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Gastroesophageal Reflux Symptoms and Nutritional Preferences

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ABSTRACT The increase in the prevalence of symptoms of Gastroesophageal Reflux Disease (GERD) demonstrates the importance of defining the changeable risk factors. Diet is the primary one among the changeable risk factors. The objective of this research is to identify the general characteristics of patients who are newly diagnosed with gastroesophageal reflux by using endoscopy, their eating habits before and after GERD symptoms, and their anthropometric measurements. In order to identify the general characteristics, eating habits, food consumption status, and some anthropometric measurements of individuals comprising 150 newly diagnosed GER outpatients were selected by using the random sampling method. When the eating habits of individuals were examined according to their status before and after experiencing GERD symptoms, significant changes were detected in their number of meals, meal skipping status, eating speed, and food temperatures ($p<0.05$). After experiencing GERD symptoms, individuals reduced their consumption of carbonated beverages, coffee, artificial juice, spices, chocolate, deep-fried food, onions, tomatoes, and citrus fruits, which are refluxogenic foods. The study showed that changes in eating habits are effective in decreasing the prevalence and severity of GERD symptoms.

INTRODUCTION

Gastroesophageal Reflux Disease (GERD) is defined as a clinical status, which emerges due to the backward flow of stomach content into the esophagus causing uneasy plaints and/or complications (Patrick 2011). GERD is an endemic disease with a fifteen to twenty percent prevalence ratio (El Serag et al. 2005). The weighted mean prevalence of at least weekly GERD symptoms is greatest in North America (19.8%), lowest in East Asia (5.2%), and intermediate in Europe and the Middle East (15.2% and 14.4%, respectively) (Rubenstein and Chen 2014).

The increase in the prevalence of symptoms of GERD and the rapid rise in incidence of adenocarcinoma demonstrate the importance of defining the changeable risk factors. Diet is the primary one among the changeable risk factors. In the studies conducted, it was stated that enlargement of waist circumference due to obesity and abdominal fat has an impact on the emergence of GERD by causing an increase in abdominal pressure and loosening in the lower esophageal sphincter. It was also shown that along with obesity, the prevalence of GERD symptoms such as pyrosis, acid regurgitation, and GERD complications such as esophagitis increased (Karakaya et al. 2014; Namura et al. 2014; Nocon et al. 2007).

The conducted studies show that nutrients such as total fat, saturated fatty acid, cholesterol taken with diet, some foods such as carbonated beverages, caffeine, chocolate, mint, onions, and eating habits such as eating fast and skipping meals, have an impact on the formation and treatment of GERD (Patrick 2011;Wu et al. 2014).

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The objective of this research was to identify the general characteristics of patients who are newly diagnosed with gastroesophageal reflux by using endoscopy, their eating habits before and after GERD symptoms, and their anthropometric measurements.

MATERIAL AND METHOD

Experimental Design

This research was conducted between April 1st and September 15th 2011 in 150 individuals, of which 81 are male and 69 are female. Participants were individuals aged between 18-65 years, who visited Izmir Atatürk Training and Research Hospital's Gastroenterology Clinic within the last one year with GERD symptoms such as pyrosis and acid regurgitation but without diagnosis, had an endoscopy and were diagnosed with "Gastroesophageal Reflux Disease" in accordance with their endoscopy results. Pregnant women and individuals who had been diagnosed before with GERD or other gastrointestinal system diseases such as ulcer or cancers,those who used non-steroidal, anti-inflammatory agents, proton-pump inhibitors, or histamine 2 receptor antagonists, and had a gastrectomy history were not included in the research.

The inclusion criteria (age, medicine use status and so on) of the individuals who were diagnosed with GERD after the endoscopy were questioned. Questionnaire forms developed for this research were filled out by the researchers during face-to-face meetings with individuals. The anthropometric measurements of the participants were taken. In addition, the individuals were asked to record their food consumption amount for three consecutive days including one weekend day before they began medication treatment for GERD. They were also previously informed with examples about what to pay attention to during recording. After food consumption amount recordings, the participants were trained on gastroesophageal reflux disease by trained dietitians.

Permission from the Izmir Atatürk Training and Research hospital was obtained. All subjects gave their written and verbal informed consent and the study was approved by the Ethics Committee of Faculty of Medicine, Hacettepe University, Ankara, Turkey (Approval number, 431-1642/2011).

Questionnaire Form

The first part of the participant questionnaire form dealt with definitive information (age, educational and professional status, cigarette/alcohol use, medicine/vitamin use) about the individuals. Moreover, questions were asked about the gastroesophageal symptoms of the participants, how often and how long they had experienced these symptoms, and their family GERD history.

Information regarding the eating habits of the individuals was also asked for in the questionnaire forms. The individuals' numbers of meals and snacks, meal skipping status, reasons for skipping meals, snack preferences, status of eating bedtime snacks and waking up at night to eat were recorded according to their status before and after experiencing reflux symptoms. Temperature of food and eating rate were classified according to the individuals self-reports. The daily energy and nutrients intake of the individuals were calculated using their food consumption amount recordings of three days. The Nutrient Database (BeBiS, Ebispro for Windows, Germany; Turkish Version/BeBiS 7) was used to determine the energy and nutrient intakes and the results were compared with the Dietary Guidelines for Turkey (The Ministry of Health of Turkey 2006; Rakicioglu et al. 2009).

Anthropometric Measurements

The body weight, height, waist circumference and hip circumference of the individuals were measured, and the waist to hip ratio was calculated, in addition the body mass index (BMI) values were calculated by dividing the weight (kg) by height (m) squared.

Body Weight and Height: Body weight, with the subject wearing as light clothes as possible and no shoes, was measured with a regularly calibrated sensitive scale (sensitivity of ±0.1 kg). Body height was measured without shoes with the feet placed side by side and the skull positioned in the Frankfort plane (Baysal et al. 2002).

Body Mass Index (BMI): Body Mass Index (BMI), which is crucial in determining and evaluating overweight or obesity, was calculated as kg/m^2 using the body weight/height (m^2) formula (Baysal et al. 2002), and evaluated in accordance with the classification of the World Health Organization (WHO).

Waist Circumference: Waist circumference was measured from the circumference of the midpoint between the lowermost rib and navel with a nonflexible measuring tape. Waist circumference measurements ≥94 cm for males and ≥80 cm for females are regarded as risk, while measurements ≥102 cm for males and ≥88 cm for females are regarded as high risk (Baysal et al. 2002).

Hip Circumference: Circumference of the highest point was measured with a nonflexible measuring tape while standing next to the individual (Baysal et al. 2002).

Waist to Hip Ratio [Waist Circumference (cm)/Hip Circumference (cm)]: This ratio is used in defining the android and gynoid fat distribution. A ratio of ≥1.0 for males, and ≥0.8 for females is regarded as risk, for it is associated with chronic diseases (Baysal et al. 2002).

Endoscopy

All the participants were individuals who applied to Izmir Atatürk Training and Research Hospital's Gastroenterology Clinic with pyrosis and/or acid regurgitation complaints. They were referred to the Endoscopy Unit, and underwent esophagogastroduodenoscopy with sedative/non-sedative methods in the Endoscopy Unit. Individuals whose reflux findings and/or complications were shown endoscopically by being diagnosed with "lower esophagus sphincter deficiency" and/or "Grade A/B/C/D Esophagitis" based on Los Angeles classification as result of endoscopy were included in the study.

Statistical Analysis

All data collected from the research was evaluated by using the SPSS 16.0 software. Simple and cross distributions of the counted data were given as number and percentage tables. Differences among groups were analyzed using the "chisquare test". The Shapiro-Wilk test was used to determine whether or not variables are normally distributed, while the Levene's test was used to homogeneity of variances. Descriptive statistics (mean, minimum value, maximum value, standard deviation, and median) were calculated for data such as anthropometric measurements, daily consumption amount of food groups, energy and nutrients intake, and number of meals. Independent Samples t-test was used to compare anthropometric measurements and dietary intake assessments of women and men. So as to determine the changes in eating habits of the individuals based on gastroesophageal reflux disease findings, the Wilcoxon test was used for numerical data, and the McNemar Bowker test for nonnumeric data.

RESULTS

Of the individuals who participated in the study, fifty-four percent were male, and forty-six percent were female. The mean age of men was found as 44.3±13.2 years, and that of women as 42.2±12.2 years. Of the 51.3 percent individuals stated that they smoke cigarettes, and 74.2 percent of them smoke 11-20 cigarettes a day. In the study, the time period of smoking in those who gave up smoking and of those who still smoke was also considered. It was found that 28.7 percent of the individuals had smoked for 11-20 years, and thirty-seven percent had smoked for 21-30 years. The status of alcohol usage differed with gender ($p<0.05$). The majority (39.5%) of individuals who consumed alcohol (25.3%) stated that they had been doing so for more than 30 years (Table 1).

It was learned that 39.3 percent of the individuals had another chronic disease besides GERD. The percentage of those with another disease besides GERD was higher in women (43.5%) than in men (35.8%) ($p>0.05$). When the types of chronic diseases were examined, it was found that 23.7 percent of the individuals had cardiovascular disease, 23.7 percent had type 2 diabetes, and 37.3 percent had hypertension (Table 1).

In order to collect information about the individuals' eating habits, the number of their daily meals, their status and reasons for skipping meals, snack preferences, habits of eating bedtime snacks and waking up at night to eat, speed of eating and the hotness of their food, habits of eating out, and frequency of food consumption were questioned according to their status before and after experiencing GERD symptoms.

The distribution of individuals according to numbers of meals and snacks, speed of eating, and food consumption temperatures before and after symptoms is shown in Table 2.

Differences with regard to numbers of meals before and after symptoms were significant ($p<0.001$). It was found that before symptoms,

Table 1: Distribution of the individuals according to age, smoking, alcohol consumption, and disease

	Man (n:81)		*Woman (n:69)*		*Total (n:150)*		*p*
	n	*%*	*n*	*%*	*n*	*%*	
Age (year)							
≤18	1	1.2	1	1.5	2	1.3	
19-30	11	13.6	14	20.3	25	16.7	
31-50	36	44.4	35	50.7	71	47.3	0.357
51-65	33	40.8	19	27.5	52	34.7	
x±SD		44.3 ± 13.2		42.2 ± 12.2		43.3 ± 12.8	0.310
Smoking							
Smoker	23	28.4	8	11.6	31	20.7	
Non-smoker	27	33.3	50	72.5	77	51.3	0.000**
Quitter	31	38.3	11	15.9	42	28.0	
Number/Day							
1-10	5	21.7	3	37.5	8	25.8	0.078
11-20	18	78.3	5	62.5	23	74.2	
Median	20		15		20		
Duration Time (Year)							
≤10	8	14.8	3	15.8	11	15.1	
11-20	12	22.2	9	47.4	21	28.7	
21-30	22	40.8	5	26.3	27	37.0	0.161
>30	12	22.2	2	10.5	14	19.2	
Median	25		15		23.0		
Alcohol Consumption							
User	30	37.0	8	11.6	38	25.3	0.000**
Non-user	51	63.0	61	88.4	112	74.7	
Duration Time (Year)							
≥10	1	3.3	2	25.0	3	7.9	
11-20	9	30.0	3	37.5	12	31.6	
21-30	6	20.0	2	25.0	8	21.0	0.016
>30	14	46.7	1	12.5	15	39.5	
Median	27.5		14.0		26.0		
Disease							
No	52	64.2	39	56.5	91	60.7	0.429
Yes	29	35.8	30	43.5	59	39.3	
Disease Groups							
Cardiovascular	9	31.0	5	16.7	14	23.7	
Hypertension	15	51.7	7	23.3	22	37.3	
Tip 2 DM	7	24.1	7	23.3	14	23.7	
Respiratory	1	3.4	5	16.7	6	10.2	
Goitre	-	-	10	33.3	10	16.9	
Bone/elbow	5	17.2	3	10.0	8	13.6	
Anemia	-	-	6	20.0	6	10.2	
Neurologic	-	-	2	6.7	2	3.4	
Psychiatric	1	3.4	1	3.3	2	3.4	

*Student t-test ($p<0.05$) **Pearson Chi-square test ($p<0.05$)***Mann Whitney U test ($p<0.05$)

48.7 percent of the individuals ate two meals, and 50.7 percent had three. However, after symptoms, thirty-six percent of the individuals had two meals, and sixty-four percent had three. When the numbers of snacks were examined, it was learned that the percentage of those who never have snacks before symptoms was six percent, while it was two percent after symptoms. The percentage of those who eat one snack a day before symptoms was 49.3 percent, while it was 46.7 percent after symptoms, in those who eat two snacks a day before symptoms the percentage was 36.7 percent, while it was forty-four percent after symptoms. The number of snacks individuals ate before and after symptoms significantly differed in terms of statistics ($p<0.05$).

It was stated that 41.3 percent of the individuals ate too fast, 36.7 percent ate fast, 17.3 percent ate at medium speed, and 4.7 percent ate slowly before symptoms. After symptoms, these percentages became respectively thirty-four

Table 2: Distribution of individuals according to their numbers of meals and snacks, speed of eating and food consumption temperatures

	Man (n:81)				*Woman (n:69)*				*Total (n:150)*			
	Before symptom		*After symptom*		*Before symptom*		*After symptom*		*Before symptom*		*After symptom*	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Number of Meals												
1	1	1.2	-	-	-	-	-	-	1	0.7	-	-
2	38	46.9	27	33.3	35	50.7	27	39.1	73	48.7	54	36.0
3	42	51.9	54	66.7	34	49.3	42	60.9	76	50.7	96	64.0
		p <0.001*				p=0.005				p<0.001*		
Number of Snacks												
None	6	7.4	2	2.5	3	4.3	-	-	9	6.0	2	1.3
1	43	53.1	39	48.1	31	44.9	31	44.9	74	49.3	70	46.7
2	27	33.3	36	44.4	28	40.6	30	43.5	55	36.7	66	44.0
3	5	6.2	4	4.9	7	10.1	8	11.6	12	8.0	12	8.0
		p=0.018*				p=0.034*				p=0.002*		
Speed of Eating												
Slow	-	-	-	-	7	10.2	7	10.2	7	4.7	7	4.7
Medium	7	8.6	1	13.6	19	27.5	20	29.0	26	17.3	31	20.7
Fast	32	39.5	36	44.4	23	33.3	25	36.2	55	36.7	61	40.6
Too fast	42	51.9	34	42.0	20	29.0	17	24.6	62	41.3	51	34.0
		p=0.010**				p=0.102				p=0.003**		
Food Temperature												
Cold	-	-	-	-	1	1.4	1	1.4	1	0.7	1	0.7
Warm	18	22.2	20	24.7	25	36.2	26	37.7	43	28.7	46	30.7
Hot	48	59.3	47	58.0	36	52.2	35	50.7	84	56.0	82	54.7
Too hot	15	18.5	14	17.3	7	10.2	7	10.2	22	14.7	21	14.0
		p=0.083				p=0.317				p=0.046**		

*Wilcoxon test ($p<0.05$), **Mc Nemar Bowker test ($p<0.05$)

percent, 40.6 percent, 20.7 percent and 4.7 percent. There was an important difference in the individuals' speed of eating before and after symptoms ($p<0.05$). When food consumption temperatures were examined, it was identified that fifty-six percent of the individuals consumed their food when it is hot, and 28.7 percent consumed when it is warm. It was seen that after symptoms, the percentage of those who ate hot food declined to 54.7 percent, and that of those who ate warm meals increased to 30.7 percent, and that this change was statistically important ($p<0.05$).

Distribution of the individuals according to their preferences for snacks before and after symptoms is shown in Table 3. It was identified that before symptoms, 80.1 percent of the individuals consumed tea and coffee, 75.9 percent consumed fruits and juice, 68.1 percent consumed bagel, biscuits, cookies, and 51.8 percent consumed carbonated beverages as snacks. The individuals' carbonated beverages consumption after experiencing symptoms was stated as 39.2 percent, and the difference was stated as statistically important as well ($p<0.001$).

It was determined that before symptoms twenty-four percent and after symptoms fourteen percent of the individuals had the habit of eating bedtime snacks, and that this difference was not statistically important ($p>0.05$) (Table 4). It was identified that before symptoms, the percentages of snack preferences of those who have the habit of eating bedtime snacks are 68.1 percent for fruits and juice, 44.1 percent for carbonated beverages, 26.5 percent for milk, yoghurt, buttermilk, cheese, and 19.1 percent for bagels, biscuits, cookies. These percentages became respectively 95.6 percent, 29.4 percent, 23.9 percent, and 15.2 percent. The change in bedtime snack preferences of the individuals before and after symptoms was regarded as important ($p<0.05$).

Distribution of the individuals according to their status and reasons for skipping meals is shown in Table 5. Differences between before and after symptoms with regard to individuals' status of skipping meals were important ($p<0.001$). It was observed that the percentage of those who do not skip meals before symp-

Table 3: Distribution of the individuals according to their preferences for snacks

	Man (n:81)				*Woman (n:69)*				*Total (n:150)*			
	Before symptom		*After symptom*		*Before symptom*		*After symptom*		*Before symptom*		*After symptom*	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Selected Types Of Snack Foods[1]												
Sandwich, toast, patty	15	18.5	17	21.0	28	40.6	29	42.0	43	30.5	46	311
	p=0.625				p=1.0				p=0.180			
Bagel, biscuit, cookies	48	59.3	48	59.3	47	68.1	46	66.7	96	68.1	93	62.8
	p=1.0				p=1.0				p=0.705			
Fruit, fruit juices	49	60.5	53	65.4	48	69.6	51	73.9	107	75.9	104	70.3
	p=0.219				p=0.375				p=0.035			
Milk, yoghurt, buttermilk, cheese	9	11.1	11	13.6	7	10.1	8	11.6	16	11.3	19	12.8
	p=0.50				p=1.0				p=0.083			
Carbonated beverages	41	50.6	33	40.7	32	46.4	25	36.2	73	51.8	58	39.2
	p=0.021*				p=0.016*				p<0.001*			
Sugar, chocolate, wafer	31	38.3	30	37.0	23	33.3	2	31.9	54	38.3	52	35.1
	p=1.0				p=1.0				p=0.480			
Tea, coffee	62	76.5	64	79.0	51	73.9	49	71.0	113	80.1	113	76.4
	p=0.625				p=0.50				p=1.0			

*Mc Nemar Bowker test (p<0.05)
[1]Due to those who have more than one response, total number is greater than n.

toms was 46.7 percent, and that after symptoms this percentage increased to fifty-six percent. No change could be found in the meal that the participants skipped before and after symptoms (p>0.05). It was learned that the majority of individuals skipped lunch both before and after experiencing symptoms (67.5% and 66.7%, respectively). The reasons for skipping meals show a similarity before and after symptoms (p>0.05). Individuals stated "not feeling like eating" and "snacking" as the most frequent reasons for skipping a meal (48.8% and 45.5%, respectively) before and after symptoms (Table 5).

In Table 6, the intake of daily energy and some nutrients intake are given separately according to gender. The daily energy intake of men was approximately 1975.6±321.4 kcal, and that of women was 1903.6±389.7 kcal. While the daily protein intake of men was approximately 69.2±12.6 g, that of women was approximately 63.7±13.6 g. The difference between men and women with regard to their daily protein intake was statistically important (p<0.05). Although statistically insignificant, the percentage of energy received from fat was higher in women (36.2%) than in men (35.3%) (p>0.05).

It was seen that the daily cholesterol intake of women (197.9±78.8 mg) was significantly lower than that of men (232.7±82.8 mg) (p<0.05). Although statistically insignificant, daily fiber intake was found to be higher in females (21.9±5.7 g) than in males (23.6±7.0 g) (p>0.05).

No difference was found according to gender with regard to vitamin and mineral intake except for vitamin B_{12} and potassium (p>0.05). While the mean value of daily vitamin B_{12} intake of men (3.7±3.6 µg) was significantly higher than that of women (2.5±1.5 µg), the mean value of daily potassium intake of women (2864.3±1144.4 mg) was found to be higher than that of men (2580.2±462.9 mg) (p<0.05).

The mean of the individuals' anthropometric measurements is given in Table 7. While the mean value of BMI is 27.6± 3.2 kg/m² in men, it is 30.4±6.2 kg/m² in women, and the difference is statistically important (p<0.05).

No difference according to gender was found in the mean waist circumference (98.4±10.2 cm in men; 96.4±14.1 in women) (p>0.05). 36.2 percent of women were at high risk while 88.9 percent of men were mostly at high risk for metabolic diseases according to waist circumference (Table 8). It was found that the mean hip circumference in women (102.6±7.3 cm in men; 108.7±11.5 cm in women), and the waist/hip ratio in men (0.96±0.8 in men; 0.89±0.7 in women) were significantly

Table 4: Distribution of the individuals according to eating habit and bedtime snack preferences

	Man (n:81)				*Woman (n:69)*				*Total (n:150)*			
	Before symptom		*After symptom*		*Before symptom*		*After symptom*		*Before symptom*		*After symptom*	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Snacking Habits Before Bedtime												
No	37	45.7	52	64.2	45	65.2	52	75.4	82	54.6	104	69.3
Sometimes	23	28.4	17	21.0	9	13.0	8	11.6	32	21.3	25	16.7
Yes	21	25.9	12	14.8	15	21.7	9	13.0	36	24.0	21	14.0
		p=0.439				p=0.132				p=0.117		
Snack Preferences Before Bedtime												
Sandwich, toast, patty	6	7.4	4	4.9	7	10.1	5	7.2	13	19.1	9	19.6
		p=0.157				p=0.317				p=0.102		
Bagel, biscuit, cookies	10	12.3	5	6.2	3	4.3	2	2.9	13	19.1	7	15.2
		p=0.025*				p=0.317				p=0.014*		
Fruit, fruit juices	27	33.3	21	25.9	15	21.7	13	18.8	42	61.8	44	95.6
		p=0.014*				p=0.157				p=0.005*		
Milk, yoghurt, buttermilk, cheese	13	16.0	8	9.9	5	7.2	3	4.3	18	26.5	11	23.9
		p=0.025*				p=0.157				p=0.008*		
Carbonated beverages	19	23.5	11	13.6	11	15.9	9	13.0	30	44.1	20	29.4
		p=0.005*				p=0.157				p=0.002*		
Sugar, chocolate, wafer	9	11.1	6	7.4	6	8.7	5	7.2	15	22.1	11	23.9
		p=0.180				p=0.317				p=0.102		
Tea, coffee	8	9.9	4	4.9	1	1.4	2	2.9	9	13.2	6	13.0
		p=0.046*				p=0.317				p=0.180		

**Mc Nemar Bowker test (p<0.05)* *[1]Due to those who have more than one response, total number is greater than n.*

Table 5: Distribution of the individuals according to their status of and reasons for skipping meals

	Man (n:81)				*Woman (n:69)*				*Total (n:150)*			
	Before symptom		*After symptom*		*Before symptom*		*After symptom*		*Before symptom*		*After symptom*	
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*	*%*
Skipping Meals												
No	38	46.9	46	56.8	32	46.4	38	55.1	70	46.7	84	56.0
Sometimes	7	8.6	9	11.1	6	8.7	8	11.6	13	8.7	17	11.3
Yes	36	44.4	26	32.1	31	44.9	23	33.3	67	44.7	49	32.7
		p=0.008*				p=0.008*				p<0.001*		
Skipped Meals[1]												
Morning	18	41.9	15	42.9	4	10.8	3	9.7	22	27.5	18	27.3
Noon	24	55.8	19	54.3	30	81.1	25	80.6	54	67.5	44	66.7
Evening	1	2.3	1	2.8	3	8.1	3	9.7	4	5.0	4	6.0
		p=0.317				p=1.0				p=0.317		
Reasons for Skipping Meals[1]												
Lack of time	4	9.3	4	11.4	4	10.8	3	9.7	8	10.0	7	10.6
Not feeling like	21	48.8	16	45.7	18	48.6	14	45.2	39	48.8	30	45.5
Food not prepared	6	14.0	4	11.4	1	2.7	1	3.2	7	8.8	5	7.6
Lose weight	-	-	-	-	1	2.7	1	3.2	1	1.3	1	1.5
No habit	4	9.3	3	8.6	1	2.7	1	2.7	5	6.3	4	6.1
Snacking	8	18.6	8	22.9	12	32.4	11	35.5	20	25.0	19	28.8
		p=0.1				p=0.1				p=0.1		

*Wilcoxon test (p<0.05), **Mc Nemar Bowker test (p<0.05) [1]Due to those who have more than one response, total number is greater than n.

higher in terms of statistics (p<0.001). According to their BMI, 49.3 percent of the individuals were overweight. While the percentage of being overweight was higher in men (61.7%) than in

Table 6: Average daily energy and nutrients intake values of the individuals

Energy and nutrients	*Gender*	*n*	*x*	*SD*	*Min*	*Max*	*p*
Energy (kcal)	Men	81	1975.6	321.4	1426.5	3274.4	0.217
	Women	69	1903.6	389.7	1078.9	2777.7	
Protein (g)	Men	81	69.2	12.6	38.5	98.7	0.011*
	Women	69	63.7	13.6	38.4	91.7	
Protein (%)	Men	81	14.5	2.0	10.0	20.0	0.052
	Women	69	13.8	4.0	8.0	20.0	
Fat (g)	Men	81	78.3	20.7	46.1	180.5	0.632
	Women	69	76.7	20.0	43.9	147.5	
Fat (%)	Men	81	35.3	5.4	27.0	54.0	0.336
	Women	69	36.2	5.9	22.0	50.0	
Saturated fat (g)	Men	81	26.9	7.1	13.8	54.0	0.973
	Women	69	27.0	7.1	12.3	41.9	
Monounsaturated fat (g)	Men	81	27.1	9.0	14.1	74.1	0.662
	Women	69	26.5	8.1	13.9	55.6	
Polyunsaturated fat (g)	Men	81	18.8	7.3	6.9	41.9	0.529
	Women	69	18.1	7.8	7.2	45.0	
Cholesterol (mg)	Men	81	232.7	82.8	52.3	447.5	0.012*
	Women	69	197.9	78.8	74.1	447.5	
Carbohydrate (g)	Men	81	233.7	43.5	155.8	395.4	0.395
	Women	69	232.5	60.0	108.3	418.6	
Carbohydrate (%)	Men	81	49.9	5.6	36.0	59.0	0.938
	Women	69	49.9	6.4	36.0	70.0	
Fiber (g)	Men	81	21.9	5.7	11.1	37.1	0.115
	Women	69	23.6	7.0	11.1	45.3	
Vitamin A (µg)	Men	81	1054.5	742.1	318.9	7058.5	0.202
	Women	69	1280.8	1370.7	553.2	1048.2	
Vitamin B_1(mg)	Men	81	1.0	0.2	0.64	1.90	0.920
	Women	69	1.0	0.3	0.61	1.97	
Vitamin B_2 (mg)	Men	81	1.3	0.3	0.73	2.38	0.819
	Women	69	1.4	0.3	0.88	2.12	
Niacin (mg)	Men	81	12.8	4.1	5.8	24.6	0.193
	Women	69	12.0	3.9	5.9	24.5	
Vitamin B_6 (mg)	Men	81	1.4	0.3	0.9	2.32	0.435
	Women	69	1.5	0.4	0.9	3.6	
Folic acid (µg)	Men	81	327.4	89.1	151.2	703.6	0.219
	Women	69	348.8	122.9	152.7	1112.3	
Vitamin B_{12} (µg)	Men	81	3.7	3.6	0.5	24.9	0.019*
	Women	69	2.5	1.5	0.2	7.4	
Vitamin C (mg)	Men	81	130.9	60.4	32.7	333.4	0.136
	Women	69	155.4	131.2	44.9	1054.1	
Potassium (mg)	Men	81	2580.2	462.9	1363.8	3865.5	0.042*
	Women	69	2864.3	1144.4	1741.9	11096.3	
Calcium (mg)	Men	81	713.0	150.0	356.5	1017.6	0.095
	Women	69	759.8	185.6	395.1	1236.5	
Iron (mg)	Men	81	11.7	2.3	7.3	18.9	0.617
	Women	69	11.9	2.8	7.0	22.7	

*Student t test ($p<0.05$)

women (34.8%), the percentage of those with second degree obesity was significantly higher in women (18.8%) than in men (4.2%) ($p<0.001$).

DISCUSSION

Gastroesophageal reflux is a digestive system disease that is common in Western countries. Untreated GERD accelerates the development of the complications such as esophagitis, peptic stricture, Barett's esophagus, and adenocarcinoma, which increase morbidity, and affect life quality in a negative way (DeVault et al. 2005). Ness-Jensen et al. (2015) demonstrated a positive relationship between etiology of the disease and factors such as nutrition and life style. The general characteristics of individuals who were newly diagnosed with gastroesophageal reflux after endoscopy, their eating habits before and after GERD symptoms, and their an-

Table 7: Anthropometric measurements values of the individuals

	Men (n:81)		*Women (n:69)*		*Total (n:150)*		
	x	*SD*	*x*	*SD*	*x*	*SD*	*p*
Anthropometric Measurements							
Weight (kg)	82.6	11.9	79.0	16.0	80.9	14.0	0.123
Height (cm)	173.0	6.1	161.5	6.4	167.7	8.4	0.000*
BMI (kg/m^2)	27.6	3.2	30.4	6.2	28.7	5.1	0.001*
Waist circumference (cm)	98.4	10.2	96.4	14.1	97.5	12.1	0.340
Hip circumference (cm)	102.6	7.3	108.7	11.5	105.4	9.9	0.000*
Waist/Hip ratio	0.96	0.8	0.89	0.7	0.92	0.1	0.000*

*Student t test ($p<0.05$)

Table 8: Distribution of individuals according to waist circumference and BMI (kg/m^2)

	Men (n:81)		*Women (n:69)*		*Total (n:150)*		
	x	*SD*	*x*	*SD*	*x*	*SD*	*p*
Waist Circumference							
No risk	3	3.7	32	46.4	35	25.3	
Risky	6	7.4	12	17.4	18	12.0	0.000*
High risk	72	88.9	25	36.2	97	64.7	
BMI (kg/m²)							
<20.0 (Thin)	1	1.2	2	2.9	3	2.0	
20.0 – 24.9 (Normal)	13	16.0	11	15.9	24	16.0	
25.0 – 29.9 (Overweight)	50	61.7	24	34.8	74	49.3	0.000*
30.0 – 34.9 (1.degree obesity)	16	19.8	13	18.8	29	19.3	
35.0 – 39.9 (2.degree obesity)	1	4.2	13	18.8	14	9.3	

*Pearson Chi-square test ($p<0.05$)

thropometric measurements were evaluated in this study.

Frequency of food consumption and the amount of energy and nutrients per meal play a significant role in maintaining the physiological balance of the body and protecting the organs (The Ministry of Health of Turkey 2006). Daily intake of energy and nutrients required by the body in the necessary amounts forms a sufficient and balanced diet, and for this, the consumption of three meals in a day is a must (The Ministry of Health of Turkey 2006).

The number and size of the meals are the significant factors reflecting the eating habits of individuals. However, only a few studies have been conducted on the effect of the number of meals on GERD. Randhawa and colleagues (2015) reported that feeding two times in a day with liquid meals decreased the reflux symptoms.

Jarosz and colleagues (2014) demonstrated that feeding 1-2 times with a big portion was a risk factor for GERD. However, it was found that when humans eat intermittently according to the "eat less and often" style, the increase in the consumption of food amount per meal causes gastric distention, and food leaves the stomach earlier (Tai et al. 1991). As gastric distention induced by the delay of gastric emptying causes an increase in the relaxation frequency of the lower esophageal sphincter, and a prolonging in the exposure of the esophagus to reflux material, a relationship between GERD and number of meals is considerable (Stacher et al. 2000).

In this research, 50.7 percent of the individuals stated that they eat three meals a day before symptoms, and after experiencing GERD symptoms, sixty-four percent of the individuals started to eat three meals a day (Table 2). There is a significant difference before and after GERD symptoms with regard to the number of meals and snacks individuals consume ($p<0.05$). While 53.4 percent of the individuals stated that they had skipped meals before symptoms, the percentage of individuals who skipped meals after experiencing GERD symptoms decreased to forty-four percent (Table 2).

The relationship between obesity and GERD was shown in various studies (Fass 2008; Djärv et al. 2012). Of the participants in this research, 49.3 percent were overweight, 19.3 percent had

first-degree obesity, and 9.3 percent had second-degree obesity. Obesity is related to the number of the meals. In the studies conducted, it was reported that obesity decreased as the frequency of meals increased (Berg et al. 2009; Fulkerson et al. 2008). As skipping meals causes obesity, it can be indirectly related to GERD.

Carbonated beverages decrease lower esophageal sphincter pressure and increase frequency of transient lower esophageal sphincter relaxation, increase gastric acid secretion, and cause gastric distention and acid reflux. For this reason, carbonated beverages are an important risk factor in terms of GERD (Hamoui et al. 2006; Shukla et al. 2012). Song and colleagues (2011) reported that consumption of carbonated beverages had increased the risk of reflux symptoms with odd ratios of 1.69.In a study, in which the researchers examined the effects of carbonated beverages on GERD symptoms, Feldmann and Barnett (1995) reported that 10-19.8 percent of the participants experienced a burning sensation after consuming different carbonated beverages.

In a study by Fass et al. (2005) examining the burning sensation in the stomach while sleeping, twenty-four percent of 15.314 participants reported that they experienced a burning sensation while sleeping, and the consumption of carbonated beverages before sleeping was a significant increasing factor (95% OR=1.24 1.07-1.45).

In this study, 51.8 percent of the individuals who ate snacks, and 44.1 percent of the individuals who were in the habit of eating bedtime snacks before GERD symptoms stated that they consumed carbonated beverages. After experiencing GERD symptoms, carbonated beverages consumption in snacks and before bed decreased to 39.2 percent and 29.4 percent, respectively. It was shown that there was a significant difference as regards before and after experiencing GERD symptoms in carbonated beverages consumption in snacks and before bed ($p<0.05$).

In guidelines developed for the diagnosis and treatment of GERD, the patients are advised not to eat for at least 3 hours before sleeping. Sleeping after consuming food increases GERD risks by causing gastric distention and an increase in the temporary relaxation frequency of the lower esophageal sphincter (LES) (Katz 2004).

In the research conducted by Fujiwara et al. (2005) with 147 GER patients aged between 23-69 years, patients were questioned as to how many hours before going bed they had their dinner. The answers were classified as less than three hours, three to four hours, or more than four hours. As result of the research, it was reported that the period between dinner and bedtime was shorter in GER patients than in the control group, and those who slept less than three hours after dinner increased their GERD risks by 7.45 (95% 3.38-16.4) times compared to those who slept four hours after having dinner.

Sontag et al. (2004) reported that asthma patients ate before sleeping more often than the control group and experienced serious GERD symptoms while sleeping. In this study, 150 GER patients' habits of eating bedtime snacks were studied. It was found that 45.2 percent of the individuals were in the habit of eating bedtime snacks before GERD symptoms. Even though this percentage decreased to 30.7 percent after experiencing GERD symptoms, no statistical relationship was found ($p>0.05$).

Eating fast increases physiological reflux frequency by causing gastric distention, and therefore might cause GERD. In a study conducted with 20 healthy individuals, individuals were asked to eat a standard meal within 5 and 30 minutes. It was reported that those who finished within 5 minutes experienced reflux 14 times more two hours later, while those who finished within 30 minutes experienced reflux 10 times. It was found that eating fast might pose a risk for GERD in healthy individuals (Wildi et al. 2004).

In this study, it was shown that before symptoms 36.7 percent of the individuals ate fast, and 41.3 percent ate too fast. After experiencing GERD symptoms the percentage of those who ate fast increased to 40.6 percent, and that of those who ate too fast decreased to thirty-four percent, and the difference was significant ($p<0.05$) (Table 2).

Even though there are few epidemiological studies examining the relationship between eating speed and obesity, it is indicated that obese individuals mostly eat fast. This situation is related to the higher energy and food consumption by individuals within a certain period of time (Otsuka et al. 2006; Ohkuma et al. 2013). The fact that obesity is an important factor in the development of GERD and that the majority of participants eats fast and are overweight (49.3%) or obese (28.6%) (Table 8) showed that there may be a positive relationship between GERD and eating fast.

The mean values of the participants' daily energy and nutrients intake are given in Table 6. Accordingly, the mean daily energy intake of male GER patients is 1975.6±321.4 kcal, and that of female patients is 1903.6±389.7 kcal. In a study examining the daily nutrients and energy intake of GER patients, El-Serag et al. (2005) reported that the daily energy intake of GER patients was 1937±834 kcal, and that of the control group was 1770±786 kcal ($p<0.05$). In a study by Shapiro et al. (2007), a daily energy intake of 2126±106 kcal was stated for GER patients.

When the carbohydrate, protein and fiber intake of the participants was examined, it was found that daily protein intake of men was approximately 69.2±12.6 g, while that of women was approximately 63.7±13.6 g, and the difference between genders was found to be significant ($p<0.05$). No difference was found between men and women with regard to fiber intake (21.9±5.7 g in men, 23.6±7.0 g in women) and the percentage of energy received from carbohydrates (49.9% in men and women). 65.4 percent of men and 72.8 percent of women took fiber in sufficient amounts ($p<0.05$). El-Serag et al. (2005) reported that the daily protein intake of individuals with erosive reflux was 73±33 g, and that of the control group was 61±28 g. The difference between the groups was significant ($p=0.027$). It was also found that the daily carbohydrate intake value of GER patients and that of the control group was similar. However, the daily fiber intake value of GER patients was significantly lower than the control group.

In a study, which examined the nutrients and energy intake amounts of GER patients, Shapiro et al. (2007) stated that the daily protein intake of the patients was 79.2±4.3 g, and the percentage of the energy received from protein was 15.2±0.7 percent.

Shapiro et al. (2007) reported that the daily fat intake of GER patients was 94.2±5.5 g, saturated fatty acid intake was 33.7±2.0 g, and cholesterol intake was 311±28 mg. El-Serag et al. (2005) stated that the daily fat intake of the patients was 77±40 g, and that of the control group was 68±36 g. The saturated fatty acid intake of the patients was 23±12 g, and that of the control group was 20±11 g. The cholesterol intake was 231±132 mg in the patients group, and 202±131 mg in the control group. According to study results, fat (especially SFA) and cholesterol intake in high amounts were reported to increase GERD symptoms and the frequency of erosive esophagitis.

In this study, the nutrients and energy intakes of GER patients were found to be similar to a few other studies on this subject. The mean daily fat intake of male participants was 78.3±20.7 g, and that of females was 76.7±20.0 g. The daily saturated fatty acid intake was 26.9±7.1 g in men, and 27.0±7.1 g in women. The mean cholesterol intake value was 232.7±87.8 mg in men, and 197.9±78.8 mg in women. The percentage of energy received from fat was 35.3±5.4 percent in men, and 36.2±5.9 percent in women. It is recommended that twenty-five to thirty percent of energy should to be received from fat within the frame of the principles of a healthy diet (The Ministry of Health of Turkey 2006). The fact that the percentage of the energy individuals receive from fat is high may be related to the majority of them (49.3%) having obesity prevalence, which has increased in several places in the world, and this increase causes many diseases related to obesity (El-Serag 2008). Obesity causes GERD through mechanisms such as increase in intra-abdominal pressure, delay in gastric emptying, decrease in LES pressure and increase in transient lower esophageal sphincter relaxation (TLESR) frequency (Hampel et al. 2005).

Body mass index (BMI) is used in order to define obesity. Overweight (BMI: 25-29.9 kg/m²) or obese (BMI $\geq$ 30kg/m²) individuals are within the risk group for GERD (El-Serag 2008).

In their study examining the relationship between dietary factors and GERD in Korea, Song et al. (2011) reported that overweight and obese individuals with BMI $\geq$23 kg/m² have 2.5 times greater risk of developing GERD than healthy individuals.

Murray et al. (2003) stated that the prevalence ratio of pyrosis, a GERD symptom, in overweight individuals (BMI: 25-29.9 kg/m²) increased 1.82 times compared to individuals of normal weight (BMI:20-24.9 kg/m²), the acid regurgitation prevalence ratio increased 1.5 times, and in obese individuals (BMI $\geq$30 kg/m²) GERD symptoms and acid regurgitation prevalence increased respectively 2.91 and 2.23 times.

In a study conducted on 6215 GER patients, Nocon et al. (2007) reported that the frequency and severity of GERD symptoms such as heartburn and acid regurgitation increases along with an increase in BMI, and that there is an increase in the severity of esophagitis in obese women

compared to women of normal weight. In other studies examining the severity of GERD symptoms and BMI, a positive link between the severity of GERD symptoms and BMI was also found (Jacobson et al. 2006; Alvarenga et al. 2009).

In another study with 1659 individuals with GERD, it was stated that a decreased LES pressure prevalence ratio is high in individuals with high BMI, and that there is a positive correlation between BMI and acid exposure time of the esophagus (Ayazi et al. 2009).

In this study, 49.3 percent of the individuals were assessed as overweight (BMI: 25.0-29.9 kg/m²), 19.3 percent as having first-degree obesity, and 9.3 percent as having the second-degree obesity (Table 8). The BMI mean of men (27.6±3.2 kg/m²) was significantly lower than the BMI mean of women (30.4±6.2 kg/m²).

Abdominal obesity is a greater risk factor for GERD compared to BMI. Waist circumference measurement is an important indicator of visceral adiposity (Kang 2007). In 2457 individuals in Korea, while abdominal obesity (waist circumference in women ≥80 cm, in men ≥90 cm) prevalence was found in 24.2 percent, after endoscopy results erosive esophagitis prevalence was found as 6.6 percent. Individuals with abdominal obesity have a 2.3 times greater risk for erosive esophagitis (Kang 2007). Chung et al. (2008) reported that in the control group and patient group with 3539 reflux esophagitis patients, an increase in waist circumference also increases the risk for reflux esophagitis by 1.5 times (95% 1.30-1.65). In their research examining the relationship between anthropometric measurements and intra-gastric pressure, El Serag et al. (2006) stated a minimal but positive relationship between increase in waist circumference and intragastric pressure in 322 GER patients with a mean waist circumference of 89.4±14.5 cm.

In this study, the mean waist circumference of 150 GER patients was 97.0±13.7 cm. The majority (64.7%) of the participants had high-risk values with regard to waist circumference (for women ≥88 cm, for men ≥102).

The eating habits of GER patients must be altered in order to reduce GERD symptoms and prevent probable complications. The meals of GERD patients should be frequent, not much food should be eaten in a meal, and GER patients should go to sleep at least 3 hours after eating. They should consume food with low fat and cholesterol, and increase the protein content of their diet. GER patients should avoid fatty and fried foods, which decrease LES pressure, and spices, carbonated beverages, tomato, citrus fruits and coffee, which increase irritation of the esophagus, and foods such as chocolate, mint, onion, and garlic. In addition, GER patients should increase their fiber intake by consuming fruit and vegetables in order to protect themselves from GER complications.

Obesity is one of the most important factors accelerating the development of GERD and increasing the severity of GERD symptoms. Maintenance of a proper body weight prevents the development of GERD as well as helps decrease the frequency and severity of GER symptoms.

CONCLUSION

This study showed that approximately half of the individuals were overweight. Moreover, one in three women and nine in ten men were at high risk for metabolic diseases according to waist circumference. Significant changes were detected in GER patient's number of meals, meal skipping status, eating speed, food temperatures and patients reduced their consumption of carbonated beverages, coffee, artificial juice, spices, chocolate, deep-fried food, onions, tomatoes, and citrus fruits, which are refluxogenic foods after experiencing GERD symptoms.

RECOMMENDATIONS

Eating habits and lifestyle are changeable factors that can prevent the development, symptoms and complications of GERD. The prevalence of GERD can be reduced with changes in eating habits and lifestyle. Moreover, with these changes, the life quality of GER patients can also be increased, as the frequency and severity of symptoms will decrease.

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