ABSTRACT

Irritable bowel syndrome (IBS) and functional constipation (FC) are highly prevalent functional gastrointestinal conditions worldwide and occur approximately twice as often in women as in men. Although the exact prevalence is uncertain because of variations in diagnostic criteria, symptom overlap, patient populations, and sociocultural factors, most studies cite prevalence for each of approximately 10% to 15%. This article reviews findings surrounding the epidemiology of both IBS and FC, including differences among sex and race, quality of life, and health-seeking patterns and predictors. Relevant findings surrounding costs to healthcare delivery systems and society as a whole also are highlighted.


FUNCTIONAL BOWEL DISORDERS

Functional bowel disorders are a group of conditions with a variable combination of chronic or recurrent gastrointestinal (GI) symptoms that are not explained consistently by structural or biochemical abnormalities.1 Irritable bowel syndrome (IBS) and functional constipation (FC) are among the most common functional bowel disorders. IBS is a GI condition characterized by the presence of abdominal pain and/or discomfort associated with altered bowel habits. FC is characterized by symptoms of constipation (ie, decreased bowel movement frequency, difficult stool passage). Constipation may be the result of a number of causes, such as medications or systemic or neurologic conditions.2 However, the term “functional constipation” refers to a group of functional disorders (ie, not the result of organic disease with structural or biochemical abnormalities) that present as persistent difficult, infrequent, or seemingly incomplete defecation.1 The diagnoses of IBS and FC are symptom-based, as no definitive organic abnormalities can be demonstrated reliably for these conditions. Symptom-based diagnostic criteria for IBS have evolved over the years, from the Manning criteria3 published more than 25 years ago, to the more recent Rome I and Rome II criteria (Tables 1 and 2).1,4 Whereas symptoms of constipation may be present in a subset of patients with IBS (ie, constipation-predominant IBS), patients with FC do not have abdominal pain as a predominant symptom as is the case in IBS. Patients can only meet the Rome II diagnostic criteria for FC if there are insufficient criteria for IBS.

PREVALENCE

Epidemiologic data vary considerably as a result of differences among diagnostic criteria, definitions, the subjectivity of self-reports, patient populations, and dietary and cultural characteristics. It is important to recognize that because symptoms for IBS and constipation overlap, survey respondents who self-report constipation may in fact have IBS, and vice versa. Therefore, precise estimates of each condition are not possible, although data clearly indicate that both are highly prevalent.

For IBS, estimates of prevalence in the Western world range from 3% to 25%, but most studies estimate a prevalence of 10% (Table 3).5 Similar estimates of prevalence are reported in North American studies of constipation, ranging from 2%17,18 to 27%,19 with
most studies estimating a prevalence of approximately 10% to 15% (Table 4).20,21

SEX, AGE, AND RACIAL DIFFERENCES

Population-based studies reveal that women report IBS approximately twice as often as men.28 However, the ratio of women-to-men with IBS symptoms is higher in healthcare-seeking populations than in the community. Early studies reported a higher prevalence of IBS in the young and a decrease in prevalence with age,5,29 but other surveys have not shown age to be a factor.30

Overall, studies evaluating sex differences in the clinical symptoms of IBS have found that women are more likely to experience bloating and extraintestinal manifestations of constipation, but have pain symptoms similar to men.31-34 In general, women have reported higher levels of constipation, and men higher levels of diarrhea. Interestingly, studies conducted in Eastern societies35,36 have not reported a female predominance for IBS, possibly because of different cultural factors and diagnostic criteria.

One population-based study found that IBS symptoms are more likely to be persistent in patients with first-degree relatives who suffer from GI symptoms.37 These findings support those of an earlier population-based, case-control study that showed subjects with a family member with abdominal pain or bowel symptoms had a 2-fold increase of reporting IBS symptoms.38 Twin studies have suggested a role of genetic predisposition for IBS, but also indicated that family learning was likely a major contributing factor.39

Constipation is a heterogeneous disorder, and therefore, differences in the prevalence of constipation overall and among the different subtypes in studies will vary depending on a number of factors, such as the definitions and classifications used. Given the subjective nature of the individuals’ responses, survey-based estimates of constipation prevalence may not be entirely accurate. However, as with IBS, constipation overall occurs approximately twice as frequently in women as in men.40 Severe constipation (eg, bowel movements only twice a month) generally occurs only in women.40

A survey conducted in 1989 of more than 14 000 participants from the first US National Health and Nutrition Examination Survey asked the question, “Do you have trouble with your bowels that makes you constipated or gives you diarrhea?” Nearly 21% of women and 8% of men self-reported constipation.24 A more recent survey conducted in 1997, the Epidemiology of Constipation (EPOC) study,18 revealed a shift in this demographic. In this survey of 10 000 individuals, fewer women reported constipation than in the 1989 analysis (16% vs 20.8%), but more men reported it (12% vs 8% in 1989). Constipation was defined as the self-report of constipation or by the “loose” criteria for FC (ie, 2 or fewer than 3 bowel movements per week, the need to strain 20% or more of the time when having a bowel movement, incomplete evacuation 20% or more of the time, or hard or lumpy stool 20% or more of the

Table 1. Rome II Symptom-Based Diagnostic Criteria for Irritable Bowel Syndrome

| Must have for at least 12 weeks (need not be consecutive) out of the past 12 months | Abdominal pain or discomfort |
| Associated with 2 of the following symptoms | Relief with defecation |
| Associated change in stool frequency | Associated change in stool consistency |
| Associated change in stool consistency | Supportive symptoms include |
| Loose, watery, or hard, lumpy stools | Stool frequency of <3 times per week or >3 times per day |
| Stool frequency of <3 times per week or >3 times per day | Fecal urgency |
| Fecal urgency | Straining with bowel movement |

Data from Drossman et al.1

Table 2. Rome II Symptom-Based Diagnostic Criteria for Functional Constipation

- 2 or more symptoms for >3 months and at least with 25% of defecation:
  - Hard or lumpy stools
  - Sensation of incomplete evacuation
  - <3 bowel movements per week
  - Straining
  - Sense of anorectal obstruction
  - Manual maneuvers (digital disimpaction)
- Loose stools are not present
- Criteria for irritable bowel syndrome are not fulfilled

Data from Drossman et al.1
Individuals with constipation were further classified into groups with IBS, FC, or outlet type constipation. The prevalence of the different subtypes of constipation varied by sex as well as by age. Outlet type of constipation was the most common subtype in women, and FC was the most common subtype in men. The outlet type and IBS-outlet type (individuals with both IBS and outlet type of constipation) had an increased ratio of women-to-men. The prevalence of IBS subtype in men and women and IBS-outlet type in women increased until age 35, and then declined. The prevalence of FC decreased with age. Outlet type was more common in nonwhite men and women (the study authors used a category of “nonwhite” to include those subjects who identified themselves as African American, Native American, Asian, or Hispanic, or who refused to identify their race/ethnicity or whose race/ethnicity was unknown).

Although the EPOC study reported differences in specific constipation subtypes across ages, a Canadian survey of 1149 individuals also found that constipation (defined as self-report and meeting Rome II criteria for FC) affected women almost twice as often as men, but affected the young and older population with similar frequency. However, an earlier study, drawing on data from the National Hospital Discharge Survey, National Disease and Therapeutic Index, and Morbidity Statistics from General Practice in England and Wales, reported that constipation is more prevalent in older adults than in younger adults, in nonwhites than whites, and is 3 times more common in women than in men. An increased prevalence of constipation among nonwhites also was reported in the 1989 analysis of data from the US National Health and Nutrition Exam Survey. A recent task force of clinical experts indicated that the increased prevalence of FC in nonwhites might be attributed to dietary habits and recommended further investigation into this issue.

In summary, although different diagnostic criteria have been used in epidemiologic studies of chronic constipation, overall it appears to be more common in women than in men, particularly for the IBS and outlet subtypes, in nonwhites than in whites, and in older individuals.

### Health-Related Quality of Life

Increasingly, clinical research has focused on the assessment of health-related quality of life (HRQOL) in patients. Particularly in symptom-based conditions such as IBS and FC, assessment of HRQOL may be a better measure of a patient’s health status than GI symptom severity. In a comprehensive review of controlled and noncontrolled studies (published prior to 2003) surrounding the impact of IBS on HRQOL,

<table>
<thead>
<tr>
<th>Author</th>
<th>Setting</th>
<th>N</th>
<th>Survey Method</th>
<th>IBS Definition</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talley</td>
<td>Olmsted County, Minnesota</td>
<td>835</td>
<td>Mailed questionnaire</td>
<td>Manning</td>
<td>12.8</td>
</tr>
<tr>
<td>Hahn</td>
<td>NHIS</td>
<td>42</td>
<td>Face-to-face interview</td>
<td>Manning</td>
<td>3</td>
</tr>
<tr>
<td>Dressman</td>
<td>United States, household</td>
<td>392</td>
<td>Phone interview</td>
<td>Rome I</td>
<td>12</td>
</tr>
<tr>
<td>Saito</td>
<td>Olmsted County, Minnesota</td>
<td>5430</td>
<td>Phone interview</td>
<td>Rome I</td>
<td>9.4</td>
</tr>
<tr>
<td>Mearin</td>
<td>Spain, population random sample</td>
<td>2000</td>
<td>Face-to-face interview</td>
<td>Manning</td>
<td>15.7</td>
</tr>
<tr>
<td>Bommelaer</td>
<td>France, population quota sample</td>
<td>8221</td>
<td>Phone interview</td>
<td>Rome I</td>
<td>10.3</td>
</tr>
<tr>
<td>Thompson</td>
<td>Canada, general practice</td>
<td>3111</td>
<td>Questionnaire</td>
<td>Rome I</td>
<td>12.1</td>
</tr>
<tr>
<td>Boyce</td>
<td>Australia, urban population</td>
<td>4500</td>
<td>Mailed questionnaire</td>
<td>Manning</td>
<td>12.1</td>
</tr>
<tr>
<td>Jones</td>
<td>England, general population</td>
<td>1620</td>
<td>Mailed questionnaire</td>
<td>Manning</td>
<td>3.9</td>
</tr>
<tr>
<td>Agreus</td>
<td>Sweden, general population</td>
<td>1290</td>
<td>Mailed questionnaire</td>
<td>Manning</td>
<td>12.5</td>
</tr>
<tr>
<td>Wilson</td>
<td>United Kingdom, general practice enrollees</td>
<td>8386</td>
<td>Mailed questionnaire</td>
<td>Rome II</td>
<td>10.5</td>
</tr>
</tbody>
</table>

NHIS = National Health Interview Survey.
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El-Serag found that the degree of severity of bowel symptoms is a predictor of HRQOL (i.e., patients with worsening symptoms are likely to experience deterioration in HRQOL). Similar findings were demonstrated in IBS patients in a managed care organization. In multivariate regression models controlling for age, sex, work status, and education, severity of abdominal discomfort/pain was a significant independent predictor of HRQOL.43

In a recent study that evaluated GI and extraintestinal symptoms as clinical predictors of HRQOL in IBS, Spiegel et al44 found that 7 additive factors independently predicted physical composite score of HRQOL (in order of decreasing significance): (1) >5 physician visits per year; (2) tiring easily; (3) low energy; (4) severe symptoms; (5) predominantly painful symptoms; (6) feeling that there is "something seriously wrong with body"; and (7) symptom flares lasting more than 24 hours. Eight additive factors independently predicted mental composite score HRQOL: (1) feeling tense; (2) feeling nervous; (3) feeling hopeless; (4) difficulty sleeping; (5) tiring easily; (6) low sexual interest; (7) IBS symptom interference with sexual function; and (8) low energy. Whereas mental HRQOL was associated with abnormalities in sexuality, mood, and anxiety, physical HRQOL was associated with symptom severity, symptom periodicity, and pain. These novel findings demonstrated that HRQOL was not determined by traditionally elicited GI symptoms, including stool frequency, stool characteristics, or IBS bowel habit subtype.

The literature also has shown that patients who seek healthcare for IBS are more likely to have a worse HRQOL than individuals who have not consulted a physician. Several studies have shown that quality of life can be improved with treatment, with good evidence to suggest that HRQOL scores correlate well with improvements in symptoms and disability.42 The American College of Gastroenterology treatment guidelines recommend instituting treatment for patients who suffer unacceptable impairments to HRQOL.45

Table 4. Prevalence of Constipation in Representative Population Samples in North America

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Year</th>
<th>Ascertain</th>
<th>N</th>
<th>Case Criteria</th>
<th>Prevalence per 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammond22</td>
<td>ACS</td>
<td>1964</td>
<td>Mail survey</td>
<td>890 394 (NR)</td>
<td>Self-report</td>
<td>27.1</td>
</tr>
<tr>
<td>Sandler23</td>
<td>NHANES I</td>
<td>1971–1975</td>
<td>FTF</td>
<td>15 014 (NR)</td>
<td>Self-report</td>
<td>12.8</td>
</tr>
<tr>
<td>Everhart44</td>
<td>NHANES I</td>
<td>1971–1975</td>
<td>FTF</td>
<td>11 024 (74.4)</td>
<td>Self-report</td>
<td>15.8</td>
</tr>
<tr>
<td>Harari26</td>
<td>NHIS</td>
<td>1989</td>
<td>FTF</td>
<td>42 375 (NR)</td>
<td>Self-report</td>
<td>3.4</td>
</tr>
<tr>
<td>Talley6</td>
<td>Olmsted whites</td>
<td>1991</td>
<td>Mail survey</td>
<td>835 (82)</td>
<td>(Strain and hard or &lt;3/wk) Self-report</td>
<td>17.4†</td>
</tr>
<tr>
<td>Talley27</td>
<td>Olmsted whites</td>
<td>1993</td>
<td>Mail survey</td>
<td>690 (83)</td>
<td>Rome I FC</td>
<td>19.2†</td>
</tr>
<tr>
<td>Drossman8</td>
<td>Household</td>
<td>1993</td>
<td>Mail survey</td>
<td>5430 (66)</td>
<td>Rome I OD</td>
<td>11.0</td>
</tr>
<tr>
<td>Stewart18</td>
<td>US EPOC</td>
<td>1997</td>
<td>Phone survey</td>
<td>10 018 (53.6)</td>
<td>Rome II, FC or OD or C-IBS</td>
<td>14.7</td>
</tr>
<tr>
<td>Pare19</td>
<td>Canada</td>
<td>2000</td>
<td>Mail survey</td>
<td>1149 (57)</td>
<td>Self-report</td>
<td>27.2</td>
</tr>
</tbody>
</table>

ACS = American Cancer Society volunteers; NR = not reported; NHANES = National Health and Nutrition Examination Survey; FTF = face-to-face interview; NHIS = National Health Interview Survey; FC = functional constipation; OD = obstructive defecation; US EPOC = United States Epidemiology of Constipation; C-IBS = constipation-predominant irritable bowel syndrome.

†Age- and gender-adjusted prevalence. ‡Age-adjusted prevalence.
Minimal data are available regarding HRQOL in patients with constipation. One Canadian study reported a statistically significant decrease in mental and physical HRQOL measures in patients with FC. As with the IBS HRQOL studies, poor HRQOL was an important predictor of healthcare utilization in patients with constipation. Further research in this area is needed.

COSTS OF CARE

Approximately 50% of individuals suffering from IBS will seek healthcare for their symptoms. Overall, GI disorders account for more than 35 million physician office visits in the United States annually. IBS patients are responsible for up to 12% of new patient evaluations by primary care providers and up to 28% of referrals to gastroenterologists.

A conservative estimate of costs associated with a diagnosis of IBS for the year 2000 was more than $1.6 billion, but other estimates place the annual cost for diagnosis and treatment of IBS in the United States at more than $21 billion when direct (Figure 1) and indirect (Figure 2) costs are taken into consideration. An analysis of costs within a health maintenance organization population showed cost of care to be 51% higher in patients with IBS as compared with other patients. The impact on the public sector also is great. One recent analysis found that Medicaid expenditures for IBS patients in California and North Carolina were 48% and 59% higher, respectively, than those for matched controls.

The high overall healthcare costs may be the result of several factors. A recent review of the medical literature revealed that some IBS patients present with symptoms that are misinterpreted as indicators of surgically remediable disease. As a result, IBS patients are more likely to undergo abdominal and pelvic surgery, such as cholecystectomy, appendectomy, and hysterectomy. Two population-based studies revealed that the prevalence rates for cholecystectomy and hysterectomy were increased in IBS patients compared with the general population (odds ratio 1.9 and 1.6, respectively, 95% confidence interval). In addition to the higher prevalence of abdominal and pelvic surgeries, IBS...
patients have 50% higher rates of back surgery compared to non-IBS controls. The prevalence of surgery is even higher in studies of referral populations than in the population-based studies. Patients with IBS often are poor responders to abdominal and pelvic surgery. For example, individuals undergoing elective colonic resection for diverticular disease often reported persistent symptoms after surgery. In addition, 20% of women with IBS who underwent hysterectomy reported worsening of symptoms. Ten percent of women undergoing hysterectomy who did not have IBS developed IBS symptoms post-surgery. These findings suggest that either IBS is misdiagnosed for surgically correctable conditions or that a surgical intervention (particularly in the pelvic cavity) may contribute to the onset or exacerbation of IBS symptoms. Based on these data, physicians are advised to exercise caution before referring IBS patients for abdominal and pelvic surgery.

Interestingly, the majority of excess total healthcare costs appear to result from non–lower GI-related rather than GI-related services and were increased particularly with regard to outpatient rather than inpatient services. These findings are supported by the facts that IBS patients have a high prevalence of extraintestinal symptoms and comorbid functional syndromes and have increased physician visits, not only for GI symptoms, but for non–IBS-related symptoms.

Given the serious economic burden associated with healthcare utilization among patients with IBS, considerable epidemiologic research has focused on the healthcare-seeking patterns of patients with functional bowel disorders. This research has shown that women are 2 to 4 times more likely than men to seek healthcare for GI disorders. Predictors of consulting behaviors include symptom severity, symptom frequency, interference with function, and older age. Women also are more likely than men to seek complementary or alternative care for IBS. Despite an established association between IBS and FC across populations, although the exact prevalence is uncertain as a result of variations in diagnostic criteria, self-reporting of symptoms, symptom overlap, patient populations, and dietary and sociocultural factors. Most studies have reported an increased prevalence of IBS and FC in women. Although pain-related symptoms of IBS are common across both sexes, non–pain-associated symptoms, such as bloating and extraintestinal manifestations, are more common in women. Constipation appears to be more common in nonwhites than in whites. Studies surrounding the relationship between age and prevalence of IBS and FC have yielded conflicting results, although constipation seems to be more common in older adults.

There is increasing evidence of decreased HRQOL in IBS and limited evidence of a similar pattern in patients with FC. HRQOL in IBS appears to be lower or comparable to other chronic conditions such as asthma, diabetes, and end-stage renal disease. Increased severity of symptoms, particularly pain, increased number of physician visits, and extraintestinal symptoms such as fatigue and sleep and sexual disturbances, are associated with worsening HRQOL in IBS. HRQOL predicts healthcare utilization in both IBS and FC.

A significant healthcare burden has been associated with IBS, both for GI- and non–GI-related symptoms, which profoundly affects both public and private delivery systems. Some of these costs are related to possible misdiagnoses and inappropriate surgical interventions, which can sometimes worsen symptoms. Women are more likely than men to seek care for their symptoms. Symptom severity and frequency and psychiatric comorbidity are important predictors of healthcare-seeking behavior.
REFERENCES


