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Relationship between Symptoms and Quality of Life in Fecal Incontinence

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Abstract

Background—Most measures of fecal incontinence (FI) severity assess the frequency of solid and liquid FI, but may incorporate other features. We compared two scales – the Fecal Incontinence Severity Score (FISS) and Fecal Incontinence Severity Index (FISI) – to determine which questionnaire and which individual questions predict FI Quality of Life (FIQOL).

Methods—A national sample of American adults completed a health questionnaire, and 234 with monthly FI were selected. Participants completed assessments of FI severity, FIQOL, and somatization. Stepwise linear regression models evaluated whether FISS and FISI total scores, or individual items on the FISS and FISI predicted FIQOL after adjusting for gender, age, income, and somatization (Brief Symptom Inventory-18).

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Disclosures

The authors have no competing interests.

Contributions:

KB analyzed the data and wrote the paper; SH designed the research study, AB wrote the paper, OP designed the research study and analyzed the data, and WW designed the research study, analyzed the data and wrote the paper.

Key Results—Reliable responses were provided by 186. Age was 49 years, and 52% were women. The mean FISS score was 8.4 (95% Confidence Interval (CI) 8.0-8.9, 13 questions) and mean FISI was 29.9 (95% CI 27.4-32.4, 62 questions), indicating moderate FI severity. The mean FIQOL was 2.6 (95% CI 2.4-2.7, 5 questions). Lower income, greater somatization, and total FISS and FISI scores explained 69% of FIQOL; and total FISS and FISI scores were independent predictors. On the FISS, frequency, amount, and urgency to defecate were independently associated with FIQOL. After adding somatization, all but amount remained significant. For the FISI scale, solid and liquid FI and gas were significant predictors, but adjusting for somatization excluded solid FI.

Conclusions and Inferences—Five variables independently explained FIQOL: overall frequency of FI, frequency of liquid and gas leakage, urgency, and somatization.

Graphical abstract

We compared two commonly used scales of the severity of fecal incontinence to determine which is the best predictor of disease-specific quality of life (Rockwood Fecal Incontinence Quality of Life Scale). The two scales are the Fecal Incontinence Severity Scale and the Fecal Incontinence Severity Index.

Fecal incontinence (FI) is a psychologically and socially debilitating condition that can lead to embarrassment, social isolation, loss of self-confidence, and even depression¹. These consequences contribute to the well-documented lower quality of life reported by individuals with the disorder². The prevalence of FI is 7-15% in noninstitutionalized U.S. adults³, demonstrating a wide burden on patients, families, caregivers, and communities.

FI is defined as the involuntary loss of solid or liquid feces or mucus. A National Institute of Diabetes and Digestive Kidney Diseases (NIDDK) conference in 2013 identified the need for research to evaluate the psychometric properties of instruments for evaluating symptom severity and quality of life in FI³. There are several published scales to determine the severity of incontinence, but they differ as to whether they discriminate between the types of stool loss, the volume of stool loss, whether urgency was present preceding the incontinence, and whether individuals used pads or other methods for preventing or managing FI. Currently, it is unknown whether these severity measures of FI are assessing the same thing (i.e., how well they correlate with each other), and which is the most sensitive and specific for FI.

One approach to answering these questions was to compare FI severity scales to an external standard – the Fecal Incontinence Quality of Life Scale (FIQOL)⁵. The severity of FI symptoms correlates with its impact on QOL in a cross-sectional survey⁶. In this study our aims were to test which of two commonly used FI severity scales – the Fecal Incontinence Severity Index (FISI)⁷ and the Fecal Incontinence Severity Score (FISS), which was previously known as the Fecal Incontinence and Constipation Assessment scale⁸ – is the better predictor of the impact of FI on the patient's quality of life⁵. We also sought to determine which questions within these instruments are best able to predict variations in reported FIQOL impact. This study may ultimately help us develop more sensitive and specific scales to measure FI severity.

Materials and Methods

This is a descriptive study of a single cohort of people identified in an internet survey as having FI. The study's objectives were addressed using a nationally representative sample of patients with FI who were identified from the registry of a market-research company (Cint USA, Inc., Lawrenceville, New Jersey). The Internet survey included the FISI⁷, the FISS⁸, and FIQOL⁹ questionnaires.

The FISI assesses FI over the previous month and consists of 4 questions about the frequency of different types of FI – solid, liquid, mucus, and gas¹ – on an ordinal scale with response options of “Never”, “1-3 times a month”, “once a week”, “2 or more times a week”, “once a day”, or “2 or more times a day”. However, a specific frequency of leaking stool may have more or less impact on the patient's life depending on the consistency of the stool that is lost. For example, losing liquid stool twice a week may have more impact than losing gas twice a week. Consequently, the test developers provided two sets of “weights” for each possible response: weights based on the average ratings of a group of 34 patients with FI, or the average ratings of a group of 26 colorectal surgeons. Patients or surgeons were instructed to rate the frequency of each type of FI (gas, mucus, liquid stool, solid stool) on a grid showing the frequency of occurrence. They were then asked to assign a rating to each category with 20 representing the most severe FI and 1 representing the least severe. The average ratings were calculated for each cell in the table. When a subject completed the questionnaire, the average weight assigned by reference patients (or surgeons) was substituted for their response, and these numbers were added together. The score could range from 0 to 61. In our opinion, patients are better able to judge the subjective qualities (e.g., embarrassment) of different types of FI than are physicians, so we used the patient weights rather than physician weights to compute the total FISI score.

The second severity scale, the FISS, includes 5 questions: frequency of FI in the last year, type of FI (i.e., stool only, liquid or mucus only, both liquid/mucus and stool, or gas only), amount of stool leaked (i.e., small, moderate, or large amount), frequency of having to rush to the toilet, and frequency of having stool leakage without any warning. The fourth and fifth questions are merged to determine whether the patient has passive FI (i.e., FI without any warning), urge FI, both, or neither. The responses to these four questions are assigned physician-derived weights and added together for a total severity score ranging from 4 to 13.

The FIQOL questionnaire⁵ consists of 29 questions to assess the patient's quality of life. There are four scales: lifestyle (10 questions), coping/behavior (9 questions), depression/self-perception (7 questions), and embarrassment (3 questions). The response choices are (1) "Most of the time", (2) "Some of the time", (3) "A little of the time", (4) "None of the time", and (5) "Not applicable". Lower numbered responses indicate a poorer QOL. A mean score was calculated for each scale (excluding items marked "not applicable"). The FIQOL total score was calculated by averaging the responses for all four scales. This was done because the subscales of the FIQOL are highly correlated with each other (Pearson $r=0.72-0.88$) and because this provided a single dependent measure for regression analysis.

The Brief Symptom Inventory⁹ is a self-report inventory designed to assess the psychological symptoms of individuals. The short version of this questionnaire, called the Brief Symptom Inventory 18 (BSI-18) because it contains 18 questions, was used in this study. It measures 3 primary symptom dimensions (anxiety, depression, and somatization); and the subscale of particular interest for this study was the somatization (SOM) domain. This subscale measures the psychological tendency to report more bodily symptoms and to interpret them as distressing. Each symptom is rated on a 5-point scale (0-4) of distress during the previous week, ranging from 'not-at-all' to 'extremely'. The SOM scale was included as a covariate in the analyses to test whether estimates of the effects of FI severity on FIQOL were confounded by a general tendency to endorse more symptoms.

The health and continence status of people within the internet registry of survey respondents was unknown. Invitations extended to potential subjects described the study as a health survey in order to minimize possible bias due to self-selection for participation. Screening questions were included in the invitation to determine potential subjects with FI at least once a month. Quota sampling was employed to recruit approximately equal numbers of participants with and without FI, equal numbers of males and females, 60% Caucasians, 20% Hispanics, and 20% African Americans, and balanced age strata (i.e., 40% aged 20-40 years, 40% aged 41-60 years, 20% aged 61+).

The survey included 43 to 53 questions, dependent upon branching, and participants required approximately 20 minutes to complete the questionnaires. Two questions from the first section of the interview were repeated near the end for quality control. Subjects whose responses to the repeated questions differed by more than one step on a five-point ordinal scale were considered unreliable and were excluded from analysis.

Descriptive statistics including means, standard deviations, and correlations with demographic variables were used to address the aims of this study. Statistical analyses employed SPSS version 25 software. Stepwise linear regression identified independent predictive variables of FIQOL. Demographic variables were entered as a block in the first step, followed by the FISS, the FISI, and lastly the somatization scale of the Brief Symptom Inventory. A p-value of <0.05 was considered statistically significant. The regression was then repeated with individual items from the FISS and the FISI to identify which questions from each scale best explained FIQOL.

The Institutional Review Committee for the Protection of Human Research Participants at the University of North Carolina reviewed this study, and approved it by expedited review because all the data were collected anonymously.

Results

Two hundred thirty four individuals with FI completed the survey. Forty-eight (20.5%) were considered unreliable and were excluded because they gave inconsistent responses to repeat questions used for quality control. Of the 186 individuals remaining for analysis, 97 (52%) were women and 89 (48%) were men. The average age was 49 years (range 20-91 years). Approximately 40% of people surveyed had post-baccalaureate education. Hispanic subjects represented 9% of the study population and non-Hispanic black subjects represented 8%. Table 1 shows demographic characteristics of all participants. Note that the sample quotas for black race and Hispanic ancestry were not filled with the targeted numbers (20% of each) because relatively few subjects in these categories with self-reported FI were available in the pool of subjects maintained by the internet survey provider.

The average FIQOL score, on a 1-5 scale with 1 indicating a lower quality of life, was 2.57 (95% CI 2.44-2.69), the mean FISI score was 29.9 (95% CI 27.4-32.4) on a 0-61 scale, and the average FISS score on a 1-13 scale was 8.4 (95% CI 8.0-8.9), indicating moderate severity. Higher scores on both the FISS and the FISI scales represent greater FI symptom severity. The average somatization T-score was 65.6 (95% CI 63.7-67.5). A T-score of 50 is representative of the population mean, and a standard deviation of 10 points above or below the mean T-score is equivalent to one SD, so a T-score of 65.6 is 1.56 standard deviations above the mean for the population.

In the initial regression analysis, demographic factors accounted for an R^2 of .269 of the variance observed in the combined FIQOL measure. Adding the FISS increased the R^2 to .617, and adding the FISI increased the R^2 to .666. The change in R^2 was significant at each step by ratio of F-values. In the last stage of the regression analysis, adding the somatization scale modifier to the model increased R^2 to .690. The FISI and FISS both made significant contributions (p .001) to FIQOL even after adjusting for the confounding effect of somatization.

The utility of independent questions of FI severity for predicting the FIQOL was evaluated in Table 2. The initial models (Models 1 and 3, Table 2) incorporated demographic features and FI severity questions from the FISS and FISI instruments. Thereafter, somatization scores were added to these models (Models 2 and 4, Table 2). Model 1 demonstrates that age, the frequency of FI, amount of stool lost, and the presence of urge sensation (i.e., urge FI, passive FI, combined, or neither urge nor passive FI) evaluated with FISS were independently associated with FIQOL. After somatization was added to the model (Model 2, Table 2), frequency of FI and passive/urgent FI remained significant, as well as somatization. Model 3 in Table 2 shows the first step in the analysis of the FISI scale. In addition to sex and age, solid FI, liquid FI, and gas FI from the FISI scale independently predicted FIQOL. When somatization was added to the FISI model in Model 4, the

frequency of solid stool FI was no longer a significant predictor. Greater somatization scores were associated with a lower FIQOL with FISS (Model 2) and FISI (Model 4).

Although the volume of stool lost was not a significant independent predictor of FIQOL after adjusting for somatization, we evaluated its association with FIQOL because some investigators believe it is a critical dimension of FI severity³. As shown in Figure 1, individuals who reported a small amount of FI (staining only) had significantly ($p<.001$) higher FIQOL scores (i.e., lower impact) than those who lost a moderate amount, and those who experienced the loss of a moderate amount had significantly higher FIQOL scores ($p<.001$) than those who experienced the loss of a full bowel movement. However, after multivariate adjustment for other risk variables, the association between volume of stool loss and FIQOL was no longer significant ($p=.272$).

Additional post hoc analyses were carried out to understand how to explain the discrepancy between the univariate analysis of FI volume and the failure to find a significant effect of volume in the final regression analysis after adding somatization. This might have occurred if the sample contained a disproportionate number of individuals with staining only, so we calculated the number of individuals with staining only ($n=69$), moderate volume FI ($n=58$), and large volume FI ($n=59$) and found no significant differences. An alternative explanation is that the volume of stool loss failed to be significant after multivariate adjustment because it was highly correlated with other variables that predict FIQOL. This was confirmed: the volume of stool loss was significantly correlated with the overall frequency of FI ($\rho=.604$), the frequency of liquid stool FI ($\rho=.632$), and the frequency of urgency ($\rho=.665$; $p<.001$ in all three comparisons).

Discussion

In this study, a national sample of US adults showed that both the FISS and FISI are significant independent predictors of FIQOL even after taking into account somatization. The significant independent predictors of a negative impact on FIQOL are overall frequency of FI, the consistency of the lost stool, the frequency of liquid FI, and whether the FI is urge-related or passive. If one has to choose between these two measures, the FISS has the advantage of a larger beta coefficient than the FISI, but the important point is that these two measures both make independent contributions to FIQOL.

The second aim of our study was to show the relative predictive value of each question on these scales to provide insights into why these two scales are independent predictors of FIQOL: The FISS includes the symptoms of urgency, which is strongly associated with FIQOL¹⁰, and also includes volume of stool loss which is significantly associated with FIQOL in univariate tests. The FISI does not include these symptoms.

Conversely, the FISI assigns greater weight to liquid stool loss whereas the FISS assigns greater weight to solid than to liquid stool loss in computing the FISS severity score. This difference is significant because Rockwood has shown that patients report a greater quality of life impact score to liquid than to solid stool loss. By contrast, surgeons assign a greater impact score to solid compared to liquid FI because leakage of solid stool generally reflects

more severe anal weakness. The frequency of liquid stool FI was more strongly associated with FIQOL than solid stool FI (Table 2, Model 1). In the future, scoring instructions for the FISS could be modified to invert scores for solid and liquid FI.

Another important distinction between the two scales is the time-frame for reporting symptoms: the last month for the FISI and the last year for the FISS. A consequence of this difference is that the FISI is better able to tell whether the subject is currently symptomatic and perhaps better able to detect the impact of treatment whereas the FISS is more likely to identify patients with intermittent FI. (The instructions for the FISS can be modified to request subjects to report on the previous month or the previous week in order to use this scale as an outcome measure in treatment studies¹¹).

Many investigators believe that amount of FI is a major determinant of quality of life impact of FI. In this cohort, the amount of FI independently predicted the quality of life before but not after adjusting for somatization. For this reason we evaluated the univariate association of FI volume with FIQOL (Figure 1) and found that individuals who experienced only staining reported significantly better FIQOL scores (i.e., less impact from FI) than individuals who experienced moderate volumes of stool loss, and that individuals with moderate volumes of loss in turn had a significantly better quality of life than those who had large volume FI (full bowel movement). Post hoc analyses to explain the discrepancy between the univariate and the multivariate analyses of the relationship between FI volume and FIQOL showed that this could not be explained by a disproportionate number of individuals with staining only in the sample. Instead we found that the discrepancy was due to high correlations between volume of stool loss and other variables that were strongly associated with FIQOL, namely overall frequency of FI, frequency of liquid stool FI, and frequency of strong urge sensations preceding FI. More research is needed to evaluate how volume of FI should be incorporated into measures of FI severity¹².

Comorbid conditions that influence FI Quality of Life

Other studies¹³ show that older age is significantly associated with an increased prevalence of FI, so we investigated whether it contributed to the impact of FI on quality of life. In this study, it did not. However, it is possible that our quality of life measures are related to other age effects such as whether the individual is retired or still working. Future studies will need to address this.

While somatization is associated with functional GI disorders^{14, 15}, to our knowledge, the contribution of somatization to FIQOL has not been recognized hitherto. Perhaps this explains the limited correlation between FI symptom severity and FIQOL in some studies¹⁶ and underscores the importance of considering somatization when interpreting FIQOL.

Study limitations

Responses from 20% of individuals were considered unreliable and excluded from the survey. Individuals who had completed post-baccalaureate education were over represented (39.2%) in this sample, and educational level is associated with increased consultations for functional GI symptoms¹⁷. However, our primary aims were to determine which severity scales and which components of those scales are the most strongly associated with FIQOL,

and there is no reason to believe the generalizability of these associations would be limited to more highly educated patients.

Another limitation of this study was that only the FISS and FISI severity scales were evaluated while other frequently used questionnaires¹⁸ such as the Wexner (Cleveland Clinic Florida) and the Vaizey scales were omitted. The Wexner and Vaizey scales both have components that assess pad usage and lifestyle alteration (i.e., coping behaviors). It was decided that these questionnaires would not be included in this study because the use of pads could reflect the patients' fastidiousness¹⁹ rather than the severity of FI.

Another limitation of our study is that we did not take the unpredictability of FI events into account when assessing symptoms which influence FIQOL. Sung and colleagues¹² identified this as an important component of FI severity in focus groups which they conducted. This symptom should be incorporated into future studies directed towards the development of improved FI severity measures. Lastly, as a consequence of selecting only patients with at least one episode of solid or liquid stool per month, most of these subjects had moderately severe FI; none had mild or severe FI, which comprise 43% and 5% of women with FI in the community⁶.

Conclusions

This study shows that, if one has to choose a single measure of FI severity, the FISS has advantages over the FISI, although both have their strengths and they make independent contributions to the prediction of FIQOL. The most important contributions of this study are the identification of which symptom questions are the most strongly associated with FIQOL because this should enable investigators to design more sensitive and reliable measures of FI severity than either the FISS or the FISI. If clinicians or clinical investigators choose to use the FISS as a measure of treatment efficacy, they should modify the time interval for reporting to the last month.

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Key Points

- Several scales measure the severity of fecal incontinence (FI), but the best measure is unknown. We compared two commonly used scales to assess how well they predict the impact of FI on quality of life.
- Both scales are independent predictors of quality of life. Specific symptoms were overall frequency, liquid and gas frequency, and urgency. Somatization (awareness of many symptoms) is a strong contributor.
- These data may enable us to develop more sensitive and reliable measures of FI severity.

Figure 1. Association between volume of FI and FIQOL. Larger FI volume was associated with lower, i.e., worse, FIQOL (* $p < .001$).

Table 1

Characteristics of the Sample

	Total
	n (%)
Total Sample	186 (100)
Gender	
Female	97 (52.1)
Male	89 (47.8)
Age (years)	
Up to 35	50 (26.9)
Over 35 Less than 65	94 (50.5)
65 and Older	42 (22.6)
Race	
White/Caucasian (non-Hispanic)	154 (82.8)
Black/African American (non-Hispanic)	15 (8.1)
Hispanic (of any Race)	17 (9.1)
Education	
High school	27 (14.5)
College	86 (46.2)
Postgraduate	73 (39.3)

Respondents with missing data and responses of “refused” and “don’t know” were excluded from the table

Table 2Contribution of Demographic Features, FI Attributes, and Somatization on FIQOL¹

Parameter	Model 1 ²	Model 2 ²
Based on FISS instrument		
Sex	.023	.058
Age	.114 ³	.019
Race/ethnicity	.003	.031
Education	-.038	-.052
Income	.076	.073
Relationship/marital status	-.022	-.035
Frequency of FI	-.235 ⁵	-.216 ⁵
Amount of FI	-.204 ⁴	-.113
Composition of FI	-.031	-.007
Urgency/passive FI	-.462 ⁵	.344 ⁵
Somatization	NA	-.353 ⁵
Total Adjusted R²	0.644	0.693
Based on FISI instrument		
	Model 3	Model 4
Sex	.141 ³	.138 ⁴
Age	.156 ⁴	.054
Race/ethnicity	.087	.086
Education	-.075	.080
Income	.113	.085
Relationship/marital status	-.020	-.044
Solid stool FI	-.240 ⁴	-.115 ³
Liquid stool FI	-.429 ⁵	-.330 ⁵
Mucus stool FI	-.044	-.001
Gas – FI	-.213 ⁵	-.162 ⁴
Somatization	NA	-.367 ⁵
Total Adjusted R²	0.606	0.655

¹Values are standardized β coefficients. Negative values imply that greater values for the attribute (eg, frequency of FI) are associated with lower values for FIQOL (i.e., poorer FIQOL)

²In addition to demographic features, Models 1 and 3 incorporate attributes of FI as characterized respectively by the FISS and FISI scales. In addition, Models 2 and 4 also include somatization for FISS and FISI scales respectively.

³p < 0.05,

⁴p < 0.01,

⁵p < 0.001