



Perceived Gastrointestinal Symptoms and Association With Meals in a French Cohort of Patients With Irritable Bowel Syndrome

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Background/Aims

The aim of our study is to evaluate the association between meals and perceived gastrointestinal symptoms in real life in a French cohort of irritable bowel syndrome (IBS) patients.

Methods

This prospective cross-sectional observational study included patients from the French association (association des patients souffrant du syndrome de l'intestin irritable [APSSII]) of IBS. Data were collected on demographics, IBS subtype, dietary food, and meal-induced gastrointestinal symptoms from patient filled self-questionnaires or questionnaires.

Results

Eighty-four patients with IBS were included; 82.3% female with a mean age of 46.9 ± 15.7 years. Each transit pattern subtype represented one-third of the population. Forty-five percent of patients had severe IBS according to IBS-Severity Scoring System; mean IBS Quality of Life score was 53.9 ± 18.3 . Patients believed that food could trigger or exacerbate gastrointestinal symptoms in 73.3% and 93.4%, respectively. Eighty-nine percent had already tried diets, mostly lactose free diet and low fermentable, oligosaccharides, disaccharides, monosaccharides, and polyols diet in 61.3% and 53.6% of cases. Thirty-nine percent of meals induced gastrointestinal symptoms. Meal-induced gastrointestinal symptoms were associated with severity and subtype but not with quality of life.

Conclusions

This study has confirmed the important link between gastrointestinal symptoms and food. Gastrointestinal symptoms induced by meals are frequent and associated with severity and IBS-diarrhea subtype. Our study also underlines patients' interest in food and diet. More knowledge is needed on food that triggers IBS symptoms but also on diet conditions in order to improve this condition.

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Key Words

Food; Irritable bowel syndrome; Meals

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Introduction

Irritable Bowel Syndrome (IBS) is one of the most frequent functional gastrointestinal (GI) disorders. IBS is defined according to the Rome IV criteria as chronic or recurrent abdominal pain associated with abnormal bowel habits.¹ IBS is divided into 3 predominant subtypes according to the predominant transit: IBS with predominant constipation (IBS-C), IBS with predominant diarrhea (IBS-D), and mixed IBS (IBS-M). The prevalence of IBS is around 5.0% to 10.0% according to the classification used. In the French Nutrinet-Santé cohort² the prevalence was 5.6% using the most recent Rome criteria (Rome IV) and around 10.0% in an older study using the previous Rome III criteria. The impact of IBS on the quality of life (QOL), in particular in patients with the most severe disease, representing one-quarter of all IBS patients, is significant in at least 5 domains of daily life.³

The pathophysiology of IBS is multifactorial and incompletely understood.⁴ Altered gut-brain interactions, visceral hypersensitivity, psychosocial distress, GI motor disturbances, low-grade inflammation, intestinal immune activation, increased intestinal permeability, genetic and altered microbiome can all contribute to symptom generation in IBS. This heterogeneity of IBS presentation makes it difficult to treat and to improve the symptoms of individual IBS patients.

There is also a growing interest in the role of food in symptom generation.⁵ Meals and different food items (foods containing carbohydrates and fat) have been identified by patients as triggers of GI symptoms.⁵ When patients believe their symptoms to be related to food, they change their diet by avoiding the foods that they perceive as symptomatic.⁶ Food-related GI symptoms have been associated with more severe disease and reduced quality of life.⁷

The current interest in the dietary management of IBS symptoms has largely focused on the negative effect of fermentable, oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAP).⁸ These unabsorbed carbohydrates can generate IBS symptoms, suggesting the feasibility of a low FODMAP diet in IBS management. A low FODMAP diet could improve up to half of IBS patients.⁹

Most of these studies were performed in North Europe or Australia. Their results are difficult to generalize in France where food habits are different. Indeed, food shopping habits¹⁰ and food cooking practices are different between northern and southern European countries.^{11,12} Therefore, the aim of our study is to evaluate the association between meals and perceived GI symptoms in real

life in a French cohort of IBS patients.

Materials and Methods

Study Protocol

This prospective cross-sectional observational study was conducted in France. All patients from the French Association of IBS patients (APSSII) who had agreed to participate in studies in accordance with the General Data Protection Regulation were contacted by e-mail and asked to participate in this study by answering anonymous online surveys between October and November 2017. The inclusion criteria were a clinically confirmed diagnosis of IBS according to the Rome IV criteria. Patients with incomplete surveys were not included. There were no exclusion criteria.

Ethics Statement

The agreement of the French Data Protection Authority (Commission Nationale de l'Informatique et des Libertés) was obtained for this online study (No. C3F2291202I). Privacy of patient information was ensured by password-protected access to the data collection forms, recording no information that could reveal the identity of individual patients in the online response database, and storing the online database on a secured internet server. No financial compensation was given for study participation. A patient's response to the surveys was considered as written consent. Patient responders were presented with information of the study.

Patients

Demographic and socio-demographic data were recorded: sex, age, body mass index (BMI), professional status, civil status, and monthly income. Smoking and alcohol consumption were also noted. The presence of a regular physical activity (> 30 minutes/week) was recorded. Surgical history and co-morbidities such as allergy, fibromyalgia, and dyspepsia were also recorded.

Patients were asked the date of their IBS diagnosis to calculate IBS duration. IBS was defined according to Rome IV criteria¹ and assessed with standardized questionnaires: IBS-Severity Scoring System (IBS-SSS) for severity,¹³ IBS-QOL for QOL,¹⁴ Hospital Anxiety and Depression Scale (HADS) for anxiety and depression,¹⁵ and Bristol stool scale for IBS subtype.¹⁶ Patients were asked whether they were followed by a general practitioner or by a gastroenterologist, and if they had consulted in the last 12 months. Patients were asked about stress and food as triggering factors.

Another part of the survey focused on the perceived link be-

tween food/diet and IBS symptoms. Patients were first asked if they believed that diet could improve IBS symptoms (in general and for their own disease). They were also asked if they believed that food could trigger or exacerbate their GI symptoms. Other questions about diet difficulties, diet preferences and previous diets were also asked.

Dietary Food and Gastrointestinal Symptoms

Patients reported 4 days of meals: 3 consecutive days during the week and at least 1 day during the weekend and their related GI symptoms. This part of the study was time consuming and participation was voluntary.

Patients reported the type of meal: breakfast, lunch, dinner, colation, or snack; and the day of the meal; weekday or weekend day. They had to report the day and time of each meal.

Patients reported GI symptoms for each meal. For this part, patients had to answer the question “Did you have gastrointestinal symptoms following this meal?” and if the answer was yes, then they had to report the presence of symptoms as abdominal pain, bloating, flatulence, and stools, as well as the time of the symptoms. Only 1 symptom could be reported for each type of symptom for each meal. For example, the patient was not able to report abdominal pain 3 times following the same meal but she/he could report abdominal pain once and bloating once for the same meal.

Statistical Methods

Data are expressed as percentage (95% CI) and mean \pm SD. Differences between subgroups were analyzed by Chi-squared test and correlation by Spearman test. Associations were considered statistically significant when $P < 0.05$. The analysis was done using SPSS Statistics version 25.0 (IBM Corp, Armonk, NY, USA).

Table 1. Irritable Bowel Syndrome Socio Demographic Data

Socio-demographic data	Percentage
In a relationship	69.0%
With one or more children	22.6%
Active employment	63.1%
Monthly income	
< 1000 euros	5.7%
1000-2000 euros	50.9%
2000-3000 euros	24.5%
> 3000 euros	18.9%
Educational level	
Middle school	3.6%
High school	22.6%
Higher education	73.8%

Results

Patients

A total of 84 IBS patients were included. Patients were mostly women ($n = 69$, 82.3%) with a mean age of 46.9 ± 15.7 years and a BMI of 21.7 ± 3.7 kg/m².

Most of the patients were working (63.1%), had a high level of education (73.8%), and were in a relationship (69.0%) (Table 1).

Patients were active smokers in 15.5% and 14.3% had a minimal-moderate consumption of alcohol. In our population, 76.2% had a regular physical activity. Patients had allergy history in 52.4% with a drug allergy in 23.8%, allergic rhinitis in 36.9%, eczema in 20.2%, and asthma in 10.7%. Fibromyalgia was associated in 11.9% and dyspepsia in 53.6%.

Socio-demographic data are presented in Table 1.

Irritable Bowel Syndrome

The mean disease duration was 8.0 ± 10.6 years. Colonoscopy was performed in 81.0% of patients. In the previous 12 months, 83.3% of patients had consulted for their disease. IBS subtypes were diarrhea, constipation, and mixed-type in around one-third respectively and 44.6% of the patients had severe disease. Anxiety was reported in 38.1% of patients, with stress as a triggering factor in 69.0%. QOL was altered in each of the 8 dimensions and mean IBS-QOL score was 53.9 ± 18.3 . Other IBS characteristics are presented in Table 2.

Table 2. Irritable Bowel Syndrome Characteristics

IBS characteristics	Percentage
IBS subtype	
Diarrhea	33.8%
Constipation	32.5%
Mixed	33.8%
IBS-SSS	
Severe (> 300)	44.6%
Moderate (175-300)	33.8%
Mild (75-175)	18.9%
Remission (< 75)	2.7%
HAD depression > 10	15.0%
HAD anxiety > 10	38.1%
Stress triggering symptoms	69.0%
Food triggering symptoms	79.8%

IBS, irritable bowel syndrome; IBS-SSS, irritable bowel syndrome-severity scoring system; HADS, Hospital Anxiety and Depression Scale.

Food and Diet

Patients believed that food could trigger or exacerbate GI symptoms respectively in 73.3% and 93.4%, and that diet could improve IBS symptoms in general and for their own symptoms in 83.3% and in 65.5% of cases. Patients considered diet as an easy treatment to follow in daily life in 78.6% of cases. Ninety percent of the patients had already followed a diet, the diets used are presented

Table 3. Dietary Characteristics and Patients' Preferences for Diet Supervision

Dietary characteristics	Percentage
Patients having followed a diet	89.3%
Type of diet	
Lactose free diet	61.3%
Low FODMAP diet	53.6%
Gluten free diet	44.0%
High fiber diet	21.3%
Elimination diet for allergy	10.7%
Vegetarian diet	9.3%
Vegan diet	4.0%
Patients preferences for diet supervision	
Dietician	70.2%
Physician	56.0%
Website	53.6%
Mobile application	52.4%
Book	50.0%

FODMAP, fermentable, oligosaccharides, disaccharides, monosaccharides, and polyols.

in Table 3. The diets most used were lactose free diet (61.3%) and low FODMAP diet (53.6%) (Table 3). Patients preferred to be supervised by a dietician as shown in Table 3.

Dietary Food and Gastrointestinal Symptoms

GI symptoms following meals were recorded and analyzed for 59/84 patients corresponding to 590 meals during 194 days (69.6% during weekdays and 30.4% during weekend days). These 59 patients had similar characteristics to the 84 patients of the cohort. 38.6% of meals induced GI symptoms. The number of days with (at least 1 symptom) or without GI symptoms was not different between weekdays and weekend days (71.9% vs 69.5%).

Regarding the type of meal, dinner, lunch, and breakfast induced more frequent symptoms than collation and snacks ($P <$

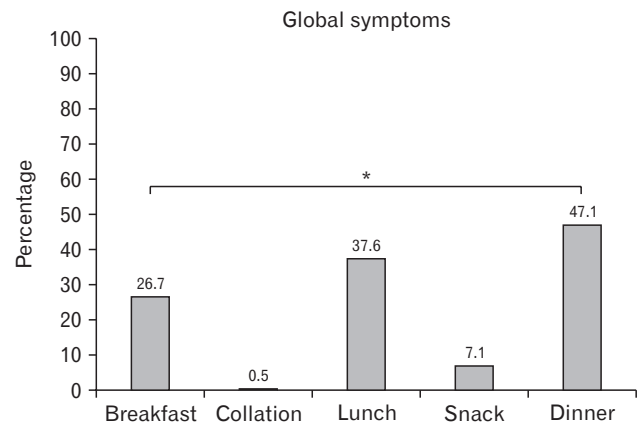


Figure 1. Prevalence of self-reported global gastrointestinal symptoms induced by meals according to type of meal. * $P < 0.001$.

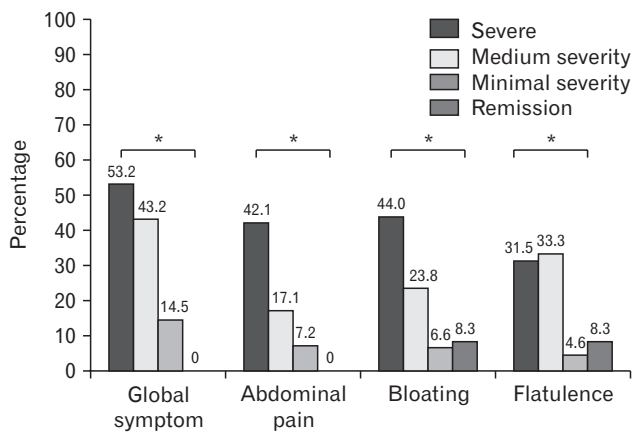


Figure 2. Prevalence of perceived gastrointestinal symptoms induced by meals according to irritable bowel syndrome (IBS) severity. Severe: IBS-severity scoring system (IBS-SSS) > 300 , moderate: IBS-SSS between 300 and 175, mild: IBS-SSS between 175 and 75, remission: IBS-SSS < 75 . * $P < 0.001$.

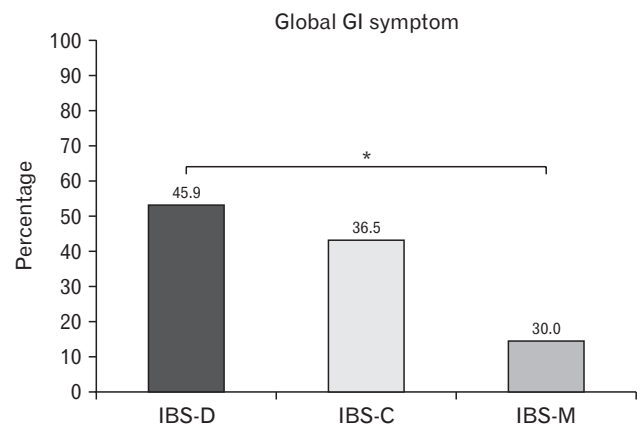


Figure 3. Prevalence of perceived global gastrointestinal (GI) symptoms induced by meals according to irritable bowel syndrome (IBS) subtype. IBS-D, IBS with predominant diarrhea; IBS-C, IBS with predominant constipation; IBS-M, mixed IBS. * $P = 0.019$.

0.001; Fig. 1).

Global GI symptoms induced by meals were more frequent according to IBS severity (Fig. 2). Individual GI symptoms as “abdominal pain,” “bloating,” and “flatulence” were more frequent according to IBS severity ($P < 0.001$; Fig. 2). There was no difference for the symptom “meal-induced stools” according to the degree of severity (severe: 36.6%, moderate: 41.0%, mild: 35.5%, and remission: 33.3%; $P = 0.713$). There was no correlation between the number of GI symptoms induced by meals and QOL ($P = 0.900$).

GI symptoms induced by meals were more frequent in IBS-D subtype (IBS-D: 45.9%, IBS-C: 36.5%, and IBS-M: 30.0%, $P = 0.019$) (Fig. 3), and no difference was found for “meal-induced stools” according to subtype (38.6%, 29.5%, and 40.8% for IBS-D, IBS-C, and IBS-M; $P = 0.057$). There was no difference in GI symptoms induced by meals according to associated comorbidities, as functional dyspepsia ($P = 0.120$).

Discussion

Several international studies have assessed the role of food on GI symptoms and food habits. IBS patients are known to adapt their diet according to their symptoms.¹⁷ All these studies report the importance of food on GI symptoms, and the frequent use of elimination diets by IBS patients. In the French Nutrinet-Santé cohort, 2423 IBS patients were classified in 3 major dietary patterns: healthy, traditional, and western diet.¹⁸ This study underlined the role of fatty and sugary products in IBS, and found a strong association between western diet and IBS in this cohort.¹⁸ Unfortunately, the use of a specific elimination diet was not analyzed in this study.¹⁸ The role of sugar such as fructose and fat in IBS symptoms has already been highlighted in the past.^{5,19}

Therefore, an observational study in real life in France is useful for a better understanding of the relation between meals and GI symptoms. Indeed, the results of international studies are difficult to extrapolate to French dietary habits. Our study is the first to assess in France the direct impact of meals on GI symptoms in an IBS population. In our population, 79.8% of patients declared that food triggered their symptoms with 38.6% of meals inducing GI symptoms with no difference between week and weekend days. This rate is higher than that obtained in Sweden, in a cohort of 330 patients with 63.0% of patients with food-related GI symptoms.⁵ It could be due to a recruiting bias. Indeed, the IBS patients of our French association des patients souffrant du syndrome de l'intestin irritable (APSSII) were asked to participate in this study by e-mail.

This voluntary participation could have led to a higher representation of patients with food-related symptoms and severe disease. The other explanation is the growing interest of patients and physicians in food and diet in IBS over the last decade. For example, in France, in 2013, only 45.9% of the IBS patients of our French association (association des patients souffrant du syndrome de l'intestin irritable [APSSII]) were following a diet at the time of the study compared to 78.3% in 2020.²⁰ IBS patients wished to have more information on diet because they believe that elimination diets may improve their symptoms.^{21,22} This need for more information on elimination diets seems to be less pronounced in countries in which diets are used in first intention.²³ Another point is that light meals (snack and collation) were less associated with GI symptoms than other meals (breakfast, lunch, and dinner). In Sweden, people eat lighter and healthier meals than in France, which could explain the difference between meal-induced symptoms between France and Sweden.

Most GI symptoms induced by meals were associated with severity but not with QOL in our study. Böhn et al⁷ found the same results for severity but found an association with impaired QOL. Probably our results lack power while 200 patients were analyzed in the Böhn study.⁷ It would have been interesting to use another tool, the more specific food related QOL.²⁴ Indeed, food related QOL measures the impact of diet, eating behavior and food-related anxiety and is probably more relevant to measure the impact of food-related symptoms and diet on IBS QOL.²⁵ Another interesting point is that global GI symptoms induced by meals, as abdominal pain, bloating, and flatulence, were associated with IBS subtype. Symptoms induced by meals were more frequent in IBS-D than in IBS-C and IBS-M. This result was not found for the symptom “meal-induced stools” which is surprising, since IBS-D was more involved. However, this could be due to the fact that symptoms were self-reported using the Bristol stool scale, and also to the role of visceral hypersensitivity. Simrén et al⁵ also found a link between symptoms induced by food and IBS subtype for some food items. There are unfortunately very few data in the literature according to this result.

Our recruiting method resulted in a population with more severe disease, interested in diet and with a high social level. Regarding sex ratio, BMI, age, and subtype these results are similar to those in the literature.^{5,7,18,26} IBS was severe in our population, with less than 3.0% of patients considered in remission. As expected, severity was associated with impaired QOL.²⁷ Regarding associated comorbidities, functional dyspepsia was reported in 53.6% and fibromyalgia in 11.9%.^{22,28} A history of allergy was highly represented in our population (52.4%) in comparison with 30.0% of atopy in

the French population. A correlation is already known between atopy and IBS.²⁹ Tobacco and alcohol were underrepresented in our population, respectively 15.5% and 14.3%. The same results were found in the Nutrinet-Santé cohort¹⁸ and could be explained by the impact of tobacco and alcohol on the intestine.⁵

Most of our patients had already followed a diet as expected with our recruiting bias. An interest in low FODMAP diet and the recent recommendations for its use in IBS patients³⁰ probably led to an increase in the number of patients following this diet. Indeed, in 2013, only 9.0% of all patients following a diet were on a low FODMAP diet²⁰ in comparison with 53.6% in this study. The lactose free diet and the gluten free diet were also frequently used, which is interesting as they both excluded the FODMAP subtype. This was not surprising for the lactose free diet since lactose intolerance is very common in France,³¹ For the gluten free diet, it was probably a trend with the recent development of gluten free products. Unfortunately, we do not have enough information on the conditions of these diets or of their perceived efficacy. It is likely that social media have helped the diffusion of these diets among patients and patients' associations.

In our population, 23.2% of patients had a low BMI. We did not record patients' history of eating disorders. This result could be related to associated eating disorders. Before prescribing a diet in IBS, physicians should always search for an underlying eating disorder, which is present in one in four of our patients and is associated with severity and impaired QOL.³² In particular, eating disorders are associated with a better adherence to low FODMAP diet in IBS.³³

Even if there is a better knowledge today of food that triggers GI symptoms in IBS, food still plays a key role in this pathology and warrants further investigation.

In conclusion, this study conducted among patients from the French association of IBS patients has confirmed the important link between GI symptoms and food. GI symptoms induced by meals are frequent and associated with severity and IBS-D subtype. Our study also underlines patients' interest in food and diet. Lactose free diet and low FODMAP diet are the most frequently used. More knowledge is needed on food that triggers IBS symptoms but also on diet conditions to improve IBS treatment.

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