



Research article

Determining the relationship between fiber consumption and physical activity and bowel habits in office workers

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Abstract

It is thought that bowel transit time decreases with reduced fiber consumption and physical activity in office workers who lead a sedentary life. The consumption of plant-based diets is decreasing due to technological advances, which leads to a decrease in dietary fiber consumption. Furthermore, office workers have low physical activity levels. Therefore, the aim of the present study was to determine the relationship between fiber intake, physical activity and bowel habits in office workers. A total of 100 office workers with a mean age of 33.25 ± 7.28 were included in this cross-sectional study. A questionnaire consisting of 29 questions was prepared by the researchers. The questions on bowel habits were prepared based on the Rome III criteria and the Bristol scale was used as the diagnostic criteria of intestinal diseases. It was found that 50% of participants with low fiber consumption and 91.7% of those with high fiber consumption defecate once a day ($p < 0.05$). A significant difference was found in the frequency of defecation according to the water consumption of the participants ($p < 0.05$). It was not found difference between Bristol scale scores and defecation frequency of the participants according to physical activity levels ($p > 0.05$). Further studies should be conducted to increase the knowledge level of individuals about healthy nutrition in order to improve bowel habits and lead a healthier life.

Keywords: Bowel habits; constipation; dietary fiber; office workers; physical activity

1. Introduction

Nutrition is one of the most important factors affecting human health and plays a fundamental role in achieving a healthy and long life (Martin et al., 2017). With long working hours and stressful working environment, office workers are at risk of unhealthy diet and insufficient physical activity (Jeong et al., 2013). Healthy nutrition increases the productivity of office workers, strengthens their immune system, and reduces the risk of disease and the rate of occupational diseases (Close et al., 2018).

In the diagnosis of constipation, there are factors that negatively affect the quality of life, such as infrequent and difficult defecation (Song et al., 2019). Although chronic constipation is extremely common among adults, it is difficult to estimate the exact prevalence of constipation due to the lack

of a generally accepted definition by doctors and patients. However, population-based studies indicate a global prevalence of 14%. It has been determined that the prevalence increases with age and is almost twice as common in women as in men (Scott et al., 2021). It is stated that the prevalence of functional gastrointestinal diseases in Turkey varies between 15-20% (Dengiz et al., 2022). In a population study conducted on 3214 people from 20 cities, the rate of constipation in Turkey was found to be 8.3% (Kasap and Bor, 2006). Constipation affects people's social lives, performance in daily life, and quality of life (Singh et al., 2007). Studies show that constipation is more common in office workers, who are thought to have more sedentary and stressful occupations (Song et al., 2019). Constipation is associated with low quality of life due to psychosocial effects (Dennison et al., 2005; Mirghafourvand et al., 2016; Li et al., 2021), which is thought to negatively affect

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work efficiency.

Dietary strategies, along with laxatives and faecal bulking agents, are also effective in the treatment of constipation (Aslam et al., 2022). Although lifestyle changes are generally recommended as first-line therapy in the treatment of constipation, data on the effectiveness of these measures are limited. The most recommended treatment in this regard is to increase dietary fiber intake and physical activity (Yang et al., 2012). Dietary fiber, which is resistant to digestive enzymes, is mostly found in grains, fruits and vegetables. Soluble fiber fermented by gut bacteria absorbs water to become a gelatinous, sticky substance. However, insoluble fiber has a bulking effect (Otlés and Ozgoz, 2014). In addition, it is believed that exercise facilitates defecation by shortening the transit time in the gastrointestinal tract. Furthermore, the decrease in muscle tone due to sedentary life leads to reduced function of the abdominal and pelvic floor musculature, which is involved in defecation (Gao et al., 2019). Studies in Turkey examining the bowel habits of office workers who are thought to be at risk for constipation are limited. The aim of our study was to determine the relationship between daily fiber intake, physical activity levels and bowel habits of office workers.

2. Materials and methods

2.1. Study design

Our study was conducted between June 2018 and November 2018 with the aim of determining the relationship between daily fiber intake, physical activity levels and bowel habits of office workers. Daily fiber intake was determined with food consumption records. The International Physical Activity Questionnaire (IPAQ) was used to determine the physical activity levels of the participants (Karaca and Turnagol, 2007). Bowel habits were determined by the Rome III Diagnostic Criteria and the Bristol Stool Scale. The sample of this cross-sectional study included 100 volunteer office workers in the province of Istanbul, aged 19-65, without any diagnosed bowel disease. The data collection process of the study was carried out after the approval of the ethics committee (2018-05/04).

2.2. Questionnaire

A questionnaire consisting of 29 questions was created by the researchers in order to determine the demographic characteristics, nutrition and physical activity habits, and bowel habits of the participants. The questions on bowel habits were prepared based on the Rome III criteria, used as the diagnostic criteria of intestinal diseases, and the Bristol Stool Form Scale which was developed in 1990 by Lewis and Heaton. According to this scale, the stool of individuals is classified into 7 groups. The shapes of the stools differ according to their residence time in the colon. For this reason, Bristol Stool Form Scale has been accepted as a reliable and fast indicator of transition time. Low scores (1, 2) represent slow transit, high scores (5-7) represent fast transit and impaired rectal tenderness (Lewis and Heaton, 1997).

According to the activities calculated by the MET-minute score, the participants were divided into 3 activity groups: inactive, minimally active, very active (Gay et al., 2019).

The 24-hour dietary recall method was used to determine the nutritional status of the participants. After agreeing to participate in the research, the participants were asked to keep a

food consumption record for three straight days, 2 days on weekdays and 1 day on weekends. Average fiber intakes from food consumption records were grouped according to Recommended Dietary Allowances (RDA) (Food and Nutrition Board, 2002). Household units (such as water glass, thin/thick slice, coffee/teacup, matchbox, meal/tea spoon) were used in the records.

2.3. Data analysis

Statistical evaluation of the data was done with the SPSS (Statistical Package for Social Sciences) 23.0 package program. Chi-square test was used to evaluate the differences between variables. Descriptive statistics were presented as number, percentage, mean and standard deviation. The data obtained from the food consumption records were entered into the Nutrition Information System (BEBIS) version 7.2 and the daily average fiber intake was determined.

3. Results

The general characteristics of the individuals are given in Table 1. The mean age of the participants was 33.25 ± 7.28 years and 73.0% were women. 55.0% of the participants were married. 89.0% of the participants had an educational status of college or above. It was observed that the majority of the participants (88.0%) were physically inactive or minimally active (Table 1).

Table 1
General characteristics of office workers (n=100).

Demographic Characteristics	n	%	
Gender	Female	73	73.0
	Male	27	27.0
Marital status	Married	55	55.0
	Single	45	45.0
Educational status	High school	11	11.0
	College and above	89	89.0
Physical activity status	Inactive	30	30.0
	Minimally active	52	52.0
	Very active	18	18.0

The comparison of Bristol scale scores and defecation frequencies according to the activity status of office workers is given in Table 2. According to the Bristol scale, 31.8% of the inactive participants and 27.3% of the very active participants had slow bowel transit ($p=0.590$). When compared according to the frequency of defecation, it was found 6.7% of the inactive and 5.6% of the very active participants defecated once in three days ($p>0.05$) (Table 2).

The knowledge levels of the individuals about dietary fiber are shown in Table 3. While 43.0% of the participants answered yes to the question "Is dietary fiber essential for maintaining a healthy life?", 51.0% of the participants stated that they had no knowledge. Of those who answered yes to this question, 47.9% were women ($p<0.05$). While 39.0% of the participants answered yes to the question "Does increasing dietary fiber consumption affect defecation frequency?", no difference was found between men and women ($p>0.05$). To the question "Which is the natural food group with the highest dietary fiber content?", the most common answers were vegetables and fruits (60.0%), I do not know (18.0%), and legumes (13.0%), respectively. When the average daily fiber consumption of the individuals participating in the research is examined; it was

Table 2

Comparison of Bristol form and defecation frequency according to physical activity level of office workers.

		Physical Activity						p
		Inactive		Minimally Active		Very Active		
		n	%	n	%	n	%	
Bristol scale	Low scores (1,2)-slow transit	7	31.8	10	40.9	6	27.3	0.590
	Moderate scores (3,4)-normal transit	18	28.6	34	54.0	11	17.5	
	High scores (5-7)-fast transit	5	35.7	8	57.1	1	7.1	
Frequency of defecation	Once a day	16	53.3	23	44.2	6	33.3	0.822
	Twice a day	7	23.3	19	36.5	8	44.4	
	Once in two days	5	16.7	7	13.5	3	16.7	
	Once in three days	2	6.7	3	5.8	1	5.6	

Table 3

Knowledge levels of office workers about dietary fiber and their daily fiber intake.

Knowledge Level About Dietary Fiber		Female		Male		Total		p
		n	%	n	%	n	%	
Is dietary fiber essential for maintaining a healthy life?	Yes	35	47.9	8	29.6	43	43.0	0.039
	No	2	2.7	4	14.8	6	6.0	
	I do not know	36	49.3	15	55.6	51	51.0	
Does increasing dietary fiber intake affect defecation frequency?	Yes	33	45.8	6	22.2	39	39.0	0.092
	No	2	2.8	3	11.1	5	5.0	
	I do not know	38	51.4	18	66.7	56	56.0	
Fiber content Which natural food group has the highest fiber content?	Milk and dairy products	5	6.8	0	0.0	5	5.0	0.162
	Vegetables and fruits	46	63.0	14	51.9	60	60.0	
	Legumes	10	13.7	3	11.1	13	13.0	
	Meat and meat products	1	1.4	0	0.0	1	1.0	
	Grains	1	1.4	2	7.4	3	3.0	
Daily dietary fiber intake	I do not know	10	13.7	8	29.6	18	18.0	0.521
	Insufficient (<20 g)	20	27.4	8	29.6	28	28.0	
	Normal (20-35 g)	44	60.2	16	59.2	60	60.0	

Table 4

Comparison of Bristol form and defecation frequency according to fiber consumption of office workers.

Variables		Fiber						p
		Low		Normal		High		
		n	%	n	%	n	%	
Bristol scale	Low scores (1,2)-slow transit	6	21.4	13	21.7	3	25.0	0.378
	Moderate scores (3,4)-normal	19	67.9	39	65.0	5	41.7	
	High scores (5-7)-fast transit	3	10.7	8	13.3	4	33.3	
Frequency of defecation	Once a day	14	50.0	20	33.3	11	91.7	0.019
	Twice a day	7	25.0	26	43.3	1	8.3	
	Once in two days	5	17.9	10	16.7	0	0.0	
	Once in three days	2	7.1	4	6.7	0	0.0	

Table 5

Bristol form and defecation frequency status of office workers according to water consumption.

		2-3 Glasses		4-6 Glasses		7-9 Glasses		10-12 Glasses		Total		p
		n	%	n	%	n	%	n	%	n	%	
		Bristol scale	Low scores (1,2)-slow transit	4	23.5	4	18.2	4	18.2	10	25.0	
Moderate scores (3,4)-normal transit	11		64.7	13	59.1	16	76.2	23	57.5	63	63.0	
High scores (5-7)-fast transit	2		11.8	5	22.7	1	4.8	7	17.5	15	15.0	
Frequency of defecation	Once a day	8	8.1	10	10.7	6	6.1	20	20.4	44	44.9	0.025
	Twice a day	6	6.1	5	5.3	8	8.1	14	15.0	33	33.7	
	Once in two days	2	2.1	7	7.5	4	4.2	2	2.1	15	15.3	
	Once in three days	1	1.0	0	0.0	3	3.2	2	2.1	6	6.1	

determined that men consumed an average of 22.5±6.14 g and women consumed an average of 18.6±9.44 g. There was a significant difference between the genders in terms of fiber consumption ($p < 0.05$). When fiber intake was evaluated, it was

determined that 27.4% of female employees and 29.6% of male employees had insufficient dietary fiber intake (<20 g) ($p > 0.05$) (Table 3). Considering the energy and other nutrient intakes of the participants, the daily energy, carbohydrate and protein

intakes of both men and women were lower than the RDA recommendations; it was determined that the fat intake was higher than the RDA recommendations.

The Bristol scale scores and defecation frequency of the office participants according to fiber consumption are shown in Table 4. There was no difference between fiber consumption and Bristol scale scores ($p>0.05$). When defecation frequency was compared, it was found that 50.0% of those with low fiber intake and 91.7% of those with excess fiber intake defecated once a day. The difference between the groups was found to be statistically significant ($p<0.05$) (Table 4). However, no significant differences were found between the Bristol scale and defecation frequency of the participants and daily carbohydrate, protein and fat intakes ($p>0.05$).

The Bristol scale scores and defecation frequency of the participants according to water consumption are shown in Table 5. According to the Bristol scale scores, 23.5% of those who drank 2-3 glasses of water a day had slow transit, 64.7% had normal transit, and 11.8% had fast transit ($p>0.05$). When defecation frequency was compared, it was found that 20.4% of those drank 10-12 glasses of water per day defecated once a day, 15.0% defecated twice a day, 2.1% defecated once in two days, and 2.1% defecated once in three days ($p<0.05$) (Table 5).

4. Discussion

It is thought that intestinal transit rate decreases due to the decrease in fiber consumption and physical activity in office workers who lead a sedentary life. The aim of our study was to examine the relationship between daily fiber intake, which varies depending on the dietary habits, physical activity levels, and bowel habits of office workers and to make recommendations in line with the results obtained.

It has been determined that increased physical activity level is associated with a significant decrease in the prevalence of constipation (Yurtdas et al., 2020). According to the results of a study conducted on women ($n=62,500$), in which 5.4% of women were diagnosed with constipation, the prevalence of constipation was found to be lower in women who reported doing physical activity every day. The prevalence rate of constipation among women with both high physical activity levels and high fiber intake was found to be 0.32 compared to those with physical activity levels of less than once a week and those in the lowest quantile of fiber intake (Dukas et al., 2003). Surprisingly, in another population-based study, self-reported physical inactivity was not strongly associated with fewer than 3 defecations per week or hard/lumpy stools (Wilson, 2020). Similarly, in the present study, no significant difference was found in the Bristol scale scores and the frequency of defecation according to the physical activity levels of office workers ($p>0.05$). Some studies have shown that exercise can reduce the risk of constipation by stimulating colonic motility and accelerating gastrointestinal transit (Strid et al., 2011; Costa et al., 2017). However, these effects may vary depending on the lifestyle (nutrition, exercise) of the person (Costa et al., 2017). This supports the lack of data showing the effects of physical activity on constipation. There is a need for randomized controlled studies on physical activity and constipation.

Common risk factors of chronic constipation include inadequate fiber and fluid intake. It has been determined that adequate fiber consumption increases stool weight and leads to a decrease in bowel transit time, while inadequate fiber consumption causes constipation (Forootan et al., 2018).

However, diets containing soluble fiber may be associated with the improvement of chronic constipation symptoms (Suarez and Ford, 2011). Evidences indicated that soluble fiber improves symptoms of constipation in irritable bowel syndrome with varying effects on abdominal pain (Bijkerk et al., 2004). In a study evaluating the effect of dietary fiber supplementation on functional constipation, placebo group, low dose group (LD: 7 g/day insoluble fiber + 1.2 g/day soluble fiber) and high dose group (HD: 14 g/day insoluble fiber + 2.4 g/day soluble fiber) were compared in parameters of constipation. When the subjects were subdivided on the basis of bowel transit time, a significant improvement was observed only in the HD group (Kim et al., 2006). Consistent with the literature, a significant difference was found between the fiber intake and the defecation frequency of the participants in the present study ($p<0.05$). In addition, in our study, it was determined that 27.4% of the female employees and 29.6% of the male employees had insufficient dietary fiber intake (<20 g). In a similar study conducted on office workers ($n=58$), the average fiber intake of the participants was 7.7 (2.70-37.80) grams. In the study, it was determined that only 3.44% of the participants had adequate dietary fiber intake (Faridahanum et al., 2021).

Considering the proven effects of dietary fiber on bowel habits (McRae, 2020), the knowledge level of people about dietary fiber is important. In our study, while 43% of the participants thought that dietary fiber is essential for a healthy life; 18% could not answer the question of the food with the highest fiber content. In a study with a high number of participants ($n=1363$), the majority of the participants had sufficient knowledge about the positive effects of dietary fiber-rich foods on obesity (84.3%), cardiovascular diseases (70.5%) and blood sugar regulation (68.9%). However, there was an inconsistency in translating this information into healthy food choices, especially when dining out (Alfawaz et al., 2020). These findings are similar to the fact that although the participants in our study knew the importance of dietary fiber, they did not know about foods containing dietary fiber. This contrasts with some studies that have shown that nutritional information is associated with food choices. Food choices depend not only on nutritional information, but also depends on external factors such as sensory evaluation, packaging, labeling, consumer perceptions, etc.

The number of studies examining the effect of fluid intake on constipation is insufficient (Lindeman et al., 2000; Shen et al., 2019). A study with a large number of participants ($n=10,914$) indicated that low fluid intake was associated with constipation (Markland et al., 2013). In a cohort of Turkish adults ($n=4561$), it was determined that decreased fiber intake and insufficient physical activity, as well as decreased fluid intake, were associated with an increased risk of constipation (Yurtdas et al., 2020). The majority of the individuals participating in the present study (78.0%) consume 10-12 glasses of water daily. A significant difference was found in defecation frequency with respect to daily water consumption of the participants ($p<0.05$).

5. Conclusion

Based on the results obtained in the present study, it was determined that dietary fiber intake was insufficient in 28% of office workers. A significant difference was found in bowel habits with respect to dietary fiber intake and fluid intake. It was determined that the participants with low fiber intake defecated

less frequently compared to participants with high fiber intake. There was no significant relationship between bowel habits and physical activity levels of office workers. These findings support studies showing that office workers, who are usually sedentary, have insufficient fiber intake. There is a need for further studies conducted with office workers who are at risk for constipation to elucidate this issue. Our study will be a reference for further studies that will question the dietary fiber intake and bowel habits of office workers. In addition, dietitians should raise awareness of office workers about healthy nutrition with simple

practices that can be adapted to daily life in order to improve constipation symptoms and allow office workers to lead a healthier life.

Conflict of interest: The authors declare that they have no conflict of interests.

Informed consent: The authors declare that this manuscript did not involve human or animal participants and informed consent was not collected.

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