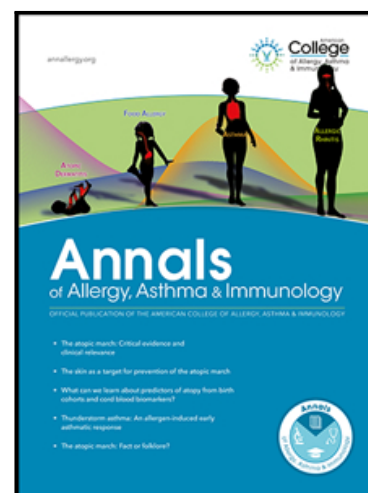


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Coping, social support, and anxiety in people with Mast Cell Disorders

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Background : Mast cell disorders (MCDs) are rare, chronic, debilitating diseases with a varied and complex clinical trajectory that creates challenges to physical and mental health. Reliable estimates of the prevalence of anxiety in this population are largely nonexistent. Furthermore, very little is known about how sufferers' coping efforts affect their emotions and adjustment. Because a person with a MCD cannot eliminate the stressors associated with their chronic illness, it is important to understand what helps them adjust.

Objective: To document the magnitude of anxiety in MCD sufferers, their physical symptoms, levels of social support, and ways of coping with the stress of the disease, and examine the extent to which symptoms, social support, and coping are associated with anxiety.

Methods: Individuals with a mast cell disorder completed an anonymous Internet-based survey (N=157).

Results: More than half of individuals with mast cell disorders in this study found their illness to be very stressful and nearly a third were experiencing moderate levels of anxiety. Participants who had more

frequent and severe physical symptoms reported higher levels of anxiety. Those who reported coping with their problems by using planning strategies and those who felt they had more social support available to them were less anxious; those who used more avoidant strategies to cope were more anxious.

Conclusion: Based on the current results, and intervention work in other chronic illness groups, it seems likely that coping behaviors are a fruitful target of intervention for patients with a MCD to reduce their emotional distress.

Keywords

mast cell disorders, chronic illness, anxiety, coping, social support

Introduction

Mast cell disorders (MCDs) are a group of rare, chronic, debilitating illnesses (including mastocytosis and mast cell activation syndrome) associated with cutaneous, gastrointestinal, musculoskeletal, cardiovascular, and neuropsychiatric abnormalities (1). MCDs have a varied and complex clinical trajectory that creates challenges to physical and mental health. Affected individuals face substantial stressors associated with having a chronic illness, compounded by the unique circumstances of these rare disorders. Physical symptom variability between and within individuals over time (2) and limited physician familiarity and expertise complicate and delay diagnosis of mast cell disorders (3) (average time from illness onset to diagnosis is 6.5 years) (4) and can result in multiple medical evaluations, often incurring considerable out-of-pocket cost (5). Treatments are available for symptom management, but there are no cures. Trying new medications is also a concern because of the possibility of being treated with medications that are contraindicated for mast cell disorders (6) including potentially life-threatening anaphylactic reactions (7). Managing the unpredictable physical symptoms associated with MCDs is an overwhelming task that is emotionally distressing for sufferers (3, 4, 8, 9). Although levels of depression have been reported to be as high as 40-70% in MCDs (8, 10-

13), reliable estimates of the prevalence of anxiety in this population are largely nonexistent. Furthermore, very little is known about how sufferers' coping efforts affect their emotions and adjustment. Because a person with a MCD cannot eliminate the stressors associated with their chronic illness, it is important to understand what helps them adjust. The purpose of the current study was to document the magnitude of anxiety in MCD sufferers, their physical symptoms, levels of social support, and ways of coping with the stress of the disease, and examine the extent to which symptoms, social support, and coping are associated with anxiety.

Mast Cell Disorders and Anxiety

When mast cells are activated, they release pro-inflammatory substances (14, 15) which can lead to a wide variety of symptoms including anaphylaxis, fatigue, headache, angioedema, flushing, rash/hives, diarrhea, uterine cramps or bleeding, shortness of breath, blood pressure instability, acid reflux, muscle and bone pain, syncope, brain fog, and flushing (1, 14). Potential triggers of mast cell activation include heat/cold, emotional and physical stress including pain, exercise, fatigue, foods and beverages, medications, infections, and venom (4).

The relationship between anxiety and symptoms of chronic illnesses such as MCD is not well understood (16, 17), but is likely bidirectional, involving a variety of behavioral and biological processes (18). Anxiety is also associated with poorer quality of life in people with various chronic illnesses (19, 20), and with greater physical disability (21), healthcare utilization (22), physical symptoms, functional impairment (23, 24), and disease progression (25).

The Present Study

Documenting levels and contributors to anxiety in this population can facilitate the development of appropriate interventions and highlight pathways through which anxiety might affect mast cell disorders. One aim of this study was therefore to identify the magnitude of

anxiety in individuals with these disorders. Given the complex clinical presentation and psychological consequences of having a mast cell disorder, we expected individuals with a mast cell disorder to experience levels of anxiety comparable to those in other chronic illnesses, and we predicted that greater physical symptomatology would be associated with higher anxiety.

A second aim was to examine social support and ways of coping that are likely to be associated with anxiety in this population and that have been shown to aid psychological adjustment to a variety of chronic illnesses such as cancer, cardiovascular disease, and rheumatoid arthritis (26-31). We hypothesized that greater social support and adaptive coping efforts such as planful problem solving (e.g., generating multiple solutions to a problem, creating and focusing on a plan of action), seeking social support, self-control, and positive reappraisal (a cognitive emotion regulation strategy involving identification of positive aspects of a stressor (Folkman & Moskowitz, 2000; Gross, 1998; Garnetski et al., 2001)) would be associated with lower anxiety, whereas ways of coping previously shown to be maladaptive such as distancing, escape-avoidance, and accepting responsibility would predict higher levels of anxiety.

Methods

Overview

The current study analyzes data from a larger study on individuals with a chronic disorder (Author, 2019); here we report on those with MCDs and only results for variables pertinent to our hypotheses about that group. For the larger study, English speaking adults 18 or older with any type of chronic illness were invited to complete an anonymous, 90 minute Internet-based survey about their “experience of having a chronic illness.” The study was approved by the Institutional Review Board of [removed for blind review]. Written informed consent was obtained from all individual participants included in the study. Among efforts to recruit

participants with various chronic disorders, we advertised the current study on the website, Facebook page, and newsletter of The Mastocytosis Society, a non-profit organization for patients and families affected by MCDs. The study was also advertised on the website of the National Organization for Rare Disorders (NORD), a non-profit patient advocacy organization. A total of 157 participants with an MCD responded.

Measures

Anxiety. The State Anxiety subscale of the State-Trait Personality Inventory (STPI; (32)) includes 10 items (e.g., right now “I feel worried,” “I feel calm” [reverse scored]), rated on a 4-point scale from 0 (not at all) to 3 (very much). Items were averaged. The STPI is highly correlated with its parent measure, the State-Trait Anxiety Inventory (33) which has well-established validity as a measure of anxiety in chronic illness (34). This subscale performed well in the current study (Cronbach’s $\alpha = .94$).

Coping. Coping was assessed using an abbreviated version of the Revised Ways of Coping Questionnaire (WCQ) (35) which was previously used successfully with mastocytosis patients (12) Participants indicated over the past month how often they tried each of a list of strategies to manage the strains and challenges of what they indicated was the most stressful aspect of having a mast cell disorder on a 5-point scale from 0 (never) to 4 (very often). Subscales included: confrontive coping, distancing, self-control, seeking social support, accepting responsibility, escape-avoidance, planful problem-solving, and positive reappraisal. Items comprising each subscale were averaged. The measure has well-demonstrated psychometric properties (12). In the current study, Cronbach’s alphas for the coping subscales ranged from .59 to .74.

Participants were also asked to describe the most stressful aspect of their illness and to identify what it involved (e.g., quality of intimate/romantic relationships, work, finances, health). Additionally, participants indicated how stressful their illness was over the past month on a 3-point scale from 0 (not at all) to 2 (very stressful).

Social Support. The 20-item Medical Outcomes Study-Social Support (MOS-SS)(36), a psychometrically sound instrument that was developed for patients with chronic conditions, was used to measure perceived functional social support including affection, positive interactions, emotional and tangible support, and information. Respondents indicate “how often someone is available” if each type of support were needed (e.g., “to listen to you,” “to take you to the doctor”) on a 5 point scale from 1 (none of the time) to 5 (all of the time)(36). Items comprising the total score were averaged as was each subscale. The MOS-SS had high internal consistency in the current study (Cronbach’s $\alpha = .97$), as did the subscales (all Cronbach’s $\alpha > .93$).

Symptoms. Physical symptoms were assessed using a self-report symptom checklist modeled after the symptom codes in the International Classification of Diseases, Tenth Revision (ICD10)(37). Participants indicated the frequency with which they experienced a symptom (e.g., “Tachycardia,” “Nausea,” “Flushing,” “Tremor,”) from 1 (never) to 5 (very often) as well as the severity of each symptom they experienced from 1 (not severe) to 4 (severe). A z-score composite of the two subscales was created.

Results

Data Preparation

To prepare the data for all subsequent analyses, summary statistics including means, standard deviations, and frequencies were examined to ensure that all values were within range and showed sufficient variation between participants (see bottom of Table 2). Each variable was

examined for missing values. Roughly 34% of the coping data were missing, which was likely attributable to its position toward the end of the long survey (90 minutes). Therefore, we took a conservative approach and used listwise deletion in the regression analysis.

Pearson product moment correlations were used to determine bivariate associations of symptoms of anxiety with age, physical symptoms, social support, and ways of coping. Sequential regression analysis was the multivariate technique used to determine unique predictors of anxiety. Sequential regression analysis (also known as hierarchical regression) allows independent variables to be entered into the equation in an order based on a priori hypotheses. Variables hypothesized to predict the dependent variable (e.g., age) are entered into the equation first, producing an R^2 value (i.e., the percent of variance in the dependent variable explained by the independent variables in the regression model). The addition of subsequent independent variables or sets of independent variables (e.g., physical symptoms, social support, ways of coping) into the equation produces a change in R^2 value. This analysis allows researchers to determine what each independent variable or set of independent variables uniquely add to prediction of the dependent variable by assessing the change in R^2 value (Tabachnick & Fidell, 2013).

Sample Description. As shown in Table 1, a majority of the 157 participants were White, female, partnered, college-educated, not employed but not on disability, and roughly half had a household income of \$60,000 or less.

The mean item anxiety score was 1.20, representing an average endorsement of feeling “somewhat” anxious with 29.44% of the sample reporting feeling “moderately” anxious.

Mean perceived social support was 3.42, representing an endorsement that one had social support “some of the time.” On average, participants perceived having affection, positive interactions, emotional, informational, and tangible support “some of the time.”

When asked about their illness, more than half (55%) of respondents reported that over the past month their illness was “very stressful.” Participants indicated that the most stressful aspects of the illness were related to personal health, finances, work/employment, and social relationships. The most frequent ways of coping with their illness were planful problem solving, positive reappraisal, and self-controlling (see Table 2).

In correlation analyses, age was the only participant characteristic associated with symptoms of anxiety (see Table 2). The social support total score and subscales including emotional and informational support, affection, and positive interactions along with the coping subscales of positive reappraisal and planful problem solving were inversely associated with symptoms of anxiety. Escape avoidant coping and accepting responsibility along with physical symptoms were positively associated with symptoms of anxiety.

Predictors of symptoms of anxiety. Stepwise linear regression was used to predict symptoms of anxiety, adjusting for age. Analyses tested the hypothesis that physical symptoms would predict higher levels of anxiety, while social support and adaptive coping efforts such as planful problem solving (e.g., generating multiple solutions to a problem, creating and focusing on a plan of action), seeking social support, self-control, and positive reappraisal (e.g., identifying positive aspects of a stressor), seeking social support, self-control, and positive reappraisal) would be associated with less anxiety and maladaptive ways of coping (distancing, escape-avoidance, and accepting responsibility) would be associated with higher levels of anxiety. Controlling for age, greater physical symptoms and more frequent use of escape

avoidance predicted greater anxiety; more frequent use of planful problem solving and greater perceived availability of social support were associated with lower anxiety. Together these factors accounted for 43% of the variance in anxiety ($p < 0.01$). Age, accepting responsibility, and positive reappraisal were not significant predictors of anxiety.

Discussion

This study is one of the first investigations of the prevalence and predictors of anxiety in individuals with mast cell disorders, suggesting coping strategies that may influence their psychological adjustment. More than half of individuals with mast cell disorders in this study found their illness to be very stressful and nearly a third were experiencing moderate levels of anxiety. More frequent and severe physical symptoms were related to elevated levels of anxiety. Those who reported more adaptive coping strategies, namely more frequent use of planning strategies and more social support, were less anxious, whereas those who used more avoidant coping strategies such as escape avoidance were more anxious.

Individuals in this study tended to rely on problem-focused coping involving efforts to change or control stressors associated with having a mast cell disorder, which predominantly involved their health, finances, work, or social relationships. However, participants also engaged in avoidant coping more frequently and sought out social support slightly less frequently than previously reported in individuals with mast cell disorders (12). Positive reappraisal (e.g., strategies involving identifying the positive aspects of stressor) and accepting responsibility were associated with lower and higher anxiety, respectively, in bivariate correlations, but were not associated with anxiety when other variables were examined simultaneously. These results are also consistent with research on coping with chronic illnesses such as cancer, cardiovascular disease, and rheumatoid arthritis (26-28). Avoidant coping hinders decisions and actions that an

individual may need to make in order to manage their illness (38). Paradoxically, attempting to avoid thinking about a stressor may actually intensify those thoughts and exacerbate distressing emotions (39) and it requires significant effort (40, 41). Conversely, problem-focused coping behaviors allow an individual to directly address the stressors associated with having a disorder through creating a plan of action, drawing on past experiences, preparing different solutions to the problem, and concentrating on what has to be done (42).

Although participants who felt that they had social support were less anxious than those who lacked support, on average, the sample reported less social support compared to individuals with HIV/AIDS (43), cancer (44), and those with ambulatory chronic illnesses (36). These results are consistent with a recent study that found that individuals with mastocytosis frequently experience difficulties with social interactions, limited activities with other people, disruption to social relationships, and negative impact of the disease on their friends and family (3). Because of the rarity of MCDs and the public's unfamiliarity with them, sufferers are likely to feel they have to prove the legitimacy of their illness to family and friends, adversely affecting the quality of their relationships.

The current study is not without limitations. In an effort to capture a robust psychological picture of chronic illness and the novelty of including individuals with a rare chronic illness, participants were asked to complete a long questionnaire (i.e., around 90 minutes). Variables at the end of the questionnaire had the most missing data, likely due to its length. Although the majority of study measures were well validated and common in the literature, a few of the coping subscales had fairly low internal consistency, meaning that our results may underestimate their true association with anxiety. The physical symptom questionnaire instructed participants to rate the frequency and severity of a variety of symptoms that were not illness specific. Additionally,

variables were assessed at one point in time, limiting interpretation of their direction of association. The sample, which consisted predominantly of White, educated, women may not be representative of all individuals with MCDs; the sociodemographic factors characterizing people with MCDs have not been documented. Still, the current study is one of the first to examine the magnitude of anxiety in individuals with MCDs and to identify ways of coping and other factors associated with anxiety in this understudied population.

Coping is a dynamic process (35, 45) and as a stressor evolves, individuals may change their coping efforts (46). Adjustment to chronic illness has been shown to unfold over time (28), often with newly diagnosed individuals experiencing the worst psychological states (47). Therefore, future studies evaluating coping and emotions in individuals with MCDs would do well to employ a repeated measures, longitudinal design, such as using daily diary methods to examine associations over time. Another vital direction for future research in this population is to explore the role of mast cells in explaining anxiety and anxiety-like behaviors.

Based on the current results, and intervention work in other chronic illness groups, it seems likely that coping behaviors are a fruitful target of intervention for patients with a MCD to reduce their emotional distress. Although individuals tend to rely on the same coping strategies (48), coping efforts are modifiable (49). Coping interventions aimed at increasing problem-focused coping and decreasing avoidance have shown great promise in people with a variety of chronic illnesses (50, 51) including reducing anxiety in those with breast cancer (52) or HIV (53), pain in those with inflammatory bowel disease (54), depression among Rheumatoid Arthritis patients (55), and general distress in people with diabetes (56). Coping interventions focused on emotional expression have also been shown to have lasting mood-related benefits in a variety of chronic illnesses (57-60). Without effective, proven treatments for this poorly

understood, debilitating disorder, understanding what helps affected people cope with the stressful nature of a MCD and providing them with the support they need to cope successfully is an especially important goal.

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Table 1
Sample Characteristics

	<i>M (SD)</i>	<i>n</i>	<i>%</i>
Age	43.30 (13.16)		
Mast Cell Disorder			
Mastocytosis		33	21.02
Mast Cell Activation		124	78.98
Missing		<u>0</u>	<u>0</u>
		157	100.00
Diagnosed by a physician			
Yes		136	86.62
No		0	0
Missing		<u>21</u>	<u>13.38</u>
		157	100.00
Gender			
Female		149	94.90
Male		6	3.82
Other		1	0.64
Missing		<u>1</u>	<u>0.64</u>
		157	100.00
Marital Status			
Married or Living with Partner		92	58.60
Not Married		48	30.57
Missing		<u>17</u>	<u>10.83</u>
		157	100.00
Education level			
High School graduate		20	12.74
Associate's Degree		29	18.47
Bachelor's Degree		48	30.57
Master's Degree		24	15.29
Doctorate/Professional Degree (Ph.D., M.D., J.D.)		12	7.64
Other		6	3.82
Missing		<u>18</u>	<u>11.46</u>
		157	100.00
Racial/ethnic background			

White	129	82.17
African American	2	1.27
Hispanic	4	2.55
Asian American	0	0.00
Native American	3	1.91
Missing	<u>19</u>	<u>12.10</u>
	157	100.00

Employment

Employed	59	37.58
Not employed	81	51.59
Missing	<u>17</u>	<u>10.83</u>
	157	100.00

Annual household income

Under \$15,000	23	14.65
\$15,001 - \$45,000	33	21.02
\$45,001 - \$60,000	13	8.28
\$60,001 - \$75,000	8	5.10
\$75,001 or More	60	38.22
Missing	<u>20</u>	<u>12.74</u>
	157	100.00

Table 2

Pearson product moment correlations among study variables and descriptive statistics

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Anxiety	1	-.325**	.356**	-.315**	-.0085	-.225*	-.369**	-.290**	.016	.020	.028	.201*	.492**	-.448**	-.215*	-.0027
2. Age		1	-.0204	.0034	.0014	-.0022	.0099	.0033	.329**	.083	.0162	-.0023	-.336**	.0104	.379**	.0132
3. Physical symptoms			1	-.0200	-.0055	-.0127	-.0168	-.0171	.0166	.0142	.0193	-.0017	.311**	-.0135	.254*	-.0012
Social support																
4. Emotional & info				1	.628**	.623**	.745**	.925**	.0051	.0118	.479**	-.0090	-.0117	.292**	.0014	-.0078
5. Tangible					1	.529**	.553**	.800**	-.0021	.0127	.235*	-.0003	-.0064	.0069	.0027	-.0084
6. Affectionate						1	.724**	.791**	.0073	-.0004	.251*	.0038	-.0057	.397**	.0113	.0077
7. Positive interactions							1	.863**	-.0014	.0048	.285**	-.0076	-.0207*	.332**	.0025	-.0008
8. Social support total								1	.0023	.0102	.395**	-.0055	-.0134	.296**	.0009	-.0058
Ways of Coping																
9. Confrontive									1	.0119	.405**	.269**	.454**	.276**	.0143	.0134
10. Distancing										1	.000	.205*	.0073	.232*	.271**	.473**
11. Seeking social support											1	.0020	.201*	.320**	.0148	-.0116
12. Accepting responsibility												1	.387**	.0116	.270**	.434**
13. Escape avoidan													1	-.212*	.0051	.0109

ce																
14. Planful problem solving														1	.367**	.271**
15. Positive reappraisal															1	.365**
16. Self controlling																1
M	1.20	43.30	0.61	3.34	3.27	3.83	3.45	3.42	1.63	2.08	2.10	1.65	1.87	2.48	1.90	2.45
SD	.77	13.16	0.84	1.04	1.29	1.22	1.11	.98	.60	.64	.69	.79	.66	.66	.62	.60
α	0.94	NA	NA	0.95	0.95	0.95	0.93	0.97	0.59	0.59	0.68	0.66	0.66	0.74	0.62	0.61

* $p < 0.05$ (2-tailed), ** $p < 0.01$ (2-tailed)

Table 3 Results of sequential regression analysis predicting symptoms of anxiety

	Variable	t	β	R^2	R^2 change	df	F	F change
Anxiety	<i>Model 1</i>			0.05*		1,84	4.77	4.77
	Age	-2.185	-0.23*					
	<i>Model 2</i>			0.43*	0.38	7,78	8.35	8.51
	Age	-0.04	-0.00					
	Physical symptoms	2.30	0.21*					
	Social support	-1.95	-0.14					
	Accepting responsibility	0.17	1.71					
	Escape avoidance	2.60	0.33*					
	Planful problem solving	-2.06	-0.25*					
	Positive reappraisal	-0.14	-1.05					

** $p < 0.01$ (2-tailed)

* $p < 0.05$ (2-tailed)