

## The Association between Some Good Mood Foods and Depression\*

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### Abstract

**Aim:** Depression is a main public health problem and disability worldwide. A bi-directional influence can be between foods and psychological disorders. This study aimed to determine the association between some good mood foods and depression.

**Method:** In this cross-sectional study, 100 undergraduate students and academicians over the age of 18 studying at Istanbul-Turkey universities were included. Demographic characteristics and eating habits were asked, and Beck Depression Scale was used to determine depression status.

**Results:** High intakes of milk, yogurt, meat, egg, fish, walnut, fig, almond, banana, kiwi, pineapple, chocolate, honey, tomato and oyster were associated inversely with depression. There was a significant relationship between fig, kiwi and honey (borderline) and depression. So that the OR (odds ratio) (95% CI) in the low and high consumption category of fig was 0.39 (0.15-0.98) and 0.24 (0.08-0.76) respectively ( $p < 0.05$ ). The higher consumption of kiwi decreases the risk of depression. The ORs (95% CI) of low and high consuming of kiwi were 0.56 (0.19-1.68;  $p = 0.3$ ) and 0.12 (0.03-0.41;  $p = 0.001$ ) respectively. For honey the ORs (95% CI) in low and high consumption categories were 0.42 (0.12-1.46.  $p = 0.17$ ) and 0.32 (0.1-1.02.  $p = 0.05$ ) respectively.

**Conclusion:** It was observed that the frequency of depression decreased in people who consumed high amounts of fruits, vegetables, nuts, legumes, milk and yogurt.

**Keywords:** Depression, mood, diet, psychological disorders.

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*ETHICAL STATEMENT: Before the start of the research, a written decision No: 2018-23 was taken from the Ethics Committee of İstanbul Gelisim University. Ethics committee was taken on 13.12.2018.*

## Bazı İyi Ruh Hali Besinleri ile Depresyon Arasındaki İlişki

### Öz

**Amaç:** Depresyon dünyada halk sağlığı için temel bir sorundur. Besinler ile psikolojik bozuklukların arasında çift yönlü bir etkileşim olabilmektedir. Bu çalışmada iyi ruh hali besinlerin tüketim sıklığı ile depresyon arasındaki ilişkinin belirlenmesi amaçlanmıştır.

**Yöntem:** Bu kesitsel çalışmaya İstanbul-Türkiye üniversitelerinde öğrenim gören 18 yaş üstü lisans öğrencileri ve akademisyenlerin olduğu 100 kişi dahil edilmiştir. Demografik özellikleri ve beslenme alışkanlıkları sorulmuş, depresyon durumunu belirlemek için Beck Depresyon ölçeği kullanılmıştır.

**Bulgular:** Sıklıkla süt, yoğurt, et, yumurta, balık, ceviz, incir, badem, muz, kivi ve bal (borderline) ananas, çikolata, bal, domates ve midye tüketiminin depresyonla ters bir ilişkisi olduğu belirlendi. İncir, kivi ve bal (sınırdan) ile depresyon arasında anlamlı bir ilişki vardı. Böylece incirin düşük ve yüksek tüketim kategorisinde OR (odds ratio), (%95 CI) sırasıyla 0,39 (0,15-0,98) ve 0,24 (0,08-0,76) anlamlı olarak bulunmuştur ( $p < 0,05$ ). Yüksek kivi tüketiminin depresyon riskin düşürdüğü tespit edilmiştir. Düşük ve yüksek kivi tüketimi OR'leri (%95 CI) sırasıyla 0,56 (0,19-1,68;  $p = 0,03$ ) ve 0,12 (0,03-0,41;  $p = 0,001$ ) olarak bulunmuştur. Bal için düşük ve yüksek tüketim kategorilerindeki OR'ler (%95 GA) sırasıyla 0,42 (0,12- 1,46;  $p = 0,17$ ) ve 0,32 (0,1-1,02;  $p = 0,05$ ) olarak bulunmuştur.

**Sonuç:** Yüksek miktarda meyve, sebze, kuruyemiş, baklagiller, süt, yoğurt tüketen kişilerde depresyon sıklığının azaldığı görüldü.

**Anahtar Sözcükler:** Depresyon, ruh hali, diyet, psikolojik bozukluklar.

### Introduction

Depression is a main public health problem and disability worldwide. Based on the world health organization (WHO) estimates in 2015, the total number of people suffering from depression is 322 million worldwide nearly half of these people live in the South-East Asia region and Western Pacific region<sup>1</sup>. Mental health is a key factor in daily and social activities<sup>2</sup>. However, different factors including age, gender, socioeconomic status, and psychological characteristics can be associated with depression, but foods can have different effects on feelings and mood<sup>3</sup>. Foods are necessary for the metabolic metabolism of the body. In addition, they have effects on brain functions such as mood and cognitive function. The study of the effect of adequate diet on the brain has become so important that "nutritional psychiatry" has emerged as a research field today<sup>4</sup>. Many foods can affect inflammation factors and improve psychological disorders. Scientific evidence has shown that compounds, such as flavonoids, essential fatty acids, minerals, vitamins, phytonutrients, and amino acids are associated with many chronic diseases including mood disorders and depression. They can improve mood and regulate emotions<sup>5</sup>. A diet containing high amounts of anti-inflammatory and free-radical scavenging including fruits and vegetables can have various health outcomes on depression pathophysiology<sup>6</sup>. Several food such as fruits and vegetables, walnuts, eggs, milk, coffee, and chocolate have been identified usually as

good mood foods<sup>7</sup>. The association between foods groups with depression was assessed in different studies that these studies showed that legumes, fruits, vegetables, and non-refined grains were associated inversely with depression, anxiety, and stress<sup>8</sup>. While other studies showed that higher intakes of sugar and sweet food/beverage positively were associated with mental disorders and depression<sup>9</sup>. Food-related behaviors are still discussed. A bi-directional influence can be between foods and psychological disorders. Emotions can affect food choices, and on the other hand, eating and drinking behavior can be independent of traditional factors such as liking, wanting, and suitability. However, the compounds and natural mood of foods can influence on depression and anxiety. This study aimed to determine the association between some good mood foods and depression.

## **Materials and Methods**

### **Study Type**

This cross-sectional study was conducted on students and academicians in Istanbul, Turkey.

### **Study Group**

100 participants over 18 years old were randomly selected and included in this study. A survey containing demographic characteristics (age, gender, income, weight, height, and Body Mass Index-BMI) and diet behaviors (number of meals, skipping of meals, consumption of snacks between meals, daily coffee consumption, fast food consumption) was filled out for every participant. Frequency of consumption of foods such as milk, yogurt, meat, eggs, fish, walnuts, figs, almonds, bananas, kiwi, pineapple, chocolate, honey, tomatoes, oysters, every day, 1-2 times a week, 3-4 times a week and a month, It was collected face-to-face with 10 minutes interviews.

### **Procedures**

The validated Beck Depression Scale was used for assessing depression status. The Beck Depression Scale is a self-rating depression scale with 21 questions. Each question has four options that indicate the severity of depression from low to high. Based on the overall depression score the participants were categorized into two groups: Score <10 as no depression and score > 10 as a depressed group.

### **Statistical Analysis**

Continuous variables were presented as mean  $\pm$  SD and categorical variables as numbers and percentages. The demographic characteristics and diet behaviors were compared using the Person's Chi-square Test and Fisher's Exact test, and the mean of continuous variables was compared using an independent t-test between not depressive and depressed groups. The depression Beck score was compared using One-way ANOVA by food intake. The association between food intake and depression was assessed by logistic regression.

## Ethical Considerations

Before the start of the research, a written decision No: 2018-23 was taken from the Ethics Committee of Istanbul Gelişim University. Ethics committee was taken on 13.12.2018.

## Results

A total of 100 participants were included in this cross-sectional study, consisting of 62 (62%) females and 38 (38%) males. 98 (98%) of participants had ages between 18-30 years and only 2 subjects (2%) were 31-50 years. 99 people (99%) had academic education. The frequency of income level as income>expense, income=expense, and income<expense categories were 23 (23%), 55 (55%), and 22 (22%) respectively. The demographic characteristics between non-depressed and depressed groups were not statistically significant (Table 1).

**Table 1.** Comparison of the demographic characteristics between non-depressed and depressed groups

Variables		No depression	Depression	p-value
		Beck <10 (n=42)	Beck ≥10 (n=58)	
		n (%)	n (%)	
Gender	Male	25 (59.5)*	37 (63.8)	0.66 <sup>¶</sup>
	Female	17 (40.5)	21 (36.2)	
Age groups	18-30	40 (95.2)	58 (100)	0.17 <sup>¶¶</sup>
	31-50	2 (4.8)	-	
Income	income>expense	14 (33.3)	9 (15.5)	0.07 <sup>¶</sup>
	income=expense	22 (52.4)	33 (56.9)	
	income<expense	6 (14.3)	16 (27.6)	
Number of meals	1-2	10 (23.8)	24 (41.4)	0.19 <sup>¶</sup>
	3-4	27 (64.3)	29 (50)	
	5-6	5 (11.9)	5 (8.6)	
Skip of meals	Yes	22 (52.4)	34 (58.6)	0.53 <sup>¶</sup>
	No	20 (47.6)	24 (41.4)	
Eating snacks between meals	Yes	30 (71.4)	30 (51.7)	0.05 <sup>¶</sup>
	No	12 (28.6)	28 (48.3)	
Daily coffee consumption	No consume	14 (33.3)	13 (22.4)	0.35 <sup>¶</sup>

	1-2 cups	23 (54.8)	31 (53.4)	
	2-3 cups	5 (11.9)	13 (22.4)	
	3-5 cups	0	1 (1.7)	
<b>Fast food consumption frequency</b>	No consume	1 (2.4)	7 (12.1)	0.30 <sup>¶¶</sup>
	Daily	3 (7.1)	6 (10.3)	
	1-2 a week	21 (50)	27 (46.6)	
	1-2 a month	17 (40.5)	18 (31.0)	
		<b>mean ±(SD)</b>	<b>mean ±(SD)</b>	
<b>BMI (kg/m<sup>2</sup>)</b>	-	22.57±3.20 <sup>**</sup>	21.72±3.10	0.19 <sup>§</sup>

\*: data are as number (%). \*\*: data are as mean ±standard deviation (SD).

¶: P-values are for Chi-square test. ¶¶: P-values are for Fisher`s Exact test. §: P-values are for Independent t-test.

The comparison of Beck depression score between food consumption categories is shown in Table 2. Generally, Beck depression score in people who consumed higher amounts of foods was lower than people who have not to consume. The Beck depression score was statistically significant between categories of kiwi consumption so that the mean of depression Beck score was 14.4±7.2; 11.3±5.6 and 7.3±6.2 in no consume, low consume and high consume groups.

**Table 2.** Comparing the Beck depression score between food categories

<b>Foods</b>	<b>Beck depression score</b>			<b>P-value<sup>¶</sup></b>
	<b>No consume</b>	<b>Low consume</b>	<b>High consume</b>	
	<b>mean ±(SD)</b>	<b>mean ±(SD)</b>	<b>mean ±(SD)</b>	
<b>Milk</b>	11.6±6.5	10.2±7.4	11.1±6.7	0.79
<b>Yogurt</b>	13.4±8.6	10.12±6.09	11.01±6.9	0.65
<b>Meat</b>	12.1±3.7	12.5±6.1	10.5±7.2	0.52
<b>Egg</b>	12±3.9	11.5±7.3	10.9±6.9	0.93
<b>Fish</b>	13.3±9.04	10.4±6.2	10.5±5.8	0.23
<b>Walnut</b>	12.8±8.09	10.08±5.6	9±6.09	0.10
<b>Fig</b>	11.9±5.9	10.9±8.2	9.2±5.6	0.37
<b>Almond</b>	10.6±7.1	11.7±7.7	10.1±5.1	0.61
<b>Banana</b>	11.6±6.9	11.9±7.1	10.3±6.7	0.56

<b>Kiwi</b>	14.4±7.2	11.3±5.6	7.3±6.2	0.001
<b>Pineapple</b>	11.9±7.2	10.6±6.2	9.2±7.2	0.39
<b>Chocolate</b>	12.5±7.08	12.2±6.5	9.1±6.7	0.65
<b>Honey</b>	13.2±7.8	11.5±7.05	9.8±6.1	0.14
<b>Tomato</b>	15.5±5.5	8.3±8.07	10.9±6.7	0.16
<b>Oyster</b>	11.5±6.8	10.3±7.5	10.1±4.7	0.65

¶: P-values are for one-way ANOVA test.

Table 3 shows the association between foods and depression. Results showed that the consumption of all foods in high or low amounts compared to the no consumption category was associated inversely with depression. There was a significant relationship between figs, Kiwi and honey (borderline) and depression. So that the OR (odds ratio) (95% CI) in the low and high consumption category of figs was 0.39 (0.15-0.98) and 0.24 (0.08-0.76) respectively ( $p < 0.05$ ). The higher consumption of kiwi decreases the risk of depression. The ORs (95% CI) of low and high consumption of kiwi were 0.56 (0.19-1.68;  $p = 0.3$ ) and 0.12 (0.03-0.41;  $p = 0.001$ ) respectively. For honey the ORs (95% CI) in low and high consumption categories were 0.42 (0.12-1.46;  $p = 0.17$ ) and 0.32 (0.1-1.02;  $p = 0.05$ ) respectively.

**Table 3.** The association between foods and depression using logistic regression

<b>Foods</b>		<b>OR (95% CI)</b>	<b>SE</b>	<b>B</b>	<b>p-value</b>
<b>Milk</b>	No consume	1(Ref)	-	-	-
	Low consume	0.48 (0.11-1.98)	0.72	-0.73	0.31
	High consume	0.61 (0.17-2.22)	0.65	-0.49	0.46
<b>Yogurt</b>	No consume	1	-	-	-
	Low consume	0.32 (0.03-3.56)	1.23	-1.13	0.35
	High consume	0.33 (0.03-3.09)	1.14	-1.11	0.33
<b>Meat</b>	No consume	1	-	-	-
	Low consume	0.18 (0.02-1.86)	1.18	-1.6	0.15
	High consume	0.17 (0.02-1.5)	1.09	-1.7	0.11
<b>Egg</b>	No consume	1	-	-	-
	Low consume	1(0.06-15.9)	1.41	0.00	1
	High consume	0.42 (0.4-4.18)	1.17	-0.87	0.46
<b>Fish</b>	No consume	1	-	-	-
	Low consume	0.51 (0.17-1.49)	0.55	-0.68	0.22

	High consume	0.58 (0.16-2.21)	0.67	-0.53	0.43
<b>Walnut</b>	No consume	1	-	-	-
	Low consume	1.9 (0.53-6.9)	0.66	0.66	0.32
	High consume	0.86 (0.25-2.93)	0.63	-0.15	0.81
<b>Figs</b>	No consume	1	-	-	-
	Low consume	0.39 (0.15-0.98)	0.48	-0.95	0.046
	High consume	0.24 (0.08-0.76)	0.58	-1.41	0.015
<b>Almond</b>	No consume	1	-	-	-
	Low consume	1.05 (0.34-3.2)	0.57	0.05	0.93
	High consume	0.84 (0.26-2.7)	0.60	-0.17	0.77
<b>Banana</b>	No consume	1	-	-	-
	Low consume	0.64 (0.11-3.67)	0.89	-0.45	0.61
	High consume	0.34 (0.06-1.86)	0.86	-1.06	0.21
<b>Kiwi</b>	No consume	1	-	-	-
	Low consume	0.56 (0.19-1.68)	0.56	-0.57	0.3
	High consume	0.12 (0.03-0.41)	0.63	-2.12	0.001
<b>Pineapple</b>	No consume	1	-	-	-
	Low consume	0.79 (0.33-1.89)	0.44	-0.23	0.6
	High consume	0.44 (0.13-1.48)	0.62	-0.82	0.18
<b>Chocolate</b>	No consume	1	-	-	-
	Low consume	0.9 (0.3-2.71)	0.56	-0.1	0.85
	High consume	0.53 (0.19-1.52)	0.54	-0.63	0.24
<b>Honey</b>	No consume	1	-	-	-
	Low consume	0.42 (0.12-1.46)	0.64	-0.87	0.17
	High consume	0.32 (0.1-1.02)	0.58	-1.12	0.05
<b>Tomato</b>	No consume	1	-	-	-
	Low consume	0.1 (0.005-2.52)	1.38	-2.5	0.08
	High consume	0.28 (0.03-2.53)	1.12	-1.26	0.28
<b>Oyster</b>	No consume	1	-	-	-
	Low consume	0.76 (0.32-1.81)	0.44	-0.27	0.53
	High consume	0.4 (0.1-1.58)	0.7	-0.92	0.19

## Discussion

The disease burden and the costs that depression imposes on the healthcare system are higher. Medical treatment of persons diagnosed with a chronic mood disorder is longer, and may be to continue over the lifetime. Therefore, the implementation of methods that to prevent depression is very important<sup>10</sup>. In this study aimed to determine the association between some refreshing foods and depression. The study revealed that higher consumption of milk, yogurt, meat, eggs, fish, walnuts, figs, almonds, bananas, kiwis, pineapples, chocolates, honey, tomatoes, and oysters was inversely associated with depression. The inverse relationship between kiwis, figs, and honey (borderline) and depression was statistically significant. Foods have different effects on mood due to their different compounds. Fruits and vegetables have higher amounts of vitamins especially vitamins C and A; minerals, especially electrolytes; and more recently phytochemicals, especially antioxidants and they are as a source of dietary fiber<sup>11</sup>. Also, phenolic compounds in a variety of fruits and vegetables (such as apples and onions) found that affect mental health. The best example is quercetin, an abundant flavonoid<sup>12</sup>. A diet with higher intakes of plant-based foods can prevent of chronic diseases, such as heart disease, cancer, stroke, diabetes, and psychological disorders<sup>13</sup>. Consistent with the results of the current study, the inverse relationship between fruits and vegetables and psychological disorders especially have shown in others studies<sup>6,8</sup>. In a study by Saeidlou et al. showed that a healthy dietary pattern with higher intakes of fruits, vegetables, egg, fishes and olives decreases the risk of depression<sup>14</sup>. The association of some micronutrients with depression has been assessed in different studies<sup>15</sup>. Oxidative stress has an important role in many chronic diseases including psychological disorders. Consumption of high levels of antioxidants may have protective effect. Legumes and red meat contain antioxidants such as zinc and selenium which can have a protective effect against chronic diseases<sup>16</sup>. Researches showed that micronutrients such as zinc, magnesium, and selenium have positive effect on mental health<sup>17</sup>. The current study showed that high level consumption of walnut and almonds was related to lower depression. Nuts contain high intakes of phenolic compounds. The main of them are phenolic acids, flavonoids, tannins, phenolic lignans, and stilbene derivatives<sup>18</sup>. Also, nuts have a protective effect against oxidative stress-related disorders<sup>19</sup>. Consistent with results, the protective effects of nuts on depression have been evaluated in some studies. The nuts have the source of vegetable protein and fat, especially unsaturated fatty acids<sup>20</sup>.

Fatty acids (FAs) are one of the main components of cell membranes. unsaturated FAs including omega-3 and omega-6 can have a protective effect on neuroinflammation<sup>21</sup>. The availability of dietary fatty acids is necessary for growth, and maintenance of the nervous system, especially long-chain polyunsaturated fatty acids belonging to both n-3 family (derived from  $\alpha$ -linolenic acid and n-6 family (derived from linoleic acid). Of particular relevance for neuroprotection are n-3 eicosapentaenoic acid and docosahexaenoic acid, primarily found in fatty fish and seafood<sup>22</sup>. A-linolenic acid supplies through seeds and nuts and encourages the consumption of seafood<sup>23</sup>.

Eicosapentaenoic acid and docosahexaenoic acid incorporate phospholipids and cholesterol esters embedded in neuronal membranes. Goldsmith et al. confirm that severe mental illnesses, including major DD and schizophrenia, are associated with higher levels of inflammatory peripheral and systemic biomarkers<sup>24</sup>. Docosahexaenoic acid modulates inflammation by acting on a variety of transcription factors involved in metabolic pathways<sup>25</sup>. Results have shown an inverse relationship between high levels of milk and yogurt consumption and depression. Dairy is the most important source of calcium and phosphorus. The relationship between calcium and depression has been evaluated in some studies<sup>26</sup>. Some researchers showed the effects of minerals such as calcium and magnesium on depression. Calcium dysregulation is critical in nervous system disorders such as depression<sup>27</sup>. It is reported that in the hippocampus of a rat, the calcium/calmodulin-dependent protein kinase II mediates the activity of Group I metabotropic glutamate receptors (mGluRs) which derives the development of long-term depression<sup>28</sup>. Changes in extracellular Ca concentration could have stimulatory effects on neuromuscular junctions, and irritability, mania and agitation have been reported in conjunction with hypocalcemia<sup>28</sup>. In summary, a plant-based diet and high intakes of nuts, legumes and dairy can affect depression and prevent it. The limitations of the study were that in this study the association between some foods and depression have been evaluated. The study was performed among students who may not represent the general population. Depression is a multifactorial disease and there may be a bidirectional influence between foods and psychological disorders. Therefore, cohort or case-control studies may provide better evidence.

## Conclusion

It was observed that a frequency of depression decreased in people who consumed high amounts of fruits, vegetables, nuts, legumes, milk and yogurt.

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