**Research article**

# Role of orocaecal transit time in irritable bowel syndrome

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## ABSTRACT

**Introduction and Aim**: Irritable bowel syndrome (IBS) is a global disorder characterized by recurrent abdominal pain and altered bowel habits. Small intestinal bacterial overgrowth (SIBO) is a condition with abnormally high bacterial count (>=$10^5$ colony forming units /ml) in the proximal small intestine. SIBO should be considered as a possibility of explaining abdominal symptoms in IBS.

**Materials and Methods**: A total of 100 IBS patients were divided equally (n=50) into two groups – IBS-Normal (IBS-N) and IBS- Constipation (IBS-C). All of them were subjected to lactulose hydrogen breath test to assess orocaecal transit time (OCTT) and incidence of SIBO was also noted.

**Results**: OCTT's mean and standard deviation was significantly higher in IBS-C than IBS-N. SIBO was more in IBS-N than in IBS-C, though not significant.

**Conclusion**: Constipation in IBS patients can be due to prolonged orocaecal intestinal transit time (OCTT). Small intestinal bacterial overgrowth (SIBO) and IBS symptoms overlap to a large extent therefore, all IBS patients should be screened for SIBO.

**Keywords**: Irritable bowel syndrome (IBS); small intestinal bacterial overgrowth (SIBO); orocaecal transit time (OCTT).

## INTRODUCTION

Irritable bowel syndrome (IBS) is a usual problem affecting 20 % of the world's population, including Asia. The classical features of IBS are recurrent abdominal pain or discomfort associated with altered bowel habits (1). The mechanism of IBS is not precisely clear (2), but the hypothesis depends on the psychological concept (3) and altered gut motility (4). IBS was diagnosed clinically by symptoms, according to Rome's criteria.

If a patient was diagnosed with IBS, it is important to consider small intestinal bacterial overgrowth (SIBO) as a possibility of explaining their abdominal symptoms. SIBO is a condition having abnormally high bacterial count (>=$10^5$ colony forming units /ml) in the proximal small intestine (5). Many studies state a high frequency of SIBO in IBS (6). Conventionally, glucose hydrogen breath test (HBT) is used in diagnosing SIBO.

Orocaecal transit time (OCTT) is an indirect estimate of small bowel motility. It also determines the transport of micronutrients and influences digestive functions by interfering with mixing of digestive juices. Radioisotope studies and hydrogen breath tests can assess OCTT. Radioisotope scintigraphy is the standard method, but breath tests are non–invasive, cost-effective, and well-tolerated alternative methods. In this study we used the lactulose HBT to measure orocaecal transit time in patients with IBS and correlate it with SIBO. Conventionally, the double peak in lactulose HBT is the diagnostic of SIBO.

## MATERIALS AND METHODS

One hundred IBS patients attending to gastroenterology department on an outpatient (OP) basis in a tertiary care center of north coastal Andhra Pradesh participated in the study. The duration of the study was for a period of two months, from November to December 2019. The institutional ethics committee approved the study. We took informed consent from participants before the study.

### Inclusion criteria

All patients aged between 20 to 60 years who were diagnosed with IBS clinically as per Rome's criteria were included in the study.

According to Rome III criteria, IBS is abdominal pain, or discomfort without inflammatory, anatomic, or neoplastic explanation that has been present at least once a week for two months and is associated with two or more of the following for 25% of the time: Pain improved with bowel evacuation; onset of pain associated with altered frequency of stools; pain onset associated with a change in stool form (7).

### Selection of patients

We placed fifty IBS patients with normal or regular bowel movements in one group (IBS-N) and

constipation-predominant fifty IBS patients in the other group (IBS-C).

**Exclusion criteria**

All patients who had a history of previous gut surgery, history of diseases affecting intestinal motility, diabetes mellitus, and recent antibiotics usage in the past two months were excluded from the study.

All test subjects were subjected to Lactulose Hydrogen Breath Test to assess orocecal transit time (OCTT), which is observed by raised hydrogen gas levels in the exhaled air plotted as raised 1st peak in the graph. The incidence of SIBO (Small Intestinal Bacterial overgrowth) as a double peak was also noted in both the groups, which can also be determined by the same breath test.

The lactulose hydrogen breath test was done by the method described by Nagasako *et al.*, (8). The patients were supposed to have a carbohydrate-free diet on the day before the test. They had to gargle with 50 ml of 1% chlorhexidine solution after an overnight fast. From that point, two expiratory breath samples were collected with 10 minutes interim. Soon after that, all patients had 15 grams of lactulose dissolved in 100 ml of water. From that point, breath samples were taken repeatedly for every 10 minutes till 240 minutes by a UK Bedfont breath analyzer. During the test period, they were not permitted to eat, drink, work out, or smoke. The hydrogen concentration in parts per million (ppm) was measured on a quintron gas chromatograph in each collected sample and, the mean concentration of two fasting samples was taken as baseline esteem. Orocecal transit time is the time frame between the ingestion of lactulose and a steady increase in breath hydrogen at the minimum 10 ppm above the mean values (9).

**Statistical analysis**

Statistical analysis was done using the SPSS (Statistical package for social sciences) software. The independent Student's 't' test was used to compare the means of two groups. P value <= 0.05 was considered to be statistically significant.

**RESULTS**

The difference in mean ± SD of age between the IBS-N group and IBS-C group was not statistically significant. The mean ± SD OCTT between the IBS-N group and IBS-C group was statistically significant p value< 0.05. The difference in the number of SIBO patients between IBS-N and IBS-C was not statistically significant as seen in table1. Out of fifty patients in the IBS-Normal group, there were 33 males and 17 females. Out of 50 patients in the IBS-Constipation group, there were 34 males and 16 females. Males were predominant in both groups as seen in figs. 1 and 2.

**Table 1.** Parameters of IBS- N and IBS- C groups

| **Parameters (Mean± SD)** | **IBS – Normal** | **IBS- Constipation** | **p-Value** |
|---|---|---|---|
| AGE (years) | 47.6 ± 13.82 | 46.01 ± 14.10 | 0.57; not significant |
| OCTT by Lactulose hydrogen breath test (minutes) | 95 ± 24.12 | 106.42 ± 20.44 | 0.01; significant. |
| SIBO patients (%) | 30 (60%) | 22 (44%) | 0.11; not significant. |

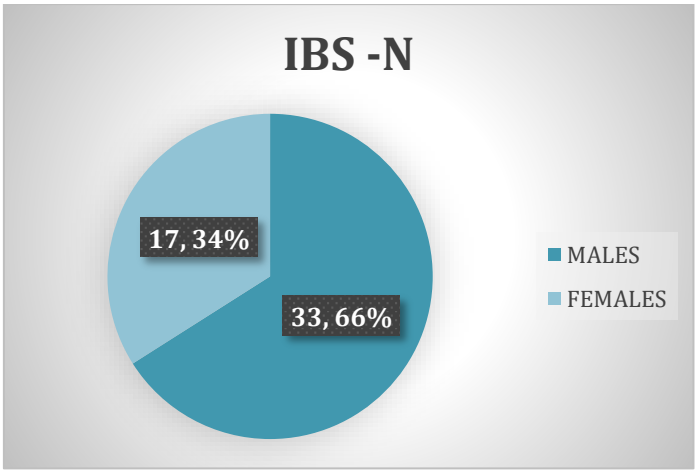


**Fig. 1**: Sex distribution in IBS- Normal (IBS-N) group

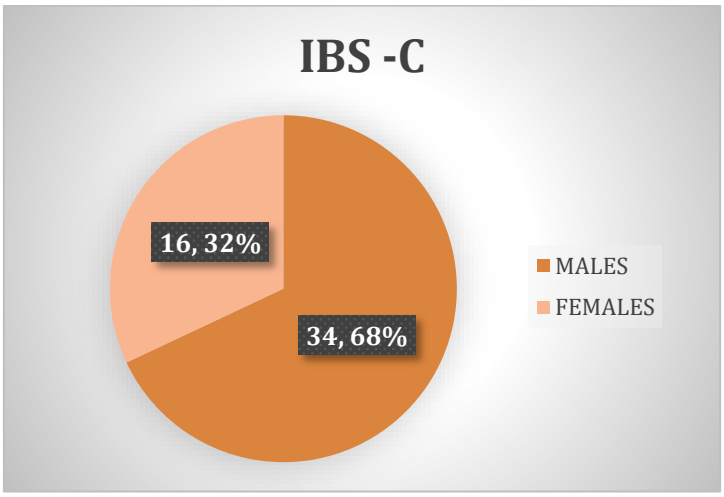


**Fig. 2:** Sex distribution in IBS- Constipation (IBS-C) group

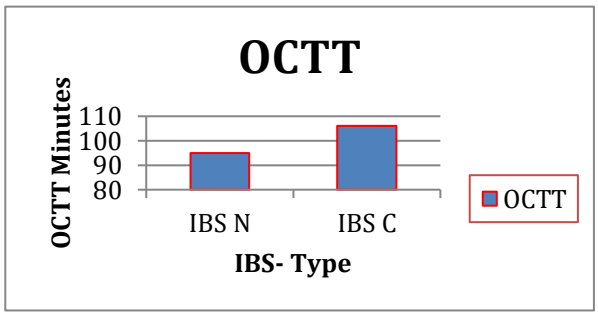


**Fig.3:** Comparison of means of OCTT in both the groups

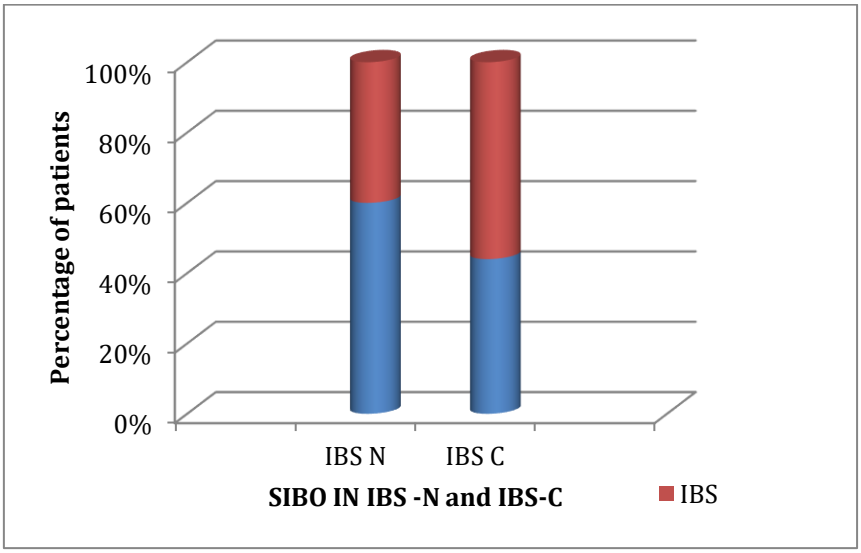


**Fig. 4:** Comparison of SIBO in both groups

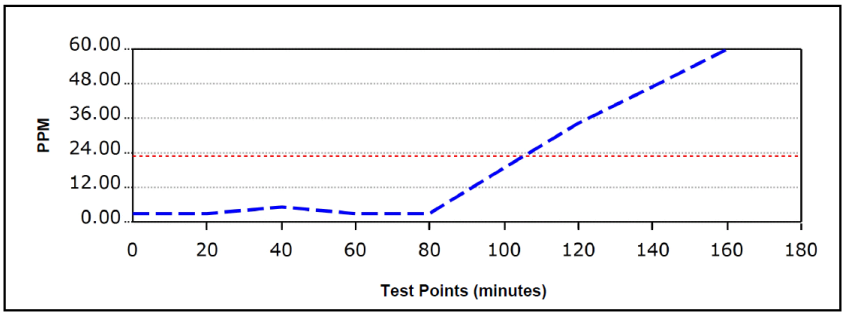


**Fig. 5**: Lactulose Breath test in parts per million with a single peak (calculating OCTT)

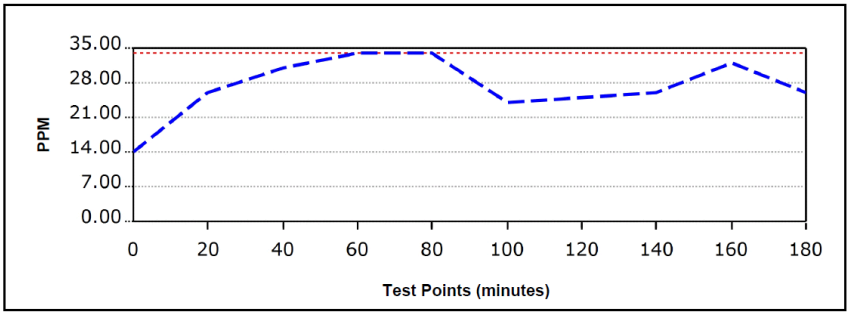


**Fig. 6:** Lactulose breath test in parts per million with double peak (calculating OCTT and Positive SIBO)

## DISCUSSION

The present study showed prolonged orocecal transit time (OCTT) in IBS patients with predominant constipation (IBS-C) compared to IBS patients with regular bowel movements (IBS-N), and the difference was statistically significant. These findings correlated with Cann *et al.*, Read *et al.,* (10) and Corbett *et al.,* (11). Agarwal *et al.,* (12) also reported prolonged OCTT values in 17% of IBS patients with constipation. A study of Nagasako *et al.,* (8). showed no significant association between OCTT values, abdominal symptoms, and IBS subtypes. Camilleri *et al.,* (13) stated that small bowel transit time were similar among different IBS subgroups. However, most of the authors found a relationship between colonic transit and IBS-C and accelerated transit with IBS- Diarrhoea. Disturbances in colonic transit led to alterations in bowel function in IBS patients.

We used the latest Rome III criteria for diagnosing IBS patients, unlike Manning's criteria used by other studies. Most of our patients had abdominal pain or discomfort, unlike Agarwal *et al.,* (12) where one-third of the patients did not report pain or discomfort. IBS patient's other common symptoms include bloating of the abdomen, feeling of incomplete evacuation, and meal-related symptoms as per other Asian studies (14,15).

This study showed the relationship between OCTT and IBS, correlation of IBS with SIBO. We observed a higher incidence of SIBO in the IBS-N group, around 60%, compared to the IBS-C group, about 44% though the difference was not statistically significant. So, the patients diagnosed as IBS- N should be ruled out for a possibility of SIBO, which may be a root cause for explaining their symptoms, as Pimental *et al.,* (16) concluded that the abdominal bloating is the most common symptom of SIBO.

However, in delayed OCTT, there is an overlap of the peaks resulting in false negatives for SIBO. In such patients, the glucose hydrogen breath test is more specific for the diagnosis of SIBO. There is an association with elevated levels of breath methane and stool *M. smithii* (*Methanobrevibacte smithii*, a key methanogen; 16), in some patients with constipation, which can be diagnosed by methane breath test but not by hydrogen breath test. It is understood that delayed intestinal transit prevents intestinal clearance and may result in bacterial overgrowth. SIBO and IBS diagnosis overlap significantly due to the above- said reasons.

## CONCLUSION

Constipation in IBS patients can be due to prolonged orocaecal intestinal transit time (OCTT). We did lactulose breath test in irritable bowel syndrome(IBS), constipation predominant patients, which is safe, convenient, outpatient based test, cost effective, non- radioactive method to know the orocaecal transit time (OCTT) and incidence of the SIBO (small intestinal bacterial overgrowth). Clinically diagnosis of SIBO should be done in all IBS patients which might be a possibility for

explaining their symptoms as they overlap to a large extent.

## CONFLICT OF INTEREST

Authors declare no conflict of interest for this study.

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