ORIGINAL ARTICLE

Factors associated with functional constipation in Iranian adults: a population-based study

Seyed Ali Kaboli[1], Mohamad Amin Pourhoseingholi[2], Bijan Moghimi-Dehkordi[1], Azadeh Safaee[1], Manijeh Habibi[1], Asma Pourhoseingholi[1], Mohsen Vahedi[1]

[1] *Gastroenterology Ward, Taleghani Hospital, Shahid Beheshti University, M.C., Tehran, Iran*

[2] *Department of Biostatistics, Tarbiat Modares University, Tehran, Iran*

ABSTRACT

Aim: To determine the prevalence of constipation and its associated factors using Rome III criteria in Iranian population.

Background: Due to the appearance of Amoxicillin-resistant H. pylori strains all over the world, the decreased efficacy of conventional Amoxicillin-containing treatment regimens has become a matter of concern.

Patients and methods: A cross-sectional study conducted in Tehran province from May 2006 to December 2007, including 18180 adult persons. In the first part of interview, characteristics and gastrointestinal symptoms were considered Those who reported at least one symptom referred for the second interview consisted of questions about different gastrointestinal disorders based on Rome III criteria.

Results: 6.33% of interviewees reported constipation and 2.41% had functional constipation (3.5% women and 1.3% men). The prevalence of constipation increases in the group older than 50 years. Constipation was more common in none or low educated than educated groups.

Conclusion: It can be concluded that constipation has a less common prevalence in the general Iranian population. Women, older, obese, married and low education subjects are more likely to suffer from constipation.

Keywords: *Functional constipation, Rome III criteria, Adult, Iran.*

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INTRODUCTION

Constipation is a common problem in the population and its symptoms vary from a relatively mild bowel habit disturbance to rare serious sequelae (1). Although physicians almost define constipation according to stool frequency (2), patients define this problem as a multisymptom disorder that includes infrequent bowel movements, hard/lumpy stool, straining, bloating, and feeling of incomplete evacuation after a bowel movement and abdominal discomfort (3). It affects from 2% to 27% of North Americans, and is more common in women than men (4). However, less of a female dominance across some Asian people was observed (5). It is reported that the prevalence rate of constipation is in direct proportion to age (6, 7), and in inverse proportion to education levels and economic status (7).

The environmental factors including diet, smoking, alcohol, and exercise play important roles in the etiology of constipation. Some studies showed an association while others did not. Sandler *et al*. showed that constipated people

reported lower consumption of meat, beverages (sweetened carbonated and carbonated), fruits, and vegetables (8). Campbell *et al*. in New Zealand did not find constipation to be related with dietary fiber or fluid intake (9) and the studies of Talley *et al*. and Campbell *et al*. did not find any association of smoking and constipation (6, 9). Chronic illnesses and medications such as aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs), and analgesics are other associated factors (10-12). In addition, 25% of subjects with idiopathic constipation in Hong Kong reported seeking healthcare services and constipated subjects had higher anxiety/depression scores than healthy controls (13).

This gastrointestinal disorder is an important public health problem due to its effects on patient life-style, lost productivity and to the costs of medical consultation (14). With the purpose of determining the importance of constipation as a health problem in our community, we aimed to identify the prevalence and risk factors associated with constipation.

PATIENTS and METHODS

A community-based survey was conducted from May 2006 to December 2007 Tehran province, Iran, in order to find the prevalence and epidemiology of gastrointestinal symptoms and disorders (15-19) and the related factors, including five Tehran suburb cities; Tehran metropolitan, Firoozkouh, Damavand, Varamin and Pakdasht. Approximately 5000 households selected on the basis of random numbers of postal cods and all members surveyed (A total of 18180 adult persons). Then trained health personnel from which corresponding local health centre referred to each selected house, door-to-door and face-to-face, and asked them to participate in the first interview. Before the interview survey, the interviewer explained the purpose of these questions and requested their participation and

informed consent was obtained. The research protocol was approved by the Ethics Committee of Research Center for Gastroenterology and Liver Diseases, Shahid Beheshti University (M.C).

The questionnaire included two parts, the first part that was conducted by health personnel, consisted of questions, regarding to personal and family characteristics. In addition, interviewers asked about 11 gastrointestinal symptoms including; abdominal pain or distress, constipation, diarrhea, bloating, heartburn, acid regurgitation, proctalgia, nausea and vomiting, fecal incontinence, existence of blood in the stool or black stool (melena), weight loss or anorexia, and difficulty in swallowing. Those who reported at least one of these 11 gastrointestinal symptoms were for participating in the second interview, which was done according to the second part of the questionnaire. The second part of questionnaire consisted of questions about different gastrointestinal disorder on the basis of Rome III criteria (20, 21) which was standardized in Persian designed by a working group, translated from English to Persian.

Constipation was defined to exist in an individual who met Rome III criteria as follows; at least 3 months, with onset at least 6 months previously of two or more of the following:

1. Straining during at least 25% of defecations (At least often). Lumpy or hard stools at least 25% of defecations (At least often).
2. Sensation of incomplete evacuation at least 25% of defecations (At least sometimes).
3. Sensation of anorectal obstruction/blockage at least 25% of defecations (At least sometimes).
4. Manual maneuvers to facilitate at least 25% of defecations (e.g., digital evacuation, support of the pelvic floor) (At least sometimes).
5. Fewer than three defecations per week (At least often).

Some demographic and clinical variables like sex (male/female), age (in four groups; 15-34, 35-49, 50-64 and more than 64), marital status (single, married, widow), education (less than high school, high school, college), Body mass index (BMI) calculated as body weight divided by the square body height in meters (kg/m2) These definitions are consistent with the recommendations of the World Health Organization (22), tobacco smoking (non-smokers, and current-smokers of cigarettes, cigars, and pipes), self report of depression (yes or no), the history of abdominal surgery (present or absent), functional proctalgia (based on Rom III), evacuation instrument (Finger, Hose, Drug, Herb) included in the analysis in order to find associated factors and estimate the adjusted prevalence of functional constipation.

All statistical analysis carried out using SPSS and SAS. Student's t-test was used to compare means of continuous variables. Pearson's chi-square and contingency tables were performed to test for independence between discrete classification variables and estimate the adjusted prevalence according to some demographic factor such as age and sex. Cohen's kappa coefficient was used to measures the agreement between self report of constipation and Rom III criteria. A P-value of 0.05 or less was considered statistically significant and all reported P values were two sided.

RESULTS

The response rate of the participants was more than 92% and those who refused to interview replaced with additional random samples. Of the 18180 subjects, 9108 (mean age [± standard deviation: SD]: 39±17.4years) were males and 9072 (mean age [SD]: 38.4±16.7years) females; about two-thirds (64.6%) were married and 3281(18%) college educated (Table1).

Table 1- Demographic data of sampled population

	Male (n=9108)	Female (n=9072)	P-value
Mean age (years)	38.95±17.4	38.40±16.7	<0.001
Age range (%)			<0.001
16-29 years	3060 (38.6)	3502 (38.6)	
30-39 years	1721 (18.9)	1724 (19.0)	
40-49 years	1494 (16.4)	1542 (17.0)	
50-59 years	1011 (11.1)	1052 (11.6)	
60-69 years	683 (7.5)	689 (7.6)	
70-79 years	510 (5.6)	408 (4.5)	
>80 years	173 (1.9)	118 (1.3)	
Education (%)			<0.001
Less than high school	1621 (17.8)	2292 (25.3)	
High school	5738 (63.0)	5234 (57.7)	
College	1748 (19.2)	1533 (16.9)	
Marital Status (%)			<0.001
Single	3151 (34.6)	2458 (27.1)	
Married	5875 (64.5)	5878 (64.8)	
Widow	55 (0.6)	662 (7.3)	

Table 2- Prevalence of functional constipation by sociodemographic characteristics

	Number	Prevalence per 100 Person (95% CI)[*]	P-value
Sex			<0.001
Male	117	1.3 (1.0-1.5)	
Female	320	3.5 (3.1-3.9)	
Age range (year)			<0.001
15-34	103	1.1 (0.09-1.4)	
35-49	152	3.2 (2.7-3.7)	
50-64	118	4.1 (3.4-4.9)	
>64	66	3.6 (2.8-4.5)	
Marital Status			<0.001
Single	48	0.8 (0.6-1.0)	
Married	327	2.8 (2.5-3.1)	
Widow	52	7.4 (5.4-9.3)	
Educational level			<0.001
Less than high school	134	3.4 (2.8-4.0)	
High school	246	2.3 (2.0-2.6)	
College	6	0.2 (0.04-0.3)	

* 95% confidence interval

Table 3- Distribution of clinical factors in patients with functional constipation

	Number (%)
Symptoms	
Fewer than three defecations per week	303 (66)
Lumpy or hard stools	394 (85.8)
Straining	413 (90)
Sensation of incomplete evacuation	283 (61.7)
Sensation of anorectal obstruction/ blockage	122 (26.6)
Manual maneuvers to facilitate	120 (26.1)
Evacuation instrument	
Finger	49 (10.7)
Hose	36 (7.8)
Drug	87 (19)
Herb	131 (11.4)
BMI (Kg/m^3)	
<18.5	4 (1)
18.5-25	155 (39.8)
25-30	157 (40.4)
>30	73 (18.8)
Smoking	
Yes	52 (11.3)
No	407 (88.7)
Self Report of Depression	
Yes	220 (51.6)
No	206 (48.4)
Bloating	
Yes	249 (56.7)
No	190 (43.3)
Abdominal Pain	
Yes	178 (40.5)
No	261 (59.5)
Proctalgia	
Yes	98 (22.3)
No	341 (77.7)
Abdominal Surgery	
Yes	180 (39.2)
No	272 (59.3)

A total of 2931 participants had at least one gastrointestinal symptom; among them 459 (2.41%; 95% CI: 2.19-2.64) adult persons found with functional constipation based on ROM III criteria; Also, the prevalence of self-reported constipation was 6.33 (95% CI: 5.97-6.68). The level of agreement between self-reported and criteria-based constipation was poor (Kappa= 0.27). The prevalence of FC were predominantly higher for female (P<0.001), older (P<0.001) and lower levels of education (P<0.001) (Table 2).

Table 3 presents the frequency of common symptoms of FC by Rome III criteria. Drugs were the most common auxiliary instrument for evacuation (19%). Herb, finger and hose were the subsequent agents for evacuation. Also, the association of BMI, smoking, abdominal pain and surgery with constipation were reviewed in table 3.

The prevalence of FC adjusted for marital status for people aged more than 50 years old are as following; Married: 3.26% (95% CI: 2.7-3.8), Single: 5.81% (95% CI: 0.7-10.8) and Widow: 6.4% (95% CI: 4.5-8.4).

In addition, up to 60% of women with low education (less than high school) who involved with FC have BMI more than 25, in spite of high educated women (College) who were only 43.3% have BMI more than 25 (P<0.001).

DISCUSSION

The prevalence of constipation demonstrated by our study appears to be lower than previously reported in other countries, but high compared with most previous Iranian studies. Constipation affects from 1.9% to 27.2% of North Americans, with most estimates concentrated around 15 % (2). In Asia, prevalence was up to 14.3 % (13, 23, 24). In Iran, the prevalence of constipation was 32.9% in Isfahan (25), 3.5% in Tabriz (26), and 1.4% and 3.3% in nomads and industrial labourers, respectively (27). The possible explanations for the variability could be due to different sampling methods, definitions of FC, or dietary and cultural characteristics of the study populations. One possible explanation for lower prevalence of FC in our community could be due to the architecture of Iranian toilets. The design of the toilets allows the one to more flex the hip joints. Full flexion of the hips stretches the anal canal in an anteroposterior

direction and straightens the anorectal angle, thereby promoting emptying of the rectum (28). Also, Iranians use vegetables and fruits in large amounts in their diet regimen, which could lower the frequency of constipation. Increased rice consumption in our community was thought to be associated with lower constipation rates. Rice is a staple food of Iranians. It was established that half of Iranian people consume high quantity of energy and protein and the main sources of nutrients they used were with bread and bakery products (29). Also, the mean age of participants in this study was 38.7 years, which was younger than most other studied populations.

Women were more likely to be constipated than men. In Canadian population, FC was almost twice as common in women as in men (3) and other studies show it occurs about three times more frequently in women (7, 30). This trend is more remarkable in self-reported constipation than in FC by Rome criteria (4). Sex hormones in mediating GI motility and the autonomic nervous system may be related to this female predominance. For instance, Teff et al. (31) pointed out that women had delayed gastric emptying of liquids and solids compared to men. Also some study demonstrated that men have a faster colonic transit time than women (32). Furthermore, some studies have focused on female sex hormones, due to this fact that the luteal phase of the menstrual cycle, when plasma progesterone levels are high, is associated with prolongation of gastrointestinal transit time (33). However, the effect of sex hormone on chronic constipation is also skeptical (34). In contrast, the Singaporean constipation study did not identify a gender difference in the incidence of FC (17).

The prevalence of constipation increases in the group older than 50 years in our study, as described previously in most studies (6, 8, 9). Constipation in the elderly may be caused by a low energy intake that reflects a low dietary intake, leading to reduction of fecal volume and weight, and thus possibly causing the tendency towards constipation (35). Brandt et al. suggested that the increasing prevalence of chronic constipation with advancing age might reflect the increased prevalence of secondary causes of constipation (e.g. an increased prevalence of Parkinson's disease, diabetes mellitus, etc) (36).

In our study 6.33 % of subjects self-reported constipation; in contrast, the proportion of FC by the Rome criteria was 2.41%. Whereas, in the Korean study 16.5% of subjects had self-reported constipation, the proportion of FC by the Rome criteria was 9.2% (36). Using the Rome III definition as the gold standard for constipation, we found that self-reported constipation offered poor sensitivity; 63.5% of women and 36.5% of men reported that they were constipated. Men might be less likely to understand the term constipation and more likely to claim that they are healthy. Women appear to be more susceptible to intestinal dysfunction, or may be more inclined to acknowledge and report variations in bowel habit, or both.

In Western studies, the standard for normal bowel frequency has been from three times per week to three times per day. And the most common symptom of FC by the Rome II criterion has been straining during defecation, followed by lumpy or hard stool, a feeling of incomplete evacuation after defecation, a feeling of obstruction in the anus, defecation less than three times per week, and a need for manual help to facilitate defecation. In this study, among the subjects diagnosed as having FC by the Rome III criterion, straining during defecation was the most common symptom (90%), followed by lumpy/hard stool, defecation less than three times a week, a feeling of incomplete evacuation after defecation, a feeling of obstruction in the anus, and a need for manual help to facilitate defecation, similar to Western studies for the leading symptoms of constipation. in contrast, in The Korean study (37), the feeling of incomplete evacuation after

defecation was the most common symptom. Thus, the more accurate symptoms to confirm the presence of constipation were straining and lumpy or hard stool. Straining and hard stools were highly associated with the presence of constipation in a multinational study reported by Talley et al. (38).

We observed that constipation was more common in none or low educated groups. This result is similar to that published by Sonnenberg (7), but in contrast to the results of EPOC study (39). Unlike Sandler *et al.'s* study in the United States (8), we found constipation to decrease with increasing education, even after controlling for age and gender. The differences in constipation rates by educational level could be due to differences in dietary habits or other factors that have not been considered in our study. In addition, constipation was seen in single more than married individuals after adjustment of marital status for people aged more than 50 years. Marital status was not a significant predictor for chronic constipation in other studies (40).

The other risk factors evaluated in this study, such as smoking and abdominal surgery did not show any association with the development of FC resembling reports by other study (40).

51.6 % of patients report history of depression. In the Hong Kong, constipated subjects had higher anxiety/depression scores than controls (13). It seems that psychological and psychiatric comorbidity is increased in those with FC, but this association could be due to consultation bias.

Our study observed a greater percentage of obese individuals with FC than in normal BMI individuals. In contrast, no significant relationship was observed between BMI and constipation in other studies although constipation was somewhat more frequent in obese patients (41). In Iranian women, like the women in developed countries, the level of education was negatively related to BMI, while in men the association was positive (42). There may be an association between higher BMI level, low educational status and constipation in Iranian women. The age-adjusted means for BMI were 24.6 kg/m^2 in men and 26.5 kg/m^2 in women. The age-adjusted prevalence of overweight or obesity (BMI $\geq$25 kg/m^2) was 42.8% in men and 57.0% in women; 11.1% of men and 25.2% of women were obese (BMI $\geq$30 kg/m^2), in patients with Functional Constipation (43). According to the results, 59.2% of constipated patients had BMI $\geq$25 kg/m^2, which was more than the mean of our community (43). The prevalence of obesity and overweight in Iran is as high as the US. However, Iranian women are more obese than American women and Iranian men are less obese than their American counterparts. This discrepancy might be due to the low rate of smoking among Iranian women (44).

It can be concluded that FC is less common in the Iranian population than in western countries. The self-perception of constipation is greater than that determined by objective criteria. Straining, and hard stools show the greatest accuracy for the diagnosis of constipation. Women, older, obese, married and low educated subjects are more likely to suffer from constipation.

ACKNOWLEDGEMENTS

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