

# The Relationship Between Depression and Constipation: Results From a Large Cross-sectional Study in Adults

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## Research Article

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# Abstract

**Background and objective:** accumulating evidence based on scarce studies suggests that the relation between depression and functional constipation is possible. However, more studies in order to provide more reliable evidence are needed. About one-third of depressed people experience constipation and, it has a key role in reducing the perceived quality of life of the affected individuals. In the current study, therefore, we aimed to evaluate whether depression is associated with higher risk of functional constipation and whether it is gender specific.

**Methods:** This cross-sectional study was carried out among 3362 adults aged 18–55 years. In this study, functional gastrointestinal symptoms were determined using a Iranian reliable and valid version of the modified Rome III questionnaire. The Iranian validated version of Hospital Depression Scale (HADS) was used to evaluate psychological health. Scores of 8 or more on depression subscale in the questionnaire were considered to indicate the presence of depression. Self-administered questionnaires have been used to collect information regarding age, sex, marital status, education level, anthropometric measures, smoking, physical activity, antipsychotic medications use, dietary intakes. History of any predisposing chronic diseases including diabetes mellitus and cardiovascular diseases was also asked. Simple and binary logistic regression were used for data analysis.

**Results:** mean  $\pm$  SD age of participants was  $36.29 \pm 7.87$  years and 58.5% were female. The prevalence of depression and constipation in our study sample was 28.6% and 33.6%, respectively.

In crude model, in total sample depressed people showed higher significant risk of constipation OR=1.97 (95%CI:1.66-2.33). Although, we observed a significant association between depression and constipation in both genders, however the association was stronger in men than women (OR: 2.64; 95%CI: 1.91, 3.64 vs. OR: 1.52; 95%CI: 1.24, 1.86).

In the full adjusted model, in total sample depressed people showed higher significant risk of constipation Adjusted OR=1.69 (95%CI:1.37-2.09). Although, we observed a significant association between depression and constipation in both genders, however the association was stronger in men than women (AOR: 2.28; 95%CI: 1.50, 3.63 vs. AOR: 1.55; 95%CI: 1.21, 1.99).

**Conclusion:** Our study showed depressed people are at higher significant risk affecting by constipation. Our study findings justify mental health evaluation in all patients with functional gastrointestinal disorders particularly among constipated individuals.

## Introduction

Functional gastrointestinal disorders (FGIDs) are defined as a variable combination of chronic or recurrent gastrointestinal symptoms not explained by structural or biochemical abnormalities (1). Irritable bowel syndrome (IBS) and functional constipation (FC) are the most common functional gastrointestinal disorders. According to the Rome  $\boxtimes$  criteria these two disorders should be theoretically separated mainly

by the presence of abdominal pain or discomfort relieved by defecation (typical of IBS) and they should be mutually exclusive (2). Broadly defined, constipation is a highly prevalent gastrointestinal motility disorder characterized by persistently difficult or infrequent (i.e., less than three times per week) defecation (3). Chronic constipation (CC) is one of the most common gastrointestinal disorders. In some populations it is the most common digestive complaint, which leads to a high number of medical visits (4). In pars cohort study, Moezi et al. in 2018, with the aim of the prevalence of chronic constipation and its associated factors, among 9,000 adults in southern Iran, a total of 752 (8.1%) participants were diagnosed as having chronic constipation (9.3% of female and 6.7% of male participants (5). Previous studies have reported a wide range of prevalence for Chronic constipation (2–27% with an average of 15% in most studies (6, 7). This wide range is due to different study populations and also different inclusion criteria, for example studies that reported the prevalence based upon self-reporting, showed higher prevalence compared with those that used Rome criteria (8) or studies conducted in southeast Asia reported lower prevalence compared with American and European studies (9–11).

Several factors are associated with constipation. Some of the risk factors for functional constipation based on previous studies are female sex, older age, low socioeconomic status, physical inactivity, and insufficient fluid and fiber consumption (11–13). Also, a set of psychological variables can be related to constipation. A study was conducted by Cheng et al. in 2003 in order to investigate the prevalence of functional constipation in an Asian population, and the interplay among functional constipation, anxiety/depression, perception and coping strategies (14). Albiani et al. in 2013 examined anxiety and depression as potential mediators of the relationship between constipation severity and Quality of life (QOL) in a sample of 142 constipated patients (15). A study was conducted by Fond et al. in 2014 aiming to determine the associations of IBS and each of its subtypes with anxiety and/or depression (16). Ballou et al. in 2019 conducted a research study aiming to investigate the relationship between depression and bowel habit, controlling for clinical and demographic factors, in a representative sample of the United States population using the National Health and Nutrition Examination Survey (NHANES) (17). A study was conducted by Mokhtar et al. In 2020 to evaluate the prevalence of depression among patients with constipation-predominant IBS (IBS-C) (18).

Overall, accumulating evidence based on scarce studies suggests that the relation between depression and functional constipation is possible. However, more studies in order to provide more reliable evidence are needed. In the current study, therefore, we aimed to evaluate whether depression is associated with higher risk of functional constipation and whether it is gender specific.

## **Material And Methods**

### **Study design and subjects**

The present study is a cross-sectional study based on a part of SEPAHAN project information. SEPAHAN project was conducted to examine the epidemiological aspects of function gastrointestinal disorder and its relation or lifestyle and psychiatric factors on 10,500 non-academic staff apart from the treatment

department of Isfahan University of Medical Sciences and Health Services in April 2010. The sample consisted of non-academic staff working in 50 different centers across Isfahan province. These staffs were working in hospitals, university campus, and health centers. It is worthy to note that not all these staffs are involved in health services. In the mentioned plan, in order to increase the rate of response and participation of individuals and the accuracy of the collected data, the questionnaires were distributed in two stages with a short time interval (3 to 4 weeks). In the first stage, a questionnaire of demographic information, nutritional performance, health search behaviors and food intake and in the second set of questionnaires, participants were asked about information about gastrointestinal and mental and physical illnesses and personality traits, perceived stresses and coping styles. The response rate in the first stage was 86.1% and in the second stage was 64.64%. After merging the data in these two stages, complete information was obtained for 4763 people. In current secondary study a total of 3362 with complete data on all variables used was included. More complete information about the SEPAHAN project can be found in other published articles (19).

## **Depression assessment**

To evaluate depression, the Hospital Anxiety Depression Scale (HADS) was used. The HADS contains 14 items and consists of 2 subscales of anxiety and depression. Each item is rated on a 4-point scale, with the anxiety and depression subscales separately obtaining a maximum score of 21. Scores of 8 or more on either subscale are considered to be a significant case of psychological morbidity, and 0–7 normal (20). The validated Persian version of HADS with alpha of 0.86 for depression subscales, was used (21).

## **Constipation assessment**

Functional gastrointestinal symptoms were determined using a reliable and valid version of the modified Rome III questionnaire (22), which diagnoses functional gastrointestinal disorders and consists of six major domains, with functional oesophageal disorders and functional gastrointestinal disorders being two domainns in the questionnaire for adults. Each domain contains several questions to aid the diagnosis of these disorders based on Rome III criteria. According to the Rome III criteria, constipation was defined as the presence of at least one or two of the following symptoms, for at least three months, with the onset at least six months preceding this study.

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

## **Other variables**

Self-administered questionnaires have been used to collect information regarding age (years), sex (male, female), Marital Status (married, single), Education level (Under diploma, Diploma (12-years formal education), Collegiate), and anthropometric measures including weight, height, weight and Body mass index (BMI = weight (kg)/height square (m<sup>2</sup>). Smoking, Physical Activity Based on self-reported smoking habits, participants were divided into three category “nonsmokers,” “Ex-smokers,” or “current smokers”. General Practice Physical Activity Questionnaire (GPAQ) have been used for Physical activity levels (23). Usual dietary intakes during the preceding 12 months were assessed using a validated 106-item self-administered semi-quantitative dish-based food frequency questionnaire (FFQ), especially designed for adults living in Isfahan province (24). The semi-quantitative FFQ included 36 questions to assess intake of most commonly consumed fruits and vegetables (raw or cooked as mixed dishes). Those fruits and vegetables that are consumed raw are cucumbers, tomatoes, dates, raisins, herbs, dried berries, salad, citrus, apples or pears, cherries, apricot, plum, raw onions, kiwi, strawberries, grapes, pomegranate, mulberry, banana, figs, and all kinds of fruit juice. Daily intakes nutrients including individual dietary fiber were calculated for each participant using the US Department of Agriculture's nutrient databank (25). Fluid intake was evaluated through questions on the consumption of water, soft drinks, yogurt drink (“dough”) and other beverages, before, after or during meals, which participants could answer as never, sometimes, often, or always (26). current use of antipsychotic medications (including nortriptyline, amitriptyline or imipramine, fuoxetine, citalopram, fuvoxamine and sertraline) were gathered using a self-reported questionnaire. and history of any predisposing chronic diseases including diabetes mellitus and cardiovascular diseases was asked.

## Statistical analysis

Continuous and categorical basic characteristics of study subjects were presented as mean (standard deviation (SD)) and frequency chronic diseases (percentage) and compared between study groups using independent samples T and Chi-squared tests, respectively. Binary logistic regression analysis was used to find the association between depression and constipation. Odds ratios (OR) were reported with the corresponding 95% confidence intervals. Multiple logistic regression was used to estimate adjusted odds ratios (OR) (95%CI) in association analyses.

We fitted separate models for evaluating the association between constipation and depression. In simple binary logistic regression analysis, we only evaluated the crude association of depression and constipation. In multivariable analyses in the first model, we adjusted for age (continuous), sex (male/female), marital status (Married/Single) and Education level (under diploma/ diploma). Further adjustment was made for smoking habits (non-smoker /current smoker), physical activity (less than 1 h/week/more than 1 h/week), fluid consumption (continuous), fruits (continuous), vegetables (continuous), and total dietary fiber (continuous), and in the final model, further adjustment was made for chronic disease (non-disease/ disease), antipsychotic medicines (no/yes). All statistical analyses were done using Statistical Package for Social Sciences (SPSS, Inc., Chicago IL, United States; version 16).  $P < 0.05$  was considered significant in all statistical analyses.

## Results

mean  $\pm$  standard deviation age of the 3674 study subjects was  $36.29 \pm 7.87$  years and 58.5% were female. Table 1 presents the general characteristics of study population stratified by the status of functional constipation. The prevalence of FC in our study was 23.9% (15% in men and 30.2% in women). The prevalence of functional constipation was higher among women, diploma, non-smoker, non-depression people and people with no chronic diseases. The basic characteristics (i.e., sex ( $P < 0.001$ ), physical activity ( $P < 0.05$ ), weight ( $P < 0.001$ ), fluid consumption ( $P < 0.001$ ), antipsychotic medicines ( $P < 0.001$ ), physical activity ( $P < 0.05$ ), and depression ( $P < 0.001$ )) of people affected and not affected by functional constipation were statistically significantly different (Table 1).

Table 1  
General characteristics of participants based on categories of Functional Constipation n (%)

Variables	Functional Constipation		P_value
	No(n = 2560)	Yes(n = 802)	
Age (years)	36.25 ± 7.94	36.42 ± 7.63	0.623*
Sex			< 0.001**
Male	1193(85)	210(15)	
Female	1367(69.8)	592(30.2)	
Education level			0.583**
Under diploma	982(76.7)	299(23.3)	
Collegiate	1578(75.8)	503(24.2)	
Marital Status			0.418**
Married	2042(75.9)	648(24.1)	
Single	430(78.5)	118(21.5)	
Divorced or widowed	41(74.5)	14(25.5)	
Smoking habits			0.424**
Non smoker	2209(76.2)	689(23.8)	
Current smoker	75(79.8)	19(20.2)	
Physical activity			0.016**
less than 1 h/week	1547(74.6)	526(25.4)	
more than 1 h/week	823(78.5)	225(21.5)	
Weight (cm)	69.24 ± 13.55	66.76 ± 11.75	< 0.001*
BMI (kg/m <sup>2</sup> )	24.89 ± 3.83	24.96 ± 3.81	0.632*
Total dietary fiber	22.67 ± 9.69	21.99 ± 9.36	0.082*
Fruits	319.43 ± 245.24	304.76 ± 234.21	0.135*
Vegetables	238.34 ± 131.22	235.70 ± 130.93	0.619*

Values are mean ± SD for continuous and frequency (%) for categorical variables

\* T-Test, \*\*Chi-squared test,  $P < 0.05$  is considered as significant

Variables	Functional Constipation		P_value
	No(n = 2560)	Yes(n = 802)	
Fluid consumption	1.35 ± 0.58	1.26 ± 0.51	< 0.001*
Antipsychotic medicines			< 0.001**
Yes	119(63.6)	68(36.4)	
Chronic diseases			0.592**
Disease	116(74.4)	40(25.6)	
Depression			< 0.001**
Yes	629(66.7)	314(33.3)	
No	476(79.8)	314(20.2)	
Values are mean ± SD for continuous and frequency (%) for categorical variables			
* T-Test, **Chi-squared test, P < 0.05 is considered as significant			

Table 2 presents the general characteristics of study population stratified by the status of depression. The prevalence of depression in our study was 28.6% (20.8% in men and 34.1% in women). The prevalence of depression was higher among women, diploma, non-smoker, non-constipation people and people with no chronic diseases. The general characteristics (i.e., sex (P < 0.001), education level (P < 0.001), marital Status (P = 0.001), physical activity ((P < 0.001), dietary fiber (P < 0.001), Fruits (P < 0.001), vegetables (P < 0.05), antipsychotic medicines (P < 0.001), chronic diseases (P < 0.001), constipation (P < 0.001) of not depression and depression were statistically significantly different (Table 2).

Table 2  
General characteristics of participants based on categories of depression n (%)

Variables	Depression		P_value
	No(n = 2354)	Yes(n = 943)	
Age (years)	36.13 ± 7.94	36.32 ± 7.61	0.562*
Sex			< 0.001**
Male	1082(79.2)	285(20.8)	
Female	1272(65.9)	658(34.1)	
Education level			< 0.001**
Under diploma	837(66.9)	414(33.1)	
Collegiate	1517(74.1)	529(25.9)	
Marital Status			0.001**
Married	1901(72.2)	733(27.28)	
Single	380(70)	163(30)	
Divorced or Widowed	26(49.1)	27(50.9)	
Smoking habits			0.063**
Non smoker	2064(72.6)	779(27.4)	
Current smoker	58(63.7)	33(36.3)	
Physical activity			< 0.001**
less than 1 h/week	1394(68.5)	2034(31.5)	
more than 1 h/week	797(77.6)	1027(22.4)	
Weight (cm)	69.12 ± 13.19	67.16 ± 12.99	< 0.001*
Height (cm)			
BMI (kg/m2)	24.91 ± 3.70	24.85 ± 4.10	0.712*
Total dietary fiber	22.83 ± 9.60	21.65 ± 9.64	0.001*
Fruits	330.54 ± 247.86	276.67 ± 218.09	< 0.001*
Vegetables	241.78 ± 129.20	227.71 ± 137.19	0.006*

Values are mean ± SD for continuous and frequency (%) for categorical variables

\* T-Test, \*\*Chi-squared test,  $P < 0.05$  is considered as significant

Variables	Depression		P_value
	No(n = 2354)	Yes(n = 943)	
Fluid consumption	1.32 ± 0.56	1.34 ± 0.58	0.548*
Antipsychotic medicines			< 0.001**
Yes	76(3.2)	106(11.2)	
Chronic diseases			< 0.001**
Disease	52(54.3)	151(45.7)	
Constipation			< 0.001**
Yes	476(60.3)	790(39.7)	
Values are mean ± SD for continuous and frequency (%) for categorical variables			
* T-Test, **Chi-squared test, P< 0.05 is considered as significant			

Crude and multivariable-adjusted OR (95%CI) of constipation across the categories of depression are illustrated in Table 3. In crude model, in total sample depressed people showed higher significant risk of constipation OR = 1.97 (95%CI:1.66–2.33). The odds of constipation in depressed people is 1.97 times of non-depressed people. Although, we observed a significant association between depression and constipation in both genders, however the association was stronger in men than women (OR: 2.64; 95%CI: 1.91, 3.64 vs. OR: 1.52; 95%CI: 1.24, 1.86). In women, the odds of constipation in depressed people is 2.64 times of non-depressed people and in men, the odds of constipation in depressed people is 1.52 times of non-depressed people.

In the full adjusted model, in total sample depressed people showed higher significant risk of constipation Adjusted OR = 1.69 (95%CI:1.37–2.09). The odds of constipation in depressed people is 1.69 times of non-depressed people. Although, we observed a significant association between depression and constipation in both genders, however the association was stronger in men than women (AOR: 2.28; 95%CI: 1.50, 3.63 vs. AOR: 1.55; 95%CI: 1.21, 1.99). In women, the odds of constipation in depressed people is 2.28 times of non-depressed people and in men, the odds of constipation in depressed people is 1.55 times of non-depressed people.

Table 3  
Relationship between depression and constipation by logistic regression model

	Total	Men	Women
	OR(95%CI)	OR(95%CI)	OR(95%CI)
Crude	1.97 (1.66, 2.33)	2.64 (1.91, 3.64)	1.52 (1.24, 1.86)
Model 1	1.83 (1.52, 2.21)	2.78 (1.94, 3.99)	1.59 (1.28, 1.97)
Model 2	1.76 (1.43, 2.17)	2.31 (1.54, 3.46)	1.62 (1.27, 2.07)
Model 3	1.69 ( 1.37, 2.09)	2.28 (1.50, 3.63)	1.55 (1.21, 1.99)
Model 1: Adjusted for age, sex, marital status and Education level only in the whole population, Model 2: Further adjustment was made for smoking habits, physical activity, Fluid consumption, fruits, vegetables, and total dietary fiber, and Model 3: Further adjustment was made for chronic disease, Antipsychotic medicines			

## Discussion

In this analysis of a large cross-sectional study of general adults, depression was associated with increased risk of constipation a crude model. Although controlling for potential confounders attenuated these associations, link for depression remained strongly significant. To our knowledge, this is the first study to evaluate the relationship between depression and constipation in a nationally representative adult sample in the Iran. In this study, depression severity was significantly associated with functional constipation.

The prevalence of FC in our study was 23.9% (15% in men and 30.2% in women), which was less than the prevalence reported in most studies conducted in western countries. According to a systematic review in North America the prevalence ranged from 1.9–27% with an average of 15% in most studies (27). According to another meta-analysis the pooled prevalence in South America was 18%, and in north and south Europe was 16%, while in the middle eastern and southeast Asian studies were 14% and 11%, respectively (28). In a study conducted in Tehran province, 2.4% of general population were diagnosed as having FC based on Rome III criteria (29). Another study conducted in Isfahan showed that 9.6% of the participants had constipation according to self-reports (30). Another study conducted in Kerman, showed a prevalence of 9.4% (31).

The prevalence estimated in our study, like other studies conducted in Iran, was lower than western countries. This can be due to different life style in Iranian population (29, 32). Iranian diet consists of more fibers (vegetable and fruits). Bread and rice is the main food in Iranian diet (33). Second reason of this lower prevalence may be the style of Iranian toilet. On a normal defecation, relaxation of the puborectalis and external anal sphincter with increased intra-abdominal pressure straighten the anorectal angle and lead in defecation. Due to full flexion of hip in Iranian toilet the anorectal angle is much wider than in European toilet. This wide angle helps complete evacuation (34).

In this study, depressed and non-depressed people had 33.3% and 20.2% constipation, respectively. Our findings are consistent with previous studies that have found depression to be associated with constipation. For instance, Moezi et al. showed a significant association between depression and constipation (5). Ballou et al. showed a significant association between depression and constipation (17).

In previous studies, the relationship between mood and gastrointestinal disorders is unique from other chronic illnesses due to the significant interplay between the central nervous system and the gastrointestinal tract, also known as the brain-gut axis. For example, studies of neuronal stress pathways have found that the corticotropin-releasing factor (CRF) in the brain plays a significant role in mediating the relationship between emotional distress and changes in both upper and lower gastrointestinal (GI) motor function (35, 36). In functional GI disorders, such as IBS, functional dyspepsia, and chronic constipation or diarrhea, dysfunction of the autonomic nervous system, which acts directly on CRF, may play a role in alteration in bowel habits and gastric emptying (37). Similarly, depression is associated with hyperactivity of CRF neuronal pathways (38) and CRF receptors have been suggested as a possible treatment target for both depression and GI disorders (39, 40) It is possible that consistent activation of the stress pathways mentioned above may lead to dysfunction in the brain-gut axis, making depressed patients more susceptible to symptoms such as chronic diarrhea or chronic constipation (17).

Our findings on the depression among constipation patients is a good start to alert the medical practitioners in this country regarding the importance of having to refer them to the appropriate physicians. However, our study has several limitations: most important among them, first, due to the cross-sectional design, no causal inferences can be drawn. Other the limitation of this study is that information was not available regarding previous medical utilization by patients. While everyone in this study received an initial medical consultation to determine constipation severity, we do not have any information regarding which previous medical treat.

## **Conclusions**

Our study showed depressed people are at higher significant risk of affecting by constipation. Our study findings justify mental health evaluation in all patients with functional gastrointestinal disorders particularly among constipated individuals.

## **Declarations**

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### **Authors' contributions**

PA, AHK, HD, HA, HR, and AE contributed to SEPAHAN study concepts and design, data collection; MA contributed to data interpretation and manuscript drafting and AF contributed to statistical analysis, data interpretation and manuscript revising; HD and HA supervised the SEPAHAN study in Gastrointestinal and psychological disorders, respectively. PA is SEPAHAN principal investigator. All authors approved the final version of the manuscript. AF supervised the current secondary study.

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## **Availability of data and materials**

Data and materials supporting the results of this article are available from the corresponding author on reasonable request.

## **Ethics approval and consent to participate**

This project was approved by the Bioethics Committee of our University (Project No. 189069, 189082, and 189086).

A written informed consent was taken from all participants.

## **Consent for publication**

Not applicable.

## **Conflict of interest**

The authors declare that they have no conflict of interest.

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