From bugs to buttermilk
Feenstra, Ettje

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Quality of life in patients with gastrointestinal symptoms
Abstract

Gastrointestinal diseases are associated with a lower quality of life (QoL), but relatively little is known about how this relationship scales with symptom severity, which can be highly variable. We studied how QoL scores changed over a range of gut health by measuring RAND SF-36 scores in clinical irritable bowel syndrome (IBS) patients and in patients with functional gastrointestinal disorders (FGIDs) from a general population cohort as compared to controls. Clinical IBS patients (patients with more severe gastrointestinal symptoms) had lower QoL scores than population-based FGIDs patients (patients with milder gastrointestinal symptoms) and controls. The QoL scores in population-based FGIDs patients were also lower versus controls. In addition, we observed negative associations between total GI symptom score and the mental and physical component score of QoL. We thus conclude that higher gastrointestinal symptom scores can be linked to a greater reduction in QoL.
Introduction

Quality of life (QoL), also termed wellbeing, includes all emotional, social, and physical aspects of an individual’s life. It is well known that gastrointestinal diseases have a high impact on QoL. In irritable bowel syndrome (IBS) patients, QoL is found to be lower than in healthy controls and IBS QoL is also lower than that of patients with other common diseases like type 2 diabetes mellitus and cancer. Gut health is characterized by multiple aspects which, taken together, lead to a range in presentation of gut health. One of these aspects is gastrointestinal (GI) symptom severity, and little is known about the association between this aspect of gut health and QoL. In this study we investigated how QoL is associated to different gradations of gut health as measured via Rome III criteria and GI symptoms.

Methods

QoL was assessed via the validated Dutch language version of the RAND 36-item Short Form Health Survey scoring version I (SF-36 Health Survey). We used our SF-36 Health Survey results to calculate eight summary scores and combined these into a composite mental component score (MCS) and a composite physical component score (PCS) (Figure 1). The summary scores range from zero to 100 points, where 100 represents the best QoL. The mental and physical component scores were transformed to have a mean of 50 and a standard deviation of 10 compared to the reference population, as described previously. 

![Figure 1](attachment:image.png)

**FIGURE 1** | Contribution of the RAND SF-36 summary scores to the mental and physical component score. All summary scores contribute to the MCS and PCS. Black lines connect the summary scores with the highest contribution to the component score. Dotted lines connect the summary scores that contribute less. Adapted from Ware et al.
We studied how QoL was associated with functional gastrointestinal disorders and GI symptom severity in two cohorts: a case-control cohort of clinically diagnosed IBS patients (Maastricht IBS (MIBS), n=400) and a population cohort studied cross-sectionally (LifeLines Deep (LLD), n=1,158). In our LLD cohort, patients with functional gastrointestinal disorders (FGIDs) were diagnosed based on a self-administered Rome III questionnaire. In both cohorts the patient group included more women and more smokers compared to controls (Table 1). In the MIBS cohort, patients had a higher BMI compared to controls. Patients in the LLD cohort were on average a few years younger than controls (Table 1). Data on GI symptom severity was collected via a 7-day (LLD) or 14-day (MIBS) stool diary as described previously. In short, eight GI symptoms (e.g. bloating and diarrhea) were scored on a 5-point Likert scale over seven or fourteen consecutive days. The total GI symptom score was calculated by summing all scores for all eight symptoms over all days. In MIBS this score was divided by two to obtain a weekly GI symptom score. Participants with missing data (i.e. a total score below 56) were excluded from the analysis (n=81 LLD, n=17 MIBS). Mean and SD summary and component scores for QoL were calculated per group, and groups were compared by ANCOVA adjusted for age and gender. We performed Spearman correlation analysis to study the association between GI symptoms and the mental and physical component score of QoL. All analyses were performed with the statistical package R version 3.2.1.

**TABLE 1 | Gender, age, body mass index and smoking status of patients and controls in the clinical IBS patients cohort (MIBS) and the population cohort (LLD)**

<table>
<thead>
<tr>
<th></th>
<th>MIBS IBS Patients n = 202</th>
<th>Controls n = 198</th>
<th>FGIDs Patients n = 412</th>
<th>Controls n = 746</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women n (%)</td>
<td>149 (73.8)*</td>
<td>120 (60.6)</td>
<td>300 (72.8)*</td>
<td>384 (51.5)</td>
</tr>
<tr>
<td>Age mean (SD)</td>
<td>45.2 (17.4)</td>
<td>45.7 (19.0)</td>
<td>43.1 (12.7)*</td>
<td>46.6 (14.0)</td>
</tr>
<tr>
<td>BMI mean (SD)</td>
<td>24.9 (4.4)*</td>
<td>24.0 (3.8)</td>
<td>25.3 (4.4)</td>
<td>25.2 (4.1)</td>
</tr>
<tr>
<td>Smoking n (%)</td>
<td>47 (23.3)*</td>
<td>13 (6.6)</td>
<td>98 (23.8)*</td>
<td>124 (16.6)</td>
</tr>
<tr>
<td>GI symptom score** mean (SD)**</td>
<td>106.8 (30.6)*</td>
<td>61.9 (7.9)</td>
<td>79.1 (21.3)*</td>
<td>62.9 (8.4)</td>
</tr>
</tbody>
</table>

IBS=irritable bowel syndrome, FGIDs= functional gastrointestinal disorders, BMI=body mass index, GI=gastrointestinal, * p<0.05 in patients versus controls within the cohort, ** GI symptom score is per week, * including only participants with complete GI symptom data (n=383 MIBS, n=1077 LLD)

**Results and discussion**

In both cohorts, we found significantly lower scores on all QoL domains for patients versus controls (Figure 2). The eight summary scores for QoL measured by RAND SF-36 questionnaire were comparable between controls from both cohorts (Figure 2, red and purple lines), whereas the clinically diagnosed IBS patients (Figure 2, blue line) scored significantly lower, and the population-based FGIDs patients (Figure 2, green line) scored between IBS patients and controls. Moreover, differences between the patient groups were significant on all eight summary domains (Figure 2). A previous study conducted in England in 100 students observed the same trend
in QoL scores in IBS patients as compared to those of IBS non-consulters (who had symptoms but had not sought medical attention) and controls. Both patient groups in the British study (IBS patients and IBS non-consulters) scored lower on all domains of QoL than controls, moreover IBS patients scored lower on “role physical”, “bodily pain”, “general health”, “vitality” and “social functioning” compared to non-consulters.13

**FIGURE 2** | Quality of life scores (SF-36) in the Maastricht IBS cohort (MIBS) (blue and red) and LifeLines DEEP (LLD) (green and purple). PF=physical functioning, RP=role physical, BP=bodily pain, GH=general health, VT=vitality, SF=social functioning, RE=role emotional, MH=mental health. Lowercase letters indicate significant differences (p<0.05) between groups: a=IBS patients versus controls MIBS, b=population-based FGIDs patients versus controls LLD, c=IBS patients MIBS versus population-based FGIDs patients LLD, d=controls MIBS versus controls LLD.

Controls from our LLD cohort scored lower on the domains ‘vitality’ and ‘general health’, but higher for ‘role emotional’ compared to the MIBS controls. We postulate that the differences between the two control groups in our study originate from the fact that LLD controls are sampled from the general population rather than being chosen for their “healthy” status in the MIBS controls. Given that the prevalence of having at least one chronic disease ranges from 27.3% in individuals 25-54 years old to 79.1% in individuals aged >75 years in the Netherlands14, the LLD controls might suffer from other non-GI diseases that also impact QoL. Another factor that might add to the differences in QoL summary scores between controls from both cohorts is socio economic status (SES) as QoL is known to be lower in persons with a lower SES15. Unfortunately SES data is not available in the studied cohorts. Our two cohorts also originate from different regions of the Netherlands (LLD from the North and MIBS from the South) and, although there is no region-specific QoL data for the Netherlands, one could speculate that the regional differences might impact QoL as it has been shown to differ between countries16.
The lower scores on all eight QoL domains in patients versus controls were also reflected in lower MCS and PCS values. Our results showed that clinical IBS patients scored lower on MCS and PCS compared to controls and population-based FGIDs patients (Figure 3). Controls from LLD scored lower on the mental component. Moreover, in both cohorts the correlation analysis between the weekly GI symptom score and the MCS and PCS of QoL clearly showed a negative association between GI symptom severity and QoL (Figure 4).

**FIGURE 3** | Physical (A) and mental (B) component scores for quality of life in IBS patients and controls from the Maastricht IBS cohort (MIBS) and population-based IBS patients and controls from LifeLines DEEP (LLD). Lowercase letters indicate significant differences (p<0.05) between groups: a=IBS patients versus controls MIBS, b=population-based FGIDs patients versus controls LLD, c=IBS patients MIBS versus population-based FGIDs patients LLD, d=controls MIBS versus controls LLD.
Our results showed a difference in QoL burden of clinical IBS patients with more severe GI symptoms versus FGIDs patients from the general population who have generally milder GI symptoms. This suggests that reducing GI symptoms could improve QoL, although underlying anxiety and depression disorders\textsuperscript{17} must also be taken into account. Previous research has shown that education of IBS patients about, e.g., disease course, diet and lifestyle, improves their QoL.\textsuperscript{18,19} Recently, vitamin D supplementation, because of its beneficial effect on psychosocial factors and inflammation, was also found to be an effective method for improving QoL and gastrointestinal symptoms.\textsuperscript{20} Our study suggests that improvement of gastrointestinal symptoms is likely to result in an improvement in QoL that is relatively easy to achieve. This improvement of gastrointestinal symptoms might be achieved via personal guidance and education of patients including information on disease course and dietary advice.
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References


