Serotonin Values According to Nutritional Habits of University Students and Its Effect on Academic Achievement, Quality of Life

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Abstract

Objective: The study was planned to determine the effect of nutrition on serotonin and, consequently, the effect of different eating styles on students' academic achievement and quality of life. Method;The study was conducted with 155 students studying at Afyon Health Sciences University Faculty of Health Sciences, Nutrition and Dietetics, Physical Therapy and Rehabilitation, Nursing and Health Management departments. Blood samples and questionnaires taken from students were used in the study. Personal and nutritional status information form and World Health Organization Quality of Life Scale-Short Form (WHOQOL-BREF) were used in the questionnaire. Results; (31.6%) of the students participating in the research are students of the Department of Nutrition and Dietetics. BMI ($\bar{x} = 22.52$) of the students is between normal values. The grade point average of the female students participating in our study is 2.83, and the average of the male students is 2.62. The students' serotonin levels ($\bar{x} = 37.12$ ng/dl) were generally lower than the reference values. It was found that general stress level moderately affected academic achievement and general quality of life, and personality type moderately affected quality of life and general stress level (p<0.05). Accordingly, as the stress level of the students and consumption of fruits, vegetables and legumes increase, their academic success increases, but their quality of life decreases (p<0.05). In addition, it was determined that the quality of life of the students whose personality type was open to life, extrovert, and agreeable was stronger than those who were emotional (p<0.01). Conclusion; It was determined that students' diets affect serotonin levels and academic success. A continuous "Proper Nutrition Program" should be carried out in universities on the nutrition patterns and effects of university students, and thus both the educational success of the students should be supported, and their quality of life should be improved by improving their well-being.

INTRODUCTION

It is accepted that inadequate and unbalanced nutrition affects public health negatively and slows down social and economic development (Özmert, 2005; Odhiambo et. al., 2015; Türkmen ve Karaca Sivrikaya, 2020). With the beginning of the university period, the lifestyles of the students have changed and this has led to a change in the nutritional habits of the students. Changing nutritional behaviors can affect the mental and physical state of university students, as well as indirectly affect their academic success (Erten, 2006; Muslu, 2023).

Serotonin is mainly synthesized in the enterochromaffin cells in the intestinal mucosa, serotonergic nerve endings and pineal gland (Kuhn ve Lovenberg, 1983; Vanhoutte et.al., 1988). Although only 1% of the total serotonin in the body is found in the central nervous system, it plays a role in many important events such as blood pressure regulation, sleep, thermo-regulation, behavior, memory, eating and drinking. Some diseases are associated with pathological changes in serotonin metabolism. For example, measurement of serotonin is valuable in diagnosing carcinoid syndrome (Keller et. al., 1987).

Academic success has a significant impact on university students' future plans. University education plays a major role in guiding the future lives of individuals. For this reason, it is of great importance to know the factors affecting the success of students. Many factors affect the success of students. In order for students to be successful, they should not be adversely affected by these factors. In recent studies, different variables such as non-cognitive factors affecting students' academic success, the relationship between students' cognitive consistency and academic success, the effect of special talent exams on academic success, the relationship of nutrition, physical activity and sports with academic success have begun to be investigated. In this context, our study was planned to determine the effects of diet and serotonin levels on students' academic achievement and quality of life.

MATERIAL and METHOD

The universe of the study consists of all 3rd year students (206 students) in a state university, Faculty of Health Sciences, Nutrition and Dietetics, Physical Therapy and Rehabilitation, Nursing and Health Management departments. The study was completed with 155 students by excluding students who have any chronic disease, regularly use drugs, vitamins or minerals and do not want to participate in the study. In the study "G. Power-3.1.9.2" using the program, the sample size was calculated using the sample calculation method with a known universe at 95% confidence level. As a result of the analysis, the sample size was calculated as 155 with a theoretical power of 0.80 ($\alpha= 0.05$, $1-\beta= 0.80$).

The study is a cross-sectional study. Ethics committee approval was obtained for the study from Afyon Kocatepe University Faculty of Medicine Clinical Research Ethics Committee with the decision dated 04.08.2017 and numbered 2017/8-219. In the study, the principles of informed consent, autonomy, confidentiality and protection of confidentiality, fairness, non-harming/beneficialness were taken into consideration. Supported by Afyon Kocatepe University Scientific Research Projects Unit as Project No. 18.Kariyer.08.

Students who were eligible and volunteered for the study were informed about the study and their voluntary consent was obtained. Afterwards, the questionnaire forms were filled in and blood samples were taken in the morning while fasting. Blood samples were taken by a nurse in the nursing practice laboratory, in accordance with aseptic techniques.

Questions about nutritional status of students, socio-demographic, socio-economic, socio-cultural status (11 questions), questioning information about nutritional status (16 questions), general stress levels (1 question), questions about personality type (1 question) were reviewed by the researcher. (Erten, 2006; Dağ, 2013).

The questions of the World Health Organization Quality of Life Short Form (Whoqol Bref) (27 questions) scale (Fidaner ve ark. 1999; Aydemir ve Köroğlu, 2006; Eser ve ark., 1999) were applied. The academic success of the students was determined regarding their weighted Grade Point Average (GPA) scores obtained from Student Affairs Office. The data were analyzed using the SPSS statistics program. The significance level was taken as $p< 0.05$ for all statistical analyzes. Frequency and percentage calculations, one way analysis of variance (ANOVA) and Pearson correlation analysis were used to analyze the data.

World Health Organization Quality of Life Scale, short form (WHOQOL-BREF):

The validity and reliability of the Turkish version was shown by Eser et al. It contains 26 items, measuring general health (0-15 points), physiological health (9-35 points), psychological health (6-30 points), social relationships (3-15 points), and environmental health (16-40 points). Each sub-domain provides an independent measure of the quality of life, with a total score range of 49 to 120. Higher scores indicate a better quality of life. The reported alpha-coefficients for reliability for the above-listed subdomains in the Turkish version are 0.83, 0.66, 0.53, 0.73, and 0.73, respectively (Fidaner ve ark. 1999; Eser ve ark., 1999; Eser ve ark. 2010; Avcı ve Pala, 2014). In our study, alpha values were determined as 0.81, 0.67, 0.53, 0.75, respectively.

RESULTS and DISCUSSION

The students, 20.6% were Nursing, 17.4% Health Management formal education (FE), 14.2% Health Management evening education (EE), 16.1% Physical Therapy and Rehabilitation and 31,6% Nutrition and Dietetics, 73.5% were girls and 26.5% were boys.

The students, 59.4% stayed in the dormitory, 56.1% had a mother's education level of primary school or below, 40.0% had a father's education level at Secondary education and 44.5% of the students spent most of their lives in provincial centers determined. It is seen that 81.3% of the students do not sports regularly, 54.8% sleep 7-8 hours at night, 80% do not smoke and 84.5% do not drink alcohol, 85.2% did not follow a diet and 48.3% of them consumed a snack once a day (Table 1).

Table 1. Findings regarding the socio-demographic and nutritional characteristics of the students

Variables	Groups	f	%
Department	Nursing	32	20,6
	Formal Health Management (FE)	27	17,4
	Evening Health Management (EE)	22	14,2
	Physical Therapy Rehabilitation	25	16,1
	Nutrition and Dietetics	49	31,6
Gender	Female	114	73,5
	Male	41	26,5
Shelter	Family	15	9,7
	Country	92	59,4
	home with friends	48	31,0
Mother education	Elementary school or below	87	56,1
	secondary education	52	33,5
	High school education	16	10,3
Father education	Elementary school or below	51	32,9
	secondary education	62	40,0
	High school education	42	27,1
Where life takes place	city	69	44,5
	District	66	42,6
	Town- Village	20	12,9
Regular sport	No	126	81,3
	Yes	29	18,7
Night sleep	4 hours or less	14	9
	5-6 hours	53	34,2
	7-8 hours	85	54,8
	9 hours or more	3	1,9
Smoking	No	124	80
	Yes	31	20
Alcohol Use	No	131	84,5
	Yes	24	15,5
Diet in the past year	No	132	85,2
	Yes	23	14,8
Snack	None	29	18,7
	Once a day	75	48,3
	Twice a day	41	26,4
	Three times a day or more	10	6,4
Total		155	100

While the average GPA of the female students participating in our study is 2.83, the average age is 20.84, and the Body Mass Index (BMI) is 21.62, the average GPA of the male students is 2.62, the average age is 21.45, and the BMI is 23.43 (Table 2).

Table 2. Descriptive statistics on quantitative variables

Variables	FEMALE				MALE			
	Min.	Max.	Ort.	SS	Min.	Max.	Ort.	SS
GPA	2,12	3,65	2,83	0,35	1,89	3,40	2,62	0,31
Age	18,00	27,00	20,84	1,43	19,00	26,00	21,45	1,46
Size	152,00	177,00	163,30	5,12	164,00	190,00	176,95	5,46
Weight	42,00	95,00	57,68	9,71	58,00	110,00	73,35	10,77
BKI	15,79	35,32	21,62	3,47	18,79	33,95	23,43	3,25

It was determined that there was a statistically significant ($p<0.01$) difference between the students quality of life sub-dimensions. Accordingly, while the physical health dimension ($\bar{x}=3.59$) of the students is the highest, the mental health dimension ($\bar{x}=3.41$) is high, the social relations dimension ($\bar{x}=3.37$) is high, and the environmental health dimension ($\bar{x}=3.35$) is high found (Table 3).

Table 3. Findings Regarding the Sub-Dimensions of Students Quality of Life

WHO-SF Sub-Dimensions	$\bar{X}$	SS	F	P
Physical Health Dimension	3,59 a	0,56		
Mental Health Dimension	3,41 b	0,65		
Social Relations Dimension	3,37 b	0,76	9,608	0,000*
Environmental Health Dimension	3,35 b	0,43		
General	**3,43**	**0,48**		

*p<0,01

The students serotonin levels ($\bar{x}=37.12$ ng/dl) were determined to be low, and there was no statistically significant difference between serotonin levels and gender ($p>0.05$) (Table 4).

Table 4. Findings Regarding the Seratonin Values of the Students

Serotonin value	$\bar{X}$	SS	p	The reference range
Female	35,19	22,62		
Male	42,23	75,01	0,562	50-250 ng/dl
General	37,12	43,52		

When the correlation coefficients were examined, it was found that there was a moderately strong positive relationship between the general stress level and academic achievement. In other words, as the general stress level increases, academic achievement increases. A negative and moderate correlation was found between general quality of life and its sub-dimensions and general stress level.

This means that as the general quality of life and sub-dimensions scores increase, the general stress level will decrease moderately. Accordingly, those with good mental health have the least stress, followed by social relations, physical health and environmental health at least. As a result, it is revealed that as the general quality of life increases, the general stress level will decrease moderately. Apart from this, although there was a weak negative relationship between serotonin hormone, general stress level and academic achievement, no statistical significance was found ($p > 0.05$) (Table 5).

Table 5. Correlation coefficients for the relationships between General Stress Level, WHO-SF and Serotonin hormone

Variables	General Stress Level	GPA	Serotonin
General Stress Level	-	0,229[*]	-0,060
Physical Health Dimension	-0,326[*]	-0,017	0,045
Mental Health Dimension	-0,420[*]	-0,050	0,052
Social Relations Dimension	-0,350[*]	-0,151	0,020
Environmental Health Dimension	-0,296[*]	0,018	0,032
General WHO-SF	-0,445[*]	-0,078	0,045
GPA	0,229[*]	-	-0,012

[*]$p < 0,01$

A statistically significant relationship was found between personality type, quality of life and general stress level ($p < 0.01$). It was revealed that the students who stated that their personality type was open to life ($\bar{x} = 3.58$), extrovert ($\bar{x} = 3.52$) and agreeable ($\bar{x} = 3.50$) had a stronger positive quality of life than those who were emotional ($\bar{x} = 3.26$). In addition, it was found that the general stress levels of those with emotional ($\bar{x} = 6.80$) and extrovert ($\bar{x} = 6.43$) personality types were higher than those whose personality type was agreeable ($\bar{x} = 5.58$) and open to life ($\bar{x} = 4.71$) reached (Table 6).

Table 6. Correlation between General WHO-SF and General Stress Levels by Personality Types

Personality Types		General WHO-SF		General Stress Level	
	n	$\bar{X}$	SS	$\bar{X}$	SS
Extrovert	23	3,52 a	0,56	6,43 a	2,46
Agreeable	46	3,50 a	0,43	5,58 b	1,85
Emotional	57	3,26 b	0,40	6,80 a	1,94
Open to life	29	3,58 a	0,54	4,71 c	2,51
p		**0,009***		**0,000***	

[*]$p < 0,01$

It was found that there was a moderately strong positive relationship between the weekly consumption of fruits, vegetables and legumes and their academic achievement (p<0.05). In other words, as the consumption of fruits, vegetables and legumes increases, academic success increases. In addition, it is seen that there is a moderately strong positive relationship between yogurt consumption and general quality of life (p<0.05). Accordingly, as yogurt consumption increases, the overall quality of life also increases (Table 7).

Table 7. Serotonin values according to nutritional status and related factors correlation coefficients

Variables	GPA	General WHO-SF	General Stress Level	Serotonin
Daily water consumption	0,059	-0,78	0,229	-0,081
Other fluid consumption per day	-0,123	-0,101	0152	0,013
Weekly milk consumption (lt)	0,024	0,046	-0,052	-0,055
Weekly cheese consumption (slice)	0,080	0,059	0,006	-0,44
Weekly yogurt consumption (bowl)	0,077	**0,175***	0,014	-0,017
Weekly red meat consumption (portion)	0,149	0,020	-0,004	0,002
Weekly chicken consumption (portion)	-0,003	0,039	-0,001	-0,029
Weekly fish consumption (piece)	-0,005	0,144	0,043	-0,050
Weekly bread consumption (piece)	-0,073	0,075	-0,009	-0,006
Weekly cake consumption (portion)	-0,022	0,047	0,075	0,066
Weekly fruit consumption (portion)	**0,167***	0,133	-0,061	-0,006
Weekly vegetable consumption (portion)	**0,203***	0,037	-0,036	-0,005
Weekly legume consumption (portion)	**0,185***	0,000	-0,034	0,003
Weekly grain consumption (portion)	0,143	0,080	-0,034	-0,035

*p<0,05

According to the validity and reliability analysis results of the World Health Organization Quality of Life Scale-Short Form (WHO-SF), "Physical Health" (ability to carry out daily activities, dependence on drugs and treatment, vitality and fatigue, mobility, pain and discomfort, sleep) and rest, ability to work) sub-dimension of "Mental Health" (body image and appearance, negative emotions, self-esteem, positive emotions, spirituality/religion/personal beliefs and thinking/learning/memory/attention) sub-dimension, "Social Relationships" (relationships with other people, social support and sexual life) and "Environmental Health" (financial resources, physical safety and security, health services and social assistance, accessibility and quality, home environment, acquiring new knowledge and skills) opportunities, listening and leisure time opportunities and being able to participate in them were determined to be higher than the physical environment (pollution/noise/traffic/climate) and transportation sub-dimension.

When the correlation coefficients between the students general stress level, general quality of life and sub-dimensions and academic achievement were examined, it was found that there was a moderately strong positive relationship between the general stress level and academic achievement. In other words, as the general stress level increases, academic achievement increases. The results of Özgan ve ark. (2008) research analysis results of the study titled "Causes of stress perceived by education faculty students in the classroom and the effect of personal variables on stress show that there is a significant difference between the stress and achievement status of Education Faculty students [F(2-107)=3,80, p0.05]. According to the results of the test conducted to determine between which groups the differences among students are, students with a grade point average between 3.00 and 4.00 (X = 63.91) have a grade point average between 2.00 and 2.99 (X = 55,94) were found to be more stressed than students. Contrary to this finding of the study, in the study conducted by Çakmak and Hevedanlı (2005), no statistically significant difference was found between the anxiety levels of students according to their perception of their success. Students with a high grade point average tend to work harder and show a greater desire to be successful. These students may have a more stressful structure than other students because they want to be more successful in their lessons and therefore work harder. At the same time, this situation can make them more stressed, as they are in the desire and effort to maintain the state of success they have. When various definitions of stress are examined, it is seen that stress is mostly handled in a negative and harmful way. However, even if stress puts the individual in difficulties, jeopardizes his harmony, causes pain and anxiety, it also has a feature that takes the person forward, happiness and success when stress is coped with. Stress and possible difficulties in daily life can increase the level of burnout of the individual; high burnout can negatively affect the academic adjustment of the individual. In other words, it can be expected that higher burnout level is associated with lower academic achievement level (Belkıs ve ark. 2011). This finding supports Yang (2004)'s view that it is necessary to take measures to reduce burnout levels and stress at the same time in order to increase students' academic success and learning motivation. A negative and moderate correlation was found between general quality of life and its sub-dimensions and general stress level. This means that as the general quality of life and sub-dimensions scores increase, the general stress level will decrease moderately. Accordingly, those with good mental health have the least stress, followed by social relations, physical health and environmental health at least. As a result, it is revealed that as the general quality of life increases, the general stress level will decrease moderately. The quality of life of people can be affected by the stress they are exposed to in the work environment as well as their individual characteristics (Hoffman ve Scott, 2003; Bjørk et. al., 2007).

According to the correlation coefficients between the students quality of life and general stress levels according to their personality types, it was found that the students who stated that their personality type was open to life, extrovert, and agreeable had a stronger positive quality of life than those who were emotional. In addition, it was found that the general stress levels of those whose personality type is emotional and extroverted are higher than those whose personality type is agreeable and open to life. Literature data showing that there is a positive correlation between personality type and quality of life (Demirci ve ark., 2016; Bal ve Şahin, 2011) is consistent with the study result. When the correlation coefficients of the Serotonin values and the factors affecting the students according to their nutritional status are examined, the academic success of the students increases as the consumption of fruits, vegetables and legumes increases. The health and school success of students who are malnourished and unbalanced are negatively affected (Uçar ve Hasipek, 2008).

Similar to the results of the study, it was determined that as the risk related to eating habits of university students increased, their BMI increased and their academic achievement decreased (Aktaş, 2019; Carrillo-López, 2023). In addition, as yoghurt consumption increases, the overall quality of life also increases. There is no overlapping study on this subject. However, it is thought that the obtained findings can be a source in terms of literature knowledge.

Although studies on the positive effects of adequate, balanced and varied nutrition on health (Karadeniz ve ark. 2008; Hawkins ve Stewart, 2012; Mikolajczyk et. al. 2010; Türkmen ve Karaca Sivrikaya, 2020) support our findings, during the period when blood samples were collected, students were exposed to sunlight, season, fruits and vegetables included in the diet. It is thought that it may vary due to variables such as the type of vegetables.

CONCLUSION

As a result, students

- Serotonin levels are low and this negatively affects academic success,

- As the general stress level increases, academic success increases,

- As the general quality of life increases, the general stress level decreases

- People whose personality type is emotional and extrovert have higher general stress levels than those whose personality type is agreeable and open to experience,

- As the consumption of fruits, vegetables and legumes increases, academic success increases.

- Quality of life scores are high and as yoghurt consumption increases, the overall quality of life score increases.

has been seen.

In addition, a continuous "Proper Nutrition Program" should be carried out in universities on the nutrition patterns and effects of university students, thus supporting the educational success of students and improving their well-being and quality of life.

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