The Relationship between Depression/Anxiety and Food Service Satisfaction in Hospitalized Patients

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Abstract

Aim: Mental conditions and food service satisfaction significantly affect dietary intake in hospitalized patients. However, research on this interaction is scarce. Therefore, this study had two objectives: i) determining the relationship between anxiety/depression and food service satisfaction and ii) testing the direct or indirect relationship between depression and daily energy intake mediated by food service satisfaction.

Method: This cross-sectional study was conducted in a public hospital. The sample comprised 218 adult inpatients (18-75 years of age). Data were collected using the Hospital Anxiety Depression Scale (HADS) and the Acute Care Hospital Food Service Patient Satisfaction Questionnaire (ACHFSPSQ). Dietary intake was analyzed based on 24-hour recall data. The data were analyzed using path analysis.

Results: Participants who were at risk for depression and anxiety had significantly lower mean ACHFSPSQ subscale scores than those who were not ($p<0.05$). There was a positive correlation between ACHFSPSQ subscale scores and daily energy and nutrient intake ($p<0.05$). However, participants who were at risk for anxiety and depression did not consume significantly less energy and nutrient than those who were not ($p>0.05$). The results showed that the risk for depression adversely affected food service satisfaction ($p<0.05$). However, it had no direct or indirect relationship with daily energy intake ($p>0.05$). The results also showed that food service quality partly mediated the risk for depression and daily energy intake ($\beta=6.003$, $p<0.05$).

Conclusion: Patients at risk for anxiety and depression may have negative perceptions of food services that are not reflected in their actual dietary intake. Therefore, healthcare professionals should consider hospitalized patients' mental status before assessing their satisfaction with food services.

Keywords: Anxiety, depression, energy intake, food service, inpatients.

Hastanede Yatan Hastalarda Depresyon/Anksiyete ile Yiyecek Hizmeti Memnuniyeti Arasındaki İlişki

Öz

Amaç: Psikolojik durum ve yiyecek hizmetleri memnuniyeti, hastanede yatan hastalarda besin alımı üzerinde önemli bir etkiye sahiptir. Ancak, bu faktörlerin etkileşimi bilinmemektedir. Bu nedenle çalışmanın amaçları: i) anksiyete ve depresyon riski ile yemek servisi memnuniyeti arasındaki ilişkiyi belirlemek, ii) depresyon riski ile günlük enerji alımı arasındaki doğrudan ve dolaylı ilişkiyi, yemek servisi memnuniyeti alt boyutları aracılığıyla test etmektir.

Yöntem: Bu çapraz-kesitsel çalışma, bir kamu hastanesinde yürütülmüştür. Örneklem 218 yatan hastadan olşmaktadır (18-75 yaş arası). Veriler Hastane Anksiyete Depresyon Ölçeği (HADS) Hastane Yiyecek

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Hizmetleri Hasta Memnuniyeti Ölçeği (ACHFSPSQ) kullanılarak toplanmıştır. Diyet alımı 24 saatlik hatırlatma yöntemiyle analiz edilmiştir. Veriler Path analizi kullanılarak analiz edilmiştir.

Bulgular: Depresyon ve anksiyete riski olan hastaların ACHFSPSQ alt puanları risk altında olmayanlara göre önemli ölçüde daha düşüktü (p<0,05). ACHFSPSQ alt puanları günlük enerji ve çoğu besin ögesi alımıyla pozitif ilişkiliydi (p<0,05). Ancak anksiyete ve depresyon riski olan hastalarla risk olmayanlar arasında enerji ve besin ögesi alımı açısından istatistiksel olarak anlamlı bir farklılık yoktu (p>0,05). Sonuçlar depresyon riskinin yiyecek hizmetleri memnuniyeti üzerinde olumsuz bir etkisi olduğunu gösterdi (p<0,05). Ancak depresyon riski ile günlük enerji alımı arasında doğrudan ve dolaylı bir ilişki bulunamadı (p>0,05). Bulgular ayrıca yemek servisi kalitesi alt puanının depresyon riski ve günlük enerji alımı arasındaki ilişkiye kısmen katkısı olduğunu gösterdi (β=6,003, p<0,05).

Sonuç: Anksiyete ve depresyon riski olan hastaların yiyecek hizmetleri ile ilgili olumsuz düşünceleri gerçek besin alımlarına yansımayabilir. Bu yüzden sağlık profesyonelleri yatan hastalarda yiyecek hizmetleri memnuniyetini değerlendirmeden önce hastaların psikolojik durumunu dikkate almalıdır.

Anahtar Sözcükler: Anksiyete, depresyon, enerji alımı, yiyecek servisi, yatan hastalar.

Introduction

The prevalence of malnutrition among hospitalized adults in Türkiye is more than 15% and increases dramatically after a one-week hospital stay[1,2]. Malnutrition is positively correlated with longer hospital stays and higher morbidity, mortality, and costs. Therefore, healthcare professionals should ensure that their patients get enough food intake[3,4]. Food intake during hospitalization is influenced by both the patient's condition and the quality of hospital meals. The patient's condition encompasses physical characteristics (e.g., difficulty eating and swallowing, poor dentition, and reduced senses of taste and smell) and psychosocial factors (e.g., anxiety, sadness, and loneliness). In addition, nutrition-related factors are abdominal bloating, diarrhea, nausea, vomiting, fatigue, and loss of appetite. Diet restrictions and interruptions during mealtime are other possible factors[5,6].

The prevalence of depression and anxiety among hospitalized patients ranges from 20% to 50%. Patients with longer hospital stays are more likely to experience anxiety and depression[7,8], which in turn leads to a dramatic loss of appetite[9]. Research also shows that older adults suffering from depression and anxiety tend to have a decreased appetite and lower food intake[10,11].

Hospital food services are a complicated system that affects patients' food intake. Patients' satisfaction with food services increases as the quality of the services improves. In this interaction, the most important factor is food quality[12]. Recognition of staff and the quality of service interactions are also key predictors of patient satisfaction[13]. Research shows that hospitalized patients who are more satisfied with food services get more energy and protein intake[14,15-17].

Anxiety, depression, and satisfaction with food services are significant factors influencing the food and energy intake of hospitalized patients. However, only a small body of research investigates the relationship between those factors. Moreover, we do not know whether patients' dissatisfaction with food services due to depression affects their energy intake. Therefore, this study first investigated the relationship between anxiety, depression, and food service satisfaction and then tested the direct or indirect

association between depression and daily energy intake mediated by food service satisfaction.

Material and Methods

Design

A power analysis (G-power) was performed to calculate the sample size (Mann Whitney U test was used). The results showed that a sample of 188 to 220 would be large enough to detect significant differences (an effect size of 0.36, the alpha value of 0.05, and the theoretical power of 80% and 85%). Between November 2019 and March 2020, 300 hospitalized patients aged 18-75 years were recruited from a public hospital in Ankara/Turkiye.

The inclusion criteria were: (1) volunteering, (2) having been hospitalized for at least one week, (3) having at least one meal (breakfast, lunch, and dinner) provided by the hospital, and (4) not undergoing enteral or parenteral nutritional support. We excluded patients who consumed at least one meal outside the hospital because our goal was to detect 24h food consumption in the hospital. We also excluded patients who reported severe pain. Therefore, the final sample consisted of 218 patients. Participants were recruited from the general surgery, neurology, cardiology, burns, gastroenterology, internal diseases, endocrinology, infection, and physical therapy units of the hospital. More than half of the participants suffered from chronic diseases. We ignored drug interactions because most participants were on multiple medications. Informed consent was obtained from all participants. The research adhered to the guidelines of the Declaration of Helsinki. The study was approved by the Ethics Committee of Karamanoğlu Mehmetbey University (Approval date/ no: 17.10.2019-E.29397). The results were reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist. The data were collected through face-to-face interviews

Data Collection Tools

Survey Form

The researcher developed the survey form. It consisted of three items on demographic characteristics (age, duration of hospital stay, and the status of chronic illness), and the amount of meals consumed, the most important factor for meals, thoughts about medical nutrition therapy, etc.

Acute Care Hospital Food Service Patient Satisfaction Questionnaire (ACHFSPSQ): The Acute Care Hospital Food Service Patient Satisfaction Questionnaire (ACHFSPSQ) was developed by Capra et al.[18] and adapted to Turkish by Ercan and Ok[19]. It consists of 21 items rated on a five-point Likert-type scale ("1 = Never" to "5 = Always"). It has four subscales: food quality, meal service quality, staff/service issues, and the physical environment. The subscales have no cut-off points. Higher scores indicate more satisfaction. The questionnaire has an extra item that asks the respondent to rate the food service on a scale of "very poor" to "very good." The Turkish version comprises 20 items and five subscales: food quality (items from 1 to 6), meal service

quality (items from 7 to 11), hunger and quantity (items from 12 to 14), staff/service issues (items from 15 to 18) and physical environment (items 20 and 21).

Hospital Anxiety Depression Scale (HADS): The Hospital Anxiety Depression Scale (HADS) was developed by Zigmond and Snaith (1983)[20] and adapted to Turkish by Aydemir et al. (1997).[21] The instrument consists of 14 items rated on a four-point ordinal scale (from 0 to 3). It has two subscales: anxiety (seven items) and depression (seven items). The total score ranges from 0 to 21, with higher scores indicating a higher risk for anxiety and depression. The subscales "anxiety" and "depression" have the cut-off points of 10 and 7, respectively.

Hospital Menu: The hospital operates a kitchen with a conventional cook-serve system, featuring centralized tray assembly and hot-trolley delivery. The menu follows a non-selective, one-month cycle, ensuring variety without repetition. It consists of a four-course set menu, including soup, an entrée (such as rice or pasta), a main dish, and a side dish (e.g., salad, dessert, fruit, or yogurt). Occasionally, the same meals are served for both lunch and dinner.

Anthropometric Measurements

Body weight was measured by health professionals to the nearest 0.1 kg. Height to the nearest 0.1 cm was measured with a stadiometer. Body Mass Index (BMI) was calculated by dividing weight (in kilograms) by the square of height (in meters) [22].

Dietary Assessment

Dietary data were gathered through a 24-hour food recall. A Food and Nutrition Photograph Catalogue was used to estimate the quantity of foods consumed[23]. Energy, macronutrient, and micronutrient contents were analyzed using the Nutrition Information System [Beslenme Bilgi Sistemi (BeBIS)] [24]. The daily consumption of food groups, including dairy, protein sources, grains, fruits, and vegetables, was also calculated using BEBIS.

Analysis

The data were analyzed using the Statistical Package for Social Sciences (SPSS, IBM, v. 22) and Analysis of Moment Structures (AMOS) at a significance level of 0.05. The Chi-square test was used to assess the relationship between anxiety/depression and thoughts about meals and dieting items. The student t-test (for parametric variables) and the Mann-Whitney U test (for non-parametric variables) were used to detect the relationship between anxiety/depression and food groups, daily energy and nutrient intake, and food service satisfaction. The path model examined the direct or indirect association between depression and meal consumption statement, food quality, meal service quality, hunger and quantity, staff/service issues, physical environment, and daily energy intake

Results

The sample consisted of 113 men and 105 women. Participants had a mean age of 49.47±12.9 years (18-75). Most participants had been hospitalized for one week to one month (Table 1).

Table 1. Demographic Characteristics (N=218)

	n	%
Gender		
Man	113	51.8
Woman	105	48.2
Age (year)		
≤40	60	27.5
>40	158	72.5
Duration of hospital stay		
1 week-1 month	194	89.0
>1 month	24	11.0
Chronic disease		
Yes	126	57.8
No	92	42.2
Risk for Anxiety		
Yes	56	25.7
No	162	74.3
Risk for Depression		
Yes	123	56.4
No	95	43.6

Participants who were at risk for anxiety and depression had significantly fewer meals than those who were not (p<0.05). However, there was no significant difference in BMI levels between participants who were at risk for anxiety and depression and those who were not. Moreover, participants who were informed by dietitians about their medical nutrition therapy were at a higher risk for anxiety than those who were not (Table 2).

Table 2. Distribution of Thoughts about Meals and Dieting by Anxiety (HAD-A) and Depression (HAD-D) (N=218)

	Risk for Anxiety n (%)		Risk for Depression n (%)	
	No	**Yes**	**No**	**Yes**
Meal consumption				
All	50 (73.5)	18 (26.5)	34 (49.3)	34 (50.0)
More than half	69 (84.1)	13 (15.9)	42 (51.2)	40 (48.8)
Half	43 (63.2)	25 (36.8)	19 (27.9)	49 (72.1)
	p=0.014		p=0.007	
Most important factor for meals				
Good smell	12 (63.2)	7 (36.8)	5 (25.0)	14(75.0)
Proper serving temperature	11 (55.0)	9 (45.0)	7 (35.0)	13 (65.0)
No repetition of meals	21 (70.0)	9 (30.0)	8 (26.7)	22 (73.3)

Good appearance	22 (75.9)	7 (24.1)	15 (51.7)	14 (48.3)
Good taste	96 (80.0)	24 (20.0)	60 (50.0)	60 (50.0)
	p>0.05		p>0.05	
Were you informed by your dietitian about your medical nutrition therapy?				
Yes	85 (66.9)	42 (33.1)	50 (39.4)	77 (60.6)
No	77 (84.6)	14 (15.4)	45 (49.5)	46 (50.5)
	P=0.003		p>0.05	
Do you think your nutritional therapy helps cure your illness?				
Yes	114 (71.3)	46 (28.7)	71 (44.4)	89 (55.6)
No	48 (82.8)	10 (17.2)	24 (41.4)	34 (58.6)
	p>0.05		p>0.05	
Body Mass Index[a]	24.4 (6.1)	25.88 (4.6)	25.5 (5.5)	25.57 (4.5)
	p>0.05		p>0.05	

Chi-square test was used for categorical variables.

[a]Student t-test was used for BMI comparison

Participants who were at risk for depression had significantly lower ACHFSPSQ subscale scores than those who were not (p<0.05). Moreover, participants who were at risk for anxiety had significantly lower "food quality," "hunger and quantity," and "physical environment" subscale scores than those who were not (p<0.05) (Table 3).

Table 3. Distribution of ACHFSPSQ subscale scores by anxiety (HAD-A) and depression (HAD-D)

	Risk for Anxiety			**Risk for Depression**		
	Yes	**No**	***p***	**Yes**	**No**	***p***
	Median (IQR)	Median (IQR)		Median (IQR)	Median (IQR)	
Food quality	18 (5)	20 (5)	0.008	18 (5)	20 (5)	<0.001
Meal Service Quality	20 (4.8)	20 (6)	>0.05	20 (5)	22 (5)	<0.001
Hunger and Quantity	10 (4)	10.5 (3)	0.03	10 (3)	11 (3)	0.010
Staff/Service issues	15 (4)	16 (5)	>0.05	16 (5)	17 (5)	<0.001
Physical Environment	6 (2)	8 (4)	0.001	7 (3)	8 (4)	<0.001

Mann-Whitney U test was used

There was a positive correlation between ACHFSPSQ subscale scores and daily energy, protein, animal protein, fat, riboflavin, niacin, vitamin B12, and iron intake (p<0.05) (Table 4).

Table 4. Distribution of Energy and Nutrient Intake by ACHFSPSQ subscale scores

Nutrients	Food Quality	Meal Service Quality	Hunger And Quantity	Staff/ Service Issues	Physical Environment
Energy (kcal)	0.188**	0.198**	0.159*	0.167*	0.221**
Protein (g)	0.199**	0.239**	0.227*	0.230**	0.203**
Animal protein	0.166**	0.208**	0.218**	0.217**	0.175**
Carbohydrate (g)	0.078	0.096	0.107	0.004	0.109
Fat (g)	0.242**	0.228**	0.172*	0.256**	0.271**
Cholesterol	0.173*	0.230**	0.214**	0.248**	0.258**
Vit. A (mg)	0.008	0.116	0.184*	0.069	0.145*
Riboflavin (mg)	0.205**	0.204**	0.175**	0.185**	0.176**
Niacin (mg)	0.193**	0.230**	0.197**	0.242**	0.196**
Vit.B6 (mg)	0.198**	0.086	0.110	0.087	0.047
Folate (mg)	0.078	0.024	0.074	-0.027	-0.036
Vit.B12 (mg)	0.172*	0.147*	0.182**	0.141*	0.175**
Magnesium(mg)	0.205**	0.163**	0.072	0.123*	0.094
Iron (mg)	0.214**	0.187**	0.117*	0.163**	0.125*
Zinc (mg)	0.250**	0.243**	0.147*	0.228**	0.178**
Fiber (g)	0.145*	0.145*	0.061	0.028	0.053

Spearman's correlation test was used.

* $p < 0.05$ and **$p < 0.01$

There was no significant difference in dairy, protein, grain, vegetable, and fruit intake between participants who were at risk for anxiety/depression and those who were not ($p > 0.05$). Moreover, there was no significant difference in daily macronutrient and micronutrient intake between participants who were at risk for depression and those who were at risk for anxiety ($p > 0.05$) (Table 5).

Table 5. Distribution of daily food group and energy and nutrient intake by anxiety (HAD-A) and depression (HAD-D)

|	Risk for Anxiety			Risk for Depression		
	Yes	No	*p*	Yes	No	*P*
	Median (IQR)	Median(IQR)		Median (IQR)	Median(IQR)	
Daily Food Group (portions)						
Dairy	2.3 (1.4)	2 (1.1)	>0.05	2 (1.3)	2 (1.3)	>0.05
Protein foods	1.24 (1.6)	1.35 (1.1)	>0.05	1.34 (1.2)	1.31 (1.1)	>0.05
Grains	4.79 (2.4)	4.7 (3.4)	>0.05	4.78 (3.3)	4.69 (2.7)	>0.05
Fruits	1.61 (2.3)	1.03 (1.2)	>0.05	1.25 (1.9)	1 (1.1)	>0.05
Vegetables	2.09 (2.8)	1.9 (2.4)	>0.05	2 (2.8)	1.87 (2.3)	>0.05
Daily Energy and Nutrient Intake						
Energy (kcal)	1586.8 (717.6)	1501.5(735.8)	>0.05	1513.8 (752.2)	1529.7 (687.6)	>0.05

Protein (g)	67.3 (24.5)	66.5 (27.3)	>0.05	61.9 (27.9)	67.6 (26.9)	>0.05
Animal protein	34.6 (20.8)	35.6 (20.7)	>0.05	33.4 (20.4)	37.6 (19.9)	>0.05
Carbohydrate(g)	196.9 (91.3)	169.4 (101.7)	>0.05	176.6 (101.6)	169.2 (97.8)	>0.05
Fat (g)	60.3 (32.3)	62.8(33.5)	>0.05	59.3 (34.5)	65.6 (29.7)	>0.05
Vit. A (mg)	611.5 (511.9)	716.7 (662.9)	>0.05	683.5 (564.7)	645.7 (723.1)	>0.05
Thiamine (mg)[a]	0.87±0.3	0.86±0.3	>0.05	0.85±0.3	0.88±0.4	>0.05
Riboflavin (mg)	1.56 (0.7)	1.47 (0.8)	>0.05	1.47 (0.8)	1.54 (0.7)	>0.05
Niacin (mg)	23.9 (9.4)	24.9 (9.7)	>0.05	24.2 (10)	25.7 (9.4)	>0.05
Vit.B6 (mg)	1.33 (1)	1.28 (0.8)	>0.05	1.31 (0.9)	1.24 (0.8)	>0.05
Folate (mg)	296.9 (236.4)	311.1 (219.4)	>0.05	317.3 (199.6)	298.9 (224.4)	>0.05
Vit.B12 (mg)	4.2 (3.3)	3.9 (3.6)	>0.05	4.2 (3.3)	4.3 (3.9)	>0.05
Magnesium[a](mg)	273.1 ± 97.9	260.5± 90.8	>0.05	267.8±95.8	258.4± 88.4	>0.05
Iron (mg)	8.3 (4.7)	8.4 (4.5)	>0.05	8.3 (4.7)	8.5 (4.4)	>0.05
Zinc	9.4 (5.2)	8.8 (4.2)	>0.05	8.9 (4.8)	8.8 (4.3)	>0.05
Fibre	22 (11.2)	21.3 (12.4)	>0.05	22.2 (10.9)	20.4 (13.3)	>0.05

Mann-Whitney U test was used

[a] Mean± SD; Student t-test was used

The path model showed that the risk for depression (HAD-D) was negatively associated with ACHFSPSQ subscale scores; food quality (β= -1.98 $p<0.05$), meal service quality (β=-0.81, $p<0.05$), hunger and quantity (β=-1.39, $p<0.05$), staff/service issues (β=-1.008, $p<0.05$), and physical environment (β=-61.41, $p=0.05$). However, the risk for depression (HAD-D) was not significantly associated with meal consumption statements (β=-2.30, $p>0.05$). Furthermore, the ACHFSPSQ "meal service quality" subscale scores were significantly related to daily energy intake (β=6.003, $p<0.05$). The path model indicated that the risk for depression did not predict daily energy intake indirectly, except for the small contribution of meal service quality (Figure 1).

Figure 1. Path analysis
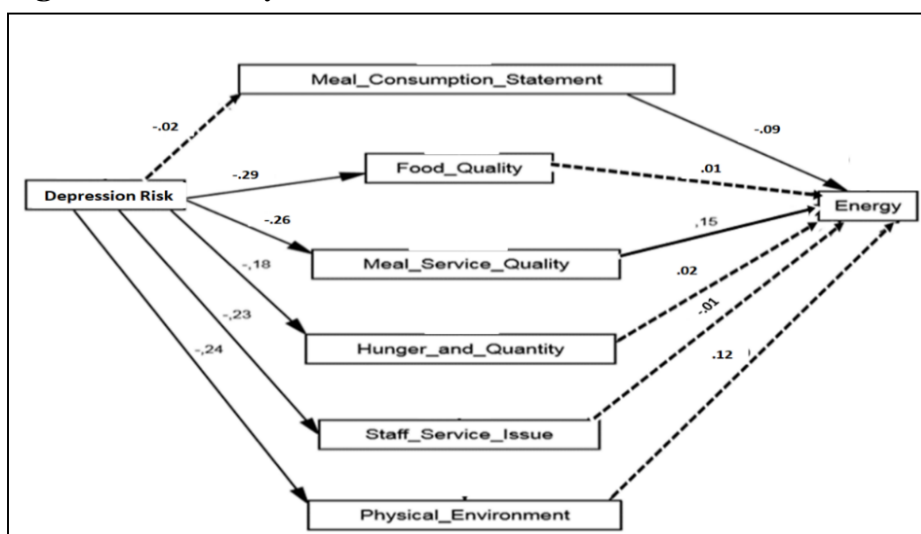
Dashed lines indicate non-significant paths

Discussion

This study first investigated the relationship between anxiety/depression and food service satisfaction. Second, it examined the direct or indirect association between depression and daily energy intake mediated by food service satisfaction.

Depression is more prevalent among medically ill individuals than in the healthy population[25]. Results showed that one in four hospitalized patients was at high risk for anxiety (26.0%), while more than half of hospitalized patients were at high risk for depression (56.6%). Research shows that the prevalence of anxiety and depression ranges from 38% to 61% and 21% to 54%, respectively[7,8,26]. Hospitalized patients who suffer from chronic diseases experience more symptoms of depression than those who do not[8,25]. Results showed that more than half of hospitalized patients had at least one chronic disease (58%), which explained the high prevalence of depression.

Our results showed that hospitalized patients who were at risk for depression paid more attention to a non-repetitive menu and good smell and taste for food service satisfaction than those who were not. Research also shows that patients' satisfaction with hospital meals is strongly influenced by food variety, taste, and presentation[31-33]. However, depression affects patients' decision-making processes and changes their choice-induced preferences[34]. Depression is associated with reduced olfactory sensitivity and identification capacity[35,36]. The olfactory impairment may lead patients who are at risk for depression to pay more attention to the smell of meals.

Our results showed that hospitalized patients who were informed of their illnesses by dietitians experienced higher levels of anxiety than those who were not. Research shows that calorie-restricted diets served by hospitals are associated with a high prevalence of anxiety[37].

Depression leads to a loss of appetite[27]. Research shows that patients who are at risk for anxiety and depression have fewer meals than those who are not[11,28,29]. However, German et al. (2008) report no relationship between depression and food intake[27]. While our results showed a direct association between anxiety/depression and less meal intake, the path analysis did not point to this relationship, which has also been reported by Sieske et al. (2019)[30]. Age, hospitalization, and gender may cause conflicting results because those researchers who reported lower food intake among patients at risk for depression were conducted on older adults[11,29].

Results did not point to a significant difference in BMI levels between patients who were at risk for anxiety/depression and those who were not. While Balcı (2021)[38] and Kaner et al (2015)[39] state that depression is associated with high BMI, other researchers[40] report that it is related to low BMI among hospitalized patients. However, Doğan, Yabancı Ayhan, and Varlı did not find an association between depression and BMI among Turkish geriatric patients[41]. Conflicting results may be due to different sample characteristics, such as age and disease type.

Our results showed that patients who were at risk for depression were significantly less satisfied with hospital food services than those who were not. Moreover, patients who were at risk for anxiety had significantly lower "food quality," "hunger and quantity," and "physical environment" subscale scores than those who were not. Our results are

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consistent with those reported by Paquet et al. (2003)[42]. Research shows that anxiety and depression significantly affect overall life satisfaction[43,44]. Moreover, many researchers state anxiety and depression are negatively associated with adults' satisfaction with food-related life[45-49]. Satisfaction with food-related life includes being pleased with food, belief in having ideal food, and being satisfied by food in daily life[50]. Considering the common points in satisfaction with food-related life and food service satisfaction, we think that our results are not surprising.

Results showed that depression and anxiety were associated with daily energy and nutrient intake among hospitalized patients. We hypothesized that patients who were at risk for anxiety and depression had significantly less energy and nutrient intake than those who were not. The results showed that depression was negatively associated with food service satisfaction, which was related to low energy and nutrient intake. Path analysis showed that depression had a negative impact on all food service satisfaction dimensions but meal service quality. However, food service satisfaction sub-dimensions were not associated with daily energy intake, suggesting that depression has no direct or indirect relationship with daily energy intake, except for the small mediator contribution of meal service quality. This result was consistent with our earlier findings on the relationship between depression and meal consumption and BMI. Some researchers[39,41] report that patients diagnosed with depression have as much daily energy intake as healthy individuals. However, our results conflict with many other studies[14,15,17,51-53], Those studies that report a positive relationship between food service satisfaction and energy intake used a few or only one question to determine satisfaction. On the other hand, we employed a comprehensive question to determine the relationship between food service satisfaction and energy intake. Having administered the same scale, Collins et al. (2017)[54] argue that an increase in energy intake is not associated with food service satisfaction among hospitalized patients.

This is one of the first studies to focus on hospitalized adults to determine the association between the risk for anxiety/depression and food service satisfaction. However, this study has three limitations. First, we recruited patients from only one public hospital. However, it is a large hospital that admits many patients from nearby cities. Second, we used a 24-hour food recall to identify daily food groups and energy and nutrient intakes, which may not sufficiently represent the daily dietary intake. The Food Frequency Questionnaire could have reflected daily dietary intake better. Third, our participants stayed in the hospital for a short period. We can argue that longer hospital stays affect patients' food service satisfaction and risk for depression. Therefore, researchers should recruit more patients who stay in hospitals for a longer period of time. Moreover, they should monitor dietary recording periods for longer (e.g., three-day food record) and employ the Food Frequency Questionnaire.

Conclusion

Food service satisfaction is highly affected by anxiety and depression. Considering that patient satisfaction plays a central role in the evaluation of food service quality, our findings are surprising and worrying. While hospitalized patients who were at risk for anxiety/depression were less satisfied with hospital food services than those who were

not, their daily dietary intakes were similar. We can conclude that hospitalized patients who are at risk for anxiety/depression are more dissatisfied with hospital food services, but this dissatisfaction is not reflected in their actual dietary intake. Therefore, healthcare professionals should take hospitalized patients' psychological status to evaluate their satisfaction with hospital food services.

Acknowledgments

Declaration of Interest Statement

REFERENCES

1. Korfali G, Gündoğdu H, Aydintuğ S, Bahar M, Besler T, Moral AR. Nutritional risk of hospitalized patients in Turkey. *Clin. Nutr.* 2009;28(5):533–537. doi: 10.1016/j.clnu.2009.04.015

2. Sökülmez Kaya P, Aydın Avci İ. Determination of nutritional risk rate in patients hospitalized in the Gastroenterology Service at Turkey hospital. *Prog Nutr.* 2014;16(2):136-142.

3. Altundağ Derin NZ. Hastanede yatan hastalarda malnütrisyon oranları ve buna etki eden faktörler [medical thesis]. Kırıkkale, Türkiye: Gastroenterology, Medicine Faculty; 2017.

4. Correia MIT, Waitzberg DL. The impact of malnutrition on morbidity, mortality, length of hospital stay and costs evaluated through a multivariate model analysis. *Clin Nutr.* 2003;22(3):235-239. doi: 10.1016/s0261-5614(02)00215-7.

5. Topal A, Tolunay O. Effect of malnutrition on length of hospital stay in children. *Turk Arch Pediatr.* 2021;56(1):37-43. doi: 10.14744/TurkPediatriArs.2020.46354

6. Lennie TA, Moser DK, Heo S, Chung ML, Zambroski CH. Factors influencing food intake in patients with heart failure: a comparison with healthy elders. *J Cardiovasc Nurs.* 2006;21(2):123-129. doi: 10.1097/00005082-200603000-00008

7. Osman NS, Nor N, Sharif MS, Hamid SBA, Rahamat S. Hospital Food Service Strategies to improve food intakes among inpatients: A systematic review. *Nutrients.* 2021;13(10):3649. doi: 10.3390/nu13103649.

8. AlBekairy A, AbuRuz S, Alsabani B, Alshehri A, Aldebasi T, Alkatheri A. Exploring factors associated with depression and anxiety among hospitalized patients with Type 2 diabetes mellitus. *Med Princ Pract.* 2017;26(6):547-553. doi: 10.1159/000484929

9. Fattouh N, Hallit S, Salameh P, Choueiry G, Kazour F, Hallit R. Prevalence and factors affecting the level of depression, anxiety, and stress in hospitalized

patients with a chronic disease. *Perspect Psychiatr Care*. 2019;55(4):592-599. doi: 10.1111/ppc.12369

10. Baxter LC. Appetite changes in depression. *Am J Psychiatry* 2016; 173(4): 317-318. doi: 10.1176/appi.ajp.2016.16010010

11. Lopes AA, Elder SJ, Ginsberg N, Andreucci VE, Cruz JM, Fukuhara S. Lack of appetite in haemodialysis patients--associations with patient characteristics, indicators of nutritional status and outcomes in the international DOPPS. *Nephrol Dial Transplant*. 2007;22(12):3538-3546. doi: 10.1093/ndt/gfm453

12. Kim DM, Kim KH. Food and nutrient intake status of Korean elderly by perceived anxiety and depressive condition: data from Korean National Health and Nutrition Examination Survey 2013~2015. *J Nutr Health*. 2019;52(1):58-72.

13. Messina G, Fenucci R, Vencia F, Niccolini F, Quercioli C, Nante N. Patients' evaluation of hospital foodservice quality in Italy: what do patients really value? *Public Health Nutr*. 2013;16(4):730-737. doi: 10.1017/S1368980012003333

14. Dall'Oglio I, Nicolò R, Di Ciommo V, Bianchi N, Ciliento G, Gawronski O. A systematic review of hospital foodservice patient satisfaction studies. *J. Acad. Nutr. Diet*. 2015;115(4):567-584. doi: 10.1016/j.jand.2014.11.013.

15. McCray S, Maunder K, Krikowa R, MacKenzie-Shalders K. Room service improves nutritional intake and increases patient satisfaction while decreasing food waste and cost. *J Acad Nutr Diet*. 2018;118(2):284-293. doi: 10.1016/j.jand.2017.05.014

16. Kuperberg K, Caruso A, Dello S, Mager, D. How will a room service delivery system affect dietary intake, food costs, food waste and patient satisfaction in a paediatric hospital? A pilot study. *Journal of Foodservice*. 2008;19(5):255-261.

17. Mahoney S, Zulli A, Walton K. Patient satisfaction and energy intakes are enhanced by point of service meal provision. *Nutr Diet*. 2009;66(4):212-220.

18. Sathiaraj E, Priya K, Chakraborthy S, Rajagopal R. Patient-centered foodservice model improves body weight, nutritional intake and patient satisfaction in patients undergoing cancer treatment. *Nutr Cancer*. 2019;71(3):418-423.

19. Capra S, Wright O, Sardie M, Bauer J, Askew D. The acute hospital foodservice patient satisfaction questionnaire: the development of a valid and reliable tool to measure patient satisfaction with acute care hospital foodservices. *Int. Food Res. J*. 2005;16(1-2):1-14.

20. Ercan G, Ok MA. Hastane yiyecek hizmetleri hasta memnuniyeti ölçeğinin türkçe formunun geçerlilik ve güvenirlilik çalışması. *Turk. Klin. J. Med. Sci.* 2018;3(3):187-194.

21. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand*. 1983;67(6):361-370. doi: 10.1111/j.1600-0447.1983.tb09716.x

22. Aydemir Ö, Güvenir T, Küey L, Kültür S. Hastane anksiyete ve depresyon ölçeği Türkçe formunun geçerlilik ve güvenilirliği. *Turk Psıkıyatrı Derg*. 1997;8(4):280-287.

23. WHO Consultation on Obesity (1999: Geneva, Switzerland) & World Health Organization. (2000). Obesity: preventing and managing the global epidemic : report of a WHO consultation. World Health Organization

24. Rakıcıoğlu N, Acar N, Ayaz A, Pekcan G. *Yemek ve Besin Fotoğraf Kataloğu*. Ankara: Ata Ofset Press; 2012.

25. BeBİS. Beslenme Bilgi Sistemi. https://bebis.com.tr/anasayfa. Yayınlanma tarihi 2010. Erişim tarihi 3 Ekim 2023.

26. Gunn JM, Ayton DR, Densley K, et al. The association between chronic illness, multimorbidity and depressive symptoms in an Australian primary care cohort. Soc Psychiatry *Psychiatr Epidemiol*. 2012;47(2):175-184. doi:10.1007/s00127-010-0330-z

27. Dos Santos AP, Lazzari TK, Silva DR. Health-Related Quality of Life, Depression and Anxiety in Hospitalized Patients with Tuberculosis. *Tuberc Respir Dis (Seoul)*. 2017;80(1):69-76. doi:10.4046/trd.2017.80.1.69

28. German L, Feldblum I, Bilenko N, Castel H, Harman-Boehm I, Shahar DR. Depressive symptoms and risk for malnutrition among hospitalized elderly people. *J Nutr Health Aging*. 2008;12:313–318. doi: 10.1007/BF02982661.

29. Agarwal E, Ferguson M, Banks M, et al. Malnutrition and poor food intake are associated with prolonged hospital stay, frequent readmissions, and greater in-hospital mortality: Results from the Nutrition Care Day Survey 2010. *Clin Nutr*. 2013;32:737–745.

30. Rogozinski A, Zisberg A. Associations between depressive symptoms, appetite and food ıntake among hospitalized older adults. *Innov Aging*. 2020;4:919–919.

31. Sieske L, Janssen G, Babel N, Westhoff TH, Wirth R, Pourhassan M. Inflammation, appetite and food intake in older hospitalized patients. *Nutrients*. 2019;11:1986.

32. Sahin B, Demir C, Celik Y, Teke AK. Factors affecting satisfaction level with the food services in a military hospital. *J. Med Syst*. 2006;30:381–387.

33. Wright ORL, Connelly LB, Capra S. Consumer evaluation of hospital foodservice quality: an empirical investigation. *Int J Health Care Qual Assur*. 2006;19:181–194.

34. Abdelhafez A, Al Qurashi L, Al Ziyadi R, Kuwair A, Shobki M, Mograbi H. Analysis of factors affecting the satisfaction levels of patients toward food services at general hospitals in Makkah, Saudi Arabia. *Am J Med Med Sci*. 2012;2:123–130.

35. Miyagi M, Miyatani M, Nakao T. Relation between choice-induced preference change and depression. *PLoS One*. 2017;12:e0180041.

36. Kohli P, Soler ZM, Nguyen SA, Muus JS, Schlosser RJ. The Association Between Olfaction and Depression: A Systematic Review. *Chem Senses*. 2016;41:479–486. doi: 10.1093/chemse/bjw061.

37. Schablitzky S, Pause BM. Sadness might isolate you in a non-smelling world: olfactory perception and depression. *Front. Psychol.* 2014;5:1-20. doi: 10.3389/fpsyg.2014.00045.

38. Aucoin M, LaChance L, Naidoo U, et al. Diet and anxiety: A scoping review. *Nutrients.* 2021;13(12):4418. doi: 10.3390/nu13124418

39. Balcı M. Koronavirüs Hastalığı Nedeniyle Hastanede Yatarak Tedavi Gören Hastalar İle Diğer Nedenlerle Yatan Hastaların Hastane Anksiyete ve Depresyon Düzeylerinin Karşılaştırılması. [Medical Thesis]. İstanbul, Türkiye: Aile Hekimliği Ana Bilim Dalı, Konya Şehir Hastanesi; 2021.

40. Kaner G, Soylu M, Yüksel N, Inanç N, Ongan D, Başmısırlı E. Evaluation of nutritional status of patients with depression. *Biomed Res Int.* 2015;2015:1–9.

41. Jieqiong H, Yunxin J, Ni D, Chen L, Ying C. The correlation of body mass index with clinical factors in patients with first-episode depression. *Front Psychiatry.* 2022;13:938152. doi:10.3389/fpsyt.2022.938152

42. Doğan G, Yabancı Ayhan N, Varlı M. Association between nutritional status and depression in hospitalized elderly patients. *Aging Med Healthc.* 2022;13:118–124.

43. Paquet C, St-Arnaud-McKenzie D, Kergoat MJ, Ferland G, Dubé L. Direct and indirect effects of everyday emotions on food intake of elderly patients in institutions. *J Gerontol A Biol Sci Med Sci.* 2003;58:153-158. doi:10.1093/gerona/58.2.m153

44. Beutel ME, Glaesmer H, Wiltink J, Marian H, Brähler E. Life satisfaction, anxiety, depression and resilience across the life span of men. *Aging Male.* 2010;13:32-39.

45. Mahmoud JS, Staten R, Hall LA, Lennie TA. The relationship among young adult college students' depression, anxiety, stress, demographics, life satisfaction, and coping styles. *Issues Ment Health Nurs.* 2012;33:149-156. doi:10.3109/01612840.2011.632708

46. Cohen-Mansfield J. Perceived control, reinforcement, satisfaction, and depression in community elderly. *J Appl Gerontol.* 1990;9:492-503.

47. Seo S, Cho M, Kim Y, Ahn J. The relationships among satisfaction with food-related life, depression, isolation, social support, and overall satisfaction of life in elderly South Koreans. *J Korean Diet Assoc.* 2013;19:159-172.

48. Schnettler B, Lobos G, Lapo MD, Adasme-Berríos C, Hueche C. Satisfaction with life and food-related life in Ecuadorian older adults. *Nutr Hosp.* 2017;34:65-72.

49. Schnettler B, Miranda-Zapata E, Grunert KG, Ahn J. Depression and satisfaction in different domains of life in dual-earner families: A dyadic analysis. *Rev Latinoam Psicol.* 2019;51:199-209. doi: 10.20960/nh.977

50. Beckers E, Schnettler B, Orellana L, Hueche C. Typologies of dual-earner households with adolescent children according to their satisfaction with food-related life. *Rev. Latinoam. Psicol.* 2021;53:10-19. doi: 10.14349/rlp.2021.v53.2

51. Grunert KG, Dean M, Raats MM, Nielsen NA, Lumbers M. A measure of satisfaction with food-related life. *Appetite*. 2007;49:486-93. doi: 10.1016/j.appet.2007.03.010

52. Freil M, Nielsen MA, Biltz C, Gut R, Mikkelsen BE, Almdal T. Reorganization of a hospital catering system increases food intake in patients with inadequate intake. *Scand J Food Nutr*. 2006;50:83-88. doi: 10.1080/17482970600743186

53. Maunder K, Lazarus C, Walton K, Williams P, Ferguson M, Beck E. Energy and protein intake increases with an electronic bedside spoken meal ordering system compared to a paper menu in hospital patients. *Clin Nutr ESPEN*. 2015;10:e134-e139. doi: 10.1016/j.clnesp.2015.05.004

54. McCray S, Maunder K, Barsha L, Mackenzie-Shalders K. Room service in a public hospital improves nutritional intake and increases patient satisfaction while decreasing food waste and cost. *J Hum Nutr Diet*. 2018;31(6):734-741. doi: 10.1111/jhn.12580

55. Collins J, Porter J, Truby H, Huggins CE. A foodservice approach to enhance energy intake of elderly subacute patients: a pilot study to assess impact on patient outcomes and cost. *Age Ageing*. 2017;46:486-493. doi: 10.1093/ageing/afw238