


Social Relationship Quality Among Patients With Chronic Pain: A Population-Based Sample

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Abstract

Objective: Chronic daily pain is experienced by 11.2% of United States adults and psychosocial factors have significant impact on self-reported pain. Most research in this area has focused on pain-related conditions, not the general population. This study sought to understand the associations between clinically significant chronic pain and multiple dimensions of social relationship quality in a general population. **Methods:** A cross-sectional survey was deployed and adjusted logistic regression models were constructed for chronic pain against independent social support domains. The moderating effect of self-rated health on social support quality was explored. **Results:** Of all, 26.1% of surveys were completed (3920/15 000) and 18.8% reported clinically significant chronic pain. Patients with chronic pain had lower friendship quality (aOR = 0.78; 0.64-0.94) and higher perceived rejection (aOR = 1.26; 1.04-1.53) and perceived hostility (aOR = 1.26; 1.05-1.52). Within our moderation analysis, chronic pain patients with low self-rated health had higher odds of low friendship quality, high loneliness, and high perceived rejection. **Conclusions:** Chronic pain patients experience social relationships differently than those without, and self-rated health differentially impacts these perceptions.

Keywords

chronic pain, social support, survey, NIH social support toolkit

Background

Pain is one of the most common reasons for visits to a health-care provider (1), and chronic daily pain is experienced by 11.2% of United States adults (2). Approximately one-third of patients seen in a primary care setting have chronic pain (3). Despite the lack of understanding of long-term efficacy for the chronic pain indication (4–6), opioids are commonly prescribed to manage it (6).

Psychosocial factors play a significant role in pain (7–11). Episodes of loneliness have been associated with increased pain (12,13) and negative social relations (14). Mental health disorders influence pain perceptions, and current estimates suggest that 16% of the US population with these conditions receive over one-half of prescribed opioids (15).

The majority of this research has been conducted among patients with pain or pain-related conditions. Furthermore, a relationship between the quality of social relationships and pain has not consistently been observed (16). Previous studies have demonstrated the associations between psychosocial factors and pain, but no identified investigations have

assessed these associations in a general population. Additionally, few studies have explored multiple social support domains simultaneously. The National Institutes of Health (NIH) developed brief self-report scales designed to assess aspects of social support, companionship, and social distress. These broad concepts of social relationships are subdivided into subdomains of social support (emotional and instrumental support), companionship (friendship and loneliness), and social distress (perceived rejection and perceived hostility)

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(17). Insight into the potential impact of varying subdomains of social relationships on chronic pain in the general population may advance the development of strategies to combat the coexisting pain and opioid epidemics.

The present study conducted a survey of 15 000 adults in a multistate medical practice to explore the associations between clinically significant chronic pain associated with prescription opioid therapy and the quality of social relationships. The main hypothesis was that patients with chronic pain associated with the receipt of a prescription opioid in the last 12 months would report lower levels of social support and companionship and higher levels of social distress.

Data and Methods

Study Overview

This study was approved as research by the institutional review board of Mayo Clinic. The present study deployed a cross-sectional, electronic survey in January of 2018 using Qualtrics (Provo, Utah) to 15 000 respondents using the personal e-mail address on file. An initial invitation was sent, followed by 2 e-mail reminders. Respondents were provided the ability to opt out of survey participation and all survey responses were anonymous.

Study Population

This study surveyed individuals who had (1) at least one interaction with one of the 3 main Mayo Clinic sites (Jacksonville, Florida; Phoenix, Arizona; Rochester, Minnesota) during the 12 preceding months, (2) an e-mail address on file, (3) an age of ≥ 18 years, and (4) provided research authorization per state-specific guidelines. Institutional records were used to exclude patients deceased at survey deployment.

Measures

The main exposure of interest was self-reported chronic pain with an associated opioid prescription in the 12 months preceding survey completion. This study used the receipt of an opioid prescription as validation of clinically significant chronic pain. Survey respondents were first asked: "We would like to understand if you have had pain and have used pain medications, specifically opiate medicines (opioids). Opiate medicines ("opioids") include tramadol, oxycodone, hydrocodone, codeine, morphine, hydromorphone, oxymorphone, fentanyl, methadone, and buprenorphine. In the past year, did you use any opioids that were prescribed to you by a health-care provider?" If respondents responded affirmatively, they were prompted with: "This question asks about pain. SHORT-TERM PAIN is from an injury or surgery and is expected to resolve after a few days. LONG-TERM PAIN lasts weeks to months and may never go away. The last time you used an opioid that was prescribed for you by a health-care provider, was it to relieve SHORT-TERM pain, or LONG-TERM PAIN, or both?" Survey respondents were

included in the "chronic pain associated with an opioid prescription" group if they answered "long-term pain" to this second question.

The second set of primary measures was the NIH Adult Social Relationship Scales (17). These tools were developed to fill the need for brief yet precise scales to evaluate distinct constructs of social relationships. Three broad domains and 6 subdomains were explored: social support (emotional support, instrumental support), companionship (friendship, loneliness), and social distress (perceived rejection, perceived hostility). Each subdomain question set contained between 5 and 8 individual survey items on a 5-point Likert scale. Internal consistency for each subdomain was assessed via the calculation of Cronbach's α , and each subdomain demonstrated high internal consistency (Cronbach's α range: 0.93-0.97). Each subdomain was scored independently by summing responses for all included survey items according to item response theory. Subdomain response directionality was set to be consistent across subdomains from most positive (1) to most negative (5). Distributions of summed responses were assessed by subdomain, and cut points were established to dichotomize each scale in order to identify the least favorable 25% of responses. This approach resulted in dichotomized subdomain level groups to represent low degree of emotional support, instrumental support, and friendship and high degree of loneliness, perceived rejection, and perceived hostility.

Other items included in this survey included age, gender, race, ethnicity, self-rated health, self-report of diagnosis by a health-care provider of anxiety and depression, insurance type, and current working status. Each of these items was assessed as potential covariate, moderation, and mediation variables in this study. The list of survey questions can be found in Online Appendix 1.

Statistical Analyses

Population characteristics were stratified by report of clinically significant chronic pain associated with prescription opioid therapy and were described using mean (SD, standard deviation) or median (IQR, interquartile range) for continuous variables and count (% , percentage) for categorical variables. Bivariate comparisons were performed using χ^2 and Mann Whitney *U* tests, as appropriate.

To understand respondent perception of social relationship constructs by clinically significant chronic pain, the present study analyzed the bivariate distributions with χ^2 and then deployed logistic models against the dichotomized low 25%/remaining 75% subdomain score on each of the 6 social relationship subdomains independently. Unadjusted logistic regression models were constructed of report of chronic pain with prescription opioid therapy against dichotomized subdomain social relationship constructs. Each respondent's descriptive characteristic was entered into the direct effect models individually to assess for confounding identified by a 10% change in β within the overall model.

Adjusted logistic regression models then included continuous patient age, respondent-reported diagnosis of anxiety and/or depression, and self-rated health status as a 5-point categorical variable. Both unadjusted and adjusted odds ratios (ORs) and associated 95% confidence intervals (CIs) are provided.

Due to the apparent effects of self-rated health on perceptions of social relationship subdomains among patients with chronic pain, stratified unadjusted and adjusted logistic regression models were created, and ORs and 95% CIs were calculated for this subpopulation. The moderating effect of self-rated health on the associations between chronic pain and perception of social relationship constructs was also assessed using the Baron and Kenny's approach (18).

All data management and statistical analyses were performed using Statistical Analysis Software (SAS) version 9.3 (Cary, North Carolina). Statistical significance was detected with a $P < .05$ and an OR and associated 95% CI that did not include the null value.

Results

Demographics

The present study had 3920 respondents to the survey (response rate: 26.1%), 737 of whom reported chronic pain with an associated opioid prescription over the past 12 (18.8%) months, 12 who reported acute pain with an associated opioid prescription over the past 12 (0.3%) months, and 3 (0.07%) who identified both acute and chronic pain. The majority of respondents was female, white, non-Hispanic, had "very good" self-rated health, held private insurance, and were currently working (Table 1). Patients reporting chronic pain associated with a prescription opioid were significantly different than those reporting not having chronic pain with respect to age, self-rated health, and self-reported anxiety and depression.

Chronic Pain Associated With Prescription Opioid Therapy and Social Relationships

Within the unadjusted models, respondents reporting clinically significant chronic pain had higher odds of low levels of emotional support and increased odds of reporting high levels of loneliness, perceived rejection, and perceived hostility (Table 2). After adjustment, respondents reporting clinically significant chronic pain had lower odds of reporting a low level of friendship but increased odds of high levels of perceived rejection and hostility.

Moderation and Mediation of Self-Rated Health on Social Relationship for Respondents Reporting Chronic Pain

Among respondents reporting chronic pain, unadjusted models demonstrated that individuals with lower levels of

self-rated health were at increased odds of reporting low levels of friendship and high levels of loneliness and perceived rejection (Table 3). Each finding persisted after adjustment for reported diagnoses of anxiety and/or depression. Self-rated health was not a significant mediator for the relationships observed between chronic pain and the perception of the other social relationship levels.

Discussion

The present study observed that clinically significant chronic pain was associated with the quality of several social relationship subdomains in a population-based sample of patients. Specifically, clinically significant chronic pain in the previous year was associated with decreased odds of low friendship and higher odds of perceived rejection and hostility after controlling for age, self-rated health, anxiety, and depression. This study also observed that self-rated health significantly moderated the relationship between clinically significant chronic pain such that low friendship, high loneliness, and high perceived rejection were more likely to be reported among patients with low or fair self-rated health.

The finding that patients reporting clinically significant chronic pain had 26% higher odds of perceived hostility is consistent with and expand on existing literature observing associations between perceived hostility in social relationships and pain (19–21). Burns et al (22) published prospective data demonstrating that among patients with chronic musculoskeletal pain, patient-perceived spousal criticism and hostility were correlated significantly with pain intensity, and patient-perceived spousal hostility significantly predicted patient pain intensity 3 hours later (22). Burns et al (22) considered hostility and criticism as different variables and unidimensional scales were employed. The present study did not limit presented social relationship to spouses but asked about "people in your life" using multidimensional scales for the subdomains. Burns et al (22) also evaluated patients with chronic pain. The present study expands on this work by suggesting the existence of a similar relationship between clinically significant chronic pain and hostility in a population-based sample of patients. The finding that patients reporting clinically significant chronic pain also had 26% higher odds of perceived rejection supports literature elucidating the link between social rejection and physical pain (23). Human laboratory experiments have suggested a direct relationship between social rejection and reports of pain unpleasantness (24) and that physical pain is reduced by social experiences, such as inclusion(25).

Social relationships may be mitigating or exacerbating clinically significant chronic pain through the enabling or facilitation of positive pain coping strategies. Holtzman et al observed that social support and pain coping are linked among patients with rheumatoid arthritis such that satisfaction with support was associated with higher use of cognitive reframing, emotional expression, problem-solving, and distancing oneself from pain (26). Additionally, social and

Table 1. Demographic Characteristics of Survey Respondents.

	Chronic Pain (n = 737)	Nonchronic Pain (n = 3183)	Total (N = 3920)
Age ^a			
Median (IQR)	62.0 (52.0, 70.0)	59.0 (46.0, 70.0)	60.0 (47.0, 70.0)
Gender, n (%)			
Male	250 (33.9)	979 (30.8)	1,229 (31.4)
Female	479 (64.9)	1,772 (55.7)	2,251 (57.4)
Missing	8 (1.2)	432 (13.5)	440 (11.2)
Race, n (%)			
Asian	2 (0.3)	64 (2.0)	69 (1.8)
White	704 (95.5)	2639 (82.0)	3343 (85.3)
Black/African American	10 (1.4)	22 (0.7)	32 (0.8)
Hawaiian/Pacific Islander	3 (0.4)	3 (0.1)	6 (0.2)
American Indian/Alaskan Native	6 (0.8)	11 (0.3)	17 (0.4)
Other	12 (1.6)	28 (0.9)	40 (1.0)
Missing	0 (0.0)	416 (13.0)	416 (10.6)
Ethnicity, n (%)			
Hispanic/Latino	16 (2.2)	52 (1.6)	68 (1.7)
Not Hispanic/Latino	633 (85.9)	2,370 (74.5)	3003 (76.6)
Missing	88 (11.9)	761 (23.9)	849 (21.7)
Self-rated health, n (%) ^b			
Very good	113 (15.3)	879 (27.6)	992 (25.3)
Good	297 (40.3)	1465 (46.0)	1762 (44.9)
Average	144 (19.5)	481 (15.1)	625 (15.9)
Fair	140 (19.0)	224 (7.0)	364 (9.3)
Poor	40 (5.4)	45 (1.4)	85 (2.2)
Missing	51 (6.9)	89 (2.8)	92 (2.3)
Self-reported anxiety diagnosis, n (%) ^b			
Yes	271 (36.8)	718 (22.7)	989 (25.2)
No	432 (58.6)	1981 (62.2)	2413 (61.5)
I don't know	17 (2.3)	56 (1.7)	73 (1.9)
Missing	17 (2.3)	428 (13.4)	445 (11.4)
Self-reported depression diagnosis, n (%) ^b			
Yes	316 (42.9)	787 (24.8)	1103 (28.1)
No	400 (54.3)	1919 (60.3)	2319 (59.2)
I don't know	11 (1.5)	49 (1.5)	60 (1.5)
Missing	10 (1.4)	428 (13.4)	438 (11.2)
Insurance, n (%)			
Public	278 (37.7)	800 (25.1)	1078 (27.5)
Private	399 (54.3)	1796 (56.4)	2195 (56.0)
None	2 (0.3)	18 (0.6)	20 (0.5)
Other	51 (6.9)	136 (4.3)	187 (4.8)
Missing	7 (1.0)	433 (13.6)	440 (11.2)
Working status, n (%)			
Currently working	330 (44.8)	1560 (49.0)	1890 (48.3)
Not currently working	401 (54.4)	1200 (37.7)	1601 (40.8)
Missing	6 (0.8)	423 (13.3)	429 (10.9)

Abbreviation: IQR, interquartile range.

^aMann Whitney U, $P < .01$.

^bTwo-tailed χ^2 , $P < .05$.

emotional support is recommended for patients with endometriosis based on systematic review (27). Social support facilitated by technology has been studied. Guillory et al observed that twice-daily supportive text messages in conjunction with standard care was associated with reduced perceptions of pain and pain interference and improved positive affect compared to standard care controls (28). The present data reinforce the need to evolve clinical practice away from the medical model of pain as a warning sign of

tissue damage toward a biopsychosocial model. The biopsychosocial model proposes that pain is a dynamic experience between organic, clinically measurable disease activity, thoughts and beliefs about pain, and environmental factors such as social relationships. Leveraging this model will facilitate the development and incorporation of novel approaches to the treatment of pain in clinical practice that could impact the underlying disease and not just the symptoms.

Table 2. Domains of Social Relationship and Chronic Pain Associated With an Opioid Prescription in Previous Year.^a

	Chronic Pain + Opioid (n = 737)	No Chronic Pain (n = 3183)	Unadjusted Model			Adjusted Model ^b		
	n (%)	n (%)	OR	95% CI	P Value	OR	95% CI	P Value
Emotional support ^c								
Low	238 (32.3)	824 (25.9)	1.36	1.14-1.62	<.001 ^d	1.14	0.95-1.38	.16
Moderate/high	499 (67.7)	2359 (74.1)	–	–	–	–	–	–
Friendship								
Low	211 (28.6)	910 (28.6)	1.00	0.84-1.20	.98	0.78	0.64-0.94	.01 ^c
Moderate/high	526 (71.4)	2273 (71.4)	–	–	–	–	–	–
Instrumental support								
Low	194 (26.3)	894 (28.1)	0.92	0.76-1.10	.33	0.86	0.71-1.04	.11
Moderate/high	543 (73.7)	2289 (71.9)	–	–	–	–	–	–
Loneliness ^c								
High	263 (35.7)	799 (25.1)	1.66	1.40-1.96	<.001 ^d	1.07	0.89-1.30	.47
Moderate/low	474 (64.3)	2384 (74.9)	–	–	–	–	–	–
Perceived rejection ^c								
High	226 (30.7)	621 (19.5)	1.83	1.53-2.18	<.001 ^d	1.26	1.04-1.53	.02 ^c
Moderate/low	511 (69.3)	2562 (80.5)	–	–	–	–	–	–
Perceived hostility ^c								
High	248 (33.7)	786 (24.7)	1.55	1.30-1.84	<.001 ^d	1.26	1.05-1.52	.01 ^c
Moderate/low	489 (66.3)	2397 (75.3)	–	–	–	–	–	–

Abbreviations: CI, confidence interval; OR, odds ratio.

^an = 3920.^bAdjustment factors: age, self-reported diagnosis of anxiety and/or depression, and self-rated health.^cSignificantly different, *P* < .05.^dSignificantly different, *P* < .001.**Table 3.** Moderating Effect of Self-Rated Health on Quality of Social Support.

	Unadjusted Model			Adjusted Model ^a		
	OR	95% CI	P Value	OR	95% CI	P Value
Low emotional support						
Low/fair health	1.34	0.94-1.90	.10	1.13	0.79-1.63	.50
Average/good/very good health	–	–	–	–	–	–
Low friendship						
Low/fair health	2.52	1.77-3.59	<.001 ^b	2.10	1.46-3.04	<.001 ^b
Average/good/very good health	–	–	–	–	–	–
Low instrumental support						
Low/fair health	1.32	0.91-1.92	.14	1.15	0.79-1.68	.47
Average/good/very good health	–	–	–	–	–	–
High loneliness						
Low/fair health	2.02	1.44-2.85	<.001 ^b	1.60	1.11-2.32	.020 ^c
Average/good/very good health	–	–	–	–	–	–
High perceived rejection						
Low/fair health	2.11	1.49-3.00	<.001 ^b	1.75	1.22-2.53	.003 ^c
Average/good/very good health	–	–	–	–	–	–
High perceived hostility						
Low/fair health	1.23	0.87-1.75	0.24	1.00	0.69-1.44	0.99
Average/good/very good health	–	–	–	–	–	–

Abbreviations: CI, confidence interval; OR, odds ratio.

^aAdjustment factors: age, self-reported diagnosis of anxiety, and/or depression.^bSignificantly different, *P* < .001.^cSignificantly different, *P* < .01.

The present study observed that patient perception of the quality of friendship, loneliness, and rejection varies by self-reported health status for patients with chronic pain. Interestingly, individuals with chronic pain within this study report a decreased likelihood of having difficulties identifying and forming close relationships (ie, friendships); however, these individuals possess a greater likelihood to perceive rejection and hostility from these relationships. Yet, those with low self-rated health reported poorer social relationships and greater social distress. Self-rated health is recognized to be a subjective estimation of a patient's overall well-being, and research has shown that self-rated health status is associated with objective measures of health including mortality (29,30), disability (31), and morbidity (32). Additionally, self-rated health may be related to measures of social determinants of health (33). Previous studies have observed a significant relationship between chronic pain and self-rated health, but these constructs are independent of one another (34). Previous work has assessed the quality of social relationships, such as social integration at an individual level, and social capital at a community level. Community-level social capital may be significantly related to both individual-level measures of health and factors such as social trust (33). However, no studies have previously identified self-rated health as a modification factor for perceived quality of social relationships for patients with chronic pain.

Strengths and Limitations

The present study had several strengths. First, this study used a population-based sample to explore the relationship between clinically significant chronic pain and the quality of social relationships. Second, the present study deployed a validated instrument to understand multiple subdomains of social relationship quality to expand on other studies which limited measures to a single construct of social relationships (eg, loneliness) or have deployed proxy measures (eg, marital status) to gauge social support. To our knowledge, the present study of the link between chronic pain and the quality social relationships is the largest sample to date, and each subdomain demonstrated high internal consistency (Cronbach's α : 0.93-0.97).

Our study also has several limitations. First, the approach of sampling among individuals who had an interaction with the health-care system could bias the sample toward individuals who used health-care services which may increase the odds of sampling individuals experiencing chronic pain. The prevalence rate of past year chronic pain of 18.8% is higher than previously reported, and the present sample may be experiencing misclassification of the chronic pain group due to self-election to chronic or acute pain. Second, the use of an electronic survey approach may introduce selection bias into the study. This study is also unable to evaluate the impact of the quality of social relationships on opioid prescribing as it did not have a comparison of patients with

clinically significant chronic pain who did not receive opioids. Finally, this survey did not assess the temporal relationship between the quality of the social relationships experienced at the time of a clinically significant chronic pain episode. These findings could therefore be overestimating the association between these social support domains and chronic pain.

Conclusion

In conclusion, the findings of this study are underpinned by the enlarging body of literature suggesting that physical and social pain overlap in their underlying neural circuitry (23). Hypotheses derived from this link suggest that factors enhancing sensitivity to social distress should enhance and perpetuate perceptions of physical pain. The present study observed a relationship between chronic pain and perceived rejection and hostility and that self-rated health significantly moderated relationships between chronic pain and low friendship, high loneliness, and high rejection. Future research should explore the extent to which modifiable aspects of social relationship quality can be leveraged to address the chronic pain crisis.


Declaration of Conflicting Interests

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Supplemental Material

Supplemental material for this article is available online

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