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The Relationship Between Dietary Intake and Anthropometric Indices Between Dietary Intake and Anthropometric Indices with Anxiety in Female Medical Students

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Abstract

Background: Vitamins play an important role in improving mental health. Healthy diets can significantly influence the development, progression, and treatment of mental health disorders.

Objectives: This study aimed to investigate the correlation between dietary intake and anthropometric profiles with anxiety in female students of Zahedan University of Medical Sciences.

Methods: This cross-sectional study evaluated 200 female medical students for daily intake of B vitamins, omega-3, anthropometric indices, and their correlation with anxiety. The Food Frequency Questionnaire and Bronze Anxiety Questionnaire were used to examine the relationship between dietary intake and anxiety. The associations between parameters were analyzed using Pearson's correlation.

Results: The findings revealed that the mean age of the female medical students was 22.60 ± 2.10 years, with a Body Mass Index (BMI) of 23.37 ± 4.01, a waist-to-hip ratio (WHpR) of 0.81 ± 0.11, a waist-to-height ratio (WHtR) of 10.55 ± 0.10, and an anxiety score of 44.83 ± 17.71. Positive correlations were observed between BMI ($r = 0.89$, $P = 0.0001$), WHpR ($r = 0.86$, $P = 0.0001$), and WHtR ($r = 0.898$, $P = 0.0001$) with anxiety. The mean anxiety scores were 23.84 ± 4.36, 38.59 ± 4.62, 61.44 ± 13.63, and 74.44 ± 5.96 in underweight, normal, overweight, and obese participants, respectively. A negative correlation was identified between the consumption of vitamins and omega-3 and anxiety scores ($r = -0.63$, $P < 0.001$).

Conclusions: This study suggests that a higher intake of dietary B vitamins and omega-3 is associated with lower anxiety scores in Zahedan medical students.

Keywords: Anxiety, Diet, Mental Health, Obesity, Students

1. Background

The prevalence of mental health disorders has increased in recent years, posing a significant challenge to public health (1). Anxiety, one of the most common mental health disorders, is characterized by subjective feelings of tension, nervousness, worry, and the activation and discharge of the autonomic nervous system (2). Globally, the prevalence of anxiety disorders is estimated to be 7.3% (95% CI: 4.8 - 10.9%) (3). However, the prevalence of anxiety is notably higher among physicians. Physicians are particularly vulnerable to mental health disorders such as anxiety, depression, and occupational burnout due to high levels of occupational stress (4). A study in China reported 25.6% anxiety, 28.1% depression, and 19% comorbid anxiety and depression among physicians (5). Similarly, a study in Iran found 39.4% situational anxiety and 36.7% personality anxiety among physicians (6). Additionally, a high rate of anxiety was observed in physician residents under 30 years of age in Iran (7).

Anxiety disorders are frequently under-recognized and misdiagnosed. As a result, anxious individuals may not receive appropriate treatment, leading to reduced quality of life and social functioning (8). Research has indicated that healthy diets can play a significant role in the development, progression, and treatment of some mental health disorders. Polyunsaturated fatty acids, such as omega-3, are involved in the synthesis, release, reuptake, degradation, and binding of neurotransmitters, all of which can influence anxiety (9). Studies have reported a negative correlation between social anxiety disorder and erythrocyte membrane omega-3 levels (10). Vitamin B12 and folic acid also play critical roles in central nervous system development and health (11). Severe deficiencies in these vitamins have been associated with an increased risk of psychological disorders (12). Specifically, deficiencies in micronutrients such as B12 or folate are linked to a higher prevalence of depression (13).

Previous research has highlighted the correlation between anthropometric indices and depressive symptoms (14). Associations between obesity indices and psychological disorders have also been documented (15). While medical professionals provide care to the general public, they themselves require significant attention to their mental health. The prevalence of anxiety among physicians and physician residents can hinder their professional performance and negatively impact the quality of healthcare they deliver (16).

2. Objectives

Given this context, it was necessary to investigate the correlation between dietary intake and anthropometric indices with anxiety in female medical students. Thus, this study aimed to examine the relationship between dietary intake and anthropometric indices with anxiety in female medical students at Zahedan University of Medical Sciences (ZAUMS).

3. Methods

3.1. Study Design and Participants

This descriptive-analytical cross-sectional study was conducted in 2020. The study population included all female medical students at ZAUMS, Iran. A sample size of 202 students was calculated using the correlation estimation sample size formula (17), with a correlation coefficient (r) of -0.32 between omega-3 and anxiety (18), a significance level of 0.05, a power of 0.95, and a non-response rate of 0.40.

Since the students of interest were likely to have varying anxiety levels, stratified random sampling was employed during the data collection process. The academic years of the students were used as strata. Samples were then equally and randomly selected from each academic year based on a list provided by the Department of Educational Affairs.

It should be noted that despite follow-up efforts, two participants did not fully complete their questionnaires. Consequently, the data from 200 participants were analyzed.

3.2. Eligibility Criteria

The inclusion criteria for this study consisted of female medical students at ZAUMS who provided informed consent for participation. Students who were taking antidepressant drugs or dietary supplements, as well as those with a history of psychological or medical disorders, were excluded from the study.

3.3. Measurements

A validated self-administered questionnaire was used to collect data on demographic variables and population characteristics. Female medical students were also assessed for anthropometric indices, including waist-to-hip ratio (WHpR), waist-to-height ratio (WHtR), and Body Mass Index (BMI). Body Mass Index was calculated by dividing weight in kilograms (kg) by height in meters squared (m^2). Waist-to-height ratio was calculated as waist circumference (cm) divided by height (cm), and WHpR was calculated as waist circumference (cm) divided by hip circumference (cm). In this study, BMI classifications were defined as follows: Body Mass Index < 18.50 (underweight), $18.5 \leq$ BMI < 24.9 (normal), $25.00 \leq$ BMI < 29.9 (overweight), and BMI ≥ 30 (obese).

A Food Frequency Questionnaire (FFQ) was used to collect information on dietary intake over the past year. The 168-item FFQ, whose validity and reliability have been confirmed in previous studies (19, 20), was employed. Participants were asked to answer two questions regarding the frequency and quantity of food consumption, using a ten-option multiple-choice scale ranging from "never or less than once a month" to "10 or more times per day." Additionally, a photo book was used to enhance the precision and accuracy of portion size estimation. The information provided by participants through the FFQ was entered into specialized software, N4, which analyzed and provided detailed data on the nutrients and energy consumed by each subject.

Anxiety data were collected using the Bronze Anxiety Questionnaire, which comprises 33 questions scored on a 4-point Likert Scale, ranging from 0 ("never") to 3 ("very much"). The minimum possible score is 0, and the maximum is 99. Scores were categorized as follows: 0 - 33 (low anxiety intensity), 33 - 94 (moderate anxiety intensity), and above 94 (high anxiety intensity). The content validity (CVI = 0.90, CVR = 0.87) and reliability (Cronbach's alpha = 0.94) of the Bronze Anxiety Questionnaire were confirmed in a study by Salehi Morkani (21).

3.4. Ethical Considerations

Written informed consent was obtained from all participants. This study was approved by the Ethics Committee of ZAUMS (ethics code: IR.ZAUMS.REC.1398.102; project code: 2274).

3.5. Data Analysis

The normality of the data was assessed using the Kolmogorov-Smirnov test. Dietary intakes were calculated by multiplying the grams of food consumed by the nutrient content of the food and the frequency of consumption. The data were reported as mean ± SD and analyzed using SPSS software (version 23). Pearson's correlation was applied to evaluate the relationships between parameters, with a P-value < 0.05 considered statistically significant.

4. Results

Table 1 presents the demographic, anxiety, and anthropometric data of the participants. The mean age of the female students was 22.60 ± 2.10 years, with a BMI of 23.37 ± 4.01, WHpR of 0.81 ± 0.11, WHtR of 0.55 ± 0.10, and an anxiety score of 44.83 ± 17.71. The results indicated that 19% (n = 38) of participants were underweight, 44% (n = 88) were normal weight, 32.5% (n = 65) were overweight, and 4.5% (n = 9) were obese or very obese.

Table 2 summarizes the intake of B vitamins and omega-3 among participants. The results showed that participants consumed B1, B2, B3, B5, B12, and omega-3 in amounts higher than or within the recommended normal range. However, their intake of B6, B7, and B9 was below the recommended levels.

The findings revealed a positive correlation between BMI (R = 0.887, P = 0.0001), WHpR (R = 0.855, P = 0.0001), and WHtR (R = 0.898, P = 0.0001) with anxiety. The mean anxiety scores were 23.84 ± 4.36, 38.59 ± 4.62, 61.44 ± 13.63, and 74.44 ± 5.96 in underweight, normal, overweight, and obese participants, respectively. Additionally, a negative correlation was observed between vitamin intake and anxiety scores, as shown in Table 3.

5. Discussion

The results indicated that most students exhibited moderate to high levels of anxiety and had a normal BMI. These findings are consistent with those reported by Anderson et al., who evaluated the correlation between depression, anxiety disorders, and weight changes in a prospective community study, showing a positive relationship between overweight and anxiety (22). Similarly, Rivenes found that a high WHpR is associated with an increased prevalence of anxiety and depression (23), which aligns with the current study's findings.

A review article examining the correlation between anxiety and BMI reported an inverted U-shaped association between anxiety and weight status (24). However, in contrast to the present findings, another population-based study exploring anxiety disorder diagnoses and BMI across different age, sex, and racial groups found no correlation between anxiety and BMI (25). The discrepancy between this study and others may stem from differences in the studied populations. The current study focused exclusively on female students, whereas other studies included both genders.

The correlation between obesity and psychological disorders is thought to be influenced by leptin metabolites, which affect dopamine pathways (26). Furthermore, anxiety may closely correlate with social avoidance. Puhl and Heuer reported a strong association between obesity, overweight, and social discrimination, particularly among women (27).

The results revealed a negative correlation between B vitamins and anxiety. A similar negative relationship has been reported between mental disorders and cobalamin, pyridoxine, folate, and riboflavin (12). Consistent with the present findings, a study investigating the association between adolescent mental health and B vitamin consumption found that B vitamins were significantly related to a reduction in psychological disorders (28). Additionally, a study conducted among 636 British women demonstrated that low dietary intake of vitamin B12 was associated with higher psychological distress (29).

The efficacy of B vitamins and folate in alleviating anxiety symptoms can be attributed to their critical roles in central nervous system development (11). B vitamins are essential for brain development, maintenance, and functioning, with deficiencies linked to increased psychological disorders (12). Furthermore,

Table 1. The Results for Demographic, Anxiety and Anthropometric Indices

Variables	Mean ± SD	Minimum-Maximum
Age (y)	22.60 ± 2.10	18 - 29
BMI (kg/m ^{2})	23.37 ± 4.01	16 - 32.20
WHpR	0.81 ± 0.11	0.58 - 1.30
WHtR	0.55 ± 0.10	0.37 - 0.81
Anxiety (score)	44.83 ± 17.71	15 - 87

Abbreviations: BMI, Body Mass Index; WHpR, waist-to-hip ratio; WHtR, waist-to-height ratio.

Table 2. The Data for B Vitamins and Omega-3 Received by Participants

Vitamins	Mean ± SD	RDA (Recommended)
B1 (mg)	1.18 ± 0.68	1.10 - 1.20
B2 (mg)	1.17 ± 0.79	1.10 - 1.30
B3 (mg)	12.90 ± 6.29	14.00 - 16.00
B5 (mg)	4.16 ± 2.86	5.00
B6 (mg)	0.87 ± 0.50	1.30
B7 (mg)	22.86 ± 9.42	30.00
B9 (μg)	130.53 ± 75.52	400.00
B12 (μg)	3.47 ± 1.93	2.40
Omega-3 (g)	0.91 ± 0.55	1.10

Abbreviation: RDA, Recommended dietary allowances.

studies have shown that vitamins B6, B9, and B12 have protective effects against hyperhomocysteinemia, which is associated with mood disorders (30). Homocysteine can be converted to glutathione with the help of vitamin B6 and the enzyme cystathionine beta-synthase, contributing to antioxidant defense (31). Deficiencies in vitamin B12 and folate are also associated with poor responses to antidepressant medications in individuals with depression (32). Thus, B vitamins play significant roles in the antioxidant system, protect the nervous system, and influence medication efficacy. Moreover, vitamins B6, B9, and B12 are essential for proper methylation cycle functioning and the production of monoamine oxidase, which is involved in the synthesis of serotonin and other monoamine neurotransmitters (33). Impaired methylation function is associated with psychiatric disorders, including anxiety.

The findings regarding the correlation between omega-3 and anxiety align with those reported by Natacci et al., who highlighted the beneficial effects of omega-3 consumption in reducing anxiety (34). Other studies have also demonstrated a relationship between somatic anxiety and omega-3 deficiencies (35-37). Brain membranes are rich in omega-3 and its derivatives, and omega-3 deficiencies can lead to behavioral and neuropsychiatric disorders such as anxiety (38). Omega-3 fatty acids are involved in regulating several neurobiological processes, including neurotransmitter systems, neuroplasticity, and inflammation, which are all implicated in anxiety (39). Furthermore, polyunsaturated fatty acids like omega-3 play essential roles in the synthesis, release, reuptake, degradation, and binding of neurotransmitters (9), thereby influencing anxiety levels.

This study has several limitations, including potential errors in assessing food consumption and the lack of evaluation of various confounding factors, as some were unknown and, therefore, not controlled. Additionally, the study was conducted exclusively among female university students, which limits the generalizability of the findings to the broader population. Female university students may have higher nutritional literacy and greater attention to dietary intake compared to the general population, potentially influencing the results. Thus, these findings should be interpreted with caution. However, a notable strength of this study is that it is the first of its kind conducted at this university, providing valuable insights for policymakers to guide decision-making.

Table 3. The Correlation Between Receiving B Complex Vitamins and Omega-3 with Anxiety

Vitamins	R [a]	P-Value
B1 (mg)	-0.785	0.0001
B2 (mg)	-0.731	0.0001
B3 (mg)	-0.753	0.0001
B5 (mg)	-0.757	0.0001
B6 (mg)	-0.712	0.0001
B7 (mg)	-0.804	0.0001
B9 (µg)	-0.391	0.0001
B12 (µg)	-0.612	0.0001
Omega-3 (g)	-0.630	0.0001

[a] R shows correlation coefficient between receiving B complex vitamins and omega-3 with anxiety. Pearson's correlation was used.

5.1. Conclusions

In conclusion, the data analysis for this population suggests a negative correlation between dietary intake of omega-3 and B vitamins with anxiety among female medical students at ZAUMS. Nonetheless, further longitudinal studies are needed to better understand the relationship between B vitamins and omega-3 intake and anxiety. Additionally, future research should include male students to broaden the findings. This study did not evaluate serum concentrations of vitamins and omega-3, which could be an important area for investigation in subsequent studies.

Footnotes

Authors' Contribution: Study concept and design: S. Sh., and M. Sh.; analysis and interpretation of data: S. M. M. and A. P.; drafting of the manuscript: H. E.; critical revision of the manuscript for important intellectual content: H. E., M. Sh., and S. M. M.; statistical analysis: H. E., and A. P. All authors read and approved the final manuscript.

Conflict of Interests Statement: The authors declared no conflict of interests.

Data Availability: The dataset presented in the study is available on request from the corresponding author during submission or after publication. The data are not publicly available due to ethics.

Ethical Approval: This study is approved under the ethical approval code of IR.ZAUMS.REC.1398.102 .

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