

# Effect of social network use and advertising on anthropometric status and dietary intake

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**Abstract.** *Objective:* The aim of this study was to examine the effects of social media use and advertisements on anthropometric status and nutrition in adults. In this randomized and cross-sectional study, 9918 adults aged between 18 and 65 years in 30 cities of Turkey were included. *Method:* Within the scope of the research, a questionnaire consisting of 40 questions in 4 sections was applied to the participants. The questions asked included socio-demographic information, anthropometric measurements, reliance on information about nutrition in social media and advertisements, changes in eating habits caused by social media and advertisements, information about nutrition, and 24-hour food consumption frequency. *Results:* Based on the findings of the study, internet and television are used more frequently to find out about nutrition than other mass media and social media platforms, and Instagram is the most popular social media platform to this end. People who use Instagram, books, and Pinterest have been found to have lower body weight, BMI, and carbohydrate, fat, and cholesterol intake. People who use Instagram, books, and Pinterest have been found to have lower body weight, BMI, and carbohydrate, fat, and cholesterol intake. While eating unhealthy foods upon being persuaded by marketing has a detrimental impact on body composition and health, learning about healthy nutrition from social media has been found to have a favorable impact. It has been observed that individuals who modified their eating habits after being persuaded by media coverage of nutrition issues had considerably lower weights, BMIs, and energy, protein, fat, and cholesterol intakes, while having higher fiber intake. It has been revealed that celebrities in commercials or social media advertising have no bearing on consumer decisions to buy products. Instead, consumers pay attention to cited sources in social media posts that discuss nutrition-related topics and seek out dietary advice from dietitians. *Conclusion:* It has been determined that social media and advertisements, fast and effective means of obtaining information, affect eating habits, purchasing behaviors, body compositions and health status of individuals. Hence, only dietitians should share on nutrition through social media and advertisements bearing ethical rules in mind and necessary inspections should be carried out by relevant institutions.

**Key words:** internet, nutrition, social media, advertisements, body composition

## Introduction

Today, as a result of the changes regarding consumption, individuals use not only traditional printed and visual tools, but also the internet and mobile communication tools for foods and nutrition. Internet,

and thus social media and advertisements, can be accessed through many devices, especially computers, tablets and smart phones (1). Around 3.8 billion people in the world use social media, and it is reported that 55 million people use social media in Turkey (2). Food, nutrition and health topics are among the most

common topics shown interest on social media. Social media can serve as a venue for the dissemination of nutrition-related campaigns and treatments that promote health as well as for increasing exposure to evidence-based health messaging (3). Facebook, Twitter, Instagram, Snapchat, LinkedIn, Reddit, blogs, message boards and other online communities where individuals interact with others by creating content can be mentioned as leading social media platforms (4). Accessing information on nutrition and health through these platforms is both advantageous and disadvantageous in terms of the accuracy and reliability of the information found on such platforms. Social media is also used for increasing food choices, accessing recipes, exhibiting foods cooked or consumed by adults and also creating confusion among adults whilst making the right food choices (5). The types of food purchased under the influence of social media and advertisements vary by age and gender. This difference is based on four factors: eating habits, health awareness, eating behavior and weight control (6). The energy content of foods and drinks purchased under the influence of social media and advertisements is intense, while their nutrient content is insufficient, and these foods and drinks are associated with obesity and are changeable risk factor for non-infectious diseases (7).

Individuals are often unaware that they are being influenced to purchase unhealthy food (energy-dense, nutrient-poor food and drink). It is worrisome that these advertisements cause individuals to fail to recognize how these foods and drinks may affect their dietary decisions (8,9). A major issue for public health and young people's diets is the persuading internet marketing of unhealthy food goods to adults by the manufacturers (10). For this reason, governments bring regulations to reduce the influence of hazardous marketing (11-13).

It is claimed that social media and advertisements increase emotional eating behavior, consumption of high-energy foods and beverages, and decrease the consumption of vegetables and fruits (14,15). Accordingly, weight, BMI and waist/hip measurement is increasing (16,17). In light of this information, studies looking into how social media and advertisements affect people's eating habits and how they influence body composition are advised (18).

Bearing these in mind, this study was carried out in order to examine the impact of social media usage and advertising on anthropometric measurements, nutritional status, and dietary intake in adults aged between 18 and 65 in various provinces of Turkey.

## Material-methods

### *Study design and participants*

The research was a randomized and cross-sectional study. It was conducted on 9918 adult Turkish citizens between the ages of 18 and 65 in 30 cities between June 2018 and November 2019 (a period of 17 months). The stratification approach was used to calculate the sample size based on the population distribution of the provinces in TURKSTAT (19). Social media users who owned smartphones and were in good general health were included. The research was conducted using face-to-face interview technique. Participants who responded confidently to questions about general knowledge were included in the study.

### *Ethical aspects*

This study was approved by the Non-Interventional Clinical Research Ethics Committee (Approval # 10840098-604.01.01-E.12105 ). Informed consent was obtained from the participants prior to the application of the questionnaire.

### *Data collection instruments*

The questionnaire applied to individuals during the research process consisted 40 questions and 4 sections:

1. Socio-demographic data: gender, age, education level, occupation, marital status, number of people living in the family.
2. Anthropometric measurements: Height, weight, BMI.
3. Mass media and social media networks used: reliance on information about nutrition in social media and advertisements, changes in

nutrition habits caused by social media and advertisements, and information on nutrition.

4. Frequency of food consumption (20): The frequency was questioned by giving training to the participants with the “Food and Meal Photo Catalogue” (21). The resulting food consumption records were entered into Bebis 8.0 software, and the daily analysis of each participant was taken. With the 24-hour food consumption records, amounts of energy (kcal), macronutrient and micronutrient received by the participants were calculated. (22).

The first three chapters were written by the researchers upon conducting a literature review. 120 trainee dietitians applied the questionnaire to the participants.

#### *Anthropometric measurements*

Anthropometric measurements included height length (cm), body weight (kg), body mass index (BMI,  $\text{kg}/\text{m}^2$ ).

#### *Body Mass Index (BMI)*

BMI was calculated by dividing body weight by the square of height. Measurements were made by trainee dietitians. Weight was measured with a scale and height was measured with a non-stretchable tape measure (23). Weight measurements were recorded in kg with 0.1 kg sensitivity, and height measurement in cm with 0.1 cm sensitivity (24). BMI was evaluated according to WHO and TÜBER classifications (23,25).

#### *Statistical analysis*

SPSS 25.0 (Statistical Package for the Social Sciences) was used to evaluate the findings. Number (n), percentage (%), and mean  $\pm$  standard deviation ( $M \pm SD$ ) was used when evaluating the study data. Comparisons according to age and gender were carried out by chi-square test. The comparison of the groups separated according to the answers given to the questions was made with the independent groups t-test. Results from comparison data were evaluated at 95% confidence interval, and significance as  $p < 0.05$ .

## Results

The socio-demographic information of the participants is shown in Table 2. 62.7% of the subjects were female ( $n=6219$ ) and 37.3% male ( $n=3699$ ). The mean age of the participants was  $32.06 \pm 12.7$  years.

Mass media usage of the participants to obtain information about nutrition was examined, and it was determined that 59.3% of individuals aged between 18 and 34 and 32.6% of individuals aged between 35 and 65 preferred the Internet as their first source of information. The internet was the most preferred means by gender, as well. There was a statistically significant difference between mass media preferred by age ( $p < 0.05$ ). It was found that in order to get information about nutrition individuals aged 18-34 years spent most time on Instagram, and individuals aged 35-65 years on Facebook. There was a statistically significant difference in social media networks about the most time spent by age ( $p < 0.05$ ) (Table 3). When the most important criterion they pay attention to regarding the reliability of nutrition articles on social media according to both age and gender was questioned, it was seen that both female (61.1%) and male (55.0%) participants aged 18-34 (59.9%) and 35-65 (56.9) mostly responded as “[it] being written by a dietitian”.

**Table 1.** Classification of Body Mass Index in Adults.

Classification	BMI ( $\text{kg}/\text{m}^2$ )	
	Cut-off Points	Cut-off Points
Underweight	<18.50	<18.50
Severe malnutrition	<16.00	<16.00
Grade II Thinness	16.00-16.99	16.0-16.99
Grade I Thinness	17.00-18.49	17.0-18.4
Normal	18.50-24.99	18.5-22.99
		23.00-24.99
Overweight	$\geq 25.00$	$\geq 25.00$
Grade I overweight	25.00-29.99	25.00-27.49
		27.50-29.99
Obese	$\geq 30.00$	$\geq 30.00$
Grade-I obese	30.00-34.99	30.00-32.49
		32.50-34.99
Grade-II obese	35.00-39.99	35.00-37.49
		37.50-39.99
Grade-III obese	$\geq 40.00$	$\geq 40.00$

**Table 2.** Socio-demographic characteristics of participants.

Socio-demographic characteristics (n=9918)		n	%
Gender	Men	3699	37.30
	Women	6219	62.70
Age Range	<21	1445	14.60
	21-30	4241	42.80
	31-40	1718	17.30
	41-50	1456	14.70
	>50	1058	10.60
Level of Education	Primary School	782	8.00
	Middle School	657	6.60
	High School	2489	25.10
	Graduate	5496	55.40
	Postgraduate	421	4.20
	Phd	73	0.70
Marital Status	Married	4392	44.30
	Single	5526	55.70
Number of people living in the family	1-3	3564	35.90
	4-6	5960	60.10
	>7	394	4.00

**Table 3.** Relationship Between Mass Media and Social Media by Age in Adults.

		Age				p	Gender				p
		18-34		35-65			women		men		
		n	%	n	%		n	%	n	%	
What is the mass media you use to get information about nutrition?	Television	595	9.40	1106	30.90	<b>0.01</b>	993	16.00	705	19.10	<b>0.01</b>
	Radio	51	0.80	44	1.20		45	0.70	57	1.50	
	Book	394	6.20	178	4.90		379	6.10	191	5.20	
	Magazine	144	2.30	73	2.00		137	2.20	84	2.30	
	Internet	3756	59.30	1166	32.60		3150	50.70	1766	47.70	
	All	1117	17.60	688	19.20		1209	19.40	596	16.10	
	Other	278	4.40	328	9.20		306	4.90	300	8.10	
Total		6335	100.00	3583	100.00		6219	100.00	3699	100.00	
Which of the social media networks you use to learn about nutrition is the most you spend time with?	Facebook	539	8.50	1148	32.10	<b>0.01</b>	819	13.20	783	21.20	<b>0.01</b>
	Twitter	431	6.80	118	3.30		292	4.70	256	6.90	
	Instagram	3907	61.70	899	25.10		3358	54.00	1418	38.30	
	Pinterest	133	2.10	111	3.10		290	4.70	56	1.50	
	All	448	7.10	286	7.90		434	6.90	339	9.20	
	Other	877	13.80	1021	28.50		1026	16.50	847	22.90	
Total		6335	100.00	3583	100.00		6219	100.00	3699	100.00	

Table 4 compares anthropometric measurements and daily food and energy intake based on the participants' responses about mass media, social media networks, and advertisements. It was discovered that Facebook, radio, and television users had the highest BMIs. It was found that Twitter, Facebook, radio, and TV users had high energy intake. It was concluded that carbohydrate and fat consumption was mostly in the Radio, Twitter, Facebook group, and the least in the books group. It was discovered that protein was mostly consumed in the radio and Twitter group. It was discovered that people in the Facebook and TV group had the highest cholesterol levels. It was acknowledged that users of Radio and Pinterest consume the most fiber. It was found that people who consumed fat from the food products targeted by the commercials had high weight, BMI, energy, fat, and cholesterol levels, compared to those who consumed milk. It was discovered that the group who consumed legumes had the highest protein and fiber intake.

It was found that people who never read media articles about nutrition had the highest weight, BMIs, and energy, carbohydrate, and fat intake. It was determined that these data were the least together with cholesterol in those who read often. (Table 4).

It was observed that the energy, carbohydrate, fat, protein, cholesterol consumption, BMI and weight of people who followed any healthy nutrition page on social media are significantly lower than those who did not. It was found that those who considered the nutritional value information in the food advertisement had much lower daily carbohydrate intake and body weight than those who did not. In our study, 84.75 percent (8406) of the participants said they didn't believe food advertisements. It was determined that the energy intake, carbohydrate and fat consumption of those who made their product preferences according to the presence of celebrities in the advertisements were higher ( $p < 0.05$ ). It was found that participants who considered the source of the information on social media had lower weights, BMIs, intakes of carbohydrates, fats, and cholesterol, and greater intakes of fiber than those who did not. The average BMI of those who adhered to the diets promoted on social media was found to be statistically higher. It was determined that those who bought healthy foods they saw on social media had

lower BMI and weight, as well as lower daily energy and cholesterol intakes. The average weight, BMI, and daily energy, carbohydrate, protein, fat, and cholesterol intakes were discovered to be significantly lower than those of the participants who claimed to be influenced by the media's coverage of nutrition issues. It was determined that the weight, BMI, and energy, protein, fat and cholesterol intakes of the participants who changed their eating habits by being influenced by the media were significantly lower than the others. It was observed that the weight and BMI of the participants who tried a product that they had not tried before, influenced by social media news, were lower (Table 5).

## Discussion

Our study investigated the effects of mass media, use of social media platforms and advertisements on anthropometric status and diet intake in adults aged between 18 and 65 and living in various provinces of Turkey.

It was reported that the reason for the preference of social media platforms differs between age groups in line with the foundation dates of these platforms. It was found that people over 35 used the first established social media platforms, while people of younger ages used the latter ones (Snapchat, Instagram, Twitter), and young people tended to keep up with the change. It was thought that the reason why television and internet are more preferred was that they were invented much earlier than social media networks (26-28). In our study, while the use of Facebook was 81% between the ages of 18-29, it was 41% over the age of 65. Another study found that Pinterest was more popular for women (41%) to use than men (16%) (29) (Table 3).

Participants in our study preferred to get information about nutrition in social media from a dietitian and attached importance to the source of such information. In a study, it was found that pediatric dietitians were found to be more reliable than influencer mothers about the suitability and purchase of foods for the child (26). In previous studies, it was reported that despite being able to access a dietitian, nutritional information continued to be obtained from social media (28,30,31). It was reported that university students

**Table 4.** The relationship of social media and advertisements with anthropometric measurements, energy and nutrients.

	n	Weight mean ± sd	BMI mean ± sd	Energy mean ± sd	CHO mean ± sd	Pro mean ± sd	Fat mean ± sd	Cholesterol mean ± sd	Fiber mean ± sd	
What is the mass media you use to get information about nutrition?	Television	1703	74.16 ± 14.10 <sup>cddef</sup>	2345.37 ± 1005.76 <sup>fg</sup>	249.40 ± 140.32 <sup>fg</sup>	97.96 ± 47.03	107.08 ± 55.48	416.12 ± 205.18 <sup>d</sup>	29.62 ± 22.45 <sup>f</sup>	
	Radio	93	74.66 ± 14.25 <sup>cddef</sup>	2380.37 ± 1166.76	297.72 ± 233.06	109.17 ± 75.65	114.90 ± 90.78	406.13 ± 202.45	35.38 ± 31.77	
	Books	570	66.68 ± 14.38 <sup>abfg</sup>	23.34 ± 4.43 <sup>cde</sup>	2217.82 ± 1161.45 <sup>fg</sup>	238.40 ± 160.81 <sup>fg</sup>	96.22 ± 54.34	99.71 ± 59.82 <sup>fg</sup>	397.52 ± 217.35 <sup>g</sup>	30.90 ± 30.03
	Magazine	218	68.54 ± 13.75 <sup>abg</sup>	23.62 ± 3.83 <sup>abg</sup>	2247.91 ± 851.86 <sup>fg</sup>	246.14 ± 99.18 <sup>g</sup>	92.29 ± 35.74 <sup>fg</sup>	100.06 ± 63.67	360.33 ± 184.52 <sup>ae fg</sup>	29.15 ± 11.63 <sup>f</sup>
	Internet	4896	68.19 ± 14.11 <sup>abg</sup>	23.78 ± 4.21 <sup>abfg</sup>	2361.48 ± 1147.09 <sup>fg</sup>	252.00 ± 164.86 <sup>fg</sup>	94.63 ± 47.28 <sup>fg</sup>	106.57 ± 60.18	404.79 ± 206.69 <sup>fg</sup>	30.35 ± 32.43 <sup>f</sup>
	All of them	1805	69.23 ± 14.43 <sup>abg</sup>	24.42 ± 4.42 <sup>acg</sup>	2476.89 ± 1255.10 <sup>acde</sup>	266.73 ± 162.35 <sup>acc</sup>	101.48 ± 52.64 <sup>dc</sup>	110.74 ± 64.38 <sup>c</sup>	420.58 ± 223.88 <sup>d</sup>	33.20 ± 31.10 <sup>abc</sup>
Other	606	72.92 ± 15.24 <sup>stdef</sup>	25.55 ± 4.89 <sup>acdefg</sup>	2629.25 ± 1567.09 <sup>acde</sup>	284.11 ± 210.89 <sup>acde</sup>	105.88 ± 63.35 <sup>de</sup>	114.5 ± 66.98 <sup>c</sup>	441.25 ± 260.09 <sup>ode</sup>	31.79 ± 25.46	
a = Statistically significant difference was observed with television. b = Radio c = Book d = Magazine e = Internet f = All g = Other										
Which of the social media networks you use to learn about nutrition is the most you spend time with?	Facebook	1610	75.97 ± 14.37 <sup>bdef</sup>	26.59 ± 4.60 <sup>bdef</sup>	2424.90 ± 1038.43	255.61 ± 130.76 <sup>e</sup>	98.59 ± 43.37 <sup>bf</sup>	108.39 ± 52.52	422.62 ± 197.12 <sup>bc</sup>	30.42 ± 27.01 <sup>e</sup>
	Twitter	548	69.32 ± 14.29 <sup>acdf</sup>	23.65 ± 4.01 <sup>af</sup>	2472.36 ± 1579.13	262.93 ± 185.12	98.74 ± 58.97	109.22 ± 75.75	411.81 ± 245.77	29.34 ± 26.25 <sup>e</sup>
	Instagram	4777	66.33 ± 13.45 <sup>abef</sup>	23.31 ± 4.05 <sup>af</sup>	2344.40 ± 1150.74	252.60 ± 170.65 <sup>e</sup>	94.49 ± 47.74 <sup>def</sup>	105.60 ± 61.13	399.75 ± 210.05 <sup>ef</sup>	30.26 ± 30.28 <sup>e</sup>
	Pinterest	245	66.22 ± 12.17 <sup>abef</sup>	23.88 ± 3.90 <sup>af</sup>	2235.03 ± 939.18 <sup>f</sup>	243.61 ± 152.28 <sup>e</sup>	94.05 ± 50.01 <sup>e</sup>	103.26 ± 59.84	371.84 ± 176.88 <sup>def</sup>	32.37 ± 29.87
	All	732	70.10 ± 14.27 <sup>acdef</sup>	24.4 ± 4.16 <sup>abdf</sup>	2470.99 ± 1277.40	287.67 ± 215.25 <sup>acdf</sup>	106.9 ± 63.54 <sup>acd</sup>	113.24 ± 71.62	419.71 ± 196.03 <sup>d</sup>	35.78 ± 36.14 <sup>abc</sup>
	Other	1896	72.89 ± 14.73 <sup>abede</sup>	25.65 ± 4.87 <sup>bde</sup>	2425.54 ± 1191.59 <sup>d</sup>	252.50 ± 140.85 <sup>e</sup>	99.89 ± 51.95 <sup>e</sup>	109.36 ± 59.38	427.18 ± 233.54 <sup>cd</sup>	31.46 ± 29.61
a = Facebook b = Twitter c = Instagram d = Pinterest e = All f = Other										

What food products are you impressed by ads?	Chocolate, candies and chips	2956	67.50 ± 14.68 <sup>bodehgh</sup>	23.71 ± 4.40 <sup>bedfgh</sup>	2474.06 ± 1365.93 <sup>ch</sup>	266.97 ± 165.22 <sup>h</sup>	96.95 ± 54.54	111.20 ± 70.77 <sup>cdh</sup>	405.60 ± 232.12 <sup>b</sup>	30.62 ± 28.88
	Oils	616	72.88 ± 14.08 <sup>acde</sup>	25.74 ± 4.91 <sup>acdh</sup>	2525.95 ± 1368.28 <sup>h</sup>	268.28 ± 185.25 <sup>h</sup>	104.74 ± 57.94 <sup>h</sup>	116.68 ± 70.14 <sup>cdh</sup>	437.32 ± 227.55 <sup>uh</sup>	34.49 ± 36.10 <sup>h</sup>
	Beverages	1968	69.92 ± 14.20 <sup>ub</sup>	24.26 ± 4.27 <sup>abh</sup>	2348.56 ± 991.37 <sup>a</sup>	254.99 ± 175.37 <sup>h</sup>	96.99 ± 44.97	105.06 ± 54.56 <sup>ab</sup>	416.53 ± 202.75	30.04 ± 28.05
	Milk	664	69.56 ± 13.78 <sup>ab</sup>	24.28 ± 4.19 <sup>bh</sup>	2312.76 ± 1223.34	248.86 ± 173.91	97.23 ± 51.88	102.67 ± 56.97 <sup>ub</sup>	409.14 ± 221.66	30.36 ± 22.85
	Frozen food	504	69.63 ± 14.72 <sup>ab</sup>	24.38 ± 4.61 <sup>b</sup>	2412.42 ± 1200.48	270.15 ± 170.99 <sup>h</sup>	101.02 ± 57.34	111.03 ± 71.9	408.50 ± 217.82	31.85 ± 25.04
	Legumes	288	71.83 ± 14.03 <sup>a</sup>	25.40 ± 4.70 <sup>acd</sup>	2460.38 ± 1306.51	266.79 ± 181.19	107.32 ± 63.47 <sup>h</sup>	113.99 ± 73.78	414.89 ± 193.54	43.25 ± 74.74
	Canned goods	280	70.64 ± 12.59 <sup>a</sup>	24.97 ± 4.62 <sup>a</sup>	2362.30 ± 1006.97	250.39 ± 130.45	100.04 ± 52.11	106.58 ± 53.48	423.88 ± 220.60	31.00 ± 27.86
	Not affected by the product	2642	70.93 ± 14.57 <sup>a</sup>	25.00 ± 4.66 <sup>abcd</sup>	2288.14 ± 969.67	239.14 ± 140.13	94.16 ± 41.32 <sup>bf</sup>	102.59 ± 47.57 <sup>ub</sup>	403.79 ± 193.87 <sup>b</sup>	29.54 ± 23.39 <sup>b</sup>
	a = Chocolate, candies and chips b = Fats c = Beverages d= Milk e= Frozen Food f = Legumes g = Canned goods h = Not affected by product									
What is your frequency of reading about nutrition in the media?	Always	758	69.62 ± 14.58 <sup>bde</sup>	24.43 ± 4.53 <sup>e</sup>	2442.15 ± 1237.38 <sup>b</sup>	260.35 ± 183.14	107.26 ± 59.48 <sup>abc</sup>	114.14 ± 68.71 <sup>bc</sup>	437.10 ± 229.83 <sup>bc</sup>	35.63 ± 49.35 <sup>d</sup>
	Often	1936	67.28 ± 13.21 <sup>acde</sup>	23.90 ± 4.25 <sup>cde</sup>	2285.60 ± 1091.49 <sup>ade</sup>	241.57 ± 147.29 <sup>cde</sup>	95.61 ± 46.31 <sup>ac</sup>	104.18 ± 60.75 <sup>ae</sup>	405.61 ± 191.46 <sup>a</sup>	30.94 ± 28.35
	Sometimes	4044	68.98 ± 14.18 <sup>bde</sup>	24.28 ± 4.38 <sup>bde</sup>	2365.32 ± 1165.52 <sup>e</sup>	254.70 ± 170.21 <sup>bc</sup>	95.45 ± 49.09 <sup>ae</sup>	106.33 ± 59.52 <sup>ae</sup>	401.91 ± 210.42 <sup>ae</sup>	30.94 ± 29.16
	Rarely	2380	71.41 ± 15.20 <sup>abce</sup>	24.74 ± 4.72 <sup>bce</sup>	2426.49 ± 1187.68 <sup>b</sup>	260.87 ± 155.01 <sup>b</sup>	97.08 ± 50.15 <sup>a</sup>	107.38 ± 58.92	413.63 ± 224.63	29.45 ± 24.84 <sup>a</sup>
	Never	800	74.03 ± 15.04 <sup>abcd</sup>	25.78 ± 5.02 <sup>abcd</sup>	2552.03 ± 1264.75 <sup>bc</sup>	275.59 ± 165.90 <sup>bc</sup>	102.06 ± 51.56 <sup>bc</sup>	114.31 ± 66.90 <sup>bc</sup>	430.31 ± 227.94 <sup>f</sup>	30.17 ± 24.31
	a = Always b = Often c = Sometimes d = Rarely e = Never									

**Table 5.** The relationship of nutrition and nutritional information in social media and advertisements with anthropometric measurements, energy and nutrients.

		Number	Weight mean $\pm$ sd	BMI mean $\pm$ sd	Energy mean $\pm$ sd	CHO mean $\pm$ sd	Pro mean $\pm$ sd	Oil mean $\pm$ sd	Cholesterol mean $\pm$ sd	Fiber mean $\pm$ sd
Do you follow any healthy eating pages?	Yes	4600	67.44 $\pm$ 13.44*	23.85 $\pm$ 4.23*	2276.54 $\pm$ 1004.70*	243.51 $\pm$ 153.28*	95.03 $\pm$ 46.71*	103.62 $\pm$ 57.20*	401.88 $\pm$ 201.78*	31.31 $\pm$ 33.12
	No.	5318	71.64 $\pm$ 15.04*	24.97 $\pm$ 4.71*	2479.51 $\pm$ 1293.49*	266.31 $\pm$ 170.79*	99.28 $\pm$ 52.60*	110.67 $\pm$ 64.03*	417.81 $\pm$ 223.18*	31.58 $\pm$ 30.51
Does the nutritional value of products in advertisements affect you?	Yes	3243	67.87 $\pm$ 13.44*	23.58 $\pm$ 3.96	2379.85 $\pm$ 1150.47	250.81 $\pm$ 142.26*	98.67 $\pm$ 50.74	107.40 $\pm$ 59.20	418.76 $\pm$ 216.84	31.03 $\pm$ 32.34
	No.	1303	66.46 $\pm$ 13.71*	23.82 $\pm$ 4.3	2392.72 $\pm$ 1399.69	265.80 $\pm$ 232.26*	96.88 $\pm$ 58.27	108.45 $\pm$ 73.72	404.74 $\pm$ 225.61	31.82 $\pm$ 31.55
Do you trust food ads in the media?	Yes	1512	70.16 $\pm$ 14.31	24.47 $\pm$ 4.43	2362.26 $\pm$ 1105.51	262.99 $\pm$ 194.43	97.03 $\pm$ 49.42	105.58 $\pm$ 62.47	401.59 $\pm$ 208.61	30.53 $\pm$ 26.62
	No.	8406	69.60 $\pm$ 14.50	24.44 $\pm$ 4.55	2389.53 $\pm$ 1184.48	254.43 $\pm$ 157.02	97.36 $\pm$ 50.11	107.73 $\pm$ 60.80	412.01 $\pm$ 214.53	30.94 $\pm$ 30.32
Does the act of famous people in advertisements or the advertisements of celebrities on social media affect your product purchase?	Yes	1883	68.98 $\pm$ 14.43*	24.18 $\pm$ 4.50*	2446.59 $\pm$ 1349.55*	273.05 $\pm$ 188.47*	100.39 $\pm$ 58.44*	109.88 $\pm$ 68.68	411.89 $\pm$ 223.78	31.66 $\pm$ 30.34
	No.	8014	69.86 $\pm$ 14.48*	24.51 $\pm$ 4.54*	2371.89 $\pm$ 1128.07*	251.82 $\pm$ 156.69*	96.61 $\pm$ 47.82*	106.82 $\pm$ 59.15	410.13 $\pm$ 211.42	30.64 $\pm$ 29.38
Do you pay attention to references for information about health and nutrition on social media?	Yes	6328	68.56 $\pm$ 13.94*	24.11 $\pm$ 4.33*	2356.07 $\pm$ 1151.39*	251.21 $\pm$ 152.89*	96.96 $\pm$ 49.28	106.46 $\pm$ 59.77*	408.27 $\pm$ 202.84	31.59 $\pm$ 32.46*
	No.	3568	71.73 $\pm$ 15.16*	25.05 $\pm$ 4.81*	2437.59 $\pm$ 1210.02*	263.5 $\pm$ 180.39*	97.97 $\pm$ 51.35	109.17 $\pm$ 63.39*	414.17 $\pm$ 231.84	29.61 $\pm$ 24.38*
Have you administered at least one of the popular diets shared on social media?	Yes	2771	69.92 $\pm$ 14.03	24.84 $\pm$ 4.52*	2350.55 $\pm$ 1157.03	252.51 $\pm$ 155.41	96.56 $\pm$ 50.12	106.56 $\pm$ 64.08	407.17 $\pm$ 218.34	31.99 $\pm$ 31.36*
	No.	7147	69.60 $\pm$ 14.64	24.3 $\pm$ 4.53*	2398.87 $\pm$ 1178.63	256.99 $\pm$ 166.24	97.60 $\pm$ 49.95	107.73 $\pm$ 59.85	411.69 $\pm$ 211.82	30.45 $\pm$ 29.15*
Have you ever bought a popular healthy food because you see it on social media?	Yes	3353	68.75 $\pm$ 14.26*	24.11 $\pm$ 4.34*	2352.32 $\pm$ 1122.09*	256.76 $\pm$ 180.82	97.13 $\pm$ 49.84	106.43 $\pm$ 63.09	404.34 $\pm$ 199.75*	31.49 $\pm$ 32.82
	No.	6565	70.17 $\pm$ 14.56*	24.62 $\pm$ 4.62*	2402.25 $\pm$ 1197.57*	255.21 $\pm$ 153.58	97.40 $\pm$ 50.09	107.90 $\pm$ 59.99	413.53 $\pm$ 220.37*	30.57 $\pm$ 28.11

Are you influenced by nutrition issues in the media?	Yes	4991	68.36 ± 14.09*	24.18 ± 4.45*	2319.9 ± 1093.92*	250.85 ± 167.02*	94.82 ± 47.48*	105.41 ± 59.55*	398.34 ± 194.03*	30.93 ± 28.05
	No.	4927	71.03 ± 14.73*	24.71 ± 4.60*	2451.69 ± 1244.18*	260.68 ± 159.30*	99.83 ± 52.31*	109.42 ± 62.49*	422.67 ± 231.23*	30.83 ± 31.45
Have you ever changed your habits with the nutrition issues you learned from the media?	Yes	4217	68.91 ± 13.98*	24.32 ± 4.39*	2333.52 ± 1108.31*	252.47 ± 171.96	95.71 ± 47.75*	105.77 ± 60.95*	403.41 ± 199.87*	31.58 ± 29.60*
	No.	5701	70.26 ± 14.81*	24.55 ± 4.64*	2423.73 ± 1216.94*	258.15 ± 156.54	98.49 ± 51.57*	108.61 ± 61.11*	415.61 ± 223.18*	30.36 ± 29.91*
Have you been influenced by social media news and tried a product?	Yes	3664	68.61 ± 14.22*	24.08 ± 4.40*	2366.62 ± 1177.64	257.42 ± 179.13	97.07 ± 51.10	107.07 ± 64.63	407.81 ± 217.07	30.94 ± 27.30
	No.	6254	70.32 ± 14.58*	24.66 ± 4.60*	2396.36 ± 1169.87	254.75 ± 153.27	97.45 ± 49.35	107.60 ± 58.87	411.95 ± 211.64	30.84 ± 31.16
Have you been influenced by social media news and changed a product?	Yes	2853	69.34 ± 14.11	24.28 ± 4.38*	2369.85 ± 1128.84	256.55 ± 156.54	98.34 ± 50.13	107.45 ± 61.16	409.45 ± 209.87	32.64 ± 33.07*
	No.	7065	69.83 ± 14.62	24.51 ± 4.59*	2391.64 ± 1190.08	255.41 ± 165.95	96.90 ± 49.95	107.38 ± 61.02	410.82 ± 215.18	30.17 ± 28.33*
Have you been affected by social media news and stopped using a product?	Yes	3454	69.18 ± 14.28*	24.32 ± 4.46*	2374.91 ± 1226.18	260.40 ± 177.62*	98.51 ± 55.38	108.97 ± 67.61	410.33 ± 219.42	31.76 ± 28.97*
	No.	6464	69.96 ± 14.57*	24.52 ± 4.57*	2390.96 ± 1143.27	253.24 ± 155.06*	96.67 ± 46.86	106.56 ± 57.24	410.48 ± 210.53	30.41 ± 30.21*

\*statistically significant difference p <0.05

and adults, 37.4% and 89.3%, respectively, followed dietitians the most and were influenced by their ideas. Information about nutrition being given by a dietitian is important for healthy food choices, maintenance and development of health (32,33). Our results were supported by these studies. According to these results, it can be said that the awareness level of the participants about the reliability of nutrition information in social media and advertisements was high. In studies, the attitude towards healthy eating was mentioned at a rate of 67.3% and it was determined that 77.3%-83.7% of them had sufficient nutritional literacy (28,34,35).

Advertisements were associated with anthropometric measurements and intake of energy and macronutrients (carbohydrate, protein, fat). It was determined that those who received energy, macronutrients and cholesterol were mostly Twitter, Facebook, Radio, TV users, and Instagram, Pinterest, and book and magazine users were the least ones. It was determined that Facebook, Radio, TV users had the highest body weight and BMI, and Instagram, books, and Pinterest had the lowest (Table 4). Watching/listening unhealthy advertisements on radio and TV is imposed on the audience. This confirms the relationship between increased exposure to unhealthy advertisements and obesity (18,36). It has been determined that healthy food advertisements are generally on Facebook, Instagram, and YouTube (8,10) and those young adults prefer Instagram because it is not very intrusive (28). The fact that the energy, carbohydrate, fat, and cholesterol consumption of those who used these platforms in our study was the lowest, while the protein and fiber consumption was the highest, confirms the view that healthy food advertisements are generally on Facebook and Instagram (8,10). Since individuals can choose the advertisement they want to watch in social media and advertisements with health value will be watched more, their nutritional status and behaviors will develop in a positive way. It has also been stated that social media advertisements have a more persuasive effect and initiate positive thoughts than television advertisements (8). It is reported that there will be no reduction in advertising in the coming years and that social media will be used by food advertisers to normalize products and increase product attractiveness for consumers regardless of health effects (8,10).

In our study, it was observed that body weight, BMI and energy, carbohydrate, fat, and cholesterol intake amounts increased with the consumption of unhealthy foods (such as fats, soda, sweetened beverages, chocolate, candy and chips, frozen food, canned products) influenced by their advertisements. It has been reported that cardiovascular diseases and obesity will be inevitable, normal human physiology and homeostasis will be impaired, the immune system will be suppressed, systemic inflammation markers, insulin resistance and anemia may be induced, and emotional and physical health and well-being may be adversely affected when a healthy diet is not maintained (37,38). Energy intake, consumed nutrients (excluding protein), and cholesterol values were found to be at the lowest level and fiber intake at normal levels for those who did not buy food due to advertisements and those who consumed healthy food (milk, legumes, etc.). With the increase in milk consumption, calcium is thought to improve body composition by showing an antiobesity effect (39). One study found that young adults could remember unhealthy food (compared to healthy) advertisements more easily. It was reported that being constantly exposed to unhealthy food advertisements prevented them from performing healthy eating behaviors and caused them to feel guilty. These exposures might adversely affect health by causing unhealthy foods to be chosen. This study highlighted the need for advertisements that motivated eating with affordable and optional healthy foods (10). It was determined that unhealthy food and fast-food restaurants were advertised on Argentinian and Spanish televisions. 93.1% of these advertised foods contained excessive amounts of energy and/or more total fat, saturated fat, trans fat, sugar, and salt. 13.8% of these advertised foods had high nutritional value, 9.0% medium-high, 34.9% medium, 31.8% low and 10.4% very low (40,41). In this direction, the governments of Chile and Turkey (RTÜK) have blocked unhealthy food advertisements in order to protect the health of children (11,13).

Healthy nutrition, nutrition in diseases, weight control, healthy recipes are followed intensively by users in social media and our findings were found to be in parallel (42). It was determined that anthropometric measurements, daily energy, carbohydrate, fat, and cholesterol intakes of those who gained positive

eating habits by being influenced by the topics in social media were significantly lower. Fiber and protein consumption were also found to be higher (Table 4). The findings of studies on the level of nutrition knowledge in the literature are consistent with our study. Nowadays, with the media frequently giving place to the articles about healthy nutrition, it is thought that the nutritional knowledge level of the people who follow these articles has increased, and therefore, they have positive effects on their health in line with the above findings. It can be said that the participants changed their nutritional habits correctly as a result of taking the nutritional value information of the foods in the advertisements into account and following the scientific pages that provide accurate information about nutrition, and as a result, anthropometric measurements and nutritional elements changed positively. In similar studies, it was concluded that nutritional literacy positively affects healthy eating attitudes and BMI. Our results are similar to these studies (8,10,28,34,35) (Table 5).

Our study found that 84.75% (8406) of the participants did not trust the food advertisements in the media. It supports the view that even though unhealthy foods are advertised, they are not always welcomed and are considered deceptive (10). It was stated that the playing of famous people in advertisements also increases the confidence in the purchased product (43). In our study, it was found that the playing of famous people in advertisements or the advertisements of celebrities on social media did not affect product purchase, but first the brand of the product and then the discounts affected product preferences (44). It has been concluded that consumers are particularly affected by TV advertisements (62.7%) and discount days (53.4%), but on the contrary, very few of them are affected by internet advertisements (12.7%) (45). It was determined that those who were affected by the advertisements of the celebrities had lower body weights and BMIs, and higher energy, carbohydrate, protein, fat, cholesterol, and fiber intakes than those who were not ( $p < 0.05$ ). This result may indicate that consumers have started to become conscious about healthy eating and unhealthy advertisements cannot change this awareness. Advertising credibility of trust in celebrities will be stronger among younger consumers compared

to older consumers. Celebrity trust has been shown to have a significant impact on advertising credibility and brand credibility (44). Therefore, it should not be disregarded that promoting healthy marketing is a crucial factor to take into account for health.

Most individuals do not follow nutritional recommendations and they tend to follow popular diets that focus on weight loss in a short time rather than nutrition and health (46). Since consumption of certain foods is at the forefront in popular diets, excessive cravings for prohibited foods develop after the diet is completed, and weight gain occurs as a result of excessive consumption of such restricted foods (47). In addition, these diets can cause changes in energy metabolism, slowing of metabolism, negative changes in body composition, vitamin-mineral deficiencies, suppression of intestinal and cardiovascular health and immune system. The best diet is a personalized, rational, and goal-oriented diet (37,38,48). In this context, in our study, it was determined that the popular diets shared on social media were not followed by most of the participants. This can be explained by the fact that the participants had knowledge about the negative effects of popular diets on health and the importance of a personalized diet.

In addition, it was determined that the majority of the participants did not buy the popular healthy foods they saw on social media, and those who did, had lower daily energy and cholesterol intakes and anthropometric measurements. Within the scope of these findings, it can be thought that social media did not have a significant effect on the food purchasing behavior of the majority of those included in our study (Table 5). However, in a study conducted by the World Health Organization, it was determined that social media has a very important place among the media channels used by food businesses to reach individuals (49,50).

### **Conclusion and recommendations:**

As a result, in this study, it was determined that the participants used the internet and television, and Instagram, one of the social media platforms, more effectively to get information about nutrition. It was determined that those who used Instagram, books, and Pinterest had lower body weight, BMI and

carbohydrate, fat, and cholesterol intake. It was found that unhealthy food choices made as a result of being influenced by commercials had a detrimental impact on body composition and health, whereas social media education about healthy eating had a good impact. It was determined that the implementation of popular diets and the purchase of popular foods were avoided. It was found that celebrity endorsements or social media advertising had no influence on consumer decisions to buy products, and dietitians were consulted for nutritional advice. It is recommended that the required measures be implemented to ensure that non-dietitians are prohibited from writing posts about nutrition on social media and that only registered dietitians are permitted to do so. It has been reported that, dietitians should inform people about the food characteristics they should focus on when making a purchase and to place more weight on nutritional value than brands and discounts. It has also been reported that in the coming years, social media will be used more and more by food advertisers to increase product attractiveness for consumers, regardless of the health effects of food.

### Limitations of the study

In our study, measuring body weight with a scale and height with a measuring tape caused the limitation of the study. Another limitation was that the questionnaire applied to individuals within the scope of the research was not a valid scale. It is thought that the use of a valid scale in future studies will support the results. The strength of our study is that, since there were 9918 participants included in the study, the results we obtained with such a wide range of data will shed light on future studies.

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