; $P_{trend} = 0.01$. OR = 1.33; 95% CI: 1.05, 1.68; $P_{trend} = 0.05$; respectively). Further adjustment for various confounders, in total population strengthen the associations; in which in the final fully adjusted model, we observed that lower levels of vitamin B6 intake were associated with 41.0% increased risk of depression compared with the reference category (OR = 1.41; 95% CI: 1.19, 2.13; $P_{trend} < 0.001$), but in women the association did not change notably (OR = 1.33; 95% CI: 1.08, 2.21; $P_{trend} = 0.02$) (Table 3).

Also, in the crude model, the lower level of vitamin B6 intake (quartile 1) in total population and women was associated with the higher risk of anxiety (OR = 1.76; 95% CI: 1.37, 2.28; P < 0. 001, OR = 1.83; 95% CI: 1.34, 2.48; $P_{trend} < 0.001$). After adjustment for age, gender, marital status, educational level, physical activity, smoking, and BMI, FGIDs, antipsychotics drugs use, macronutrients, and micronutrients intakes in the final model, the associations were remained significant (OR = 2.30; 95% CI: 1.31, 4.04; $P_{trend} < 0.001$, OR = 2.30; 95% CI: 1.19, 4.46; $P_{trend} = 0.04$) (Table 4).

Discussion

This study carried out with the aim of assessing the association of vitamin B6 intake with depression and anxiety risk. The current study found that the lower levels of vitamin B6 intake in total population as well as in women were associated with the higher risk of depression and anxiety.

Gougeon, L et al.'s study revealed reduced depression risk among women with higher intakes of vitamin B6 [20]. In a longitudinal study, Skarupski et al. showed a significant reduction in depressive symptoms with higher intakes of total vitamin B6 from food and supplements but this relationship was not seen with vitamin B6 alone from food [21]. In another population-based study Pan et al. showed an association between combined deficiency of vitamin B6 and folic acid and the indication of depressive mood [10]. In an animal study, Henderson et al., showed that the lower intakes of B vitamins such as B1, B2, B3, B5, B6, and B9 were associated with higher internalizing (withdrawn/depressed) and externalizing behavior (aggressive/delinquent) scores [22].

Some few previous studies, with different population from our study, did not find significant association between intake of vitamin B6 and depression; Miyake et al. did not find significant association between intake of pyridoxine and the risk of postpartum depression, also in Watanabe et al.'s study no significant difference was observed in vitamins intake such as vitamins B6 and B12 between non-depressed and depressed women in early pregnancy

Table 1. Basic characteristics in affected and non-affected of participants with mental disorders.

	Depression			Anxiety		
	Yes	No	P-value*	Yes	No	P-value*
Age (year)	36.32 ± 7.61	36.13 ± 7.94	0.57	35.41 ± 7.13	36.31 ± 7.94	0.03
BMI (kg/m^2)	24.85 ± 4.10	24.91 ± 3.70	0.70	24.98 ± 4.14	24.88 ± 3.77	0.61
Vitamin B6 intake (mg/day)	1.93 ± 0.75	1.99 ± 0.73	0.02	1.87 ± 0.72	2.00 ± 0.74	<0.001
Sex (%)			<0.001			<0.001
Female	34.10	65.90		17.10	82.90	
Male	20.80	79.20		8.60	91.40	
Marital status (%)			<0.001			<0.001
Married	27.80	72.20		13.70	86.30	
Single	30	70		10.7	89.30	
Divorced or Widowed	50.90	49.10		28.30	71.70	
Education level (%)			<0.001			<0.001
Under diploma	39.30	60.70		21.50	78.50	
Diploma (12 years formal education)	30.30	69.70		84.40	15.60	
University graduate	23.05	76.95		8.75	91.25	
Usage of antipsychotic drug (%)			<0.001			<0.001
Yes	58.20	41.80		38.30	61.70	
Physical activity (per week)			0.02			0.43
< 1 hour/week	29.30	70.70		13.80	86.20	
≥ 1 hour/week	23.80	76.20		12.40	87.60	
Smoker (%)			<0.001			<0.001
Current smoker	36.10	63.90		18.50	81.50	
Non-smoker or ex-smoker	27.40	72.60		12.80	87.20	
B6 intake (mg/day)	1.93 ± 0.74	1.99 ± 0.74	0.01	1.87 ± 0.72	2.0 ± 0.74	<0.001
Tertile 1 (1.59)	30.80	69.20		16.20	83.80	
Tertile 2 (1.59–2.23)	29.10	70.90		14.70	85.30	
Tertile 3 (2.24)	25.80	74.20		9.90	90.10	
FGIDs† (%)			<0.001			<0.001
Yes	39.40	60.60		21.20	78.80	

Quantitative variables were reported as mean ± sd and qualitative variables were reported as percentage. *Derived from independent t-test and chi-square test for continuous and categorical variables, respectively. †FGIDs: functional gastrointestinal disorders.

[23]. Sanchez-Villegas et al. in a cohort study did not find significant association between vitamin B6 intake and depression [24].

Vitamin B6, comprised of pyridoxal, pyridoxamine, and pyridoxine, may be a relief factor in hormone related depression, via its role in the proper metabolism of different types of neurotransmitters considered relevant in the initiation of depression [24]. Vitamin B6 in its active form, pyridoxal 5′phosphate (PLP), plays as a key element in the control of plasma homocysteine concentration, which is a risk factor for vascular disease [25] and Low plasma PLP has also been inversely associated with the depression. The evidence provided by observational studies were approved by some few randomized clinical trials [26–28].

Some authors have speculated that homocysteine accumulation, may contribute to the occurrence of depression so the role of vitamin B6 in the 1-carbon pathway and production of S-adenosylmethionine (SAM), a key gradient in metabolism and maintaining the desired level of homocysteine might be another mechanism [10]. Another possible explanation for these findings is that the intake of vitamin B6 is required for synthesis of catecholamines and serotonin by activating the decarboxylase that is the main enzyme for synthesis of these neurotransmitters. The previous studies have shown that serotonin deficiency and catecholamine deficiency are related to depression and anxiety [29–31]. Population-based cohort studies have revealed that plasma pyridoxal phosphate (PLP) is inversely related to some markers of inflammation [31]. On the other hand, depression was known as an inflammatory disorder that is mediated by pro-inflammatory cytokines thus the observed correlation between vitamin B6 and depression might be explained in this way [1]. Regarding the association of vitamin B6 intake and its serum concentration with anxiety and panic attack; observational studies have shown that the lower levels of Vitamin B6 are associated with

Table 2. General characteristics of participants across tertiles of vitamin B6 intake.

	Tertiles of vitamin B6 intake			
	First (1.59 Mg/day)	Second (1.6–2.23 Mg/day)	Third (2.24 Mg/day)	P-value*
Age (year)	36.23 ± 7.58	36.01 ± 7.81	36.64 ± 8.20	0.19
BMI (kg/m^2)	25.05 ± 3.86	24.87 ± 3.87	24.79 ± 3.74	0.27
Sex (%)				<0.001
Female	63.50	58.10	53.30	
Male	36.50	41.90	47.60	
Marital status (%)				0.20
Married	83.10	80.40	81.60	
Single	14.80	18.10	17.00	
Divorced or Widowed	2.10	1.50	1.40	
Education level (%)				0.46
Under diploma	13.40	10.70	12.00	
Diploma (12 years formal education)	26.60	26.10	28.10	
University graduate	60.00	63.10	59.90	
Usage of antipsycotic drug (%)				0.03
Yes	7.00	5.40	4.40	
Physical activity (per week)				0.001
< 1 hour/week	89.00	87.60	83.90	
≥ 1 hour/week	11.00	12.40	16.10	
Smoker (%)				0.88
Current smoker	13.90	13.40	14.10	
FGIDs (%)				0.01
Yes	52.70	52.90	52.70	
Depression (%)				0.03
Yes	30.80	29.10	25.80	
Anxiety (%)				<0.001
Yes	16.20	14.70	9.90	

Quantitative variables were reported as mean ± sd and qualitative variables were reported as percentage*. Derived from one-way ANOVA and chi-square test for continuous and categorical variables, respectively

higher rate panic attack anxious mood and in clinical trials its beneficial effect on relieving symptoms has been approved [32–34]. The possible pathways have been provided by preclinical and clinical studies. It was shown that the low serum concentrations of Vitamin B6 or iron are determinants of reduction in the brain serotonin's level; whilst serotonin deficiency is an etiology of panic and hyperventilation attack [35]. Serotonin is synthesized from tryptophan, and it is well known that vitamin B6 and iron play an efficient role as cofactors in the synthesis of serotonin [36].

Another important finding in our study was that vitamin B6 intake was not significantly associated with depression and anxiety in men. As to our knowledge, there was not study in this field and we do not have an acceptable explanation for why the relationship between vitamin B6 intake and depression and anxiety was sex specific. Our study indicated the vitamin B6 intake was different between men and women and higher in the men (data not shown). As regard to, some researchers hypothesized that stronger associations between nutrients and depression risk are seen when the intake of nutrients is lower, so it seems that these results are due to the higher intake of vitamin B6 in men. On the other hand, deficiencies in vitamin B6 have been reported in women with hormone related depression (i.e. premenstrual syndrome, premenstrual syndrome and premenstrual dysphoric disorder) and associated with symptoms of discomfort [37–40].

A number of caveats need to be noted regarding the present study. First, no biomarker was used to verify the amount of vitamin B6 intake. Second, the design of the study was cross-sectional and did not allow proving any cause-effect relationships. Third, this research was conducted on staff of Isfahan University of Medical Sciences, so it is not possible to generalize the findings of this study to the usual population with different health and demographic characteristics. Finally, a number of strengths should be considered. First, we adjusted the effects of many potential confounding factors and the second, sample size was high.

Table 3. Crude and multivariable-adjusted odds ratios (95% confidence interval) for depression across the tertiles of vitamin B6 intake.

	Tertiles of vitamin B6 intake (mg/day)											
	Total sample				Male				Female			
	First (1.59)	Second (1.6–2.23)	Third (2.24)	P_{trend}	First (1.59)	Second (1.6–2.23)	Third (2.24)	P_{trend}	First (1.59)	Second (1.6–2.23)	Third (2.24)	P_{trend}
Crude	1.28 (1.06–1.54)*	1.18 (0.98–1.42)	1	0.03	0.99 (0.72–1.38)	1.04 (0.76–1.41)	1	0.96	1.33 (1.05–1.68)*	1.22 (0.96–1.56)	1	0.05
Model I	1.18 (0.96–1.45)	1.11 (0.90–1.36)	1	0.29	0.92 (0.64–1.33)	0.94 (0.66–1.33)	1	0.89	1.30 (1.01–1.68)*	1.21 (0.93–1.56)	1	0.11
Model II	1.28 (1.03–1.58)*	1.16 (0.94–1.43)	1	0.07	1.05 (0.71–1.53)	1.03 (0.71–1.48)	1	0.97	1.37 (1.06–1.78)*	1.21 (0.93–1.58)	1	0.05
Model III	1.17 (1.09–1.52)*	1.11 (0.89–1.38)	1	0.20	0.93 (0.63–1.40)	0.91 (0.62–1.34)	1	0.89	1.34 (1.03–1.75)*	1.19 (0.91–1.56)	1	0.04
Model IV	1.41 (1.19–2.13)*	1.20 (0.89–1.60)	1	<0.001	1.40 (0.66–2.94)	1.11 (0.66–1.85)	1	0.63	1.33 (1.08–2.21)*	1.19 (0.84–1.70)	1	0.02

*Values are significant.
Model 1: Adjusted for age, gender, marital status, and educational level.
Model 2: Adjusted for age, gender, marital status, educational level, physical activity, smoking, and BMI.
Model 3: Adjusted for age, gender, marital status, educational level, physical activity, smoking, BMI, and FGIDs, and usage of antipsychotic drugs.
Model 4: Adjusted for age, gender, marital status, educational level, physical activity, smoking, BMI, and FGIDs, usage of antipsychotic drugs, macronutrients, and micronutrients intakes.

Table 4. Multivariable-adjusted odds ratios (95% confidence interval) for anxiety across the tertiles of vitamin B6 intake

	Tertiles of vitamin B6 Intake											
	Total				Male				Female			
	First (1.59)	Second (1.6–2.23)	Third (2.24)	P_{trend}	First (1.59)	Second (1.6–2.23)	Third (2.24)	P_{trend}	First (1.59)	Second (1.6–2.23)	Third (2.24)	P_{trend}
Crude	1.76 (1.37–2.28)*	1.57 (1.21–2.04)*	1	<0.001	1.25 (0.77–2.05)	1.57 (0.99–2.47)	1	0.15	1.83 (1.34–2.48)*	1.52 (1.11–2.09)*	1	<0.001
Model I	1.58 (1.20–2.10)*	1.48 (1.11–1.96)*	1	<0.001	1.12 (0.64–1.96)	1.33 (0.79–2.24)	1	0.55	1.74 (1.25–2.42)*	1.52 (1.08–2.14)*	1	<0.001
Model II	1.65 (1.23–2.20)*	1.54 (1.15–2.06)*	1	<0.001	1.39 (0.77–2.49)	1.56 (0.90–2.71)	1	0.27	1.71 (1.23–2.39)*	1.51 (1.07–2.13)*	1	<0.001
Model III	1.59 (1.18–2.15)*	1.48 (1.10–2.00)*	1	<0.001	1.24 (0.67–2.27)	1.42 (0.80–2.52)	1	0.48	1.70 (1.20–2.40)*	1.49 (1.04–2.13)*	1	0.01
Model IV	2.30 (1.31–4.04)*	1.80 (1.21–2.70)*	1	<0.001	2.05 (0.68–6.20)	1.83 (0.85–3.92)	1	0.29	2.30 (1.19–4.46)*	1.76 (1.10–2.80)*	1	0.04

*Values are significant.
Model 1: Adjusted for age, gender, marital status, and educational level.
Model 2: Adjusted for age, gender, marital status, educational level, physical activity, smoking, and BMI.
Model 3: Adjusted for age, gender, marital status, educational level, physical activity, smoking, and BMI, FGIDs, and usage of antipsychotic drugs.
Model 4: Adjusted for age, gender, marital status, educational level, physical activity, smoking, and BMI, FGIDs, usage of antipsychotic drugs, macronutrients, and micronutrients.

Conclusion

The association of vitamin B6 intake, depression, and anxiety in total population and women is clearly supported by the current study findings. So, a reasonable approach to tackle these disorders could be the improvement of nutritional status, however large randomized controlled trials are suggested for providing more evidence.

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Conflicts of Interest
The authors declare no conflicts of interest.

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