HHS Public Access

Author manuscript

Neurogastroenterol Motil. Author manuscript; available in PMC 2016 October 05.

Published in final edited form as:

Neurogastroenterol Motil. 2010 August ; 22(8): 893–900. doi:10.1111/j.1365-2982.2010.01516.x.

The ties that bind: perceived social support, stress, and IBS in severely affected patients

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Abstract

Background—This study assessed the association between social support and the severity of irritable bowel syndrome (IBS) symptoms in a sample of severely affected IBS patients recruited to an NIH-funded clinical trial. In addition, we examined if the effects of social support on IBS pain are mediated through the effects on stress.

Methods—Subjects were 105 Rome II diagnosed IBS patients (F = 85%) who completed seven questionnaires which were collected as part of a pretreatment baseline assessment.

Key Results—Partial correlations were conducted to clarify the relationships between social support and clinically relevant variables with baseline levels of psychopathology, holding constant number of comorbid medical diseases, age, gender, marital status, ethnicity, and education. Analyses indicated that social support was inversely related to IBS symptom severity. Social support was positively related with less severe pain. A similar pattern of data was found for perceived stress but not quality of life impairment. Regression analyses examined if the effects of social support on pain are mediated by stress. The effects of social support on bodily pain were mediated by stress such that the greater the social support the less stress and the less pain. This effect did not hold for symptom severity, quality of life, or psychological distress.

Conclusions & Inferences—This study links the perceived adequacy of social support to the global severity of symptoms of IBS and its cardinal symptom (pain). It also suggests that the mechanism by which social support alleviates pain is through a reduction in stress levels.

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Keywords

irritable bowel syndrome; social support; stress; pain

INTRODUCTION

Irritable bowel syndrome (IBS) is a prevalent, painful, and potentially disabling gastrointestinal (GI) disorder whose primary symptoms include abdominal pain or discomfort associated with abnormal bowel habits (e.g., diarrhea, constipation, or both). Lacking a bio-marker that reliably corresponds to GI symptoms,[1,2] IBS is best understood as a functional illness whose onset, expression, and impact are influenced by a host of psychological, physiological, and social factors. One dramatic example of the importance of social factors comes from research showing that individuals who experienced chronic interpersonal stress (e.g., relationship difficulties) within 3 months of onset of an acute enteric infection were more likely to develop long-standing IBS symptoms than individuals without interpersonal stress.[3] This research has led to a series of studies showing that more chronic, severely affected IBS patients have a distinctive, submissive interpersonal style[4] that is closely intertwined with pain modulating intrapersonal processes (e.g., pain beliefs, such as catastrophizing) thought important to IBS.[5,6]

There is surprisingly little IBS research exploring the positive aspects of social relations (e.g., social support) implicated in the expression and outcome of other physical health problems. Social support is broadly defined as the resources and interactions provided by others that may be useful for helping a person cope with a problem.[7] Research has shown that supportive relationships are generally associated with better adjustment to chronic diseases. These benefits are typically explained by one of two hypotheses. The first hypothesis considers the benefits of social support as a 'main effect,' – that is, support is beneficial because it provides people with consistent positive experiences and a set of stable socially rewarding roles.[8] Supportive others may play an instrumental role in encouraging an individual to engage in specific health-protective behaviors, such as adhering to medical recommendations, exercising, eating nutritionally, and quitting smoking.[9] The second hypothesis regards social support as beneficial because it serves to buffer or attenuate the effects of stress.[8] Individuals who report that members of their social networks would provide them with support, if and when needed, display improved health in response to stressful life events than those who do not.[8,10,11]

These two perspectives predict that higher levels of social support would be associated with better adjustment to chronic health problems. There is no reason to believe that the health promoting role of social support does not extend to IBS and yet only four published studies have, to our knowledge, formally explored the relationship between social support and IBS.[12–15] With the exception of a population-based study comparing subjects with functional GI disorders vs controls,[15] the studies compared the social support of IBS patients seen in tertiary care settings to normals[12] and/or patients with other chronic medical disorders such as inflammatory bowel disease (IBD),[12,14] and recurrent headache. [13] In general, results are inconclusive. Jones, Wessinger and Crowell[12] found that IBS patients

reported significantly less support in general than normals using a composite measure of social support. Martin *et al.*[13] found that while IBS patients were less likely than headache patients to characterize the tangible support they received from significant others as helpful, the amount of received social support did not differ from medically ill controls. Kovacs and Kovacs[14] presented no evidence that IBD and IBS patients differed in the amount of received social support.

The relatively modest pattern of these data suggests that there may be value in looking beyond the quantity of social support toward the quality of social support. One qualitative aspect of support is the *perception* that support is available and adequate. Perceived availability of social support has consistently been tied to better physiological[16] and psychological adjustment to major illnesses.[17,18] The perceived adequacy of social support may be particularly important to IBS in light of (i) recently published clinical guidelines that emphasize the value of providing adequate reassurance as a way for gastroenterologists to optimize clinical care of IBS patients;[19] (ii) the empirical validation of psychological interventions[19–21] whose clinical benefit is often ascribed to their support function (e.g.,minimizing stigma, decreasing isolation, fostering the formation of a warm, trusting relationship); and (iii) research showing that the physical health benefit of social support is cognitively mediated.[22,23] Expectations regarding the availability of supportive relationships influences the perception of available support by influencing among other things how objective support is viewed and the amount of support others provide.[22,24] These expectations are a product and are therefore not necessarily linked to any particular supportive transaction or relationship.

Research showing that IBS patients have a negatively skewed information processing style that is preferentially oriented to threat appraisal,[25,26] suggests that they may be particularly susceptible to complaining of physical health problems by virtue of perceiving negatively social ties (i.e., as unhelpful). This suggests that IBS patients who view their social support as less satisfactory would experience worse IBS (e.g., increased pain, more severe IBS symptoms, quality of life, etc.) than patients who perceive their social network as more supportive. To the extent that social support attenuates the negative health impact of stress, we also predict that patients who perceive others as inadequately supportive would report higher levels of perceived stress. It may be that individuals who have greater social support will experience less stress and subsequently experience less severe IBS symptoms due to the lower levels of stress. To the extent that social support reduces stress, patients will experience less severe IBS symptoms. This hypothesis was studied in the context of an NIH-funded clinical trial comparing the efficacy of two behavioral treatments for Rome II diagnosed patients with moderate to severe IBS.

METHODS

Subjects

Subjects included 105 consecutively evaluated IBS patients recruited primarily through referral of local physicians as well as local media coverage and community advertising. To qualify, subjects must have met Rome II IBS diagnostic criteria[27] without organic GI disease (e.g., IBD, colon cancer, etc.) as determined by a board-certified study gastroenterologist.

Exclusion criteria were: presence of a comorbid organic GI disease (e.g., IBD, lactose intolerance) or mental retardation; concomitant or lifetime participation in psychotherapy featuring cognitive-behavioral techniques; current or past diagnosis of schizophrenia or other psychotic disorders; current diagnosis of unipolar depression with suicidal ideation; current diagnosis of psychoactive substance abuse. Because this study was conducted as part of a clinical trial for more severely affected patients with IBS, they must have also reported IBS symptoms of at least moderate intensity (i.e., symptom occurring at least twice weekly for 6 months and causing life interference). Table 1 displays the demographic features of our sample. Institutional review board approval and written, signed consent, was obtained before the study was begun and data collected. This study was completed in full compliance with the Declaration of Helsinki.

Procedure

After a brief telephone interview to determine whether subjects were likely to meet basic inclusion criteria, subjects were scheduled for a medical examination to confirm IBS diagnosis[27,28] and psychological testing, which for the purposes of this study included the following testing battery.

Instruments

Perceived social support—The Multidimensional Scale of Perceived Social Support (MSPSS)[29] is a self report scale measuring perceived social support. Its 12 items are divided into three factor groups (family, friends, significant others) that yield an overall measure of perceived adequacy of support. Subjects are asked to respond to each question using a seven-point rating scale (1 = very strongly disagree, 7 = very strongly agree). Responses are averaged to yield a total score ranging from 1 to 7.

IBS symptom severity—Two measures were used to assess IBS symptom severity: the IBS-Symptom Severity Scale (IBS-SSS)[30] and the IBS version of the Gastrointestinal Symptom Rating Scale (GSRS-IBS).[31,32] Irritable Bowel Syndrome-SSS is a multidimensional patient-based rating scale of four domains (pain, distention, bowel dysfunction, and general well-being) deemed important to gauging overall IBS severity. The 13-item GSRS-IBS assesses symptom severity of GI symptoms. Each item is evaluated on a seven-point scale (1 = no discomfort, 7 = very severe discomfort). Responses are summed to yield a total severity score that ranges between 13 and 91 with higher scores corresponding to more bothersome GI symptoms.

Pain severity—The severity of pain experience was measured using the Bodily Pain (BP) subscale of the SF-36 Health Survey.[33] The BP subscale is a weighted combination of two items measuring (i) the intensity of pain using a six-point verbal rating scale (1 = none, 6 = very severe) and (ii) the effect of pain on normal activities using a five-point scale (0 = not at all, 5 = extremely). These items yield an empirically validated[34] composite index of the severity of pain and its effects. The BP scale is scored so that a higher score indicates no pain/limitations due to pain and lower scores indicate very intense/extremely limiting pain.

Perceived stress—The Perceived Stress Scale (PSS)[35] is a 10-item measure that assesses the degree to which situations in one's life are appraised as stressful. The PSS assesses the amount of stress in one's life rather than in response to a specific stressor.

Health-related quality of life—The 34-item IBS-quality of life (IBS-QOL) [36] assessed the subjective well-being of patients with IBS. Each item is scored on a five-point scale (1 = not at all, 5 = a great deal) that represents one of eight dimensions (dysphoria, interference with activity, body image, health worry, food avoidance, social reaction, sexual dysfunction, and relationships). Items are scored to derive an overall total score of IBS-related quality of life. To facilitate score interpretation, the summed total score is transformed to a 0–100 scale ranging from 0 (poor quality of life) to 100 (maximum quality of life).

Distress—Psychological distress was assessed using the 52-item, Brief Symptom Inventory (BSI).[37] Respondents indicate on a five-point scale (0 = not at all, 5 = extremely) their level of distress for nine types of problems (e.g., anxiety, somatization, depression). The average intensity of all items yields a composite index of psychological distress (Global Severity Index [BSI-GSI]).

Extraintestinal diseases—Subjects were asked to indicate the number of extraintestinal diseases that were occurring in addition to their current IBS symptoms for the past 12 months. The IASP Comorbid Medical Problem Checklist[38] was used to measure the amount of extraintestinal diseases harbored by the subjects.

Statistical methods

After conducting descriptive analyses, we analyzed the relationship between social support and each of the health-related measures first using Pearson product moment (zero-order) correlations. The second set of analyses involved partial correlations to examine the independent relationship between health-related measures while controlling for demographic, psychological distress, and extraintestinal disease variables (age, gender, marital status, ethnicity, education, distress as measured by the BSI-GSI, and number of non-psychiatric comorbid medical diseases). Finally, we conducted regression analyses to examine the stress buffering properties of social support.

RESULTS

Descriptive analyses

Eighty-five percent of the study patients with IBS were women, and 93% were white (Table 1). Their average age was 47 years, and most had received education beyond high school. Fifty-three percent were married or living with someone. Subjects reported an average of six non-psychiatric comorbid medical diseases. The average duration of symptoms was 16.4 years. Patients were classified on the basis of their predominant bowel habit: 41% were diarrhea-predominant, 39% constipation-predominant, and 18% were mixed (remaining patients lacked a specific type).

Zero-order correlations

To explore the relationships among social support, symptom severity, perceived stress, and other health-related variables, we first performed a series of Pearson correlations (presented in the lower diagonal of Table 2). Results indicated that social support was negatively correlated with both scores of IBS symptom severity, signifying that patients who reported less adequate social support indicated higher IBS symptom severity. Social support was positively correlated with pain severity such that patients who reported higher pain and life interference due to pain reported less adequate social support. Perceived stress demonstrated an inverse relationship with social support indicating that patients who received inadequate support reported higher stress levels. Likewise, psychological distress was negatively correlated with social support. Conversely, social support was unrelated to quality of life impairment.

Partial correlations

To clarify the relationship between social support, symptom severity, stress, and quality of life independent of baseline levels of psychopathology (BSI-GSI), key demographic variables (age, gender, marital status, ethnicity, education), and the number of co-occurring extraintestinal diseases, partial correlations were conducted. Results of partial and zero correlations are shown in the upper diagonal for Table 2. Because BSI-GSI was used a as a control variable in this analyses, no partial correlations are presented for this variable. The magnitude of associations diminished negligibly across all correlations. Correlations among social support, severity of IBS symptoms, and pain severity retained their significance or fell to just slightly less than significant. A similar pattern of data was found for social support and perceived stress. Taken together, IBS patients who perceived their support network as more inadequate reported more somatic symptoms of IBS, but did not necessarily report more psychological dysfunction.

Regression analyses

A series of regression analyses were conducted in order to test whether the relationship of social support to severity of symptoms was mediated by perceived stress. To test for a mediating effect, three regression equations are needed.[39] Firstly, the predictor variable (perceived social support) should be significantly related to the proposed mediator (perceived stress). Secondly, the predictor variable (perceived social support) should be significantly related to the outcome variable (pain severity). Thirdly, when the mediating variable is entered into the equation, the relationship between the predictor and the outcome should be reduced to a significant degree. In addition, a test of the significance of the indirect effect of the predictor on the outcome should be significant.

Relationship of social support and perceived stress—In order for there to be any possibility of mediation the exogenous variable (in this case social support) needs to be significantly related to the proposed mediator (stress). In order to test this, we regressed perceived stress on perceived social support while controlling for age, gender, and education. The resulting regression equation was significant, $F(4,96) = 5.69$, $P < 0.001$, $R^2 = 0.16$.

Perceived social support significantly predicted perceived stress, $\beta = -0.34$, $t = -3.74$, $P < 0.001$.

Pain severity—In order to test for a mediating effect, we regressed pain severity (SF-36) on perceived social support while controlling for age, gender, and education. The resulting regression equation was significant, $F(4,96) = 2.95$, $P < 0.05$, $R^2 = 0.07$. Perceived social support significantly predicted pain severity, $\beta = 0.33$, $t = 3.39$, $P < 0.01$. Finally, perceived stress was added as a predictor into the previous regression equation. The resulting equation continued to be significant, $F(5,95) = 4.44$, $P < 0.05$, $R^2 = 0.15$. Perceived stress significantly predicted pain severity, $\beta = -0.32$, $t = -3.06$, $P < 0.01$, while the relationship of perceived social support to pain severity was reduced, $\beta = 0.22$, $t = 2.22$, $P < 0.05$. These findings suggest that perceived stress is a partial mediator of the relationship between perceived social support and pain severity. In order to test the degree of mediation, the indirect effect of social support on pain severity was tested using the Sobel[40] method. The Sobel test assesses the significance of the reduction in the strength of the relationship between the exogenous variable (support) and the endogenous variable (pain) when the mediator is entered into the equation. A significant reduction suggests that the mediator is explaining some, if not all, of the influence of social support on perceived pain. Results indicated that the indirect effect to be significant, $Z = 2.37$, $P < 0.05$, confirming the mediation. This finding means that those who perceive their support network as less supportive experience less stress and consequently report less severe pain. These data are presented diagrammatically in Fig. 1.

IBS symptom severity—In order to test for a mediating effect, we regressed one measure of symptom severity (IBS-SSS) on perceived social support while controlling for age, gender, and education. The resulting regression equation was significant, $F(4,96) = 2.99$, $P < 0.05$, $R^2 = 0.07$. Perceived social support significantly predicted symptom severity, $\beta = -0.27$, $t = -2.77$, $P < 0.01$. When perceived stress was added as a predictor into the previous regression equation the resulting equation continued to be significant, $F(5,95) = 2.76$, $P < 0.05$, $R^2 = 0.08$. Perceived stress did not significantly predict symptom severity, $\beta = -0.14$, $t = 1.35$, $P > 0.05$, while the relationship of perceived social support to symptom severity remained significant, $\beta = -0.22$, $t = -2.12$, $P < 0.05$. Because perceived stress was not related to symptom severity, no mediating effect is indicated.

We then regressed the other measure of symptom severity (GSRS-IBS) on perceived social support while controlling for age, gender, and education. The resulting regression equation was again significant, $F(4,96) = 4.71$, $P < 0.05$, $R^2 = 0.13$. Perceived social support significantly predicted symptom severity, $\beta = -0.29$, $t = -3.20$, $P < 0.01$. Perceived stress was then added as a predictor. The resulting equation continued to be significant, $F(5,95) = 3.85$, $P < 0.05$, $R^2 = 0.13$. Perceived stress did not significantly predict symptom severity, $\beta = 0.08$, $t = 0.72$, $P > 0.05$, while the relationship of perceived social support to symptom severity remained, $\beta = -0.27$, $t = -2.73$, $P < 0.05$. Because perceived stress was not related to symptom severity, no mediating effect is indicated.

Quality of life—We regressed quality of life (IBS-QOL) on perceived social support while controlling for age, gender, and education. The resulting regression equation was not

significant, $F(4,96) = 1.87$, $P > 0.05$, $R^2 = 0.03$, and perceived social support did not significantly predict QOL, $\beta = 0.01$, $t = 0.09$, $P > 0.01$. When perceived stress was added as a predictor the resulting equation was significant, $F(5,95) = 8.25$, $P < 0.05$, $R^2 = 0.27$. Perceived stress significantly predicted QOL, $\beta = -0.53$, $t = -5.60$, $P < 0.01$. Because social support was not predictive of QOL, no mediating effect is indicated.

Distress—In order to determine if psychological distress is influenced by the same mechanisms as pain, we regressed distress (BSI-GSI) on perceived social support while controlling for age, gender, and education. The resulting regression equation was not significant, $F(4,83) = 2.05$, $P > 0.05$, $R^2 = 0.05$. Perceived social support did not significantly predict distress, $\beta = -0.21$, $t = -1.95$, $P > 0.05$. When perceived stress was added as a predictor the resulting equation was significant, $F(5,82) = 17.66$, $P < 0.05$, $R^2 = 0.49$. Perceived stress significantly predicted distress, $\beta = 0.72$, $t = 8.54$, $P < 0.01$. Because social support was not predictive of distress, no mediating effect is indicated.

DISCUSSION

We found a relationship between the perceived availability of social support and abdominal pain which is often regarded as the cardinal symptom of IBS. Patients with high perceived support described their abdominal pain as less severe. Conversely, patients who perceived less available support reported more severe abdominal pain. We observed a similar pattern for the association between social support and global severity of IBS, as measured by both the total scores of the GSRS-IBS and the IBS-SSS. Patients who characterized their support network as more satisfactory reported less severe IBS symptoms in general. Partial correlations suggest that the significance of the relationship between social support and IBS symptoms essentially held when control variables, including patients' overall mental well-being, was held constant.

To our knowledge, this is the first published study that has sought to formally assess the relationship between perceived social support and IBS symptoms. The few studies that have studied social support and IBS symptoms have approached the topic by comparing IBS patients to those with other medical conditions[12,13] on measures of support. These studies have shed little direct light on the direct relationship between IBS symptoms and social support which, given our findings, suggests that a within subjects approach may have advantages over a between subjects approach at this stage of investigation. Our finding linking social support to abdominal pain has importance that extends beyond the field of FGIDs as the strongest associations between social support and a health outcome are typically seen in relation to psychological well-being not physical health variables like pain.

The apparent stress buffering role of social support did not extend to global severity of IBS symptoms. That is, social support does not protect against the impact of stress on overall IBS symptom severity. This conclusion may relate to measurement issues of the two global severity instruments. While both the GSRS-IBS and the IBS-SSS are often recommended measures of IBS symptom severity,[41] their construct validity is not well established. The GSRS-IBS gauges symptom severity in terms of distress associated with GI symptoms. While distress is an important quality of symptom severity, other parameters such as

intrusiveness, intensity and importance influence patients' estimation of symptom severity. The IBS-SSS adopts a more narrow approach and operationalizes symptom severity on the basis of five problems, two of which are not core somatic symptoms of IBS *per se* (life satisfaction, life interference due to IBS symptoms). In other words, it is unclear whether the IBS-SSS measures the severity of IBS symptoms, its sequelae, or some combination of the two. Thus, we cannot discern whether the lack of a stress buffering effect for global IBS severity reflects the psychometric properties of the instruments or the 'true' relationship among stress, social support, and IBS symptom severity. This confusion highlights the need for developing an IBS symptom severity measure with strong psychometric properties (e.g., construct validity).

We recognize that the strength of the correlations between support and IBS symptoms is moderate. We believe that the magnitude of these associations reflects the complexity of the phenomenon of social support and not the meaningfulness of our findings. Irritable bowel syndrome researchers, e.g.,[15] have tended to conceptualize social support as an unitary construct. In fact, there is broad consensus that social support is a multidimensional phenomenon. Social support research distinguishes the structural properties of support (the individual's embeddedness in interpersonal relationships as measured by proximity of others, frequency of social contact, and type of relationship such as friend, confidant, spouse relative group) from the functional aspects of social relationships. The functional aspects of support refer to the types of support people receive from others: emotional, instrumental, and informational. Emotional support refers to the things that people do that make us feel loved and cared for, that bolster our sense of self-worth (e.g., talking over a problem, providing encouragement/positive feedback); such support frequently takes the form of non-tangible types of assistance. Instrumental support refers to the various types of tangible help that others may provide (e.g., help with childcare/house-keeping, provision of transportation or money), while informational support refers to the help that others may offer through the provision of information.

Cross cutting the functional aspects of support is the distinction between perceived and enacted support dimensions. While these terms are often used inter-changeably, the amount of support some perceive is available to them and the amount of support they actually receive are conceptually and empirically independent to a large extent.[42] We chose to focus on the perceived adequacy of support for several reasons. Firstly, research shows that measures of perceptions about social support and support networks are at least as important, if not more so, than measures of actual support received in predicting various health outcomes. [43] Secondly, perceived availability of social support has been linked to physiological outcomes associated with pain perception.[44] Because perceived adequacy of social support is only one component of social support, the moderate strength of the correlations is understandable, if not predicable, and creates opportunities for studying how other types of social support bear on IBS symptoms.

Further research is also needed to understand just how social support exerts any benefit on visceral sensation, gut function, or illness behaviors that makes IBS such a difficult problem for patients and providers to manage. Drawing from cardiovascular research showing that social support can reduce the magnitude of cardiovascular changes (e.g., heart rate, blood

pressure) during stress circumstances,[45,46] one may posit that the quality of social relationships may influence IBS symptoms at a physiological level by dampening autonomic arousal that contributes to pain production and alters bowel function.[47,48] Psychologically, the availability of support may reduce stress by bolstering one's ability to cope with imposed demands and attenuating negative appraisals.[17,49] Less negatively skewed appraisal should dampen emotional and physiological reactivity which in turn may influence the experience of and response to IBS symptoms. Behaviorally, social support may alleviate the impact of stress on IBS by directly motivating individuals to make healthy lifestyle modifications (e.g., exercise, diet changes, etc.) that provide a measure of symptom relief.

These data should be interpreted in light of a number of study limitations. The SF-36 measure of pain captures bodily pain in general and is not necessarily specific to abdominal pain/discomfort. This is an important distinction given the prevalence of extraintestinal pain disorders (e.g., headache, muscle pain, pelvic pain) among more severe IBS patients. Because our data are cross sectional and correlational, we do not intend to suggest that the findings demonstrate causal relationships among social support, stress, and IBS symptoms. In fact, one could argue the effects are the reverse that more severe IBS symptoms lead individuals to perceive their social support as worse. At best, our data can be construed as suggestive of a possible causal relationship that could be confirmed through longitudinal methodology. Furthermore, our data reflected a subset of treatment-seeking individuals who were willing to enroll in a randomized controlled trial of a behavioral treatment for physical health problem. Therefore, our findings may not necessarily generalize to primary care settings or community populations (i.e., non-consulters) representative of the majority of individuals with symptoms compatible with IBS. In spite of these imperfections, these cross-sectional data reveal a link between social support and abdominal pain and global IBS symptoms in severely affected IBS patients. We also outline a potential pathway by which stress, support and abdominal pain are related. Further research using a more sensitive longitudinal design with a large sample size, a reasonable distribution of stress and support values, non-confounded stress and support measures, and *a priori* hypotheses drawn from theoretically derived models will help clarify just how support, stress, and IBS symptoms are related.

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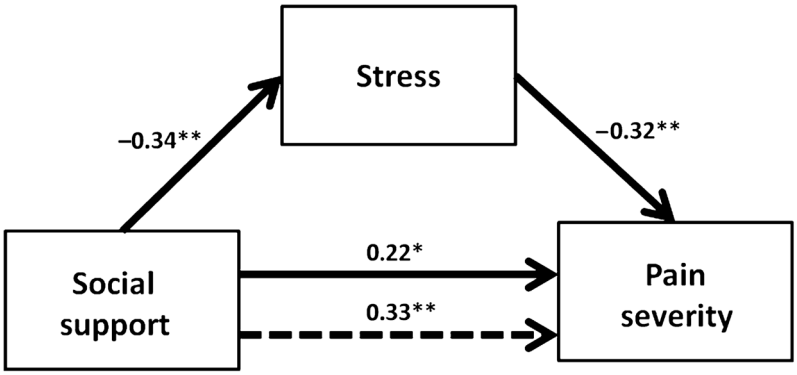

Figure 1.

Mediating effect of stress on the relationship between social support and pain. Standardized regression coefficients shown. Dotted line indicates relationship between variables without mediator in the equation. $^{\star}P < 0.05$. $^{\star\star}P < 0.01$.

Table 1

Demographics and clinical characteristics of the sample

	Females	Males	Total
Age	45.74 (16.80)	58.00 (16.26)	47.56 (17.21)
Ethnicity (White)	93.0%	93.3%	93.1%
College or above	87.2%	86.7%	87.2%
Married	52.3%	53.3%	52.5%
Employed	67.4%	53.3%	65.3%
Non-GI symptoms 12 months★	5.91 (3.52)	6.64 (4.15)	6.01 (3.59)
Duration of Illness (months)	197.42 (184.48)	200.90 (190.73)	197.88 (184.00)
IBS severity (IBS-SSS)	288.14 (80.55)	277.47 (90.04)	287.43 (80.70)
IBS severity (GSRS-IBS)	47.52 (12.35)	41.93 (12.08)	46.59 (12.40)
Pain severity (SF-36)	51.04 (19.58)	50.89 (23.95)	50.80 (19.97)
Quality of life	56.84 (19.15)	62.57 (18.57)	57.63 (19.29)
Distress (BSI-GSI)★	0.68 (0.44)	0.68 (0.48)	0.68 (0.045)
Perceived stress	19.18 (7.65)	17.52 (7.01)	18.92 (7.45)
Social support	5.67 (1.00)	5.57 (1.44)	l5.65 (1.05)

★Only 71 female patients and 11 male patients reported this data. All other data except those noted are based on female *N* = 86, male *N* = 15.

Table 2

Bivariate and partial correlations among variables of interest

	1	2	3	4	5	6	7
1. Social support	1.00	−0.30★★	–	−0.31★★	0.35★★	−0.22+	−0.04
2. Perceived Stress	−0.33★★	1.00	–	0.06	−0.23+	0.09	−0.31★★
3. BSI Global severity††	−0.21★	0.72★★	1.00	–	–	–	–
4. GSRS-IBS	−0.29★★	0.25★	0.22★	1.00	−0.53★★	0.62★★	−0.29★
5. Pain severity (SF-36)	0.33★★	−0.38★★	−0.23★	−0.58★★	1.00	−0.63★★	0.31★★
6. IBS-SSS	−0.26★★	0.27★★	0.24★	0.69★★	−0.65★★	1.00	−0.40★★
7. Quality of life	0.03	−0.48★★	−0.42★★	−0.40★★	0.39★★	−0.45★★	1.00

+ $P < 0.10$,

★ $P < 0.05$,

★★ $P < 0.01$.

Bivariate correlations presented in the lower diagonal, partial correlations presented in the upper diagonal.

†† Sample size for bivarate correlations $N = 105$ with the exception of all correlations with BSI-GSI which have a sample size of $N = 90$.

Neurogastroenterol Motil. Author manuscript; available in PMC 2016 October 05.