Clinical and Experimental
Health Sciences

Does Physical Activity Level, Anthropometric Measurements, and Nutritional Status Affect Stool Type in Adult Women?

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Received: May 17, 2025 **Accepted:** August 26, 2025

ABSTRACT

Objective: The objective of this study was to determine the stool types of adult women and evaluate their relationships with physical activity status, anthropometric measurements and nutritional status.

Methods: This study was conducted with 1479 women between the ages of 18-65 years residing in Ankara, Turkey. To determine the nutritional status of the participants, a daily food consumption record was obtained using the 24-hour food recall method. The International Physical Activity Questionnaire Short Form (IPAQ) was used to determine the physical activity status of the participants, and the Bristol Stool Scale was used to determine stool types. The Bristol Stool Scale was created based on the idea that stool type indicates intestinal transport time. Body weight, height, waist, and hip circumferences of the participants were measured by the researcher. After the measurements, the waist-to-hip ratio, waist-to-height ratio and body mass index were also calculated.

Results: Among 1479 participants with a mean age of 37.72 ± 11.51 years, 81.3% had normal, 11.3% hard, and 7.4% soft stools. The rate of obesity according to hard, normal, and soft stools was 28.75%, 28.15%, and 34.85%, respectively. The group with hard stools had significantly higher total energy (kcal/day) and dietary fat (g/day) intake than the groups with normal and soft stools (p<.05). There were no significant differences between IPAQ classifications and stool types. Logistic regression analysis showed that waist-to-height ratio (OR: 17.1, 95% CI: 2.46-118.92) increased the likelihood of soft stools by 17.1 times and protein intake (OR: .98, 95% CI: .96-.996) reduced the likelihood of soft stools by a factor of .979 (p<.05).

Conclusions: There were no significant differences between IPAQ classifications and stool types. Normal stool type is common among adult women in Turkey. Physical activity levels do not affect the type of stools.

Keywords: Fiber intake, obesity, physical activity, stool type.

1. INTRODUCTION

Nutrition forms the basis of health throughout every stage of the life cycle. Adequate and balanced nutrition entails the intake of sufficient amounts of energy and nutrients necessary for the growth, renewal, and functioning of the body and their appropriate use in the body (1). There are important physiological, neurological, and hormonal differences in women's health that affect their nutritional needs throughout the life cycle. Women, the elderly, and individuals of low socioeconomic status are more prone to experiencing constipation (2). The overall prevalence of constipation among adults ranges from 7% to 10%. Constipation prevalence varies between the sexes, with women experiencing rates approximately 6% higher than men. Constipation is a common health problem that negatively affects health-related quality of life due to decreased physical, mental, and social well-being (3). Many patients are advised to consume more high-fiber foods and engage in more physical exercise to relieve constipation (4).

Diarrhea, a prevalent digestive system symptom associated with obesity, significantly impacts the quality of life and the health of patients. The precise etiology of chronic diarrhea in obese individuals remains unclear; however, multiple studies indicate a higher prevalence of bile acid malabsorption in obese individuals compared to those with normal body mass index (BMI) values (5, 6). Compared to individuals with normal BMI values, obese individuals exhibit quicker colonic transit, and obesity is linked to heightened intestinal permeability, microbial dysbiosis, and endotoxemia (i.e., increased lipopolysaccharide levels) (7).

Physical inactivity, poor nutrition, and unmanaged stress have detrimental effects on both physical and mental health,

How to cite this article: Baran Ö, Kartal ME, Coşkun A, Süt Kurt C, Dağ B, Nahya Servi N, Doğan G, Yücecan S, Dağ A. Does Physical Activity Level, Anthropometric Measurements, and Nutritional Status Affect Stool Type in Adult Women?. Clin Exp Health Sci 2025; 15: 674-681. https://doi.org/10.33808/clinexphealthsci.1700763

significantly impacting the overall quality of life. Recent findings have shown that physical activity can improve the gut microbiome, genetic components, and microbial biodiversity, which may be beneficial for healthy aging. Several factors, including low dietary fiber intake and inadequate physical activity, might contribute to the onset of both obesity and constipation (8).

The objective of this study was to determine the stool types of adult women and evaluate their relationships with physical activity status, anthropometric measurements and nutritional status.

2. METHOD

2.1. Study Design

This study was conducted with women between the ages of 18 and 65 years residing in the Mamak district of Ankara, Turkey, during June and July 2022. G*Power analysis was used to calculate a sufficient number of samples to represent the research population. Accordingly, the number of samples to be selected from the research population of 2800 people was calculated as 580 people for power of 0.95 and an acceptable type I error of 0.05, based on an effect size of 0.30, and 1479 women were included in the research. Before beginning the study, approval was received from the Lokman Hekim University Non-Interventional Clinical Research Ethics Committee with decision dated 07.07.2022 and numbered 2022/10. Additionally, participants were informed about the study and signed a consent participation form that adhered to the protocols of the Declaration of Helsinki (World Medical Association).

Individuals under 18 or over 65 years of age, males, and those using medications or having conditions (such as celiac disease) that could affect bowel habits or stool type were excluded from the study.

The researchers administered a survey form in person to individuals who willingly agreed to participate in the study. The survey form included sections for participants' personal information (age, marital status, education level, occupation, and income level) in the first part, their health status in the second part, tobacco use in the third part, and nutritional habits in the fourth part. To determine the nutritional status of the participants, a daily food consumption record was obtained using the 24-hour food recall method (9). The International Physical Activity Questionnaire (IPAQ) Short Form was used to determine the physical activity status of the individuals and the Bristol Stool Scale was used to determine stool types (10, 11).

2.2. Evaluation of Nutritional Status and Outcome Measures

In order to evaluate the nutritional status of the participants, a daily food consumption record was obtained using the 24-hour food recall method. The "Meal and Food Photo Catalog" was used to determine the amount of food or beverages consumed by the participants (12). The contents of the meals consumed by participants were calculated using a standard recipe book (13). Average daily dietary energy carbohydrates, protein, fat, soluble fiber and insoluble fiber intake were analyzed using the Nutrition Information Systems Package Program (BeBiS, EBISpro for Windows, Germany; Turkish Version/BeBiS 8) (14).

2.3. Bristol Stool Scale

The Bristol Stool Scale was created based on the idea that stool type indicates intestinal transport time. This chart aims to estimate intestinal transport time based on 7 different stool forms (11). According to the Rome IV diagnostic criteria, types 1 and 2 reflect hard stools (constipation); types 3, 4, and 5 reflect normal stools; and types 6 and 7 reflect soft stools (diarrhea) in the Bristol Stool Scale (15).

2.4. International Physical Activity Questionnaire (Short Form)

The IPAQ Short Form was used to determine participants' physical activity levels. This form evaluates vigorous activities, activities of moderate intensity, and walking performed for at least 10 minutes in the last 7 days. Additionally, the average sedentary time spent in a day is noted. Respondents are asked how many days a week and for how long the activities are performed. While calculating the total score, the weekly MET-min value is obtained by multiplying the metabolic equation (MET) values assigned to the activities (vigorous activity = 8 MET, moderate activity = 4 MET, walking = 3.3 MET) by the number of days the activity was performed and the duration (min). According to the scores obtained, individuals' physical activity levels are grouped as "inactive," "moderately active," and "active" (10).

2.5. Anthropometric Measurements

Anthropometric measurements were carried out by the researchers. Body weight measurements and detailed body analyses were performed with a Hometta HMY-1500B device while participants were in light clothing, without shoes, and after defecation if possible. Height measurements were performed with a stadiometer while ensuring that the feet were together and participants were in the Frankfort plane (eyes and auricles at the same level) (16). The waist-to-hip ratio, waist-to-height ratio and BMI were also calculated. Participants' BMI values were calculated by dividing their body weight in kilograms (kg) by the square of their height in meters (m). BMI values were grouped using the World Health Organization's BMI classification for adults (17).

2.6. Statistical Analysis

Statistical analysis of the data was performed using the SPSS statistical package. The compliance of the data with normal distribution was evaluated with the Shapiro-Wilk test. The t-test was used for comparisons between groups of normally distributed data and the Mann-Whitney U test was used for comparisons of non-normally distributed data. For comparisons between more than two groups, one-way analysis of variance (ANOVA) was used for normally distributed data and the Kruskal-Wallis test was applied for non-normally distributed data. Relationships between categorical variables were evaluated with the chi-square test and relationships between numerical variables were evaluated with Spearman correlation analysis. Logistic regression analysis was performed to identify variables associated with stool evaluations. Values of p<.05 were considered statistically significant.

Table 1. *Characteristics of the participating women*

	Women (n=1479)
Age (years) ($\bar{X}$±SD)	37.72±11.51
	n (%)
Level of schooling	
Illiterate	28 (1.9)
Literate	19 (1.3)
Primary school	485 (32.8)
High school	535 (36.2)
University	380 (25.7)
Master's degree/doctorate	32 (2.2)
Marital status	
Married	1134 (76.7)
Single	345 (23.3)
Occupation	
Student	162 (10.9)
Civil servant	131 (8.9)
Retiree	23 (1.6)
Self-employed	71 (4.8)
Private sector	103 (7.0)
Housewife	947 (64.0)
Unemployed	31 (2.1)
Other	11 (0.7)
Income status	
Income less than expenses	576 (38.9)
Income equal to expenses	805 (54.4)
Income exceeding expenses	98 (6.6)
Physical activity status	
Inactive (Category 1)	545 (36.8)
Minimally active (Category 2)	586 (39.6)
Very active (Category 3)	348 (23.5)
Bristol Stool Scale	
Hard (Type 1 + Type 2)	167 (11.3)
Normal (Type 3 + Type 4 + Type 5)	1203 (81.3)
Soft (Type 6 + Type 7)	109 (7.4)
	$\bar{X}$±SD
Energy, macronutrients, and fiber intake	
Energy (kcal/day)	1293.2±556.2
Carbohydrates (g/day)	147.4±79.2
Carbohydrates (%)	45.9±12.1
Protein (g/day)	49.5±22.6
Protein (%)	16.1±4.6
Fat (g/day)	54.9±29.1
Fat (%)	38.0±11.1
Dietary fiber (g/day)	15.2±10.5
Soluble fiber (g/day)	5.0±4.4
Insoluble fiber (g/day)	9.7±6.4
Water (mL/day)	1696.9±990.6

SD: Standard deviation

3. RESULTS

The characteristics of the participants are shown in Table 1. Our study included a total of 1479 female volunteers. The mean age of the participants was 37.72±11.51 years. It was determined that 76.7% of the participants were married and 54.4% of them had income equal to their expenses. Upon analyzing the distribution of participants based on their physical activity status, similar numbers of individuals were found in the inactive (Category 1) and minimally active (Category 2) groups, while the lowest number was observed in the highly active group (Category 3). According to the Bristol Stool Scale classification, 11.3% (167) of the women had hard stools, 81.3% (1203) had normal stools, and 7.4% (109) had soft stools.

The distribution of the participants' anthropometric measurements according to various classifications is provided in Table 2. Upon evaluating the distribution of participants based on their BMI values, 4.2% (62) were categorized as underweight, 33.3% (492) as normal weight, 33.8% (500) as mildly overweight, and 28.7% (425) as obese. It was determined that 45.6% of women were in the very high-risk class according to waist circumference. The mean anthropometric measurement values of the participants were as follows: average body weight was 69.96±14.3 kg, mean height was 160.8±6 cm, mean BMI was 27.12±5.77 kg/m^2, mean waist circumference was 87.89±14.34 cm, mean hip circumference was 106.15±11.33 cm, mean waist-to-hip ratio was 0.82±0.08, and mean waist-to-height ratio was 0.54±0.09.

Table 2. *Evaluation of participants' anthropometric measurements*

	Women (n=1479)			
	n (%)			
BMI classification (kg/m^2)				
Underweight (<18.5 kg/m^2)	62 (4.2)			
Normal (18.5-24.9 kg/m^2)	492 (33.3)			
Overweight (25-29.9 kg/m^2)	500 (33.8)			
Obese (≥30 kg/m^2)	425 (28.7)			
Waist circumference (cm)				
Low risk (M: <94 cm; W: <80 cm)	507 (34.3)			
High risk (M: 94-102 cm; W: 80-88 cm)	297 (20.1)			
Very high risk (M: ≥102 cm; W: ≥88 cm)	675 (45.6)			
Waist/height ratio				
<0.4	108 (7.3)			
0.4-0.5	382 (25.8)			
0.5-0.6	631 (42.7)			
>0.6	358 (24.2)			
Waist/hip ratio				
≤0.8	680 (46.0)			
>0.8	799 (54.0)			
	$\bar{X}$±SD	**M**	**Min.**	**Max.**
Anthropometric measurements				
Weight (kg)	70.0±14.3	68.6	35.2	129
Height (cm)	160.8±6	161	140	184
BMI (kg/m^2)	27.1±5.8	26.7	14.5	58.4
Waist circumference (cm)	87.9±14.3	87	52	145
Hip circumference (cm)	106.1±11.3	105	55	154
Waist/hip ratio	0.8±0.1	0.81	0.5	1.4
Waist/height ratio	0.5±0.1	0.53	0.3	0.9

SD: Standard deviation; Min.: minimum; Max.: maximum; M: median.

The distributions of anthropometric measurements, mean energy and nutrient intake and standard deviations, and the distribution of physical activity statuses according to Bristol Stool Scale classifications are shown in Table 3. In classifications based on the stool scale, the differences in the means of body weight, height, BMI, hip circumference, waist circumference, and waist-to-hip ratio were not found to be statistically significant (p>.05).

Table 3. *Evaluation of some variables according to the Bristol Stool Scale*

	Bristol Stool Chart			
	Hard (n=478) (Type 1 + Type 2 + Type 3)	Normal (n=705) (Type 4)	Soft (n=296) (Type 5 + Type 6 + Type 7)	p
	X̄±SD	X̄±SD	X̄±SD	
Anthropometric measurements				
Weight (kg)	69.9±13.4	69.8±14.4	72.1±15.0	.253
Height (cm)	160±6	161±6	160±6	.181
BMI (kg/m²)	27.3±5.5	27.0±5.7	28.4±6.7	.48
Hip circumference (cm)	106.3±10.6	106.0±11.3	108.00±12.6	.197
Waist circumference (cm)	88.8±13.6	87.4±14.2	91.5±15.9	.14
Waist/height ratio	0.5±0.1	0.5±0.1†	0.6±0.1†	**.008***
Waist/hip ratio	0.8±0.1	0.8±0.1	0.8±0.1	.132
Energy, macronutrient, and fiber intake				
Energy (kcal/day)	1380.9±549.4†	1290.9±547.2	1185.2±478.6†	**.016***
Carbohydrate (g/day)	156.8±85.8	147.1±78.3	137.2±77.5	.122
Carbohydrate (%)	45.3±11.5	45.9±12.1	46.4±12.7	.765
Protein (g/day)	53.1±25.1‡	49.6±22.6‡	43.2±17.4§	**.02***
Protein (%)	16.2±4.6	16.1±4.6	15.6±4.7	.545
Fat (g/day)	59.6±33.7†	54.6±28.8	50.5±23.8†	**.029***
Fat (%)	38.3±11.0	37.9±11.2	37.9±10.9	.928
Fiber (g/day)	15.8±8.9	15.3±11.0	13.8±6.5	.292
Soluble fiber (g/day)	5.2±3.7	5.0±4.6	4.7±3.3	.653
Insoluble fiber (g/day)	9.9±6.0	9.7±6.5	8.8±4.5	.316
Water (mL/day)	1731.0±1089.0	1699.0±978.0	1620.0±972.0	.653
IPAQ-MET-Score	2109.9±3252.5	1742.4±2472.6	2013.4±2885.4	.168
	n (%)	**n (%)**	**n (%)**	
IPAQ classification				
Inactive (Category 1)	66 (39.5)	436 (36.3)	43 (39.4)	χ^2=1.53
Minimally active (Category 2)	62 (37.1)	485 (40.3)	39 (35.8)	p=.82
Very active (Category 3)	39 (23.4)	282 (23.4)	27 (24.8)	
BMI classification (kg/m²)				
Underweight (<18.5 kg/m²)	7 (4.2)	50 (4.1)	5 (4.6)	
Normal (18.5-24.9 kg/m²)	45 (26.9)	421 (35.0)	26 (23.8)	χ^2=10.28
Overweight (25-29.9 kg/m²)	67 (40.1)	393 (32.7)	40 (36.7)	p=.11
Obese (≥30 kg/m²)	48 (28.7)	339 (28.1)	38 (34.8)	
Waist circumference (cm)				
Low risk (M: <94 cm; W: <80 cm)	47 (28.1)	381 (31.6)	24 (22.0)	
High risk (M: 94-102 cm; W: 80-88 cm)	33 (19.8)	240 (20.0)	25 (22.9)	χ^2=5.06 p=.281
Very high risk (M: ≥102 cm; W: ≥88 cm)	87 (52.1)	582 (48.4)	60 (55.1)	
Waist/height ratio				
<0.4	2 (1.2)	47 (3.9)	5 (4.6)	
0.4-0.5	47 (28.1)	365 (30.3)	24 (22)	χ^2=9.58
0.5-0.6	73 (43.7)	504 (41.9)	44 (40.4)	p=.143
>0.6	45 (26.9)	287 (23.9)	36 (33)	
Waist/hip ratio				
≤0.8	69 (41.3)	567 (47.1)	44 (40.4)	χ^2=3.48
>0.8	98 (58.7)	636 (52.9)	65 (59.6)	p=.175

**: One-way ANOVA (post hoc: Tukey's test); †: there is a significant difference between groups; ‡, §: there is no significant difference between groups with the same letter; SD: standard deviation; p<.05*

The difference in mean waist-to-height ratios between the groups with normal and soft stool types was statistically significant (p<.05). In classifications based on the stool scale, the differences in mean energy intake and fat consumption between the groups with hard and soft stool types were also statistically significant (p<.05).

In classifications based on the stool scale, the differences in mean carbohydrate intake amount, carbohydrate intake percentage, protein intake percentage, fat intake percentage, dietary fiber intake amount, soluble dietary fiber intake amount, insoluble dietary fiber intake amount, and water consumption amount were not statistically significant (p>.05). The difference in mean protein consumption amount between the group with soft stools and the groups with hard and normal stools was statistically significant (p<.05). The differences in IPAQ classification groups based on the Bristol Stool Scale were not statistically significant (p>.05).

Logistic regression analysis was conducted to determine the variables associated with stool evaluations (Table 4). Waist-to-height ratio and energy, protein, and fat intake, which were found to be significant in pairwise comparisons, were included in the analysis. The normal stool evaluation level was taken as a reference. Waist-to-height ratio and energy, protein, and fat intake did not affect the occurrence of stool hardness (p>.05). The waist-to-height ratio increased the likelihood of soft stools by 17.11 times (p<.05). Protein reduced the likelihood of soft stools by a factor of 0.979 (p<.05). Energy and fat did not affect the occurrence of soft stools (p>.05). The independent variables explained 3% of the occurrence of soft stools.

Table 4. *Logistic regression (effect of independent variables on the occurrence of hard and soft stool types)*

		B	Std. error	p	OR	95% CI Min.	95% CI Max.	R^2
Hard	Waist/height ratio	1.378	.834	.098	3.967	.774	20.337	**.010**
	Energy (kcal/day)	.000	.000	.883	1.000	.999	1.001	
	Protein (g/day)	.002	.005	.673	1.002	.992	1.013	
	Fat (g/day)	.004	.005	.435	1.004	.995	1.012	
	Constant	-3.106	.507	.000	.045			
Soft	Waist/height ratio	2.840	.989	**.004**	17.110	2.462	118.918	**.030**
	Energy (kcal/day)	.000	.000	.650	1.000	.999	1.001	
	Protein (g/day)	-.021	.009	**.016**	.979	.962	.996	
	Fat (g/day)	.002	.006	.801	1.002	.990	1.014	
	Constant	-3.310	.620	.000	.037			

A bar graph depicting the classification based on the Bristol Stool Scale and body mass index is provided in Figure 1. The percentages of women who were obese according to hard, normal, and soft stool types were 28.75%, 28.15%, and 34.85%, respectively.

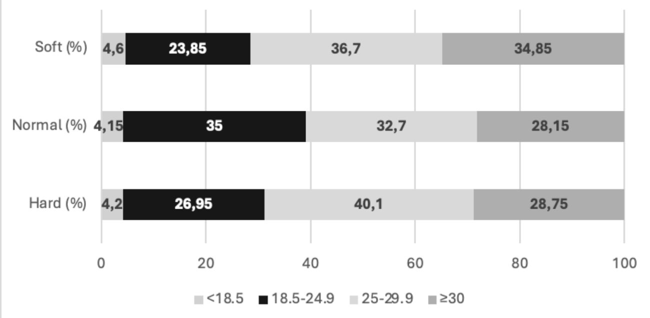

Figure 1. *Bar graph depicting the classification based on the Bristol Stool Scale and body mass index*

4. DISCUSSION

Bowel habits and stool types vary among individuals depending on their eating habits, lifestyles, and overall health statuses. Functional bowel disorders are more prevalent in women compared to men. Factors such as oral contraception, childbirth, hysterectomy, and pelvic floor dysfunction in women can be considered among the causes of intestinal disorders (18). The mechanisms behind how sex differences may affect bowel habits and stool types are not fully understood. In this study, the stool types of adult women were evaluated with the Bristol Stool Scale and their relationships with physical activity status, anthropometric measurements and nutritional status were examined.

In cases of functional bowel disorders, there are no identifiable structural or biochemical abnormalities as in other gastrointestinal disorders. Therefore, diagnosis is based almost entirely on symptoms, and the Rome diagnostic criteria constitute the most widely accepted standard for such symptom-based diagnoses. The Rome IV criteria are the most recent updated version. According to these criteria, types 1 and 2 of the Bristol Stool Scale reflect hard stools; types 3, 4, and 5 reflect normal stools; and types 6 and 7 reflect soft stools (19). Similar to other studies (20, 21), in our study, the rate of individuals with normal stools (81.3%) according to the Bristol Stool Scale was found to be higher than other types (Table 1).

Factors such as lifestyle, nutritional habits, physical activity levels, accompanying diseases, and medications used closely affect bowel habits. It is suggested that exercise affects colon motility and accelerates intestinal transit. At the same time, hormonal changes and mechanical effects during exercise can change gastrointestinal functions (22). In addition to studies that found significant relationships between physical activity and constipation (23-26), there are also studies that did not detect any such relationships (27-29). In this study, it was determined that 39.5% of individuals who reported hard stools according to the Bristol Stool Scale were inactive. The numbers of individuals who were very active were lowest for all three stool types (p>.05) (Table 3). Although physical activity is likely to have an effect on preventing constipation or reducing its severity, different results may have emerged due to the differences in population characteristics in these studies or differences in the scales used.

Dietary fibers are known to have positive effects on bowel movements. It is suggested that water-insoluble dietary fiber increases stool volume, shortens intestinal transit time, and prevents constipation (30). There are studies in the literature reporting a significant relationship between dietary fiber intake and constipation (17, 31). Markland et al. evaluated data obtained from 10,914 adults (≥20 years old) in the 2005-2008 period of the National Health and Nutrition Examination Surveys (NHANES) and did not find a significant relationship between dietary fiber intake and constipation (32). In the present study, dietary fiber intake was found to be below the recommended levels for all three stool types determined according to the Bristol Stool Scale. Surprisingly, the daily dietary fiber intake of individuals with hard stools was found to be higher than that of participants with normal and soft stools ($p>.05$) (Table 3). The reason for this result may be the tendency of constipated individuals to increase their fiber intake. Inconsistencies between studies may be due to small sample sizes or differences in the methods used to determine daily fiber intake. The answers to many questions such as the optimal dose, type, and source of fiber affecting bowel movements are not yet clear. In order to best evaluate the relationship between dietary fiber intake and constipation and explain the underlying mechanisms, it is important that researchers determine the types of total daily fiber consumed.

It has been reported that the energy content of a meal can directly affect gastrointestinal transit and may therefore be associated with constipation. Some studies have found a significant relationship between high energy intake and a high risk of constipation (33,34). On the contrary, one study found that low energy intake in women was associated with an increased risk of constipation (35). In the present study, the energy intake of individuals with hard stools was found to be significantly higher than that of individuals with soft stools ($p<.05$) (Table 3). High energy intake may be associated with the intake of foods of high energy density, such as processed foods and ready meals. In order to best evaluate the effect of total daily energy intake on bowel movements, it is important to determine the nutritional content of total daily energy in detail, considering that each macronutrient has different effects on the gastrointestinal tract.

In this study, when nutritional intakes were compared according to stool types, significant differences were detected between the groups in terms of protein and fat intake ($p<.05$) (Table 3). Protein intake was found to reduce the likelihood of soft stools by 0.979 times (Table 4). In a different study (33), total dietary fats were associated with a lower risk of constipation, while another study (35) stated that total protein and fat intakes were associated more closely with constipation in men compared to women. Also, in the same study, total carbohydrate intake was not found to be associated with constipation. Likewise, in this study, no significant relationship was detected between carbohydrate intake and stool types. Determining the types of carbohydrates consumed will enable clearer interpretation.

It has been reported that obesity is associated with chronic gastrointestinal complaints. In a previous study, 27.7% of individuals with diarrhea were categorized in the obese class when compared to those with normal bowel habits or constipation (7). Similarly, other studies have found that there is a continuous increase in bowel movements as BMI increases (21,35). In contrast, Verkuijl et al. did not find a relationship between BMI and bowel movements (18). In our study, the number of obese individuals was found to be higher among those reporting hard stools than those reporting soft stools ($p<.05$) (Table 3). Studies to date have not been able to clearly explain the mechanisms underlying the relationship between BMI and bowel movements. Factors such as changing hormonal levels, meal frequencies, nutritional intake, and fluid consumption together with high BMI may affect these results. More studies are needed to identify the underlying mechanisms more clearly.

One of the limitations of this study is that food consumption records were based on the 24-hour retrospective recall method. This method may be affected by errors in recall. Asking participants to keep 3-day food consumption records could ensure more accurate results regarding daily nutritional intake. Another limitation of this study is that the sources of daily dietary fiber could not be determined. The strengths of the study are the large sample size and the use of the Bristol Stool Scale and the IPAQ Short Form. With disorder in bowel habits, individuals' use of gastrointestinal health services increases together with the economic burdens that these diseases bring. Therefore, determining the risk factors affecting bowel habits is important in terms of making lifestyle and nutrition recommendations and guiding individuals.

5. CONCLUSION

In this study, the rate of women reporting normal stools according to the Bristol Stool Scale was found to be high (81.3%). No significant relationship was found between physical activity, BMI classification, or fiber intake and stool type. However, significant associations between energy, protein, and fat intake and stool type were observed. In order to achieve a more comprehensive understanding of the determinants influencing bowel habits, future research should encompass diverse age groups, sexes, lifestyle behaviors and dietary patterns within well-designed, large-scale studies.

We would like to thank Marmara University for providing access to academic databases.

Funding: *The author(s) received no financial support for the research.*

Conflicts of interest: *The authors declare that they have no conflict of interest.*

Ethics Committee Approval: *This study was approved by Ethics Committee of Lokman Hekim University, Noninvasive Clinic Ethics Committee (Approval date: 07.07.2022; Number:2022/10)*
Peer-review: *Externally peer-reviewed.*
Author Contributions:
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Drafting the manuscript: Ö.B., B.D., C.S.K, N.N.S, G.D.
Revising it critically for important intellectual content: S.Y., A.D., Ö.B., C.S.K.
Final approval of the version to be published: Ö.B., S.Y., A.D, B.D, M.E.K, C.S.K, G.D., N.N., A.C.

REFERENCES

[1] López-Otín C, Blasco MA, Partridge L, Serrano M, Kroemer G. The hallmarks of aging. Cell. 2013;153(6):1194-1217. https://doi.org/10.1016/j.cell.2013.05.039.

[2] Feskens EJM, Bailey R, Bhutta Z, et al. Women's health: optimal nutrition throughout the lifecycle. Eur J Nutr. 2022;61(Suppl 1):1-23. https://doi.org/10.1007/s00394.022.02915-x.

[3] Usta E, Altınbaş Akkaş Ö, Bayram S. Determining the constipation status and associated factors in the elderly people receiving institutional care. OTJHS. March 2023;8(1):31-38. https://doi.org/10.26453/otjhs.1091054.

[4] Li Y, Tong WD, Qian Y. Effect of physical activity on the association between dietary fiber and constipation: evidence from the national health and nutrition examination survey 2005-2010. J Neurogastroenterol Motil. 2021;27(1):97-107. https://doi.org/10.5056/jnm20051.

[5] Pattni SS, Brydon WG, Dew T, et al. Fibroblast growth factor 19 in patients with bile acid diarrhoea: a prospective comparison of FGF19 serum assay and SeHCAT retention. Aliment Pharmacol Ther. 2013;38(8):967-976. https://doi.org/10.1111/apt.12466.

[6] Sadik R, Abrahamsson H, Ung KA, Stotzer PO. Accelerated regional bowel transit and overweight shown in idiopathic bile acid malabsorption. Am J Gastroenterol. 2004;99(4):711-718. https://doi.org/10.1111/j.1572-0241.2004.04139.x.

[7] Ballou S, Singh P, Rangan V, Iturrino J, Nee J, Lembo A. Obesity is associated with significantly increased risk for diarrhoea after controlling for demographic, dietary and medical factors: a cross-sectional analysis of the 2009-2010 National Health and Nutrition Examination Survey. Aliment Pharmacol Ther. 2019;50(9):1019-1024. https://doi.org/10.1111/apt.15500.

[8] Macêdo MIP, Albuquerque MFM, Tahan S, Morais MB. Is there any association between overweight, physical activity, fat and fiber intake with functional constipation in adolescents?. Scand J Gastroenterol. 2020;55(4):414-420. https://doi.org/10.1080/00365.521.2020.1749878.

[9] Bailey RL. Overview of dietary assessment methods for measuring intakes of foods, beverages, and dietary supplements in research studies. Current Opinion in Biotechnology. 2021;70:91-96. https://doi.org/10.1016/j.copbio.2021.02.007.

[10] Lee PH, Macfarlane DJ, Lam TH, Stewart SM. Validity of the international physical activity questionnaire short form (IPAQ-SF): a systematic review. Int J Behav Nutr Phys Act. 2011;8:115. https://doi.org/10.1186/1479-5868-8-115.

[11] Lewis SJ, Heaton KW. Stool form scale as a useful guide to intestinal transit time. Scand J Gastroenterol. 1997;32(9):920-924. https://doi.org/10.3109/003.655.29709011203.

[12] Rakıcıoğlu N, Tek Acar N, Ayaz A, Pekcan G. Yemek ve Besin Fotoğraf Kataloğu: Ölçü ve Miktarlar. 2.Baskı. Ankara: Ata Ofset Matbaacılık; 2016. (Turkish).

[13] Merdol Kutluay T. Toplu Beslenme Servisi Yapılan Kurumlar İçin Standart Yemek Tarifleri. 5. Baskı. Ankara: Hatiboğlu Basım ve Yayın San. Tic.; 2014. (Turkish).

[14] Bebis. Base BNDBSD: the german food code and nutrient data base (BLS II.3, 1999) with additions from USDA-sr and other sources. 2004.

[15] Drossman DA. Functional gastrointestinal disorders: history, pathophysiology, clinical features and rome iv. Gastroenterology. Published online February 19, 2016. https://doi.org/10.1053/j.gastro.2016.02.032.

[16] Pekcan G, Beslenme durumunun saptanması. Baysal A, Aksoy M, Besler T, Bozkurt N, Keçecioğlu S, Mercanlıgil SM, Merdol Kutluay T, Pekcan G, Yıldız E, editörler. Diyet El Kitabı. 9.Baskı. Ankara: Hatiboğlu Yayınevi; 2016. p. 99-100. (Turkish).

[17] World Health Organization. A healthy lifestyle-WHO recommendations. https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle—-who-recommendations. 2023. (accessed 20.09.2024)

[18] Brigstocke S, Nee J, Ballou S, Mitsuhashi S, Rangan V, Singh P, et al. Women's health factors and altered bowel habits: results of a national health and nutrition examination survey. JGH Open. 2021;5(5):581–589. https://publons.com/publon/10.1002/ygh2.449

[19] Schmulson MJ, Drossman DA. What is new in rome iv. J Neurogastroenterol Motil. 2017;23(2):151-163. https://doi.org/10.5056/jnm16214.

[20] Ogasawara N, Kasugai K, Funaki Y, Ebi M, Izawa S, Tamura Y, et al. Relationships between body mass index and constipation, gastroesophageal reflux disease, stool forms based on the bristol stool form scale, and education level: results from an internet survey in japan. J Clin Biochem Nutr. 2023;73(1):84-90. https://doi.org/10.3164/jcbn.22-143.

[21] Lemay DG, Baldiviez LM, Chin EL, Spearman SS, Cervantes E, Woodhouse LR, et al. Technician-scored stool consistency spans the full range of the bristol scale in a healthy us population and differs by diet and chronic stress load. J Nutr. 2021;151(6):1443-1452. https://doi.org/10.1093/jn/nxab019.

[22] Simrén M. Physical activity and the gastrointestinal tract. Eur J Gastroenterol Hepatol. 2002;14(10):1053-1056. https://doi.org/10.1097/00042.737.200210000-00003.

[23] Gao R, Tao Y, Zhou C, Li J, Wang X, Chen L, et al. Exercise therapy in patients with constipation: a systematic review and meta-analysis of randomized controlled trials. Scand J Gastroenterol. 2019;54(2):169-177. https://doi.org/10.1080/00365.521.2019. 1568544.

[24] Harada M, Tsuboyama-Kasaoka N, Yonekura Y, Shimoda H, Ogawa A, Kobayashi S, et al. Associations between lifestyle factors and constipation among survivors after the great east japan earthquake: a 9-year follow-up study. J Epidemiol. 2024;34(4):164-169. https://doi.org/10.2188/jea.JE20220284.

[25] Iovino P, Chiarioni G, Bilancio G, Cirillo M, Mekjavic IB, Pisot R, et al. New onset of constipation during long-term physical inactivity: a proof-of-concept study on the immobility-induced

bowel changes. PLoS One. 2013;8(8):e72608. https://doi.org/10.1371/journal.pone.0072608.

[26] Yurtdaş G, Acar-Tek N, Akbulut G, Cemali Ö, Arslan N, Beyaz Coşkun A, et al. Risk factors for constipation in adults: a cross-sectional study. J Am Coll Nutr. 2020;39(8):713-719. https://doi.org/10.1080/07315.724.2020.1727380.

[27] Yurtdaş Depboylu G, Acar Tek N, Akbulut G, Günel Z, Kamanlı B. Functional constipation in elderly and related determinant risk factors: malnutrition and dietary intake. J Am Nutr Assoc. 2023;42(6):541-547. https://doi.org/10.1080/27697.061.2022. 2096150.

[28] Wilson PB. Associations between physical activity and constipation in adult americans: results from the national health and nutrition examination survey. Neurogastroenterol Motil. 2020;32(5):e13789. https://doi.org/10.1111/nmo.13789.

[29] Dias FC, Boilesen SN, Tahan S, Melli L, Morais MB. Overweight status, abdominal circumference, physical activity, and functional constipation in children. Rev Assoc Med Bras (1992). 2023;69(3):386-391. https://doi.org/10.1590/1806-9282.202.20845.

[30] Snauwaert E, Paglialonga F, Vande Walle J, Wan M, Desloovere A, Polderman N, et al. The benefits of dietary fiber: the gastrointestinal tract and beyond. Pediatr Nephrol. 2023;38(9):2929-2938. https://doi.org/10.1007/s00467.022.05837-2.

[31] Lai H, Li Y, He Y, Chen F, Mi B, Li J, et al. Effects of dietary fibers or probiotics on functional constipation symptoms and roles of gut microbiota: a double-blinded randomized placebo trial. Gut Microbes. 2023;15(1):2197837. https://doi.org/10.1080/19490.976.2023.2197837.

[32] Markland AD, Palsson O, Goode PS, Burgio KL, Busby-Whitehead J, Whitehead WE. Association of low dietary intake of fiber and liquids with constipation: evidence from the national health and nutrition examination survey. Am J Gastroenterol. 2013;108(5):796-803. https://doi.org/10.1038/ajg.2013.73.

[33] Rollet M, Bohn T, Vahid F, On Behalf Of The Oriscav Working Group. Association between dietary factors and constipation in adults living in luxembourg and taking Part in the ORISCAV-LUX 2 survey. Nutrients. 2021;14(1):122. https://doi.org/10.3390/nu14010122.

[34] Delgado-Aros S, Locke GR 3rd, Camilleri M, Talley NJ, Fett S, Zinsmeister AR, et al. Obesity is associated with increased risk of gastrointestinal symptoms: a population-based study. Am J Gastroenterol. 2004;99(9):1801-1806. https://doi.org/10.1111/j.1572-0241.2004.30887.x.

[35] Yang S, Wu XL, Wang SQ, Guo XL, Guo FZ, Sun XF. Association of dietary energy intake with constipation among men and women: results from the national health and nutrition examination survey. Front Nutr. 2022;9:856138. https://doi.org/10.3389/fnut.2022.856138.