

Irritable Bowel Syndrome in Iran: SEPAHAN Systematic Review No. 1

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ABSTRACT

Objectives: Irritable bowel syndrome (IBS) is a common gastrointestinal disorder. Due to its high prevalence and absence of curative therapy, IBS has the potential to create tremendous burden on the health care system. Herein, we systematically reviewed the published literature to investigate the epidemiology of IBS in Iran.

Methods: Studies that were reviewed in this article were primarily identified through four online bibliographic databases including PubMed, Google Scholar, IranMedex, and Scientific Information Database. Manual search of reference lists was carried out to identify any additional studies such as relevant abstracts and also recent review articles which may have been missed. Potentially related studies were retrieved and the selection criteria were applied. Eligible articles were reviewed.

Results: From 4176 studies identified, 18 eligible studies were included. It was reported that in Iran, the prevalence of IBS was in the range of 1.1% to 25% and was more common in women. In addition, the difference in frequency of different age groups was minimal. There was a minimal difference in IBS prevalence within different age groups.

Conclusions: In Iran, the incidence of IBS was in the wide range. Since there are not enough population-based studies, researchers should focus on developing well-designed population-based studies to determine the epidemiology of IBS in Iran. Moreover, cohort studies should be conducted in order to investigate the natural history of IBS. Investigating the etiology of IBS and attempt to organize health promotion programs are highly suggested.

Keywords: Irritable bowel syndrome, functional gastrointestinal disorders, epidemiology, systematic review, Iran

INTRODUCTION

Irritable bowel syndrome (IBS), as the most common functional gastrointestinal disorder (FGID), is characterized by abdominal pain or discomfort and alteration of bowel habits and disordered defecation, in the absence of organic disease.^[1]

Despite the high prevalence of IBS in general population and the personal and economic costs, its etiology remains vastly unknown; however, various studies have shown that several factors including abnormal motility of intestine, visceral hypersensitivity, inflammation, neurotransmitter imbalance, disturbance of brain-gut interaction, abnormal central processing, autonomic and hormonal events, and genetic, environmental, and psychosocial factors may contribute in incidence of IBS.^[2]

It is believed that the incidence of IBS is more prevalent in women than in men and the age of its onset is in the range of 30 to 50 years.^[3] The prevalence of IBS varies across the world, ranging from as high as 9% to 22% in the United States and European countries, to as low as 4.2% and 4.4% in India and Thailand, respectively, based on various diagnostic criteria.^[3-5]

It was reported that prevalence of IBS was 3 to 20 % in the North America.^[6] The prevalence of IBS in 8 European countries was 11.5%.^[8] In Singapore the prevalence of IBS was estimated to be 11, 10.4 and 8.6%, respectively, by using Manning, Rome I, and Rome II criteria.^[8] Such variation in these reports may be due to the difference in selected population in each study or even using different criteria in diagnosing IBS. Recently, it has been observed that the prevalence of IBS is raising among Asian communities.^[8,9]

Several studies in Iran have also reported the prevalence of IBS in different populations. Mahmoudi et al. determined it to be 4.2% based on Rome I criteria.^[10] While Pourshams et al. by employing Rome II criteria, reported that the prevalence of IBS in students of Tehran University was 4.75%.^[11] The prevalence of IBS in Iranian blood donors was 5.6%.^[12] The prevalence of IBS in 18180 people in five cities in Tehran province was estimated to be about 1 % by employing III criteria;^[13] whereas Ganji et al. by using Rome II diagnostic criteria, demonstrated that the prevalence of IBS in the city of Tehran was about 25% and also claimed that IBS was the second most prevalent gastrointestinal disorder after gastroesophageal reflux disease in outpatients visiting gastrointestinal clinics.^[14]

IBS has strong negative effect on quality of life in patients who suffer from it and it imposes substantial social and economic costs due to medical seeking behavior and absenteeism.^[15-20] In the United States, the direct and indirect cost of IBS has been estimated to be between 1.7 to 10 million dollars and 19.2 million dollars per year, respectively.^[21,22] One study in Iran investigated the economic burden of IBS, and showed that the cost of IBS in Iran is about 2.8 million dollars and this is of great significance for Iranian population.^[23]

To our knowledge, there has not been any review article in relation to the prevalence of IBS in Iran until now. The aim of this study was to systematically review the articles about the epidemiology of IBS in Iran, to discuss the limitations of current research on this subject and to make recommendations for future studies. In addition, this review provides background knowledge for the "Study on the Epidemiology of Psychological, Alimentary Health and Nutrition" (SEPAHAN).^[24] The data of SEPAHAN will explore the epidemiology of FGIDs in Isfa-

han province and it will be published later by the same study group.

METHODS

This is a systematic review of all published studies on the epidemiology of IBS in Iran.

Literature Search

SEARCH STRATEGY FOR IDENTIFICATION OF STUDIES. Studies that were used in the present review were primarily identified via searching in four online bibliographic databases including PubMed, Google Scholar, Scientific Information Database and IranMedex. Our PubMed search query was as follows: (IBS[All Fields] OR ("irritable bowel syndrome"[MeSH Terms] OR "irritable bowel syndrome"[All Fields])) AND "Iran"[All Fields]). Review of the Google Scholar database was done using the following terms: "Irritable bowel syndrome", "IBS", and "Iran". Likewise, we used keywords like "irritable bowel syndrome" and "IBS" for searching relevant articles in the Persian bibliographic databases (www.sid.ir) and IranMedex (www.iranmedex.ir). In addition, manual search of reference lists from studies with relevant abstracts and recent reviews was carried out. Search of all databases from inception to present was done and the last search was conducted on March 10, 2012.

STUDY SELECTION CRITERIA. Two investigators reviewed the titles and abstracts of all citations for eligibility criteria, to include the studies in the review. Potentially relevant studies were retrieved and selection criteria were applied. Selected articles were studies that 1) had adult sample populations; 2) reported the prevalence, incidence, or natural history of IBS; and 3) was in full manuscript publication form. Studies were excluded if they were conducted in various highly selected populations (e.g., patients with diabetes mellitus or pregnant women).

Data Extraction

Eligible articles were investigated by two reviewers. To explore the prevalence of IBS in Iran, information about gender distribution, their mean age and the reported prevalence were extracted from articles. Data in relation to the first author, province and district of the study, diagnostic definition of IBS (e.g., Manning criteria, Rome I criteria), sampled population, sam-

ple size, and case ascertainment methods to identify IBS patients (e.g., face-to-face interviews, mail surveys) were extracted too (Table 1).

Table1. Prevalence of Irritable Bowel Syndrome in Iranian Studies

#	Author	District of Study	Study Population	Mean Age ±SD	Sample Size	Case Ascertainment Method	Diagnostic Definition	Prevalence of IBS
1	Amini et al. ⁴⁷	Tehran	Medical students	22.4	197 (F:53)	Questionnaire	Rome II criteria	17% F: 8.2% M: 20.2% *
2	Bagheri-Lankarani et al. ³²	Shiraz	Medical students	23.2	801	Questionnaire	Manning criteria	16.4% F: 17.3% M: 13% NS
3	Ganji et al. ¹⁴	Tehran	Patients referring to an outpatient gastroenterology clinic	Not mentioned	7985	Interview & questionnaire	Rome II criteria	25%
4	Ghannadi et al. ³⁴	khoramabad	Medical and health-related students	22 ± 3	618 (F:423)	Questionnaire	Rome II criteria	18.4% NS
5	Hatami et al. ¹²	Tehran	Blood donors	37.22 ± 10.9	3517 (F:402)	Interview & questionnaire	Rome I criteria	5.6% F: 11.3% M: 4.9% *
6	Hosine asl et al. ³⁵	Shahrekord	General female population (females only)	37.58 ± 14.3	2664 (F:2664)	Interview & questionnaire	Rome II criteria	5.6%
7	Hoseini-Asl et al. ³⁶	Shahrekord	General population	37.9 ± 14.3	4762 (F:2650)	Questionnaire	Rome II criteria	5.8% M>F
8	Khademolhosseini et al. ³⁷	Shiraz	General population (urban and rural areas)	49.9 ± 11.14	1978 (F:1396)	Questionnaire	Rome II criteria	10.9% F: 12.7% M: 7.6% *
9	Khoshkrood-Mansoori et al. ³⁸	Four cities of Tehran province plus a small part of Tehran	General population	38.7 ± 17.1	18180 (F:9072)	Interview & questionnaire	Rome III criteria	1.1% F: 1.5% M: 0.6% *
10	Mahmudi et al. ¹⁰	Tehran	University students	19 ± 2.1	3008 (F:1785)	Interview & questionnaire	Rome I criteria	4.2% F: 4.9% M: 3.2% *
11	Mansour-Ghanaei et al. ³⁹	Rasht	Medical students	23.7 ± 2.9	422 (F:274)	Interview & questionnaire	Rome II criteria	12.6% F: 15% M: 8.1% *
12	Masoumi et al. ⁴⁰	Fars province	Qashqaei migrating nomads	43.1 ± 14.2	717 (F:433)	Interview & questionnaire	Rome II criteria	11.8% F: 13.5% M: 9.3% NS
13	Massarrat et al. ⁴¹	Tehran	Nomads and industrial labourers (All males)	Range: 35-55	Nomads:455+492 Industrial laborers:947 (F:0)	Interview & questionnaire	Unknown	Nomads: 3.1% Industrial labourers: 3.6%
14	Pourshams et al. ¹¹	Tehran	University students	19.07 ± 2.3	3008 (F:1785)	Interview & questionnaire	Rome II criteria	4.75% F: 5.1% M: 4.17% *
15	Roshandel et al. ⁴²	Tehran	Patients referring to an outpatient gastroenterology clinic	41.8 ± 16.5	1023 (F:575)	Interview & questionnaire	Rome II criteria	10.75%
16	Semnani et al. ⁴³	Gorgan	Medical students	23.6 ± 5.4	473 (F:350)	Questionnaire	Rome II criteria	10.6% F: 12% M: 6.5% *
17	Solhpour et al. ⁴⁵	Firoozkooh and Damavand	General population	34.8 ± 16.61	5733 (F:2798)	Interview & questionnaire	Rome III criteria	5% F>M
18	Yarandi et al. ⁴⁶	Tehran	Patients presented to a gastrointestinal clinic with symptoms of FGIDs	37.9 ± 13.4	6476 (F:3291)	Questionnaire	Rome II or Rome III criteria (depending on the year of diagnosis)	21.9%

SD: Standard deviation, IBS: Irritable bowel syndrome, F: Females, M : Males, *: statistically significant, NS : not significant

RESULTS

Search Results

Details of the search in electronic databases are presented in figure 1. Searching PubMed and Google Scholar led us to 10 and 24 further suitable articles, respectively. In addition, fourteen relevant studies were found using Scientific Information Database and IranMedex. After excluding several articles by reading their full texts, 28 articles remained and we applied them in our study. However, 5 of them were found to be duplicate studies.^[13,25-28] Three of the identified studies were conducted in highly selected populations,^[29-31] and in two articles, studied populations were adolescents.^[33,44] Consequently, after final evaluation and considering the overlapping articles which were found in different databases, 18 articles were included in the systematic review.^[10-12,14,32,34-43,45-47] Characteristics of the reviewed articles (first author, place of study, study population, sample size, definition criteria, gender distribution, mean age of population, and IBS prevalence) are summarized in table 1 (dissimilarities in methodology were not taken into consideration).

The earliest study was published in 1997, in which Manning criteria were employed for diagnosing IBS patients.^[32, 48]

Settings

Ten studies were conducted in Tehran province.^[10-12,14,38,41,42,45-47] Two studies were conducted

in Northern provinces of Iran,^[39,43] three in the west^[34-36] and three studies were performed in Fars Province which is located in south of Iran.^[32,37,40]

Definition criteria

The majority of studies used Rome II criteria to diagnose IBS.^[11,14,34-37,39,40,42,43,45,47] Manning,^[32] Rome I^[10,12] and Rome III criteria^[38] were also employed. In a study carried out by Yarandi et al. subjects were diagnosed with IBS by fulfilling either Rome II or Rome III criteria.^[46] In one study, no definition criteria were mentioned and patients were diagnosed with IBS after ruling out organic conditions.^[41]

Prevalence of IBS by gender

In eleven of the fourteen studies that presented the data by gender, a significant correlation between gender and IBS was observed. In 9 studies, there was marked female predilection,^[10-12,37-39,42,43,45] but male preponderance was described only by two studies.^[36,47] Amini et al. reported that IBS was more prevalent among males (20.2% vs. 8.2%). Likewise, Hosseini-Asl et al. found male preponderance.^[36] Bagheri Lan- karani et al. found that the prevalence of IBS in women was higher than in men (17.3% vs. 13%); however, the difference was not statistically significant.^[32] In another study, the of female-male ratio of IBS patients was 2.5:1 (1.5% versus 0.6%).^[38]

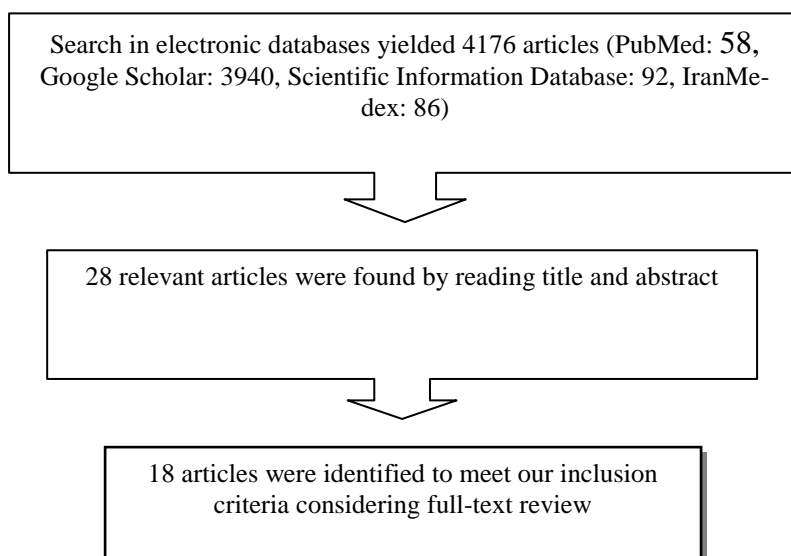


Figure 1. Diagram of the searches for articles to be included in the systematic review of irritable bowel syndrome in Iran

Age and Prevalence of IBS

Except one study, all others reported the mean age of studied population.^[41] Hatami et al. reported that prevalence of IBS in individuals older than 55 years was less than those who were younger; however, this difference was not statistically significant.^[12] In Ghannadi et al.'s study, IBS was more prevalent in 1st and 2nd year compared to 4th and 5th year medical students. This finding can be due to the students' adaptation to a new environment with difficult situations and the effect of this factor on their health.^[39] However, in another study in Shiraz, the prevalence of IBS increased with advancing age among medical students. There was also a significantly increased prevalence of IBS in 4th year students, and the least prevalence was noted among 1st year students (26% vs. 9.6%).^[32] Overall, it seems that there is a minimal difference in IBS prevalence within different age groups.

IBS Subtypes

Only three studies reported the prevalence of IBS by its subtypes.^[12,34,43] In a study conducted in Golestan University of Medical Sciences in 2005-6, individuals meeting the Rome II criteria for IBS were further divided into subgroups based on their bowel symptoms. In this study, 81.6% of patients were affected by constipation-predominant IBS, 6.1% had diarrhea-predominant IBS, and 12.2% did not meet the criteria for either constipation or diarrhea subtype.^[43] Ghannadi et al. showed that of individuals with IBS, 50% had constipation-predominant IBS and 29% fulfilled the criteria for diarrhea-predominant IBS. Additionally, in this study 21% of subjects suffered from both constipation and diarrhea alternatively.^[34] Hatami et al. found that 20.1%, 15%, and 7.2% of IBS patients suffered from diarrhea-predominant, constipation-predominant, and alternating subtype, respectively.^[12]

Prevalence of IBS in Iran

Studies that considered the prevalence of IBS in Iran, showed widely distinct estimates. The reported prevalence of IBS ranged from a low of 1.1% to a high of 25%. In the only study that used Manning criteria, its prevalence was estimated to be 16.4% among medical students.^[32] The lowest prevalence of IBS that reported in Iran was 1.1%. In this study, Rome III criteria were used in 18180 individuals who living in four cities of Tehran province plus a small part

of Tehran (including countrysides and rural areas).^[38] Ganji et al. stated the highest prevalence of IBS in Iran. They employed Rome II criteria, and reported the prevalence of IBS in outpatients visiting a gastrointestinal clinic in Tehran was 25%.^[14]

DISCUSSION

According to the 18 epidemiological studies that were included in the present systematic review, the prevalence of IBS in Iran varied from 1.1% to 25%. Several issues may contribute to such a wide range. An important factor that should be taken into account is the use of different diagnostic criteria for IBS. As previously mentioned, Manning criteria was employed only in one study, and the majority of Iranian studies used different versions of Rome criteria. For instance, Mahmoudi et al. reported that the prevalence of IBS among 3008 students of Tehran University was 4.2%, based on Rome I criteria. However, another study in this population using Rome II criteria reported a prevalence of 4.75%.^[10,11] In one study in New Zealand, the reported prevalence of IBS based on Manning 2, Manning 3, Rome I, and Rome II criteria was 16.2%, 9.7%, 5.6%, and 5.1%, respectively.^[49] In another study in Korea, the prevalence of IBS was 8% and 9% based on Rome II and Rome III criteria, respectively. Authors of this study concluded that the Rome III criteria are less restrictive and they have fine agreement with the Rome II criteria.^[50] Since Rome II criteria demand patients to report their symptoms over a longer period comparing to the Rome III, a higher number of patients will be diagnosed with IBS using Rome II.^[51] The majority of Iranian studies were conducted before Rome III criteria were proposed and only three studies used Rome III criteria.^[38,45,46] We recommend employing Rome III criteria in future epidemiological studies.

Differences in sampled population may be another reason for the wide range of reports on the prevalence of IBS in Iran. For instance, Hatami et al. determined the prevalence of IBS among blood donors in Tehran.^[12] Moreover, only University students were included in many studies.^[10,25,26,39,43]

The role of differences in socioeconomic status and cultural differences should be also taken into account. It is believed that the prevalence of IBS is less in developing countries compared to western countries.^[5,52] However some Asian stu-

dies have reported high prevalence rates of IBS.^[53,54]

Prevalence of IBS in Iranian studies was different between females and males. Based on these studies, the prevalence of IBS in women was 1.5-17.3%, while in men it was 0.6-20.2%. Several studies did not report their results in each sex separately. More than half of reviewed studies in the present systematic review demonstrated that prevalence of IBS has statistically significant correlation with gender;^[10-12,36-39,42,43,47] but four studies were the opposite.^[32,34,40,45] Only two studies showed that IBS was more prevalent in men.^{36,47} Similarly, in India, IBS was reported to be more prevalent in men than in women.^[55,56] In a study in Bangladesh, no significant difference was reported between genders.^[54] Worldwide, most studies especially those conducted in western countries showed that IBS affects women more than men.^[1,57,58]

The majority of studies performed in Iran showed that there was no relation between age and prevalence of IBS. Khademolhosseini et al. reported that the prevalence of IBS was higher in the range of 33 to 45 years old.^[37] Several studies which carried out in other countries reported that the prevalence of IBS decreases with age.^[59-62] Since most of the included studies were not population-based, we were not able to conclude in which age group IBS was more or less prevalent.

In Iranian studies, no relation was found between prevalence of IBS and educational level. Worldwide studies on this issue presented controversial results.^[8,63-65]

There was no relation between marital status and IBS in Iran. Only one study reported that married subjects were more likely to have IBS compared to singles, widows or divorced individuals.^[38]

IBS is the most costly disorder among all FGIDs. Moghimi Dehkordi et al. estimated the total 6-month cost of Iranian IBS patients to be about PPP\$160 (purchasing power parity dollars). IBS patients had the highest percentage of drug consumption and the duration of their absence from work was higher (2.26 days) in comparison with other FGID patients.^[66]

Until now, no study has investigated the natural history of IBS in Iranian population. In addition, there are not enough population-based studies in order to assess the epidemiological aspects of IBS in Iran.

CONCLUSION

Estimated prevalence of IBS in Iran has a wide range. Since there is not enough literature on the incidence and natural history of IBS in Iranian population, efforts should focus on developing well-designed studies to investigate the epidemiology of irritable bowel syndrome and ideally, these studies should be community based. Because of the high prevalence of IBS and its considerable economic burden on Iranian population, researchers should concentrate on etiology of IBS and try to plan preventive programs in future studies.

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REFERENCES

1. Longstreth GF, Thompson WG, Chey WD, Houghton LA, Mearin F, Spiller RC. Functional bowel disorders. *Gastroenterology* 2006; 130(5): 1480-91.
2. Drossman DA. The functional gastrointestinal disorders and the Rome III process. *Gastroenterology* 2006; 130(5): 1377-90.
3. Cremonini F, Talley NJ. Irritable bowel syndrome: epidemiology, natural history, health care seeking and emerging risk factors. *Gastroenterol Clin North Am* 2005; 34(2): 189-204.
4. Ghoshal UC, Abraham P, Bhatt C, Choudhuri G, Bhatia SJ, Shenoy KT, et al. Epidemiological and clinical profile of irritable bowel syndrome in India: report of the Indian Society of Gastroenterology Task Force. *Indian J Gastroenterol* 2008; 27(1): 22-8.
5. Danivat D, Tankeyoon M, Sriratanaban A. Prevalence of irritable bowel syndrome in a non-Western population. *Br Med J (Clin Res Ed)* 1988; 296(6638): 1710.
6. Saito YA, Schoenfeld P, Locke GR, III. The epidemiology of irritable bowel syndrome in North America: a systematic review. *Am J Gastroenterol* 2002; 97(8): 1910-5.
7. Hungin AP, Whorwell PJ, Tack J, Mearin F. The prevalence, patterns and impact of irritable bowel syndrome: an international survey of 40,000 subjects. *Aliment Pharmacol Ther* 2003; 17(5): 643-50.
8. Gwee KA, Wee S, Wong ML, Png DJ. The prevalence, symptom characteristics, and impact of irritable bowel syndrome in an asian urban community. *Am J Gastroenterol* 2004; 99(5): 924-31.
9. Miwa H. Prevalence of irritable bowel syndrome in Japan: Internet survey using Rome III criteria.

- Patient Prefer Adherence 2008; 2: 143-7.
10. Mahmoudi S, Pourshams A, Akbari M, Malekzadeh R. The prevalence of irritable bowel syndrome and gastroesophageal reflux disease among Tehran University students. *Govaresh* 2003; 8(4): 159-62.
 11. Pourshams A, Zendehdel N, Semnani M, Semnani Y. Irritable Bowel Syndrome and Psychiatric Disorders among University Freshmen. *Govaresh* 2006; 11(1): 22-6.
 12. Hatami K, Pourshams A, Azimi K, Sarrafi M, Mehrabani M, Mostajabi P, et al. Dyspepsia, gastroesophageal reflux disease and irritable bowel syndrome among blood donors. *Govaresh* 2003; 8(4): 138-46.
 13. Sorouri M, Pourhoseingholi MA, Vahedi M, Safaee A, Moghimi-Dehkordi B, Pourhoseingholi A, et al. Functional bowel disorders in Iranian population using Rome III criteria. *Saudi J Gastroenterol* 2010; 16(3): 154-60.
 14. Ganji A, Malekzadeh F, Safavi M, Nassri-Moghaddam S, Nourie M, Merat Sh, et al. Digestive and liver disease statistics in Iran. *Middle East Journal of Digestive Diseases* 2009; 1(9): 56-62.
 15. Hulisz D. The burden of illness of irritable bowel syndrome: current challenges and hope for the future. *J Manag Care Pharm* 2004; 10(4): 299-309.
 16. Chang L. Review article: epidemiology and quality of life in functional gastrointestinal disorders. *Aliment Pharmacol Ther* 2004; 20(Suppl 7): 31-9.
 17. Whitehead WE, Palsson OS, Levy RR, Feld AD, Turner M, Von KM. Comorbidity in irritable bowel syndrome. *Am J Gastroenterol* 2007; 102(12): 2767-76.
 18. Talley NJ. Functional gastrointestinal disorders as a public health problem. *Neurogastroenterol Motil* 2008; 20(Suppl 1): 121-9.
 19. Talley NJ, Gabriel SE, Harmsen WS, Zinsmeister AR, Evans RW. Medical costs in community subjects with irritable bowel syndrome. *Gastroenterology* 1995; 109(6): 1736-51.
 20. Nyrop KA, Palsson OS, Levy RL, Korff MV, Feld AD, Turner MJ, et al. Costs of health care for irritable bowel syndrome, chronic constipation, functional diarrhoea and functional abdominal pain. *Aliment Pharmacol Ther* 2007; 26(2): 237-48.
 21. Sandler RS, Everhart JE, Donowitz M, Adams E, Cronin K, Goodman C, et al. The burden of selected digestive diseases in the United States. *Gastroenterology* 2002; 122(5): 1500-11.
 22. Shaheen NJ, Hansen RA, Morgan DR, Gangarosa LM, Ringel Y, Thiny MT, et al. The burden of gastrointestinal and liver diseases, 2006. *Am J Gastroenterol* 2006; 101(9): 2128-38.
 23. Roshandel D, Rezailashkajani M, Shafaei S, Zali MR. A cost analysis of functional bowel disorders in Iran. *Int J Colorectal Dis* 2007; 22(7): 791-9.
 24. Adibi P, Keshteli AH, Esmailzadeh A, Afshar H, Roohafza H, Bagherian-Sararoudi H, et al. The Study on the epidemiology of psychological, Alimentory Health and Nutrition (SEPAHAN): overview of methodology. *J Res Med Sci* 2012; 17(5) In Press.
 25. Mansour Ghanaei F, Falah M, Pourrasouli Z, Ghasemipour R, Joukar Farahnaz HP, Arami M, et al. Irritable Bowel Syndrome (IBS) Prevalence in Medical Students of Gilan University of Medical Sciences. *Govaresh* 2006; 11(1): 7-11.
 26. Semnani Sh, Abdolahi N, Roshandel Gh, Besharat S, Keshtkar AA, Jabbari A, et al. Irritable bowel syndrome in Iranian young adults: a survey among medical students. *Journal of Medical Sciences* 2006; 6(6): 974-8.
 27. Ganji A, Safavi M, Nourie M, Nassri-Moghaddam S, Merat S, Vahedi H, et al. Digestive and Liver Disease Statistics in Several Referral Centers in Tehran, 2000-2004. *Govaresh* 2006; 11(1): 33-7.
 28. Sorouri M, Pourhoseingholi MA, Vahedi M, Safaee A, Moghimi-Dehkordi B, Pourhoseingholi A, et al. Functional bowel disorders in Iranian population using Rome III criteria. *Saudi J Gastroenterol* 2010; 16(3): 154-60.
 29. Hamdi K, Bastani P, Hashemi H, Pourabolghasem Sh, Fattahi K. Study on the prevalence of Irritable Bowel Syndrome in patients with preterm labor. *Pejouhesh* 2008; 32(2): 165-8.
 30. Khoshbaten M, Syah Melli M, Jabar Fattahi M, Sharifi N, Mostafavi SA, Pourhoseingholi MA. Irritable bowel syndrome in women undergoing hysterectomy and tubular ligation. *Gastroenterology and Hepatology From Bed to Bench Journal* 2011; 4(3): 138-41.
 31. Nikpoor Sh, Vahedi E. Comparison of irritable bowel syndrome (IBS) in gastro esophageal reflux disease (GERD) patients with and without esophagitis. *Pejouhandeh Quarterly Research Journal* 2007; 12(5): 33-41.
 32. Bagheri Lankarani K, Kodjori J, Agah S, Taghavi SAR, Roodagr A, Afrokhteh S. Irritable bowel syndrome, clinical manifestations and relation to lactase deficiency. *Iranian J Med sci* 1997; 21(1,2): 20-5.
 33. Fadai M, Sanagoo A, Jouybari LM, AQ-Arakakli K, Semnani Sh. The prevalence of irritable bowel syndrome among high school pupile in Gorgan, north of Iran. *Journal of Gorgan University of Medical Sciences* 2010; 11(4): 76-81.
 34. Ghannadi K, Emami R, Bashashati M, Tarrahi MJ, Attarian S. Irritable bowel syndrome: an epidemiological study from the west of Iran. *Indian J Gastroenterol* 2005; 24(5): 225-6.
 35. Hosine asl MK, Amra B. Evaluation of symptoms of irritable bowel syndrome and its relation to some risk factors in above 20 years old females, Shahrekord, 2002. *J Shahrekord Univ Med Sci* 2003; 5(1): 52-62.
 36. Hoseini-Asl MK, Amra B. Prevalence of irritable bowel syndrome in Shahrekord, Iran. *Indian J Gastroenterol* 2003; 22(6): 215-6.

37. Khademolhosseini F, Mehrabani D, Nejabat M, Beheshti M, Heydari ST, Mirahmadizadeh A, et al. Irritable bowel syndrome in adults over 35 years in Shiraz, southern Iran: prevalence and associated factors. *J Res Med Sci* 2011; 16(2): 200-6.
38. Khoshkrood-Mansoori B, Pourhoseingholi MA, Safaee A, Moghimi-Dehkordi B, Sedigh-Tonekaboni B, Pourhoseingholi A, et al. Irritable bowel syndrome: a population based study. *J Gastrointest Liver Dis*. 2009;18(4):413-8.
39. Mansour-Ghanaei F, Fallah MS, Heidarzadeh A, Jafarshad R, Joukar F, Ghasemipour R, et al. Prevalence and characteristics of irritable bowel syndrome (IBS) amongst medical students of Gilan Northern Province of Iran. *Middle East Journal of Digestive Diseases* 2009; 1(2): 100-5.
40. Masoumi SJ, Moradi F, Mehrabani D, Khademolhosseini F, Mostaghni A, Zare N, et al. Prevalence and quality of life in qashqai migrating nomads with irritable bowel syndrome in Southern Iran. *Iranian Red Crescent Medical Journal* 2009; 11(4): 403-7.
41. Massarrat S, Saberi-Firoozi M, Soleimani A, Himmelmann GW, Hitzges M, Keshavarz H. Peptic ulcer disease, irritable bowel syndrome and constipation in two populations in Iran. *Eur J Gastroenterol Hepatol* 1995; 7(5): 427-33.
42. Roshandel D, Rezailashkajani M, Shafaei S, Zali MR. Symptom patterns and relative distribution of functional bowel disorders in 1,023 gastroenterology patients in Iran. *Int J Colorectal Dis* 2006; 21(8): 814-25.
43. Semnani S, Roushanel GHR, Besharat S, Keshkar A, Moradi A, Zendebyad A, et al. Irritable bowel syndrome in students of Golestan University of Medical Sciences. *Govaresh* 2007; 11(4): 249-54.
44. Sohrabi S, Nouraie M, Khademi H, Baghizadeh S, Nasser-Moghaddam S, Malekzadeh R. Epidemiology of uninvestigated gastrointestinal symptoms in adolescents: a population-based study applying the Rome II questionnaire. *J Pediatr Gastroenterol Nutr* 2010; 51(1): 41-5.
45. Solhpour A, Pourhoseingholi MA, Soltani F, Zarghi A, Solhpour A, Habibi M, et al. Gastroesophageal reflux disease and irritable bowel syndrome: a significant association in an Iranian population. *Eur J Gastroenterol Hepatol* 2008; 20(8): 719-25.
46. Yarandi SS, Nasser-Moghaddam S, Mostajabi P, Malekzadeh R. Overlapping gastroesophageal reflux disease and irritable bowel syndrome: increased dysfunctional symptoms. *World J Gastroenterol* 2010; 16(10): 1232-8.
47. Amini M, Karimi Zarchi AA. The prevalence of irritable bowel syndrome and factors affecting it among medical students. *Journal of Medical Council of Islamic Republic of Iran* 2005; 2(23): 130-6.
48. Manning AP, Thompson WG, Heaton KW, Morris AF. Towards positive diagnosis of the irritable bowel. *Br Med J* 1978; 2(6138): 653-4.
49. Hillila MT, Farkkila MA. Prevalence of irritable bowel syndrome according to different diagnostic criteria in a non-selected adult population. *Aliment Pharmacol Ther* 2004; 20(3): 339-45.
50. Park DW, Lee OY, Shim SG, Jun DW, Lee KN, Kim HY, et al. The Differences in Prevalence and Sociodemographic Characteristics of Irritable Bowel Syndrome According to Rome II and Rome III. *J Neurogastroenterol Motil* 2010; 16(2): 186-93.
51. Shen L, Kong H, Hou X. Prevalence of irritable bowel syndrome and its relationship with psychological stress status in Chinese university students. *J Gastroenterol Hepatol* 2009; 24(12): 1885-90.
52. Ho KY, Kang JY, Seow A. Prevalence of gastrointestinal symptoms in a multiracial Asian population, with particular reference to reflux-type symptoms. *Am J Gastroenterol*. 1998;93(10):1816-22.
53. Rajendra S, Alahuddin S. Prevalence of irritable bowel syndrome in a multi-ethnic Asian population. *Aliment Pharmacol Ther* 2004; 19(6): 704-6.
54. Masud MA, Hasan M, Khan AK. Irritable bowel syndrome in a rural community in Bangladesh: prevalence, symptoms pattern, and health care seeking behavior. *Am J Gastroenterol* 2001; 96(5): 1547-52.
55. Shah SS, Bhatia SJ, Mistry FP. Epidemiology of dyspepsia in the general population in Mumbai. *Indian J Gastroenterol* 2001; 20(3): 103-6.
56. Thompson WG. Irritable bowel syndrome: pathogenesis and management. *Lancet* 1993; 341(8860): 1569-72.
57. Payne S. Sex, gender, and irritable bowel syndrome: making the connections. *Gend Med* 2004; 1(1): 18-28.
58. Grundmann O, Yoon SL. Irritable bowel syndrome: epidemiology, diagnosis and treatment: an update for health-care practitioners. *J Gastroenterol Hepatol* 2010; 25(4): 691-9.
59. Neal KR, Hebden J, Spiller R. Prevalence of gastrointestinal symptoms six months after bacterial gastroenteritis and risk factors for development of the irritable bowel syndrome: postal survey of patients. *BMJ* 1997; 314(7083): 779-82.
60. Jones R, Lydeard S. Irritable bowel syndrome in the general population. *BMJ* 1992; 304(6819): 87-90.
61. Thompson WG, Heaton KW, Smyth GT, Smyth C. Irritable bowel syndrome in general practice: prevalence, characteristics, and referral. *Gut* 2000; 46(1): 78-82.
62. Longstreth GF, Bolus R, Naliboff B, Chang L, Kulich KR, Carlsson J, et al. Impact of irritable bowel syndrome on patients' lives: development and psychometric documentation of a disease-specific measure for use in clinical trials. *Eur J Gastroenterol Hepatol* 2005; 17(4): 411-20.

63. Howell S, Talley NJ, Quine S, Poulton R. The irritable bowel syndrome has origins in the childhood socioeconomic environment. *Am J Gastroenterol* 2004; 99(8): 1572-8.
64. Wigington WC, Johnson WD, Minocha A. Epidemiology of irritable bowel syndrome among African Americans as compared with whites: a population-based study. *Clin Gastroenterol Hepatol* 2005; 3(7): 647-53.
65. Abdulmajeed A, Rabab MA, Sliem HA, Hebatallah NE. Pattern of irritable bowel syndrome and its impact on quality of life in primary health care center attendees, Suez governorate, Egypt. *Pan Afr Med J* 2011; 9: 5.
66. Moghimi-Dehkordi B, Vahedi M, Pourhoseingholi MA, Khoshkrood MB, Safaee A, Habibi M, et al.

Economic burden attributable to functional bowel disorders in Iran: a cross-sectional population-based study. *J Dig Dis* 2011; 12(5): 384-92.

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