

RESEARCH ARTICLE

Association of gender, physical activity, and fluid intake with bowel habits and symptoms of constipation

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ABSTRACT

Background: Studies have shown that regular physical exercise and adequate fluid intake help to regularize bowel function and reduce the risk of constipation. Female gender has also been associated with increased prevalence of constipation. However, there are few studies regarding bowel habits in India, especially among youngsters regarding bowel habits. **Aim and Objective:** The aim of the study was to determine the association of gender, physical activity and fluid intake with bowel habits and symptoms of constipation, among medical students at a tertiary care center. **Materials and Methods:** This descriptive analytical study was conducted among 591 participants. Details were collected using self-administered questionnaire. Questions regarding bowel habits and subjective bowel symptoms were based on Bristol Stool Chart and Rome III criteria. Descriptive analysis was done for the stool pattern and symptom status. **Results:** The predominant stool type among participants was found to be Bristol type 3 stool (sausage shaped stools with cracks on the surface) and stool frequency was 7–14 times/week. 196 of the participants reported symptoms related to constipation. Sedentary lifestyle was significantly associated with the symptoms of, frequent ($\geq 25\%$ times) straining ($P = 0.003$) and incomplete evacuation of stool ($P = 0.043$). Consumption of < 8 glasses of water was also significantly associated with the symptoms of frequent straining ($P < 0.001$) abdominal distension ($P = 0.010$) and incomplete evacuation ($P = 0.011$). However, gender was not associated with stool form or constipation. **Conclusion:** Hence, it could be stated that moderate physical activity and drinking adequate amount water, (≥ 8 glasses) will help to regularize bowel habits and reduce the symptoms of constipation.


KEY WORDS: Constipation; Fluid Intake; Exercise; Gender

INTRODUCTION

Bowel habits vary widely among the different populations of the world and are influenced by a plethora of factors, including physical activity, gender, lifestyle, dietary patterns, and socioeconomic level.^[1,2] Constipation refers to a pathological

reduction in bowel movements with accumulation of dry hard feces in the descending colon because of increased absorption of fluid. It was previously considered, to be due to changes in motility, but recent studies have suggested that alterations in the balance between secretion and absorption could be the cause for developing constipation.^[3]

Based on frequency, constipation was earlier defined as a stool frequency of < 3 /week.^[1] According to Rome III criteria, (set by Rome foundation to classify functional gastrointestinal disorders) a diagnosis of functional constipation is made when at least two of the following criteria are met, for the past 3 months with symptom onset at least 6 months before diagnosis: (a) Straining on $> 25\%$ of defecations, (b) lumpy

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or hard stools on >25% of defecations, (c) sensation of incomplete evacuation on >25% of defecations, (d) sensation of anorectal obstruction/blockage on >25% of defecations, (e) manual maneuvers on >25% of defecations, and (f) <3 defecations per week. World over, using the Rome Criteria, studies have shown that, 2–27% population are affected by chronic functional constipation.^[4]

Irritable bowel syndrome (IBS) is a functional disorder of the gastrointestinal tract characterized by recurrent abdominal discomfort or pain and altered bowel habits, in the absence of detectable structural abnormalities. In IBS, constipation, or diarrhea may predominate (classified as IBS-C, IBS-D).^[5] Functional constipation is similar to IBS-C, except that it does not typically exhibit intense abdominal pain, which tends to occur in IBS-C.^[6] According to Rome III criterion, IBS is characterized by recurrent abdominal pain or discomfort for at least 3 days/month in the past 3 months associated with two or more of the following: (a) Improvement with defecation, (b) onset associated with a change in frequency of stool, (c) associated with a change in form (appearance) of stool, (d) criterion fulfilled for the past 3 months with symptom onset at least 6 months before diagnosis.

Female gender is associated with increased prevalence of constipation which, has been attributed to hormonal factors, inflicting a higher risk of constipation during the luteal phase of the menstrual cycle due to progesterone. Chances of constipation is also increased by damage to the pelvic floor muscles, during childbirth or gynecological surgery.^[7] Studies have also shown that women are 2–3 times more likely to be diagnosed with IBS.^[8]

Physical Activity and Bowel Movement

Intestinal transit time has been shown to be reduced, with regular exercise.^[9] It has been found that, on increasing regular physical activity, patients with symptoms of chronic constipation had an improvement in defecation patterns.^[1] It has also been observed that subjects with active and intermediate activity tended to pass stool more often.^[1] Increased physical activity also improved gastrointestinal symptoms in IBS. Patients of IBS who are physically active patients had less symptom deterioration compared to inactive patients and hence physical activity could be used as a primary treatment modality in IBS.^[10,11] However, physical activity is considered beneficial for gastrointestinal function, vigorous and endurance sports activity has been associated with hazards such as nausea, heartburn, diarrhea, and gastrointestinal bleeding.^[12]

Fluid Intake

According to the Indian Council of Medical Research's Dietary Guidelines for Indians, a normal healthy person needs about eight glasses (2 l) of water a day, which

should go up in hot, sweaty weather, and during vigorous activities. Inadequate fluid intake is associated with chronic constipation. It has been found that both men and women had more bowel movements with increasing intakes of fluid.^[13] In individuals, who are not adequately hydrated, drinking more water increased stool frequency, thus enhancing the beneficial effect of daily dietary fiber intake.^[14] Furthermore, relatively short period of fluid deprivation decreased stool frequency and stool weight.^[15] A significant positive association between consumption of ≥ 8 glasses of water daily and odds of IBS has been observed.^[16]

There are few studies in India regarding the defecatory behavior, especially among the younger population. Hence, this study was taken up among the student population at a tertiary care hospital in Kerala, to determine the association of gender, as well as modifiable factors such as physical activity and fluid intake, on stool habit, and subjective bowel symptoms. The findings of the study could be useful for clinicians to advise lifestyle modifications for normal bowel function.

Aim

The aim of the study was to determine the association of gender, physical activity, and fluid intake with bowel habits and symptoms of constipation, among medical students at a tertiary care center.

MATERIALS AND METHODS

This descriptive analytical study was conducted among the students of a tertiary care hospital at Trivandrum. Data were collected from 591 participants. Persons involved in vigorous, endurance sports activities and having known history of organic lower bowel disturbances were excluded from the study. Details were collected using self-administered questionnaire. Personal details such as gender and age as well as details regarding water intake, physical activity, stool frequency, stool type, and subjective gastrointestinal were collected.

Questions regarding stool frequency and stool type (consistency) were based on Bristol stool chart, a medical aid designed by Dr Ken Heaton, with pictures and descriptors. The Bristol stool scale classifies stools into seven categories; Type 1: Separate hard lumps, like nuts (hard to pass); Type 2: Sausage-shaped, but lumpy, Type 3: Like a sausage but with cracks on its surface; Type 4: Like a sausage or snake, smooth and soft; Type 5: Soft blobs with clear cut edges (passed easily); Type 6: Fluffy pieces with ragged edges, a mushy stool; and Type 7: Watery, no solid pieces entirely liquid. In this study, based on the Bristol stool chart, stool consistency was further categorized as, (i) hard stool (type 1 and 2), (ii) normal soft stool type (3, 4, and 5), and as watery stool (type 6, 7, and 8). Stool Type 8 being invariably pathological.

Queries on subjective bowel symptoms were based on Rome III criteria (set by Rome foundation to classify functional gastrointestinal disorders) for functional constipation and IBS.

Questions related to physical activity was based on the International Physical activity questionnaire. Participants were categorized as:

1. Moderately active (doing exercise/such as bicycling, aerobics for 30 min or more for >3 days in a week or moderate activity such as brisk walking/house hold chores for 30 min or more ≥5 days a week)
2. Sedentary: Exerting oneself only for required daily activities. Individuals involved in vigorous sports activities were excluded since such activities tended to alter gut function.

Fluid intake throughout the day was assessed by demonstrating standard 200 ml glass and asking subjects to report, how many glasses of water they usually consumed per day.

Descriptive analysis was done for the stool pattern and symptom status. Chi-square analysis was done for qualitative data. *P*-values below 0.05 was considered significant for all statistical analysis. Data entered into Microsoft Excel. Statistical analysis was done with SPSS version 17.0.

Ethical Considerations

Study was commenced after ethical clearance from institutional ethical committee and data were collected after obtaining informed written consent from participants.

RESULTS

The findings of the present study are presented in Tables 1-7.

DISCUSSION

This study included 591 participants, in the age group of 17–25 of whom, 21% were male and 79% were female. The predominant stool type among participants was found to be Bristol type 3 stool, (39%) followed by type 4 stool (32%). Other stool types were type 1 (1.7%), type 2 (13.2%), type 5 (8.3%), type 6 (4.2%), and type 7 (0.2%). These were further categorized as normal (soft), watery, and hard [Table 1]. The stool frequency was 7–14 times/week. 118 subjects (20%) of the study population

reported a sedentary lifestyle whereas 473 subjects (80%) of the study population had a moderately active lifestyle. The most common stool type in both groups was type 3. However, 35.5% of those who were moderately active had type 4 stool consistency, compared to 17.8% of sedentary participants [Table 2]. A significant association was found between moderate

Table 1: Distribution on categorizing stool as normal, hard, and watery

Stool type	Count	Percent
Hard stool (Type 1, 2)	86	14.6
Normal stool (Type 3, 4, 5)	480	81.2
Watery stool (Type 6, 7)	25	4.2

Table 2: Study population according to physical activity based on Bristol scale

Bristol stool chart	Physical activity			
	Sedentary		Moderately active	
	Count	Percent	Count	Percent
Separate hard lumps	3	2.5	7	1.5
Sausage shaped, lumpy	29	24.6	49	10.4
Sausage shaped with cracks	48	40.7	188	39.7
Sausage shaped, smooth, soft	21	17.8	168	35.5
Soft blobs with clear cut edges	11	9.3	38	8.0
Mushy stool	6	5.1	22	4.7
Entirely liquid	0	0.0	1	0.2

Table 3: Comparison of stool type (consistency) based on physical activity

Stool type	Physical activity				χ^2	<i>P</i> -value
	Sedentary		Moderately active/active			
	Count	Percent	Count	Percent		
Hard stool (type 1, 2)	31	26.3	55	11.6	16.41**	0.000
Watery stool (type 6, 7)	5	4.2	20	4.2		
Normal stool (type 3, 4, 5)	82	69.5	398	84.1		

**Significant at 0.01 level

Table 4: Comparison of stool type (consistency) based on water consumption

Stool type	Glasses of water consumed on an average daily				χ^2	<i>P</i> -value
	<8 glasses		≥8 glasses			
	Count	Percent	Count	Percent		
Hard stool	61	21.1	25	8.3	21.87**	0.000
Watery stool	15	5.2	10	3.3		
Normal stool	213	73.7	267	88.4		

*Significant at 0.05 level

physical activity and softer stool type ($P < 0.001$) [Table 3]. Consumption of more than 8 glasses of water was also found to be significantly associated with softer stool type ($P < 0.001$) [Table 4]. 196 of the study participants reported subjective abdominal symptoms related to constipation, such as abdominal distension, straining at stool, mucus in stool, and feeling of incomplete evacuation, (on >25% of defecations), of whom 138

respondents had more than one symptom. [Table 5] Sedentary lifestyle was significantly associated with the symptoms of frequent straining, ($P = 0.003$) and incomplete evacuation of stool ($P = 0.043$). Consumption of <8 glasses of water was also significantly associated with the symptoms of frequent straining ($P < 0.001$), abdominal distension ($P = 0.010$), and incomplete evacuation ($P = 0.011$). Physical activity and water consumption did not have a statistically significant association with the other symptoms of constipation such as mucus in stool. About 16% of females reported complaints of frequent hard stool as compared to 9% of males. Complaints of frequent abdominal distension and straining at stool were also reported more in females compared to males. However, gender was not statistically associated with stool form or subjective symptoms in this study.

The predominant stool consistency that was obtained as type 3 (sausage shaped stools with cracks on the surface) in this study, is in slight contrast to the one done at in the coastal eastern population in Cuttack which had type 4 (sausage shaped, smooth, and soft

Table 5: Distribution of subjective symptoms of constipation in study population

Subjective symptoms (on >25% of defecations)	Frequency	Percentage
Abdominal discomfort usually relieved on passing stool	74	12.33
Feeling of abdominal distension frequently	84	14
Frequent passage of mucous in stool	23	3.83
Frequent straining at stool	76	12.66
Feeling of incomplete evacuation of stool	77	12.83

Table 6: Association of physical activity, fluid intake, and gender with feeling of incomplete evacuation of stool

Variables	Feeling of incomplete evacuation of stool (on >25% of defecations)				χ^2	P-value
	Yes		No			
	Count	Percent	Count	Percent		
Gender						
Male	17	13.9	105	86.1	0.11	0.739
Female	60	12.8	409	87.2		
Glasses of water consumed on an average daily						
< 8 glasses	48	16.6	241	83.4	6.4*	0.011
≥ 8 glasses	29	9.6	273	90.4		
Physical activity						
Sedentary	22	18.6	96	81.4	4.1*	0.043
Moderately active/active	55	11.6	418	88.4		

*Significant at 0.05 level

Table 7: Association of physical activity, fluid intake and gender with symptoms of frequent straining at stool

Variables	Frequent straining at stool				χ^2	P-value
	Yes		No			
	Count	Percent	Count	Percent		
Gender						
Male	10	8.2	112	91.8	2.98	0.084
Female	66	14.1	403	85.9		
Glasses of water consumed on an average daily						
< 8 glasses	53	18.3	236	81.7	15.15**	0.000
≥ 8 glasses	23	7.6	279	92.4		
Physical activity						
Sedentary	25	21.2	93	78.8	9.12**	0.003
Moderately active/active	51	10.8	422	89.2		

**Significant at 0.01 level

stools) as the predominant stool type. However, the frequency of 7–14 was similar in both the studies.^[1] This frequency was also similar to the study conducted in Iran, where a frequency of 12–14 was reported.^[17] The level of physical activity among the participants in this study was higher than certain other studies India such as the cross-sectional study in Jharkhand to study the effect of physical inactivity on quality of life, in which moderately active participants constituted only 28%.^[18] The association found between moderate physical activity and soft stools obtained here, is similar to that, obtained in other studies such as the studies conducted at Boston and Cuttack and where, subjects with regular physical activity tended to pass softer stool.^[1,19] This is also similar to a study conducted in Europe that found that on increasing regular physical activity, patients with symptoms of chronic constipation had an improvement in defecation patterns.^[10] The significant association between sedentary lifestyle and symptoms of constipation such as incomplete evacuation of stool and straining at stool, correlated well with several other studies that showed that regular exercise brought an improvement in defecatory pattern, in functional constipation and IBS.^[1,11] The association between quantity of water consumed and softer stool consistency as well as bowel symptoms obtained in this study is similar to the study conducted by Sanjoaquin *et al.*, which found that both men and women had more bowel movements on increasing fluid intake.^[13] In this study, gender did not have a statistically significant association with stool form, or constipation unlike several other studies which have shown a lower fecal output or slower intestinal transit among healthy women as compared to men.^[7] This could be due to the fact that, the participants were in the younger age group of 17–21 whereas constipation tended to occur more in older women.

Strength of the Study

Adequate number of participants for in depth analysis

Limitation of the Study

All the data obtained were self-reported. Since participants were in the younger age group, results cannot be extrapolated to the general population.

CONCLUSION

It could be concluded that moderate physical activity and, drinking adequate amount water (≥ 8 glasses), would help to regularize bowel habits and reduce the symptoms of constipation. However, further studies would be required to confirm these findings.

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