Effect of Social Support on Psychological Distress and Disease Activity in Inflammatory Bowel Disease Patients

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Background: Psychological distress increases morbidity in ulcerative colitis (UC) and Crohn's disease (CD). We examined whether social support is associated with distress and disease activity.

Methods: There were 110 UC and 147 CD patients who completed sociodemography, economic status, disease activity (UC: Patient Simple Clinical Colitis Activity Index (P-SCCAI), CD: Patient Harvey-Bradshaw Index . (P-HBI), Multidimensional Scale of Perceived Social Support (MSPSS), Brief Symptom Inventory with Global Severity Index (GSI) of psychological distress, and 2 health-related quality-of-life scales (SF-36 Physical Health and Mental Health, and Short Inflammatory Bowel Disease Questionnaire (SIBDQ). Analysis included multiple linear regressions and structural equation modeling.

Results: Disease activity was mild: UC: P-SCCAI 2.9 ± 3.5, CD: P-HBI 4.7 ± 4.7. Physical Health was better in UC 46.6 ± 11.4 versus CD 43.7 ± 10.9 ($P < .02$). GSI was lower in UC 0.6 ± 0.7 than CD 0.8 ± 0.7 ($P = .002$). MSPSS total score was equal in UC (5.9 ± 1.2) and CD (5.9 ± 1.1). MSPSS total correlated with P-SCCAI (correlation coefficient −0.240), GSI in UC (−0.470), and GSI in CD (−0.333). Economic status correlated with GSI in UC (−0.408) and CD (−0.356). MSPSS predicted GSI, Mental Health, and SIBDQ in UC and CD, and predicted P-SCCAI but not P-HBI; economic status predicted all the foregoing. Path analysis depicted GSI as mediating the effects of MSPSS and economic status on disease activity in both UC and CD. MSPSS (UC: β −0.34, CD: β −0.37) and economic status (UC: β −0.38, CD: β −0.22) reduced GSI, which then increased the disease activity (UC: β 0.56, CD: β 0.42).

Conclusions: Social support and economic status are linked to UC and CD patients' well-being. Interventions addressing these issues should be part of management.

Key Words: ulcerative colitis, Crohn's disease, social support, disease activity, psychological distress

INTRODUCTION

Ulcerative colitis (UC) and Crohn's disease (CD) are the common forms of chronic idiopathic inflammatory bowel disease (IBD). These chronic diseases are characterized by a relapsing-remittent course with relatively high rates of surgical intervention, and the need to take medications continuously. The unpredictable course of these diseases, the risk of severe adverse events from the medications, and a substantial financial burden contribute to the great psychological distress experienced by these patients.[1–3] Severe psychological distress impacts negatively on the well-being of UC and CD patients. We recently reported on the higher level of distress occurring in UC and CD patients exposed to threatening life experiences and adverse family relations.[4, 5]

Patients in distress are urged to turn to family members and friends for social support.[6] Social support is a known positive health resource contributing to the welfare of patients with chronic disease.[7, 8] The central position of the social support variable in our present study is based on the theory of social capital. Portes defines this term as the ability of actors to secure benefits by virtue of membership in social networks or other social structures.[9] Researchers have identified the 3 main avenues of social support as family, peers, and social institutions. Studies suggest that social support has both major effects

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on normal development by benefiting individuals in regular (nonstressful) periods, and buffering effects of mitigating the negative impact of life stressors on adjustment during stressful periods such as illness. Social support by family members and friends includes the ability to communicate about stressful issues, discuss fears and concerns, make decisions together, plan social activities together, and get along together in difficult situations. Such positive support helps the individual to overcome life's difficulties and challenges, particularly the stress related to coping with chronic illness. This is in line with the biobehavioral model of the patient's reaction to disease and health being influenced by relationships with family and peers.[10–13] A similar situation would be expected in IBD patients. In addition, there is an association between the psychological distress and physical health of patients[14–20] that would be anticipated in UC and CD patients. Finally, there is increasing evidence for a link between patients' economic status and their psychological and physical health.[21–25] We too found that a lower economic status was correlated with reduced psychological and physical well-being in our IBD patients.[4, 5]

In this paper we investigate the impact of perceived social support and economic status on the psychological and medical condition of UC and CD patients. Social support is examined in terms of Significant Other (spouse or very close associate), Family, and Friends. We hypothesize that where social support is greater and the economic situation is better there will be less psychological distress in IBD patients, which in turn may improve their medical status.

METHOD

Sample

This study included UC and CD patients aged 18 years and older. Patients with a confirmed diagnosis of UC or CD were recruited consecutively when presenting for follow-up or for acute (nonhospitalized) care at the Out-Patient Gastroenterology Departments of 5 participating university-affiliated tertiary care public hospitals. These hospitals included in the north (Rambam Health Campus), center (Tel-Aviv Medical Center and Sheba Medical Center), east (Shaare Zedek Medical Center), and south (Soroka Medical Center) of Israel. The patients were given the option of completing a series of questionnaires in Hebrew on paper or online (1 option only) in their own time at home. The time period of data collection in the study was August 2013 through July 2016.

Procedures

Patients completed a series of self-report measures at a single time point in this cross-sectional study.

Sociodemographics and medical history

Patients provided details about their gender, age, birthplace, education, marital and family status, religion, and economic status (self-rated scale, from 1 = poorest to 5 = richest). Patients recorded the duration of disease, medical and surgical treatments, and hospitalizations for exacerbation of IBD. Data of comorbidities were obtained from hospital records. UC patients completed the Patient Simple Clinical Colitis Activity Index (P-SCCAI), which assesses the current activity of disease and provides reliable information whether completed by the physician or the patient.[26–28] It comprises 6 questions about the clinical domains of bowel frequency by day and night, urgency of defecation, presence of visible blood in the feces, general well-being, and extraintestinal manifestations in the past week, and yields a disease activity score. The P-SCCAI does not take into account abdominal pain, results of colonoscopy and biomarkers, or use of medications for diarrhea. The possible score ranges from 0–20, with the cut-off between inactive and active disease being 2. The discriminative validity of P-SCCAI was high at 0.93.[29] CD patients completed the Patient Harvey-Bradshaw Index (P-HBI) which consists of 4 items reflecting the previous day's symptoms and signs of CD; the question regarding the physician's assessment of the possible presence of an abdominal mass in the original HBI is removed in the P-HBI, making the questionnaire suitable for completion by the patients themselves.[30, 31] A total score < 5 indicates disease remission, 5–7 mild disease, 8–16 moderate disease, and > 16 severe disease.

Perceived social support

We used the Multidimensional Scale of Perceived Social Support (MSPSS) measure to determine the degree of social support of the patients.[32] This scale in comprised of 12 questions, which are related to 3 broad situations: the special person, who is around when needed, who can be a confidant, and who cares for the patient; the family that listens, supports, is willing to help, and helps decide; and the friends, who are reliable, helpful, share feelings, and listen. The questions are given in mixed order. MSPSS divides into 3 subscales of 4 items each, relating to the source of social support, as significant other, family, or friends. Answers to the 12 questions are scored from 1 = very strongly disagree to 7 = very strongly agree. The score for total support, and for each of the 3 subscales, ranges from 1 to 7, with higher scores indicating more social support. The MSPSS has good internal and test-retest reliability and a fairly stable factorial structure.[33] It has been used very widely in many languages, including Hebrew.

Psychological distress

Patients completed the Brief Symptom Inventory (BSI) that measures the patient's psychological distress in the past month.[34] It consists of 53 items that assess 9 symptomatic dimensions or subscales: depression, somatization, obsession-compulsive, interpersonal sensitivity, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism) on a 0–4 scale. Participants rated the extent to which they have been

bothered (0 = not at all to 4 = extremely) by various symptoms: a higher score indicates more distress. The BSI yields a useful global summary score (the mean of all of the subscale scores) of psychological distress called the Global Severity Index (GSI) with range 0–4.

Health-related quality-of-life

We used 2 measures of quality of life. Patients completed the MOS 36-Item Short Form Survey Instrument (SF-36).[35] This generic quality of life measure is comprised of 36 items divided into 8 domains, which in turn are grouped as Physical Health Summary Score (physical functioning, role-physical, bodily pain, and general health) and Mental Health Summary Score (vitality, role-emotional, social functioning, and mental health). Responses refer to the past 4 weeks. The range of the Physical or Mental Health Summary Score is 0–100. A higher number indicates a better health-related quality of life. In addition, patients completed the Short Inflammatory Bowel Disease Questionnaire (SIBDQ), which measures disease-specific health-related quality of life in IBD in physical (systemic and bowel symptoms), social, and emotional dimensions.[36] It consists of 10 items referring to the last 2 weeks, and is rated on a 7 degree scale (1=all the time, 7= never). The total score is in the range from 10–70. A higher value means a better quality of life. The SIBDQ was rated as a well-established measure of assessment and demonstrated good test-retest reliability and responsiveness in a recent review of disease-specific health-related quality of life measures.[37]

Statistical Analysis

All analyses were performed separately for UC and CD. Descriptive statistics were used to document the results as means ± SD for normally distributed variables, and medians with interquartile range (IQR) where the probability distribution was not normal. A univariate analysis was performed to determine the effect of gender, family status, age, economic, status and MSPSS scales using either the Mann-Whitney test or Spearman rank correlation on P-SCCAI, P-HBI, SF-36 Physical Health and Mental Health, and GSI. In addition, we performed a regression analysis using the independent variables of MSPSS (total support score, and 3 subscales: support from significant other, from family, and from friends), age, gender, economic status, and family status; the dependent variables were P-SCCAI, P-HBI, SF-36 Physical Health, SF-36 Mental Health. and GSI. For variables with nonnormal distribution, multiple linear regressions were performed when modeling the natural logarithm transformations of dependent variables. These data analyses were performed on SPSS Statistics 22 for Windows (IBM Corp: Armonk, NY). P values <0.05 determined statistical significance for all analyses.

To understand further the relationships between the study variables, we used STATA (StataCorp LC, TX) to perform Structural Equation Modeling (SEM).[38–41] A path analysis was developed using AMOS. Variables correlating significantly with the disease activity indices (P-SCCAI for UC and P-HBI for CD) were included in a SEM analysis. A general model was drawn by placing Economic Status and MSPSS (total score) as predictors. In an iterative process, we added pathways that improved the model's fit and removed variables that did not add significantly to the model's fit. All models were estimated using the maximum likelihood estimation method. Since quality of the fit of SEM models is affected by sample size, multiple model fit indicators were assessed including χ^2, the ratio of the χ^2 to degrees of freedom (χ^2/df), the comparative fit index (CFI), P value, a root-mean-square error of approximation (RMSEA), and the standardized root mean-square residual (SRMR). For the ratio of χ^2 to the degrees of freedom index, a value of <4.0 is generally considered to represent a reasonable model fit to the data. Values close to 0.95 for the CFI, close to 0.06 for the RMSEA, and close to 0.08 for the SRMR indicate a good fit of the data to the model. In the final models, Economic Status and MSPSS were the independent variables, whereas GSI was the mediator. A single disease activity index, derived by standardizing P-SCCAI and P-HBI, was the dependent variable.

Ethical Considerations

The Ethics Committees of the participating hospitals approved the study. The patients attending at the various hospitals were informed of the purpose of the study in writing, and were required to sign an informed consent form before receiving the questionnaires in preaddressed envelopes with return postage affixed.

RESULTS

Cohort Characteristics

A total of 110 UC patients and 147 CD patients were included in the cohort (Table 1). The hospital-recruited patients represent 75% of patients who were canvassed. UC patients had a mean age of 49.6 years and CD patients of 39.5 years (P <0 .001). More than half the patients were female, most were married or coupled (UC 77.1%, CD 59.4%, P = 0.004), and over 95% were Jewish. The self-declared economic status of the cohort was moderate (median 3), and 65% of patients were working. The P-SCAAI was 2.9 ± 3.5, indicating mild UC; the median value of 2 shows that half the patients were actually in disease remission. The mean P-HBI of CD was 4.7 ± 4.7, indicating mild disease, and the median was 4, demonstrating that most patients were in remission. In UC 10% of patients reported receiving biologic medication and 3.6% had a history of UC-related surgery. By comparison, in patients with CD 19.7% reported using biologic medications and 27.2% had undergone CD-related surgery. The hospitalization rate was 22.3% for UC and 24.3% for CD in the previous year. Examination of patients' electronic records revealed that fewer than 5% had mild psychological comorbidities, and their inclusion in the cohort did not alter the outcome of the study.

TABLE 1: Sociodemographic and Medical Characteristics in UC and CD Patients

Variable	UC (n = 110) Mean±SD, Median (Min; Max) (IQR*) or No. (%)	CD (n = 147) Mean±SD, Median (Min; Max) (IQR*) or No. (%)	*P*
Age	49.6 ± 15.3 49.0 (23.0;78.0)(36.0;63.0)	39.5 ± 14.3 35.0 (19.0;79.0)(29.0;48.0)	<0.001
Education (study years)	14.5 ± 3.3 15.0 (5.0;22.0)(12.0;17.0)	14.5 ± 3.1 15.0 (5.0;30.0)(12.0;16.0)	0.697
Number of children	2.7 ± 2.2 3.0 (.0;13.0)(1.0;4.0)	1.6 ± 1.7 2.0 (.0;8.0)(.0;3.0)	<0.001
Economic status	3.3±.8 3.0 (1.0;5.0)(3.0;4.0)	3.1±.9 3.0 (1.0;5.0)(3.0;4.0)	0.478
Past Smoker	45 (41.3%)	66 (44.9%)	0.564
Current Smoker	11 (10.4%)	35 (25.4%)	0.003
Working	72 (65.5%)	96 (65.3%)	0.980
Gender			
Female	55 (50.0%)	85 (57.8%)	0.213
Male	55 (50.0%)	62 (42.2%)	
Family status			
Married or coupled	81 (77.1%)	82 (59.4%)	0.004
Single or divorced	24 (22.9%)	56 (40.6%)	
Religion			
Christian	1 (.9%)	1 (0.7%)	0.896
Jewish	105 (95.5%)	142 (96.6%)	
Muslim	4 (3.6%)	4 (2.7%)	
Degree of religiosity			
Religious	16 (14.7%)	25 (17.0%)	0.738
Secular	58 (53.2%)	84 (57.1%)	
Traditional	31 (28.4%)	34 (23.1%)	
Ultra-Orthodox	4 (3.7%)	4 (2.7%)	
Place of birth			
Africa	10 (9.2%)	7 (4.8%)	0.010
Europe	19 (17.4%)	17 (11.6%)	
America	8 (7.3%)	7 (4.8%)	
Asia	5 (4.6%)	0 (0.0%)	
Israel	67(61.5%)	115 (78.8%)	
P-SCCAI	2.9 ± 3.5 2.0 (.0;18.0)(0.0;4.0)		
P-HBI		4.7 ± 4.7 4.0 (.0;26.0)(1.0;7.0)	
Disease duration (years)	9.7 ± 6.4 9.0 (.0;23.0)(4.0;15.0)	8.8 ± 6.1 8.0 (.0;23.0)(4.0;13.0)	0.349
Medications			
Mesalamine	83 (75.5%)	39 (26.5%)	<0.001
Immunomodulators	20 (18.2%)	73 (49.7%)	<0.001
Biological	11 (10.0%)	29 (19.7%)	0.033
Corticosteroids	10 (9.1%)	60 (40.8%)	<0.001
Surgery (anytime)	4 (3.6%)	40 (27.2%)	<0.001
Hospitalized (last year)	15 (18.1%)	30 (20.4%)	0.668

* Interquartile range.
P-SCCAI, Patient Simple Clinical Colitis Activity Index; P-HBI, Patient Harvey-Bradshaw Index.

Further sociodemographic associations are given in Supplementary Table 1. Compared with males, female CD patients reported more disease activity (P =0 .002), lower SIBDQ (P = 0.02), and lower Physical Health (P = 0.037). Coupled CD patients had a lower GSI score than singles (P = 0.019).

Psychosocial Parameters

These psychosocial parameters data are in Table 2. The social support MSPSS total score was 5.9 ± 1.2 in UC and 5.8 ± 1.1 in CD, indicating a high level of social support in both diseases. The scores for "significant other" and "family" were about 85% of maximum in both diseases and somewhat higher than the score for "friends." These scores too were similar in UC and CD. The degree of psychological distress, as expressed by GSI, was significantly greater in CD than UC, 0.8 ± 7.7 vs 0.6 ± 0.7, respectively (P =0 .002); these scores however implied a low level of distress. Physical Health was lower in CD at 43.7 ± 10.9 than UC at 46.6 ± 11.4 (P = 0.013), these scores being less than 50% of maximum. The Mental Health score was similar in both diseases, 44% of maximum. The score for SIBDQ was moderate in both diseases.

Correlations

The correlation analysis is presented in Table 3A for UC and Table 3B for CD. Age was negatively correlated with physical health in UC. Economic status was negatively correlated with P-SCCAI (correlation coefficient −0.349, P < 0.001) and with P-HBI (−0.204, P < 0.013), indicating that patients who were better off economically reported less disease activity. In both diseases, economic status was correlated negatively with GSI and correlated positively with the 3 measures of quality of life (all P < 0.001). The MSPSS social support total score was negatively correlated with P-SCCAI (correlation coefficient −0.240, P = 0.012). Social support reducing the activity score in UC was derived from Significant other (P =0.019) and Friends (P = 0.011). Of note, MSPSS total score did not correlate with P-HBI.

MSPSS total score, Significant Other, Family, and Friends were all negatively correlated with GSI in both diseases (P <0.001). MSPSS total score, Significant Other, Family, and Friends were positively correlated with Mental Health and SIBDQ in UC and CD.

Multiple Linear Regression Analysis

These results are summarized in Table 4A for UC, and Table 4B for CD, where the independent variables are age, male gender, economic status, single family status, and MSPSS social support total score, and the dependent variables are the disease activity scores, GSI, and the quality of life measures. Results for Significant Other, Family, and Friends are given in the Supplementary Table 2 for UC and Table 3 for CD.

Among UC patients, multiple linear regression analysis for P-SCCAI yielded 3 significant independent predictors with negative β coefficients: gender (β = −0.235, P = 0.011),

TABLE 2: Social Support, Psychological Distress, and Quality of Life Measures in the Cohort

	UC	CD	
Variable (range)	Mean±SD, Median (Min; Max)(IQR*)	Mean±SD, Median (Min; Max)(IQR*)	*P*
MSPSS: Total (1–7)	5.9 ± 1.2	5.9 ± 1.1	0.530
	6.3 (1.0;7.0)(5.3;6.8)	6.1 (1.2;7.0)(5.3;6.8)	
MSPSS: Significant Other (1–7)	6.2 ± 1.1	6.3 ± 1.1	0.194
	6.5 (1.0;7.0)(5.7;7.0)	6.8 (1.0;7.0)(6.0;7.0)	
MSPSS: Family (1–7)	6.2 ± 1.2	6.0 ± 1.2	0.291
	6.5 (1.0;7.0)(5.8;7.0)	6.5 (1.0;7.0)(5.8;7.0)	
MSPSS: Friends(1–7)	5.4 ± 1.7	5.3 ± 1.6	0.306
	6.0 (1.0;7.0)(4.7;7.0)	5.8 (1.0;7.0)(4.3;6.8)	
GSI (1–4)	0.6 ± 0.7	0.8±.7	0.002
	0.4 (.0;3.3)(.2;.8)	0.7 (.0;3.0)(.3;1.2)	
SF-36: Physical Health (0–100)	46.6 ± 11.4	43.7 ± 10.9	0.013
	50.5 (20.6;65.5)(37.4;56.3)	45.9 (10.3;62.4)(36.8;51.8)	
SF-36: Mental Health (0–100)	44.8 ± 11.6	44.4 ± 10.5	0.642
	45.6 (18.0;67.9)(33.8;54.7)	46.1 (15.4;64.2)(35.1;52.6)	
SIBDQ (10–70)	53.1 ± 14.1	50.7 ± 12.8	0.055
	56.0 (14.0;70.0)(46.8;65.0)	52.0 (18.0;70.0)(42.0;61.0)	

* Interquartile range

MSPSS, Multidimensional Scale of Perceived Social Support; GSI, Global Severity Index; SF-36, MOS 36-Item Short Form Survey Instrument; SIBDQ, Short Inflammatory Bowel Disease Questionnaire.

TABLE 3: Correlations Between Disease Activity and Psychological Measures with Age, Economic Status, and Social Support

	P-SCCAI		GSI		SF:36 Physical		SF:36 Mental		SIBDQ	
a. UC										
	Corr coef	*P*	Corr coef	*P*	Corr coef	*P*	Corr coef	*P*	Corr coef	*P*
Age	-0.059	0.541	0.026	0.785	-0.293	0.002	0.186	0.052	0.109	0.255
Economic status	-0.349	<0.001	-0.408	<0.001	0.198	0.042	0.484	<0.001	0.477	<0.001
Social support Total	-0.240	0.012	-0.470	<0.001	0.194	0.042	0.378	<0.001	0.423	<0.001
Social support Significant Other	-0.222	0.019	-0.408	<0.001	0.166	0.084	0.354	<0.001	0.419	<0.001
Social support Family	-0.170	0.076	-0.448	<0.001	0.174	0.070	0.302	0.001	0.379	<0.001
Social support Friends	-0.242	0.011	-0.432	<0.001	0.242	0.011	0.345	<0.001	0.370	<0.001
b. CD e										
Age	0.086	0.303	-0.138	0.095	-0.066	0.425	0.159	0.054	0.054	0.512
Economic status	-0.204	0.013	-0.356	<0.001	0.293	<0.001	0.382	<0.001	0.445	<0.001
Social support Total	-0.075	0.367	-0.333	<0.001	0.078	0.345	0.360	<0.001	0.305	<0.001
Social support Significant Other	-0.115	0.166	-0.325	<0.001	0.048	0.561	0.350	<0.001	0.245	0.003
Social support Family	-0.036	0.663	-0.367	<0.001	0.013	0.877	0.417	<0.001	0.315	<0.001
Social support Friends	-0.071	0.391	-0.230	<0.001	0.108	0.194	0.240	0.003	0.237	0.004

Spearman Rank Correlations. Corr coef: correlation coefficient.
P-SCCAI, Patient Simple Clinical Colitis Activity Index; P-HBI, Patient Harvey-Bradshaw Index; GSI, Global Severity Index; SF-36, MOS 36-Item Short Form Survey Instrument (Physical Health, Mental Health); SIBDQ, Short Inflammatory Bowel Disease Questionnaire.

economic status (β = 0–.306, $P = 0.004$), and total social support (β = −0.222, P =0 .041). Interestingly, the total social support predictor effect on P-SCCAI was derived only from Friends (β = −0.245, $P = 0.02$, Supplementary Table 2). Gender predicted GSI, Physical Health, and SIBDQ. Economic status predicted GSI, Physical Health, Mental Health, and SIBDQ. Total social support predicted GSI, Mental Health, and SIBDQ. Economic status accounted for more of the variance in all the dependent variables than total social support and any other independent variable. Economic status accounted for 35% of the variance in SIBDQ, 24% in Mental Health, and 32% in GSI. The effect of total social support on these dependent variables was in the range of only 3%–7%. Significant Other, Family, and Friends had varying effects on GSI, Physical Health, Mental Health, and SIBDQ (Supplementary Table 2). Again, in this model economic status was a predictor of all 4 dependent variables and had the greatest effect on the variance. Concerning GSI, the R^2 change was greater with Family (0.060) than Significant Other (0.042) and Friends (0.051).

Among CD patients, multiple linear regression analysis for P-HBI (Table 4B) yielded 2 significant independent predictors: gender (β = −0.315, $P < 0.001$) and economic status (β = −0.255, $P = 0.005$). However, total social support was neither a predictor of P-HBI nor was any of its subscales. Gender predicted GSI, Physical Health, and SIBDQ in CD. Economic status again was a predictor of GSI and all the quality ofhealth measures. Total social support predicted GSI, Mental Health, and SIBDQ but not Physical Health. Economic status explained more of the variance of the dependent variables than the other predictors, except for P-HBI. Compared with UC, in CD a greater percentage of the variance remained unexplained. Significant Other predicted GSI, Mental Health, and SIBDQ, whereas both Family and Friends predicted GSI, Mental Health, and SIBDQ. In these models the R^2 change regarding GSI was 0.094 for Significant Other, 0.061 for Family, and 0.049 for Friends.

In view of the result of the path analysis for CD (shown below) we did a post hoc regression analysis, with GSI now acting as an independent variable, and found that GSI significantly predicted increased P-HBI (β = 0.391, $P < 0.001$), whereas total social support was not a predictor of P-HBI (β = 0.150, $P = 0.102$).

Structural Equation Modeling

We created path analysis models separately for UC (Fig. 1) and CD (Fig. 2). The models in both cohorts incorporated the

TABLE 4: Multiple Linear Regression Analysis[a] of Disease Activity and Psychological Measures with Demographic Variables and **Social Support total Score**

A. UC

	P-SCCAI*			GSI*			SF-36 Physical*			SF-36 Mental*			SIBDQ		
	Std reg coef	*P*	R^2 change	Std reg coef	*P*	R^2 change	Std reg coef	*P*	R^2 change	Std reg coef	*P*	R^2 change	Std reg coef	*P*	R^2 change
Age	-0.143	0.176	0.010	-0.030	0.746	<0.001	-0.086	0.415	0.034	0.164	0.102	.032	.128	.163	.013
Gender (male)	-0.235	0.011	0.033	-0.188	0.021	0.013	0.226	0.015	0.032	0.145	0.095	.007	.246	.002	.030
Economic status	-0.306	.0004	0.163	-0.421	<0.001	0.320	0.296	0.005	0.136	0.395	<0.001	0.243	0.488	<.001	.347
Family status (single)	-0.035	0.733	0.001	-0.005	0.957	0.006	0.184	0.079	0.015	-0.043	0.657	0.009	0.015	.865	.002
Social support Total Scale	-0.222	0.041	0.034	-0.325	0.001	0.073	0.176	0.104	0.022	0.220	0.032	0.034	0.233	.014	.038

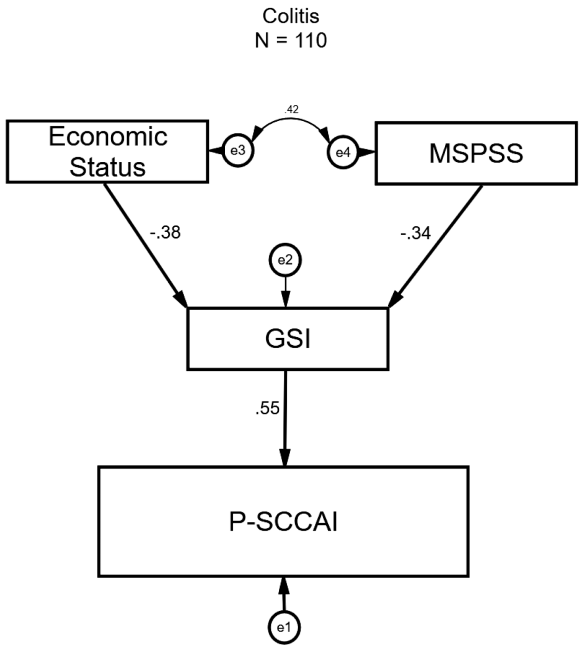
* Log-transformed values of P-SCCAI, GSI, SF:36 Physical Health, SF:36 Mental Health. Std reg coef: standardized regression coefficient. P-SCCAI, adjusted R Square = 0.201, GSI, adjusted R Square = 0.381, SF:36 Physical, adjusted R Square = 0.199, SF:36 Mental, adjusted R Square = 0.289, SIBDQ, adjusted R Square = 0.400. All model significances <0.001

B. CD

	P-HBI*			GSI*			SF-36 Physical*			SF-36 Mental*			SIBDQ		
	Std reg coef	*P*	R^2 change	Std reg coef	*P*	R^2 change	Std reg coef	*P*	R^2 change	Std reg coef	*P*	R^2 change	Std reg coef	*P*	R^2 change
Age	0.007	0.938	0.007	-0.164	0.042	0.013	-0.097	0.274	0.015	0.278	0.001	0.037	0.153	.050	.004
Gender (male)	-0.315	<0.001	0.075	-.221	0.004	0.015	0.250	0.004	0.040	0.142	0.064	0.003	0.301	<.001	.041
Economic status	-0.255	0.005	0.061	-0.254	0.002	0.160	0.240	0.009	0.070	0.371	<0.001	0.201	0.416	<.001	.245
Family status (single)	-0.038	0.666	0.001	0.060	0.447	0.009	-0.085	0.332	0.007	0.140	0.076	0.010	0.059	.446	.001
Social support Total Scale	0.001	0.990	0.000	-0.350	<0.001	0.099	0.035	0.700	0.001	0.262	0.001	0.055	0.235	.004	.044

* Log-transformed values of P-HBI, GSI, SF:36 Physical Health, SF:36 Mental Health. Std reg coef: standardized regression coefficient.

P-HBI, adjusted R Square = 0.112, GSI, adjusted R Square = 0.270, SF:36 Physical, adjusted R Square = 0.101, SF:36 Mental, adjusted R Square = 0.280, SIBDQ, adjusted R Square = 0.310. All model significances <0.001



	Estimate	S.E.	C.R.	p	β
Economic → GSI	-0.405	0.090	-4.523	0.001	-0.383
MSPSS → GSI	-0.196	0.048	-4.089	0.001	-0.343
GSI → P-SCCAI	2.856	0.417	6.843	0.001	0.548

FIGURE 1. Path analysis of variables affecting disease activity in UC patients.

Values shown are the β.

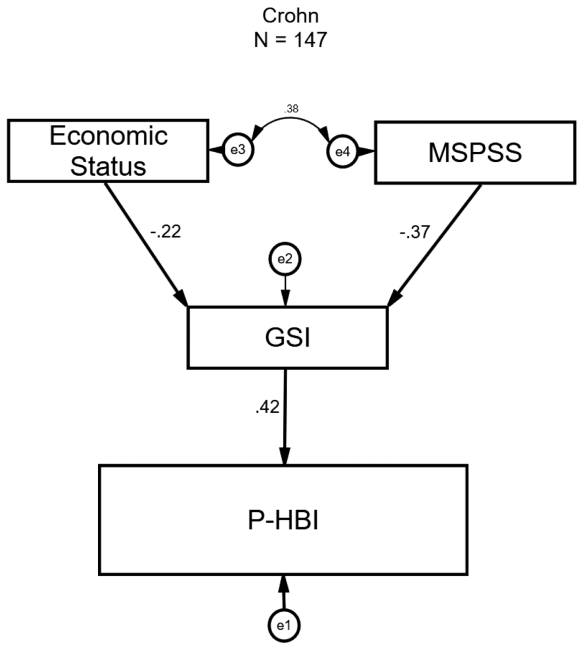
P-SCCAI, Patient Simple Clinical Colitis Activity Index; MSPSS, Multidimensional Scale of Perceived Social Support, total score; GSI, Global Severity Index.

variables economic status, total social support (MSPSS), psychological distress (GSI), and disease activity (P-SCCAI for UC and P-HBI for CD). Both models did not deviate significantly from the optimal model and reached the desirable goodness of fit measures: UC, $\chi^2 = 0.788$ DF = 2 $P = 0.674$ $\chi^2/df = 0.394$ CFI = 1 NFI = 0.993 RMSEA = 0 SRMR = 0.0199, and CD, $\chi^2 = 3.951$ DF = 2 $P = 0.139$ $\chi^2/df = 1.975$ CFI = 0.978 NFI = 0.959 RMSEA = 0.082 SRMR = 0.0376. All paths in the models drawn exceed significance of $P < 0.05$. Both models depict GSI as the mediator for total social support and economic status on the disease activity index. Total social support and economic status impact GSI negatively (reduce psychological distress) in both diseases; then GSI impacts P-SCCAI or P-HBI positively (acts to increase disease activity) in both diseases.

DISCUSSION

We have examined the impact of social support (including its 3 subscales), self-declared economic status and demographic variables on self-reported disease activity, psychological distress, and physical and mental health-related quality of life in a nonselected cohort of adult UC and CD patients in Israel. We found that patients with more perceived social support and a higher economic status had a higher quality of life and less psychological distress. Social support (total score) predicted less disease activity in UC patients in the regression model but did not predict reduced disease activity in patients with CD. Economic status predicted a reduction of disease activity in both UC and CD. However, the path analysis indicated that social support and economic status lessen disease activity in UC and CD patients by reducing psychological distress; GSI was the mediator of these effects. This would suggest that social support might lead to improved physical health.

The strong impact of economic status on patient well-being in our study was an expected result. Numerous studies have suggested that economic status is a major factor affecting the health of patients.[20–25, 42–45] It is often assumed that richer patients are able to receive high-quality medical care and to purchase more medications. Moreover, richer persons also tend to engage in better health-related behaviors such as eating, drinking, exercising, and attending psychological counseling, which improve their physical well-being.[45, 46] Thus, wealthier persons will better cope with their disease psychologically and medically. This



	Estimate	S.E.	C.R.	p	β
Economic → GSI	-0.209	0.075	-2.792	0.001	-0.218
MSPSS → GSI	-0.231	0.043	-4.684	0.001	-0.365
GSI → P-HBI	2.915	0.516	5.653	0.001	0.424

FIGURE 2. Path analysis of variables affecting disease activity in CD patients.

Values shown are the β.

P-HBI, Patient Harvey-Bradshaw Index; MSPSS, Multidimensional Scale of Perceived Social Support, total score; GSI, Global Severity Index.

is true also when expenditure on health services is reduced in times of recession.[25] Illness in a family requires redistribution of expenditures in the family budget.[47] In Israel, all patients have compulsory medical insurance, with a sliding scale of premiums based on the level of income, and are assured equal access to the public medical system. Even so, poorer individuals will be limited in their capacity to add additional private medical insurance, pay their share for medications, and consult private medical experts and meet indirect healthcare costs such as traveling to the medical facility. We cannot know from our study if the poorer patients indeed bought fewer medications or had less medical consultations, and this should be addressed in future studies. Of note, a study carried out in Paris found that socioeconomic deprivation did not adversely affect the health status of patients with IBD.[48] Perhaps access to health services is better in France than Israel. We found no further studies that examined the association between UC or CD and the patients' economic status, and this important topic should be further investigated. We also need to learn whether the health-related behavior of poorer patients is different from that of richer patients and whether such behavior indeed affects their medical condition.

The thrust of this paper concerns social support and its relationship to psychological distress and disease activity in UC and CD. Social support might be expected to be related to the psychological status and quality of life of patients with UC and CD, as shown in the regression analysis. We wished to determine whether there was any association between social support and the disease activity scores of UC and CD. Although social support correlated with P-SCCAI and predicted UC activity in the multiple linear regression analysis, it did not correlate with P-HBI and did not predict CD activity in the regression. This was an unexpected finding. However, the path analysis did indicate that social support, by its effect on the mediator psychological distress (GSI), reduced disease activity in CD as it did in UC. Interestingly, in the post hoc analysis GSI predicted increased disease activity in CD. Notably, the cohorts in both diseases were comprised of many patients in remission or with mild disease activity and with similar disease duration. More CD patients, however, had been treated with corticosteroids and biologic medication, and more patients had undergone surgery. Whether these factors account for the lack of correlation of social support with CD in the univariate analysis can only be

shown by comparing 2 CD cohorts with very different medical and surgical histories.

There are few reported studies of social support in IBD. One Canadian study found that 50% of persons with active IBD have psychological distress by the GSI score, and enhanced social support in these patients was associated with a significant reduction of distress.[49] Disease activity measures, however, were not employed. A Brazilian study reported that better social functioning was correlated with a higher quality of life in a small IBD cohort, but measures of social support were not used.[50] Another study reported that patients with IBD experienced more social support than healthy community controls, particularly when the disease was active.[51] These patients had a greater rate of missed work-days, but the effect of social support on actual disease outcome was not measured. Using the Personal Resource Questionnaire, a Canadian study found a similarly high level of social support in CD and UC patients.[52] The focus of that instrument on worth, intimacy, social integration, nurturance, and assistance however differs from the MSPSS that we have used, except for the category of assistance. Social support contributed to increased quality of life in postsurgical IBD patients; the Medical Outcomes Study Social Support Scale used in that work has much resemblance to the MSPSS.[53] Greater social support was also found to be a predictor of lower generalized distress in IBD patients at risk for colorectal cancer.[54] Few studies have examined the mechanisms whereby social support impacts on quality of life. The sensation of "helplessness catastrophizing" was found to be a negative mediator of the effect of perceived spousal social support on the quality of life in persons with IBD in 1 study.[12] We report here that social support by Significant Other, Family, and Friends can significantly improve the mental health (lowered psychological distress) and quality of life of UC and CD patients, albeit with some differences of impact. Shown here for the first time, this effect on psychological distress also tends to decrease the level of disease activity . We find in the path analysis that social support operates via the trajectory of psychological distress: it reduces psychological distress, which in return reduces disease activity. The known bidirectionality of perceived stress and IBD still poses a problem in understanding this relationship.[55] In this light, the documented associations between psychological stress and the physical condition of patients in other medical conditions also require further clarification.

Our main findings that focus on the role of social support from all 3 specified sources and the patient's economic status in UC and CD have important practical implications. Social workers, psychologists, and medical practitioners should become aware of the patient's economic status and consider what measures may be helpful in this situation. Patients themselves are often not informed about what financial sickpay benefits may be available to them in any country. In addition, medical and social practitioners should directly explore the level of social support that patients may receive from the significant other, family members, and friends. Those individuals who can provide social support to patients should be taught to have a positive supportive role whether the patient has a flare or is in remission. Whenever such support is not sufficient, interventions that may enhance it should be implemented, including live and internetsupport groups and individual and family counseling. These interventions are likely to improve both the mental and physical condition of IBD patients.

The strengths of our study relate to the cohort that was countrywide, employment of well-validated scales for patient-reported outcomes including disease activity and psychological measures, the use of advanced statistical methods of handling data that are not normally distributed, and SEM to examine path relationships. In our experience, self-declared economic status has more reliable associations with psychological scales than data of actual monthly income; furthermore, patients are reluctant to disclose actual earnings. We also recognize a number of limitations of our study. Self-reported information cannot be verified, notwithstanding the apparent reliability of such data.[56] Objective measures of disease activity, such as C-reactive protein, calprotectin, and colonoscopy data, would serve to validate patients' perception of their disease status, but this could not be mandated for ethical reasons. Furthermore, the presence of confounding symptoms of the irritable bowel syndrome could not be excluded.[57] The path analysis with disease activity set as the final dependent variable does suggest strongly that social support and economic status affect the indices of disease activity through the mediator of psychological distress. However, the cross-sectional nature of our study can limit its ability to indicate the absolute directionality of these associations. Future studies should thus consider the use of longitudinal designs to determine more objectively the directionality of the observations and the effects of enhanced social support in the long term.

In conclusion, social support appears to decrease disease activity in UC and CD patients by its ameliorating effect on psychological distress. The management of IBD patients should incorporate more psychosocial aspects in addition to advances in medical care. Until the etiology of IBD is uncovered, this joint approach will remain the mainstay of care.

SUPPLEMENTARY DATA

Supplementary data are available at *Inflammatory Bowel Diseases* online.

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