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Comparison of Frequency of Fruit and Vegetable Consumption and Intake of Vitamins and Minerals with Antioxidant Properties in Male and Female Individuals

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Abstract

Nutrition status reflects the level of meeting the individual's physiological need for nutrients. The consumption of vegetables and fruits is always emphasized in healthy dietary recommendations. These foods contain vitamins and phytonutrients, especially antioxidants This cross-sectional study was conducted among 300 men and women living in Central Anatolia, Turkey. The data including socio-economic status, dietary habits, frequency of food consumption, and food consumption records were collected by applying a questionnaire form. The "24-hour food consumption method" was used to determine the food consumption status. The daily antioxidant nutrients consumed were evaluated according to the recommended daily dietary intake (DRI). The intake of these compounds was calculated using the Phytonutrient Assessment Questionnaire. SPSS 22.0 program was used for statistical analysis of the data obtained. The proportion of individuals with adequate daily vitamin A intake was 40.7%, while the proportion of individuals with inadequate vitamin C and vitamin E intake was 43.7% and 55.3%, respectively. Phytonutrients intake was found to be low and negligible in all individuals. A significant difference was found in the intake of vitamins A and C and phytonutrients in individuals with daily fruit and vegetable consumption habits compared to individuals who never consumed fruit and vegetables ($p<0.05$). In conclusion, in this study, the frequency of fruit and vegetable consumption affects the level of antioxidant intake. Consumption of these foods at the recommended frequency is necessary for the intake of nutrients with antioxidant properties and phytonutrients.

Keywords: Food Frequency, Antioxidant, Phytonutrients, Vegetable, Furit.

Introduction

Epidemiological studies are essential for the assessment of risk factors for diseases. Imbalanced nutrient intake can be a complex and multidimensional risk factor largely determined by geographical location. However, it is recognized globally that malnutrition is an important risk factor for chronic diseases. This shows the importance of the detection and assessment of nutrition, especially for the prevention of chronic diseases [1].

It is known that chronic diseases are related to lifestyle choices. It has been determined that there is a mismatch between the nutritional requirements of the individual and unhealthy diets that contain more foods rich in carbohydrates and fats and fewer foods rich in pulp, vitamins, and minerals [2]. Fruits and vegetables are widely recommended by nutritionists, especially in developed countries, for health promotion, fruit and vegetable consumption is important for a healthy diet due to their vitamin, mineral, dietary fiber, and bioactive content. The World Health Organization recommends that adults consume at least 2 servings of fruit and 3 servings of vegetables daily [3].

More than 100 countries around the world are mandating dietary habits, nutritional status, food safety and security, and culinary cultures that increase fruit and vegetable consumption. Howev-

er, fruits and vegetables in harvested form vary widely in terms of the nutritional contribution, density, and dietary bioactive content of a standard serving [4]. Various national campaigns in various countries have reported significant and positive results in improving quality of life through increased consumption of fruits and vegetables [5].

Method

The study was conducted between March and May on a total of 300 individuals, 192 women, and 108 men, living in the Central Anatolia region of Turkey, who agreed to participate in the study. The socio-economic status, personal characteristics, dietary habits, food consumption frequency of the individuals participating in the study, and the Phytonutrient Assessment Questionnaire [6, 7].

Were questioned and analyzed. The SPSS22 package program was used for statistical evaluation of the data. In the statistical evaluation of parametric data, standard t-test one-way analysis of variance and Mann-Whitney -U test were performed for non-parametric data. Linear correlations between quantitative variables with normal distribution were analyzed with Peason's correlation coefficient, and data without normal distribution were analyzed with Spearman's correlation coefficient. The significance value was taken as $p<0.05$.

Results

The mean age of the individuals participating in the study was 27.6±10.7 years for women and 30.9±13.5 years for men. The education levels of female individuals were determined as 2.6% primary school, 5.2% secondary school, 14.6% high school, 76.0% undergraduate, and 1.6% postgraduate, whereas in males 4.6% secondary school, 31.5% high school, 60.2% undergraduate and 3.7% postgraduate. In terms of occupation, 54.8% of women and 51.9% of men stated that they were students. Among women, 22.4% were housewives and 10.9% worked in the health sector, while the rate of men working in the health sector was 5.6%. 10.9% and 20.7% of women and men, respectively, stated that they were self-employed. While the rate of women working as civil servants was 1.0%, this rate was 4.6% for men (Table 1)

Table 1: Demographic Characteristics of İndividuals

Education level, Occupation	Female (n= 192)	Male (n=108)	Total (n=300)
Elementary school	2,6		1,7
Middle school	5,2	4,6	5,0
High school	14,6	31,5	20,7
Bachelor	76,0	60,2	70,3
Master's degree	1,6	3,7	2,3
Job			
Student	54,8	51,9	53,7
Housewife	22,4	-	14,3
Health worker	10,9	5,6	9,0
Freelance	3,1	30,5	13,0
Officer	1,0	4,6	2,3
Other	7,8	7,4	7,7

When the intake levels of vitamins A, C, and E were evaluated according to DRI recommendations, 22.9% of women, 45.8% of women, 45.8% of women and 57.3% of men had inadequate intake of vitamin A, 40.7% of women had inadequate intake of vitamin C and 51.8% of men had inadequate intake of vitamin E. Vitamin A, C and E intake levels of individuals according to DRI are shown in Table 2. When the phytonutrient intake levels of the individuals were examined, it was seen that 94.3% of the sample had low phytonutrient intake levels and there was no significant difference based on gender. The phytonutrient intake levels of individuals are shown in Table 2.

Table 2: Distribution of vitamins A, C, and E according to DRI and phytonutrient intake levels according to phytonutrient assessment question-intake scale

	Insufficient (< % 67)	Sufficient (% 67 -133)	More (> %133)
Vitamin A Women Men Total	44 (22,9) 24 (22,2) 68 (22,7)	71 (37,0) 51 (47,2) 122 (40,7)	77 (40,1) 33 (30,6) 110 (36,7)
Vitamin C Women Men Total	87 (45,8) 44 (40,7) 131 (43,7)	54 (28,1) 44 (40,7) 84 (28,0)	51 (26,6) 34 (32,7) 85 (28,3)
E vitamin Women Men Total	110 (57,3) 56 (51,8) 166 (55,3)	61 (31,8) 41 (38,0) 102 (34,0)	21 (10,9) 11 (10,2) 32 (10,7)

Phytonutrient Intake Levels of Individuals - According to Phytonutrient Assessment Questions - Scale				
	Negligible (0-19)	Low (20-39)	Temperate (59-40)	High (60-70)
Women	11 (5,7)	181 (94,3)	-	-
Men	6 (5,6)	102 (94,4)		
Total	17 (5.7)	283 (94,3)		

When the nutritional status of the individuals who participated in the study was evaluated, statistics on daily vitamin A intake according to the frequency of vegetable and fruit consumption are given in Table 2. When individuals were compared in terms of vitamin A intake level, a significant relationship was found between individuals who consumed green leafy and other vegetables every day and those who did not consume any vegetables ($p<0.05$). When those who consumed fresh fruit every day were compared with those who consumed fruit once a month, the difference was not statistically significant ($p>0.05$), whereas the difference between those who consumed fresh fruit at other frequencies was significant ($p<0.05$). In terms of carotene, there was no significant difference between those who consumed fruit every day and those who consumed fruit once a month ($p>0.05$), while there was a significant difference between those who consumed fruit with other frequencies ($p<0.05$) (Table 3).

Table 3: Relationship between Vegetable and Fruit Consumption and Vitamin A Intake

Green leafy vegetables	**Vitamin A (µg/day)**					
	Mean	**Min**	**Max**	**F*/r**	**t*/z**	**p**
Every day n:34	758,2± 79,5	99.60	1923,9	-0,04	-0,24	0,81
Per week 3-5 n:79	765,7± 48,9	125,6	2316,4	-0,06	-0,72	0,47
Per week 1-3 n:113	795,4± 37,8	161,1	1923,9	-0,05	-0,39	0,69
In 15 days n: 46	716,4± 61,4	126,9	2056,1	7,56*	0,93*	0,24
Monthly n:16	644,4± 55,9	236,3	972,4	5,07*	1.59*	0,03
None n:12	533,9± 67,4	258,2	963,9			
Other vegetables						
Every day n:16	792,2± 100,6	347,9	1609,9	-0,04	-0,38	0,70
Per week 3-5 n:61	788,6± 63,9	99,6	2316,4	-0,00	-0,07	0,94
Per week 1-3 n:131	781,1± 33,5	194,8	1923,8	-0,06	-0,45	0,65
In 15 days n: 48	729,5± 58,9	126,9	1844,5	-0,11*	-0,56*	0,57
Monthly n:28	707,5± 64,9	320,1	1903,1	2.69*	2,43*	0,02
None n:16	493,0± 70,4	105,6	1133,8			
Fruits						
Every day n:107	853,9±41,2	99,6	1903,1	-0,20	-2,13	0,03
Per week 3-5 n:109	738,4± 39,7	126,9	2316,4	-0,28	-3,00	0,03
Per week 1-3 n:51	648,8± 50,4	126,6	2316,4	-0,43	-1,89	0,05
n:19	660,5± 73,6	125,6	2056,1	0,20*	1,03*	0,31
Monthly n:10	710,7± 121,8	251,3	1598,2	6,83*	2,57*	0,00
None n:4	305,2± 27,4	236,3	1299,0			
Dried Fruits						
Every day n:40	745,9± 69,4	99,6	1814,5	-0,03	-0,24	0,81
Per week 3-5 n:64	718,2± 54,0	105,6	2316,4	-0,12	-1,00	0,32
Per week 1-3 n:64	822,1± 53,1	161,1	1923,9	-0,02	-0,19	0,85
In 15 day n:61	723,8± 43,5	126,9	1461,5	-0,04	-0,31	0,76
Monthly n:40	748,1± 64,2	230,1	1903,1	-0.00	-0,04	0,97
None n:29	751,3± 82,9	125,6	1622,5			
Green leafy vegetables	Karon					
Every day n:34	2,85±0,51	0,28	11,2	- 0,03	-0,34	0,73
Per week 3-5 n:79	2,41±0,28	0,16	13,6	-0,04	-0,36	0,72
Per week 1-3 n:113	2,68±0,39	0,13	33,4	-0,17	-1,21	0,22
In 15 day n:46	2,52± 0,78	0,08	35,7	-0,21	-0,87	0,38
Monthly n:16	1,74± 0,37	0,13	4,4	-0,38	-1,35	0,18
None n:12	1,36± 0,31	0,35	4,1			
Other vegetables						

Every day n:16	2,61±0,72	0,40	10,9	-0,01	-0,14	0,88
Per week 3-5 n:61	2,39± 0,30	0,16	10,9	- 0,02	-0,25	0,80
Per week 1-3 n:131	2,99± 0,43	0,13	35,7	-0,04	-0,30	0,76
In 15 day n:48	1,97± 0,25	0,08	9,0	-0,19	-1,02	0,31
Monthly n:28	1,86± 0,37	0,13	7,8	-0,24	-0,98	0,31
None n:16	1,53± 0,40	0,50	6,5			
Fruits						
Everyday n:107	3,26± 0,44	0,28	34,74	-0,26	-2,78	0,00
Per week 3-5 n:109	2,03± 0,20	0,08	12,04	-0,43	-3,12	0,00
Per week 1-3 n:51	2,40± 0,68	0,18	33,41	-0,38	-1,69	0,09
In 15 day n:19	1,76± 0,37	0,13	6,42	-0,27	-0,86	0,39
Monthly n:10	2,05± 0,53	0,13	4,33	-1,20	-2,40	0,02
None n:4	0,68±0,08	0,50	0,85			
Dried Fruits						
Everyday n:40	3,08± 0,67	0,19	24,06	-0,12	-1,02	0,31
Per week 3-5 n:64	2,07± 0,29	0,16	11,51	-0,01	-0,11	0,91
Per week 1-3 n:64	3,34± 0,77	0,33	35,74	-0,08	-0,67	0,50
In 15 day n: 61	1,99± 0,22	0,08	10,86	-0,10	-0,64	0,52
Monthly n:40	2,15± 0,32	0.13	7,9	-0,05	-0,31	0,71
None n:29	2,42± 0,47	0,18	11,2			

Mann- Whitney test, T-test *

Vitamin E intake of individuals was not associated with the frequency of consumption of green leafy vegetables, fresh fruits, and dried fruits. However, when the frequency of consumption of other vegetables was analyzed, vitamin E intake was found to be 9.30±0.95 mg/day in those who consumed vegetables in this group every day and 5.86±1.1 mg/day in those who never consumed these vegetables and the difference between them was found to be significant ($p<0.05$) (Table 4).

Table 4: Relationship between Vegetable and Fruit Consumption and Vitamin E Intake

Green leafy vegetables	Vitamin E (mg/day)					
	Mean	Min	Max	F*/r	t*/z	p
Everyday n:34	8,64± 0,95	2,34	28,96	-0,09	-0,88	0,37
Per week 3-5 n:79	8,03± 0,61	1,45	31,63	-0,07	-0,83	0,40
Per week 1-3 n:113	9,26± 0,51	1,14	36,53	-0,08	-0,56	0,57
In 15 day n:46	10,40± 0,2	2,17	39,39	-0,15	-0,62	0,95
Monthly n:16	9,31± 1,7	2,23	30,85	-0,32	-1,13	0,31
None n:12	7,02± 1,1	2,65	15,93			
Other vegetables						
Everyday n:16	9,30± 1,2	4,09	22,06	-0,17	-1,33	0,18
Per week 3-5 n:61	8,11± 0,7	1,45	28,96	-0,05	-0,64	0,52
Per week 1-3 n:131	8,97± 0,5	1,14	36,53	-0,05	-0,41	0,67
In 15 day n:48	11,12± 1,1	1,23	39,39	-0,17	-0,93	0,34
Monthly n:28	8,53± 1,1	2,23	30,85	-0,00	0,01	0,01
None n:16	5,86± 0,9	1,88	15,9			
Fruits						
Every day n:107	9.74± 0,6	1,86	32,12	0,14	-1,43	0,15
Per week 3-5 n:109	8,51± 0,5	1,62	39,39	-0,14	-0,56	0,57
Per week 1-3 n:51	8,70± 0,7	1,14	24,27	2,74*	1,07*	0,28
n:19	8,05± 0,9	1,23	14,71	0,23*	0,84*	0,93
Monthly n:10	9,55± 1,6	4,08	18,52	0,77	-1,558	0,11
None n:4	5,85± 2,3	2,65	12,81			
Dried Fruits						

Every day n:40	8,29± 0,9	1,86	28,96	-0,07	- 0,76	0,44
Per week 3-5 n:64	9,01± 0,8	1,80	39,39	-0,15	-1,20	0,22
Per week 1-3 n:64	9,61± 0,8	2,10	36,53	-0,22	-1,72	0,08
In 15 day n:61	9,13± 0,5	1,14	22,37	-0,11	-0,35	0,72
Monthly n:40	7,96± 0,7	1,23	23,17	-0,18	-0,99	0,31
None n:29	9,24± 1,1	2,23	30,85			

Mann- Whitney test, T-test *

When the vitamin C intake levels of the individuals were analyzed, it was observed that the consumption habits of green leafy vegetables and fresh fruits were associated with vitamin C intake levels. However, no relationship was found between the consumption of other vegetables and dried fruits and vitamin C intake levels (Table 5).

Table 5: Relationship between Vegetable and Fruit Consumption and Vitamin C Intake

Green leafy vegetables	**Vitamin A (µg/day)**					
Her gün n:34 Haftada 3-5 n:79 Haftada 1-3 n:113 15 günde bir n:46 Ayda bir n:16 Hiç n:12	**Mean**	**Min**	**Max**	**F*/r**	**t*/z**	**p**
Everyday n:34	70,70±7,11	3,34	155,51	-0,07	-0,64	0,52
Per week 3-5 n:34	80,72±7,6	2,23	316,70	-0,00	-0,04	0,96
Per week 1-3 n:79	73,32±4,9	2,00	290,04	-0,13	-0,896	0,37
In 15 day n:46	73,35±7,7	1,30	223,02	14,36*	-0,79*	0,42
Monthly n:16	62,62±15,6	6,44	203,26	0,64	2,23	0,00
None n:12	43,11±4i4	13,45	64,20			
Other vegetables						
Fruits						
Everyday n:16	67,78± 9,8	24,83	155,51	-0,05	-0,41	0,67
Per week 3-5 n:61	83,11± 8,7	2,23	316,70	-0,00	-0,05	0,95
Per week 1-3 n:131	69,05±4,1	2,00	290,04	-0,09	-0,65	0,52
In 15 day n:4	82,82±8,2	1,30	227,18	-0,20	-1,09	0,27
Monthly n:28	68,76±12,6	6,22	237,72	- 0,31	-1,24	0,21
None n:16	53,76±11,6	12,65	188,30			
Fruit						
Everyday n:107	80,47± 4,9	2,42	249,98	-0,18	-1,93	0,05
Per week 3-5 n:109	81,89± 5,6	1,30	316,7	-0,36	-2,64	0,00
Per week 1-3 n:51	64,99± 8,5	2,00	235,7	-0,16	-0,71	0,47
In 15 day n:19	69,36± 10,1	4,82	166,11	-0,17	-0,56	0,57
Monthly n:10	74,83± 19,5	6,93	203,26	-1,11	-2,23	0,02
None n:4	33,24± 4,3	26,35	45,38			
Dried fruits						
Everyday n:40	70,63± 8,4	4,13	290,04	-0,08	-0,64	0,52
Per week 3-5 n:64	78,79± 7,5	1,35	316,70	-0,00	-0,04	0,96
Per week 1-3 n:64	72,91± 6,9	3,35	262,19	-0,01	-0,08	0,37
In 15 day n:61	78,20± 7,2	1,30	249,98	-0,12	-0,79	0,42
Monthly n:40	64,38± 8,6	6,20	237,72	-0,09	-0,52	0,59
none n:40	65,08± 9,7	13,50	235,77			

Mann- Whitney test, T-test *

When individuals with daily green leafy vegetable consumption habits and individuals with other green leafy vegetable consumption habits were compared in terms of phytonutrient intake, the difference between them was found to be significant (Table 6). While there was no significant difference between those who consumed other vegetables every day and those who consumed them 3-5 times a week ($p>0.05$), a significant difference was found between those who consumed them every day and other frequencies ($p< 0.05$). There was no significant difference in phytonutrient intake between individuals who consumed fresh fruit every day and those who never consumed fruit ($p>0.05$). In terms of phytonutrient intake, no significant difference was found between individuals who never consume dried fruit or consume dried fruit once a month and individuals with daily consumption habits ($p>0.05$).

Discussion and Conclusion

The World Health Organization (WHO) emphasizes the impor-

tance of consuming sufficient amounts of fruits and vegetables. It has been reported that there is a relationship between increased consumption of fruits and vegetables and the prevention or delay of chronic diseases. Fruits and vegetables have been given great importance as the main sources of dietary antioxidants such as vitamins A and C [8]. At the same time, fruits and vegetables are known to make a special and important contribution to human health as a source of nutraceuticals. Nutraceuticals are substances found as a natural component of foods or other digestible substances. These compounds, which have been identified as having a positive role in the prevention or treatment of diseases, help to improve physiological performance, maintain health, treat disease, and reduce the risk of disease. These compounds often have additional advantages such as beneficial antioxidants, natural colorants (e.g. carotenoids), minerals, and vitamins [8, 9]. Significant differences have been reported between Americans' average fruit and vegetable consumption and the amount recommended in the 2010 Dietary Guidelines for Americans. Fruits in their various forms, vegetables, whole grains, and other plant foods provide a variety of nutrients and different bioactive compounds, including phytochemicals, vitamins, minerals, and fiber. Potatoes are known to provide 25% of the plant phenolics in the American diet. [10].

However, in our study, the main sources of phytonutrient intake in the diet were fruits, dried fruits, and green leafy vegetables; this may be because food culture and food consumption habits are different in different countries and people.

According to a study conducted on adults and the elderly in Brazil, it was reported that the average fruit and vegetable consumption was adequate but the necessary variety was not provided (5.4 servings/day) [11]. According to the results of a study conducted in Brazil with individuals over 60 years of age, the prevalence of consumption of the recommended amount of fruits and vegetables was found to be 12.9%. This consumption was found to be associated with gender (40% higher in women on average), age group (80 years or older), and educational level [12]. In another study, it was observed that the prevalence of natural fruit juice consumption among students living in rural areas was higher than among those living in urban areas, and daily soft drink consumption was higher among those living in urban areas than those living in rural areas [13].

Inadequate fruit and vegetable consumption among adolescents in Arab countries has attracted attention and it has been emphasized that the risk of non-communicable diseases and the prevalence of malnutrition have increased [14].

In this study, which aimed to examine the effect of the frequency of consumption of vegetables and fruits on the intake of vitamins with antioxidant properties, 300 people (192 women and 108 men) were included. The mean age was 27.6± 10.7 years for women and 30.9± 13.5 years for men. The most preferred snack foods of the participants were prepackaged snacks (biscuits, crisps, chocolate, etc.) with 48.4% of women and 39.8% of men. The preference for fruits and vegetables in snacks was 35.4% and 0.5% for women and 38.0% and 0.0% for men, respectively (Table 2). This situation is thought to be related to the employment and education status of individuals.

A study from the United States reported that blacks and Hispanics had lower vitamin A intakes than whites. Dietary intake levels in blacks (503.0 µg retinol activity equivalent) and whites (610.5 µg retinol activity equivalent) remained stable compared to 2003, while Hispanics (509.6 µg retinol activity equivalent) showed an increase. The difference in dietary vitamin A intake suggests that access to fresh fruits, vegetables, fish, and dairy products may be limited in black and Hispanic communities [15].

According to a study conducted in China, the average daily dietary vitamin A intake of adults was 480.9 µg retinol equivalent or 307.2 µg retinol activity equivalent. Carotene and retinol intakes were reported to be 2084.7 µg/day and 133.5 µg/day, respectively. About 87% of adults consumed less vitamin A than the Chinese Estimated Average Requirement (EAR), while only 6% of adults consumed more than the Chinese Recommended Dietary Allowance (RNI). Chinese adults get vitamin A from plant-derived foods, mostly supplied as carotene (67.4% RE or 56.4% RAE) [16]. According to a study, vitamin A intake of American individuals with diabetes was found to be 688 µg/day retinol equivalent, vitamin C intake 80.6 mg/day, and vitamin E intake 7.8 mg/day [17].

In our study, according to the DRI, 40.1% of women had excessive intake of vitamin A, 47.2% of men had adequate intake, 45.7% of women and 40.7% of men had inadequate intake of vitamin C. When the intake levels of vitamins A, C, and E were evaluated according to DRI recommendations, 22.9% of women, 54% of women, 57.3% of men, and 22.2%, 40.7% and 51.8% of men, respectively, had inadequate intakes of vitamin A, vitamin C and vitamin E. It was found that 37.0%, 28.1%, and 31.8% of women and 47.2%, 27.8% and 38.0% of men took vitamins A, C and E in sufficient amounts, respectively. The rate of excessive intake of these vitamins was 40.1%, 26.6%, and 10.9% in women and 30.6%, 32.7% and 10.2% in men, respectively (Table 3).

The mean vitamin A intake was found to be 758.2±79.5 µg/day in individuals who reported daily green leafy vegetable consumption habits and 533.9±67.4 µg/day in individuals who never consumed green leafy vegetables. When these two groups were compared with each other, the difference between them was found to be significant ($p<0.05$).

According to the consumption of other vegetables, vitamin A intake was determined as 792.2±100.6 µg/day and 493.0±70.4 µg/day in those who consumed every day and never consumed, respectively, and the statistical difference between them was found to be significant ($p<0.05$).

When the frequency of fruit consumption was analyzed, it was found that vitamin A intake was 852.9±41.2 µg/day in those who consumed every day, 738.4±39.7 µg/day in those who consumed 3-5 times a week, 648.8±50.4 µg/day in those who consumed 1-3 times a week, 660.5±73.6 µg/day in those who consumed every 15 days and 305.2±27.4 µg/day in those who never consumed and the difference between them was found to be significant ($p<0.05$).

When the dried fruit consumption frequency groups were analyzed, no significant difference was found between the vitamin

A intake groups (p>0.05). For carotene intake, no significant difference was found between the consumption frequencies of green leafy vegetables, other vegetables, and dried fruits (p>0.05). There was a significant difference in carotene intake between individuals who consumed fruit 3-5 times a week and 1-3 times a week and those who never consumed fruit and those who consumed fruit every day (p<0.05).

Epidemiological evidence suggests that even in industrialized countries, the prevalence of vitamin C deficiency is 5% and the prevalence of suboptimal status is 13% [18]. According to NHANES data, 1284 of 5145 individuals aged 30 years and older received 0.00-21.70 mg/day, 1283 received 21.80-54.50 mg/day, 1290 received 54.60-113.00 mg/day, and 1288 received 113.10-964.70 mg/day of vitamin C [19].

In a randomized clinical trial, participants with a reported low intake of fruit, fruit juice and vegetables (less than 3 servings per day) were randomized to consume their usual diet or a diet supplemented with an additional 480 g of fruit/vegetables and 300 ml of fruit juice daily for 12 weeks. Plasma vitamin C (35%), folate (15%), and carotenoid levels [α-carotene (50%) and β-carotene (70%) and lutein/zeaxanthin (70%)] were significantly increased in the intervention group compared to the control [20]. When the amount of vitamin C consumption was analyzed, it was calculated as 70.70±7.11 in individuals who consumed green leafy vegetables every day and 43.11±4.4 in individuals who never consumed them, and the difference between them was found to be significant (p<0.05).

When analyzed according to the frequency of fruit consumption, vitamin C intake was found to be 853.9±41.2 mg in individuals with daily consumption habits, 738.4±39.7 mg in those who said they consumed 3-5 times a week, 648.8± 50.4, mg in those who said they consumed 1-3 times a week and 305.2± 27.4 mg in individuals who never consumed and the difference between these groups was found to be significant (p<0.05).

There was no significant relationship between the consumption frequencies of other vegetables and dried fruits in both groups (p<0.05).

When the frequency of fresh fruit consumption was examined, vitamin C intake was calculated as 3.26±0.44 in the group who reported daily fruit consumption habits, 2.03± 0.20 3-5 times a week, 2.40± 0.68 1-3 times a week and 0.68±0.08 in those who never consumed fresh fruit, and the difference between them was found to be significant when compared with the group who reported daily consumption habits (p<0.05).

According to a study conducted with 3704 Latin American women aged between 15 and 49 years and living in urban areas, it was shown that the average vitamin E intake was low (7.9 mg/day tocopherol activity), but vitamin C consumption (95.5 mg/day) was found to be sufficient [21]. According to the data obtained using the food consumption frequency method, vitamin E intake of adult individuals was found to be 11.3 mg/day, and only 40-57% of the participants were found to have adequate vitamin E intake [22].
When the consumption frequency groups of green leafy vegetables, fresh fruits, and dried fruits were compared in terms of vitamin E, no statistically significant difference was found between the individuals who stated their consumption habits every day and those who stated their consumption habits at other frequencies (p>0.05). When the frequency of consumption of other vegetables was analyzed, the amount of vitamin E intake was found to be 9.30±0.95 in those who consumed every day and 5.86±1.1 in those who never consumed, and the difference between them was found to be significant (p<0.05). When the groups who consumed fresh fruits and dried fruits every day were compared with the groups who said that they consumed fresh fruits and dried fruits at other frequencies, the difference between them in terms of vitamin E intake was not significant.

According to a study conducted in the USA, the intake of all phytochemicals except ellagic acid was found to be significantly higher in adults whose fruit and vegetable consumption was in accordance with national recommendations compared to those who did not meet the recommendations [23]. According to a study conducted in Taiwan, phytonutrient intake levels were found to be higher in those who met the national fruit and vegetable intake criteria compared to those who did not [24]. A study in Korea found that 5.3% of subjects met the recommended intake of fruits and vegetables. In particular, adolescents (aged 13 to 18 years) and young adults (aged 19 to 39 years) were less likely than other age groups to meet the recommended fruit and vegetable intake. Intakes of the major carotenoids (alpha-carotene, beta-carotene, beta-carotene, beta-cryptoxanthin, lutein/zeaxanthin and lycopene), flavonoids (anthocyanidins, hesperitin, quercetin, catechin and isoflavones) and gallic acid were significantly higher in those who met the recommendations for fruit and vegetable consumption [25].

In our study, consumption of vegetables 3-5 times or more per week significantly increased phytonutrient intake. However, no relationship was found between the frequency of fresh fruit consumption and phytonutrient intake. This may be due to the fact that the main phytonutrient intake of the individuals was dried fruits and they had a higher intake of phytonutrients from dried fruits rather than vegetables. In addition, the entire population had low and negligible phytonutrient intakes. This may be due to the population's consumption of fruits and vegetables at a level that does not meet the recommendations. In addition, it is thought that the population may have a diet poor in other phytonutrient sources such as legumes and fruit and vegetable juice.

The result is that, the frequency and amount of fruit and vegetable consumption of the individual positively affects the level of antioxidant intake. Antioxidants should be taken to protect against many diseases and to maintain a healthy life.

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