International Journal of Research in Medical Sciences
Alam MJ et al. Int J Res Med Sci. 2025 May;13(5):1895-1899
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20251287

Original Research Article

Small intestinal bacterial overgrowth in irritable bowel syndrome: frequency and its association with socio-demographic and clinical factors

Mohammad Jane Alam[1]*, A. S. M. Salimullah[2], Iqbal Hossain[1], Raj Dutta[1], Sadia Sultana Kamolika[3]

[1]Department of Gastroenterology, National Gastroliver Institute and Hospital, Mohakhali, Dhaka, Bangladesh
[2]Department of Gastroenterology, Dhaka Medical College, Dhaka, Bangladesh
[3]Department of Community Medicine, Shaheed Suhrawardy Medical College, Dhaka, Bangladesh

Received: 19 March 2025
Accepted: 17 April 2025

***Correspondence:**
Dr. Mohammad Jane Alam,
E-mail: jalamgastro@gmail.com

ABSTRACT

Background: Irritable bowel syndrome (IBS) is a chronic functional relapsing GIT disorder characterized by abdominal pain in association with altered stool form or stool frequency in the absence of any other disease. Small intestinal bacterial overgrowth (SIBO) has been increasingly linked to IBS, particularly its diarrhea-predominant subtype (IBS-D). This study aimed to determine the frequency of SIBO in IBS patients and explore its association with socio-demographic and clinical factors.
Methods: This observational cross-sectional study was conducted in the department of gastroenterology, Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh from September 2018 to August 2019. In this study, we included a total of 104 IBS patients who attended the gastroenterology department of DMCH.
Results: The mean age of patients was 31.69±10.01 years, with 75% being male. Among all patients, the majority (45%) of them were service holders, and most of them (58.6%) lived in urban areas. Among IBS subtypes, 57% had IBS-D, and 42% had IBS-M. SIBO was detected in 36.5% (38 patients), with a significantly higher prevalence in IBS-D patients (53.3%) compared to IBS-M patients (13.7%) ($p<0.001$). No significant associations were found between SIBO status and demographic factors such as age, gender, marital status, occupation, or smoking.
Conclusions: The study findings show that SIBO is more prevalent in IBS-D patients than in IBS-M, suggesting a potential role of bacterial overgrowth in the pathophysiology of IBS-D. The frequency of SIBO among IBS-D and IBS-M was 36.5% and IBS-D was the only factor associated with SIBO.

Keywords: Association, Frequency, Irritable bowel syndrome, SIBO, Socio-demographic factors

INTRODUCTION

Irritable bowel syndrome is a chronic functional relapsing GIT disorder characterized by abdominal pain in association with altered stool form or stool frequency in the absence of any other disease. IBS is commonly sub-classified based on the predominant bowel habit [i.e., constipation-predominant IBS (IBS-C), diarrhea-predominant IBS (IBS-D), or mixed IBS (occurrence of both constipation and diarrhea)]. It is an important disease entity because of its high prevalence, morbidity, negative impact on quality of life, social impact, and enormous cost.[1] Data suggests that patients with IBS-D experience significantly greater decreases in health-related quality of life and increased impairment of daily activities compared with healthy individuals ($p<0.001$).[2] IBS varies globally related to differences in study populations, diagnostic criteria, and study methodology.[3] It is most prevalent in South America (21%) and least in Southeast Asia (7%).[4] In two different studies in Bangladesh on healthy volunteers, the prevalence of IBS was found 7.7% in the urban population and 8.5% in the rural population.[5,6]

The etiology and pathogenesis of IBS is not yet understood and possibly multidimensional. Several hypotheses have been suggested that altered gut motility, abnormal brain-gut interaction (i.e., interactions between the gut microbiota and central nervous system), visceral hypersensitivity, autonomic dysfunction, and immune activation are responsible for IBS. Small intestinal bacterial overgrowth (SIBO) has recently drawn attention as a potential treatable factor in patients with irritable bowel syndrome.[7] Some symptoms of SIBO mimic the symptoms of diarrhea predominating IBS such as bloating, abdominal distention, increased flatus, abdominal pain, and diarrhea.[7] Many patients with SIBO have been previously diagnosed with diarrhea-predominant IBS, lactose intolerance, fructose intolerance, etc.[8] Different randomized controlled trials showed that patients with IBS improved their symptoms after taking metronidazole.[9]

SIBO is defined as the overgrowth of bacteria $\geq 10^5$ colonies forming unit (CFU) per ml aspirated fluid from the proximal small bowel.[10,11] Diagnostic SIBO testing includes noninvasive breath tests.[12] and direct aspiration of small bowel luminal content to identify and quantify the bacteria.[13] An increase in serum folate, due to production from small bowel bacteria, with a simultaneously low B_{12} can be an indirect marker for SIBO. As recurrence of SIBO is common, a definitive test is required to prevent the unnecessary use of antibiotics.

SIBO was first discovered by Barber and Hummel in 1939. Pimentel (2000) at Cedars-Sinai Medical Center first identified that SIBO was present in 78% of patients with IBS by using LHBT.[7] Using the same criterion, a study from Korea reported a SIBO prevalence of 48.7% in IBS and 26.5% in controls.[14] According to GHBT, the prevalence of SIBO in IBS patients was reported 31% in a US study, 46% in a European study, and 8.5-11% in Indian studies.[15-17] By using the gold standard method (culture of jejunal aspirate ($\geq 10^5$ CFU/ml of bacteria), the prevalence of SIBO in IBS patients was reported to be 18% in an Indian and 37% in a European study.[18,19] There is no published literature regarding SIBO among patients with IBS in Bangladesh.

Therefore, in this study, we aimed to determine the frequency of SIBO in IBS patients and explore its association with socio-demographic and clinical factors.

METHODS

This observational cross-sectional study was conducted in the department of gastroenterology, Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh from September 2018 to August 2019. In this study, we included a total of 104 IBS patients who attended the gastroenterology outpatient department of DMCH.

These are the following criteria to be eligible for enrolment as our study participants: a) patients aged ≥18 years; b) patients with symptoms of IBS-D and IBS-M attending gastroenterology of DMCH; c) patients diagnosed with Rome IV criteria of IBS; d) patients who were willing to participate were included in the study; and a) patients with IBS-C (constipated type); b) patients receiving antibiotics PPI, probiotics, or any drug that alters motility during 8 weeks of study; c) patients with previous major abdominal surgery; d) patients with pregnancy; e) patients with organic disorder and any history of acute illness (e.g., renal or pancreatic diseases, ischemic heart disease, asthma, COPD etc.) were excluded from our study.

Study procedure

Consecutive 230 IBS-D and IBS-M patients by applying Rome IV criteria were screened from the gastroenterology outpatient department of Dhaka Medical College Hospital. Finally, 104 patients were enrolled in the study based on our selection criteria. A data collection sheet was filled up by them; which included the demographic profile of the patients and symptom-based criteria. The demographic profile included name, age, sex, religion, marital status, education, and family income. The Rome IV questionnaire for diagnosis of IBS was included in this study. The data sheet also contained the patient's perception of their bowel habit. IBS was classified by patient's perception, western criteria, and Bristol stool chart. IBS was defined clinically by the presence of chronic lower gastrointestinal symptoms in the absence of alarm features and normal findings at investigations. Then enrolled patients were examined by upper GI endoscopy to collect distal duodenal aspirate.

Rome IV criteria for diagnosing IBS

Recurrent abdominal pain on average at least 1 day a week in the last 3 months associated with two or more of the following: a) related to defecation, b) associated with a change in the frequency of stool, c) associated with a change in form (consistency) of stool. Symptoms must have started at least 6 months ago.[20]

Data collection procedure

All participants were informed about the objectives, methodology, and purpose of the study in an easily understandable way. Verbal and written consents were obtained from all participants without any influences before sample collection. Data obtained from the study was used only for research purposes and the confidentiality of all study information was maintained strictly. Data was collected by a data sheet containing the socio-demographic characteristics of the patients.

Statistical analysis

All data were recorded systematically in preformed data collection form. Quantitative data was expressed as mean and standard deviation; qualitative data was expressed as frequency distribution and percentage. The data were analyzed using the chi-square (χ^2) test, and unpaired t-test.

A p value <0.05 was considered as significant. Statistical analysis was performed by using SPSS 22 (Statistical Package for Social Sciences) for Windows version 10. The study was approved by the ethical review committee of Dhaka Medical College Hospital.

RESULTS

Table 1 presents the demographic characteristics of IBS patients. The mean age of the patients is approximately 31.69 years with a standard deviation of 10.01 years. In terms of gender distribution, 75% (78 patients) are male, while 25% (26 patients) are female. Regarding occupation, 45% (47 patients) are service holders. The majority of the patients (58.6%) live in urban areas, while 41.3% live in rural areas. Smoking status was also recorded, showing that 26% (27 patients) are smokers, whereas the remaining 74% (77 patients) are nonsmokers.

Table 1: Demographic, clinical, and microbiological profile of study participants (n=104).

Variables	IBS patients, N (%)
Mean age (years)	31.69±10.01
Gender	
Male	78 (75)
Female	26 (25)
Occupation (service holder)	47 (45)
Residence	
Urban	61 (58.6)
Rural	43 (41.3)
Smoking status	
Smoker	27 (26)
Nonsmoker	77 (74)

The Table 2 provides the clinical and microbiological profile of IBS patients. Among all patients, 60 patients (57%) have IBS-D (diarrhea-predominant IBS), while 44 patients (42%) have IBS-M (mixed-type IBS).

We also found that 63 patients (60.6%) had a positive culture test, indicating the presence of bacterial growth. Additionally, 38 patients (36.5%) were diagnosed with SIBO (small intestinal bacterial overgrowth).

Table 2: Clinical and microbiological profile of study participants (n=104).

Variables	N (%)
IBS-D	60 (57)
IBS-M	44 (42)
Culture positivity	63 (60.6)
SIBO	38 (36.5)

Table 3: Frequency of SIBO in different types of IBS (n=104).

Types of IBS	No. of patients (104)	SIBO N (%)
IBS-D	60 (57.7)	32 (53.3)
IBS-M	44 (42.3)	6 (13.7)

Table 3 presents the frequency of SIBO (small intestinal bacterial overgrowth) in different types of IBS (irritable bowel syndrome) patients. Among patients with IBS-D, 53.3% (32 out of 60) tested positive for SIBO. In contrast, among those with IBS-M, only 13.7% (6 out of 44) had SIBO, which indicates that SIBO is more commonly associated with IBS-D than IBS-M.

Table 4: Distribution of SIBO and socio-demographic factors among the study population.

Variables	Levels	SIBO (+) (n=38) (%)	SIBO (-) (n=66) (%)	P value
Age (years)	Mean±SD	31.16±10.62	32.00±9.71	0.682*
Sex	Male	3 0(78.9)	48 (72.7)	0.481+
	Female	8 (21.1)	18 (27.3)	
Marital status	Married	23 (60.5)	41 (62.1)	0.723+
	Unmarried	15 (39.5)	24 (36.4)	
	Widow	0 (0.0)	1 (1.5)	
Occupation	Housewife	5 (13.2)	12 (18.2)	0.286+
	Students	6 (15.8)	5 (7.6)	
	Service Holder	20 (52.6)	27 (40.9)	
	Business	4 (10.5)	9 (13.6)	
	Others	3 (7.9)	13 (19.7)	
Cigarette smoking	Smoker	9 (23.7)	16 (24.2)	0.170+
	Nonsmoker	27 (71.1)	50 (75.8)	
	Ex-smoker	2 (5.3)	0 (0.0)	
IBS subtypes	IBS-D	32 (84.2)	28 (42.4)	<0.001+

*Unpaired t test, + Chi-square test

Table 4 compares various demographic and clinical characteristics between SIBO-positive (n=38) and SIBO-negative (n=66) patients. The mean age of SIBO-positive patients is 31.16±10.62 years, while for SIBO-negative patients, it is 32.00±9.71 years (p=0.682), indicating no significant difference. Of all patients, 78.9% (30 patients) with SIBO are male, compared to 72.7% (48 patients) in the SIBO-negative group (p=0.481). A majority in both groups are married (60.5% in SIBO-positive versus 62.1% in SIBO-negative), with no significant difference (p=0.723). The highest proportion of SIBO-positive patients are service holders (52.6%), followed by students (15.8%) and housewives (13.2%), which is not significantly different from the SIBO-negative group (p=0.286). Among SIBO-positive patients, 23.7% were smokers, 71.1% were nonsmokers, and 5.3% are ex-smokers. The difference in smoking status between groups was not statistically significant (p=0.170). SIBO was significantly more common in IBS-D patients, with 84.2% of SIBO-positive patients having IBS-D, compared to only 42.4% in the SIBO-negative group (p<0.001), indicating a strong association between SIBO and IBS-D.

DISCUSSION

This was an observational cross-sectional study conducted in the gastroenterology department of Dhaka Medical College Hospital, Dhaka to determine the frequency of SIBO in IBS patients and explore its association with socio-demographic and clinical factors.

One hundred four patients who were enrolled in this study presented with the symptoms of IBS-D and IBS-M. Among all patients, 78 patients were male while 26 patients were female.

This study showed that among 104 IBS-D and IBS-M patients, 38 (36.5%) had SIBO according to culture of distal duodenal aspirate, IBS-D patients were more associated with SIBO. There is scanty data on the frequency of SIBO in IBS-D and IBS-M patients according to the culture of duodenal aspirate.

In this study, 36.5% of patients of IBS-D and IBS-M had SIBO conducting duodenal aspirate culture; Pyleris et al found similar type of results where 37% were SIBO among 112 IBS patients, but Ghoshal et al, in India, found 18% SIBO among 80 IBS patients.[12,19] Whereas in this study we found that the frequency of SIBO was 36.5%. This higher frequency is possibly due to the inclusion of IBS patients who had a predominance of diarrhea, bloating, and flatulence.

Most of the patients were in the age group 21-30 years. The mean age of the patients was 31.16±10.62 years among the positive group and 32.00±9.71 years among SIBO negative group. P value was 0.682 which indicates no significant association with SIBO. A similar result was found in an Indian study by Ghoshal et al, where the mean age was 36 (18-54) years among SIBO positive and 33 (17-67) among SIBO negative group.[12]

In this study, male predominance was seen in SIBO positive 30 (78.9%) versus SIBO negative 48 (72.7%), the p value was 0.481 which reveals sex has no association with SIBO. A cross-sectional study done by Ghoshal et al, showed males were 12 (80%) in SIBO group and 53 (81.5%) in SIBO negative group.[12] Whereas Sanjeev Sachdeva et al, found that male patients had SIBO more often as compared to males without SIBO, 44.4% versus 14.6%.[21] This sex difference may be due to the following causes: a) small sample size, b) short period for study, c) due to new diagnostic criteria of IBS according to Rome IV where exclusion of organic disease by colonoscopy is refused by most female patients in our social and cultural background.

Married patients showed higher among participants 23 (60.5%) with SIBO positive versus 41 (62.1%) without SIBO patients indicating marital status has no significant association with SIBO.

The educational qualifications of the participants were 34.3% at the high school level in the SIBO group and 28.8% in the non-SIBO group. Chu et al found that 25.7% of the SIBO group were at the high school level and 27.8% in the non-SIBO group.[22]

In the present study among IBS patients, diarrhea predominating IBS (IBS-D) was more common than IBS-M participants, 60 (57.7%) versus 44 (42.3%). Among IBS-D patients, SIBO was more common 32 (84.2%) than non-SIBO 28 (42.2%), the p value was <0.001 which revealed a strong association of SIBO with IBS-D patients. Pyleris et al, in a cross-sectional study, found that IBS-D was 21 (33.8%) among the SIBO group and 14 (5.4%) among the SIBO negative group.[19]

In this study, on comparison of demographic, clinical, and microbiological variables between those patients with SIBO vs without SIBO, only IBS-D was found to be significantly associated with SBO. Sanjeev Sachdeva et al., 2011 found that three factors were associated with SIBO namely female gender, IBS-D, and history of bloating.[21]

Our study was a single-center study. We took a small sample size due to the short study period, so it does not represent the whole population of the country.

CONCLUSION

In our study, we found that SIBO is more prevalent in IBS-D patients than in IBS-M, suggesting a potential role of bacterial overgrowth in the pathophysiology of IBS-D. The frequency of SIBO among IBS-D and IBS-M in this study was 36.5%. We also found that SIBO does not appear to be influenced by socio-demographic factors and IBS-D was the only factor associated with SIBO.

Recommendations

So further study with a prospective and longitudinal study design including a larger sample size needs to be done to evaluate the prevalence and predictive factors of SIBO among diarrhea-predominant IBS in Bangladesh.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Andrews EB, Eaton SC, Hollis KA, Hopkins JS, Ameen V, Hamm LR, et al. Prevalence and demographics of irritable bowel syndrome: results from a large web-based survey. Aliment Pharmacol Ther. 2005;22(10):935-42.
2. Buono JL, Carson RT, Flores NM. Health-related quality of life, work productivity, and indirect costs among patients with irritable bowel syndrome with diarrhea. Health Qual Life Outcomes. 2017;15(1):35.
3. Chey WD, Kurlander J, Eswaran S. Irritable bowel syndrome: a clinical review. JAMA. 2015;313(9):949-58.
4. Lovell RM, Ford AC. Global prevalence of and risk factors for irritable bowel syndrome: a meta-analysis. Clin Gastroenterol Hepatol. 2012;10(7):712-21.
5. Perveen I, Hasan M, Masud MA, Bhuiyan MM, Rahman MM. Irritable bowel syndrome in a Bangladeshi urban community: prevalence and health care seeking pattern. Saudi J Gastroenterol. 2009;15(4):239.
6. Masud MA, Hasan M, Khan AA. Irritable bowel syndrome in a rural community in Bangladesh: prevalence, symptoms pattern, and health care seeking behavior. Am J Gastroenterol. 2001;96(5):1547.
7. Pimentel M, Chow EJ, Lin HC. Eradication of small intestinal bacterial overgrowth reduces symptoms of irritable bowel syndrome. Am J Gastroenterol. 2000;95(12):3503.
8. Wilder-Smith CH, Materna A, Wermelinger C, Schuler J. Fructose and lactose intolerance and malabsorption testing: the relationship with symptoms in functional gastrointestinal disorders. Aliment Pharmacol Ther. 2013;37(11):1074-83.
9. Nayak AK, Karnad DR, Abraham P, Mistry FP. Metronidazole relieves symptoms in irritable bowel syndrome: the confusion with so-called 'chronic amebiasis'. Indian J Gastroenterol. 1997;16:137-9.
10. Simon GL, Gorbach SL. Intestinal flora in health and disease. Gastroenterology. 1984;86(1):174-93.
11. King CE, Toskes PP. Small intestine bacterial overgrowth. Gastroenterology. 1979;76(5):1035-55.
12. Ghoshal UC, Srivastava D, Ghoshal U, Misra A. Breath tests in the diagnosis of small intestinal bacterial overgrowth in patients with irritable bowel syndrome in comparison with quantitative upper gut aspirate culture. Eur J Gastroenterol Hepatol. 2014;26(7):753-60.
13. Husebye E. The pathogenesis of gastrointestinal bacterial overgrowth. Chemotherapy. 2005;51(1):1-22.
14. Gwee KA, Bak YT, Ghoshal UC, Gonlachanvit S, Lee OY, Fock KM, et al. Asian consensus on irritable bowel syndrome. J Gastroenterol Hepatol. 2010;25(7):1189-205.
15. McCallum R, Schultz C, Sostarich S. Evaluating the role of small intestinal bacterial overgrowth (SIBO) in diarrhea predominant irritable bowel syndrome (IBS-D) patients utilizing the glucose breath test (GBT). Gastroenterology. 2005;128(4 Suppl 2):A460.
16. Ghoshal UC, Shukla R, Ghoshal U. Small intestinal bacterial overgrowth and irritable bowel syndrome: a bridge between functional organic dichotomy. Gut Liver. 2017;11(2):196-208.
17. Lupascu A, Gabrielli M, Lauritano EC, Scarpellini E, Santoliquido A, Cammarota G, et al. Hydrogen glucose breath test to detect small intestinal bacterial overgrowth: a prevalence case-control study in irritable bowel syndrome. Aliment Pharmacol Ther. 2005;22(11-12):1157-60.
18. Ghoshal UC, Srivastava D. Irritable bowel syndrome and small intestinal bacterial overgrowth: meaningful association or unnecessary hype. World J Gastroenterol. 2014;20(10):2482.
19. Pyleris E, Giamarellos-Bourboulis EJ, Tzivras D, Koussoulas V, Barbatzas C. The prevalence of overgrowth by aerobic bacteria in the small intestine by small bowel culture: relationship with irritable bowel syndrome. Dig Dis Sci. 2012;57(5):1321-9.
20. Drossman DA. Functional gastrointestinal disorders: history, pathophysiology, clinical features, and Rome IV. Gastroenterology. 2016;150(6):1262-79.
21. Sachdeva S, Rawat AK, Reddy RS, Puri AS. Small intestinal bacterial overgrowth (SIBO) in irritable bowel syndrome: frequency and predictors. J Gastroenterol Hepatol. 2011;26 Suppl 3:135-8.
22. Chu H, Fox M, Zheng X, Deng Y, Long Y, Huang Z, et al. Small intestinal bacterial overgrowth in patients with irritable bowel syndrome: clinical characteristics, psychological factors, and peripheral cytokines. Gastroenterol Res Pract. 2016;2016:3230859.

Cite this article as: Alam MJ, Salimullah ASM, Hossain I, Dutta R, Kamolika SS. Small intestinal bacterial overgrowth in irritable bowel syndrome: frequency and its association with socio-demographic and clinical factors. Int J Res Med Sci 2025;131895-9.