

The Influence of Dyspnea on Chronic Pain and Psychological Distress Among Adult Patients With Sickle Cell Disease (SCD)

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Resumen

Aunque el dolor es uno de los síntomas medulares de la Anemia Falciforme (AF), las enfermedades respiratorias dentro de esta población son comunes. Las enfermedades respiratorias y su influencia en el funcionamiento fisiológico y psicológico no son bien entendidas. El propósito de este estudio fue investigar los efectos de la disnea, un síntoma primario respiratorio que se asocia con muchas enfermedades, sobre el dolor y el funcionamiento psicológico ente pacientes con AF. Los resultados indican que la disnea, tras controlar por edad y género, no influyó en variables en reportes de dolor según medido por varios indicadores. Sin embargo, la disnea se correlacionó significativamente con altos niveles de somatización, sensibilidad interpersonal, depresión, ansiedad, hostilidad, ideación paranoide y psicoticismo, según medido por el la Lista de Cotejo de Síntomas-90. Las personas con disnea también reportaron un Índice de Severidad General y un Total de Síntomas Positivos. Los resultados sugieren que la disnea debe ser considerada en la concepción de factores que influyen el funcionamiento de pacientes con AF.

Palabras Claves: Disnea, Enfermedad Anemia Falciforme, psicopatología.

Abstract

While pain is the hallmark symptom of SCD, respiratory illnesses within this population are common. Respiratory illnesses and their influences on physiological and psychological functioning are not well understood. The purpose of this study was to investigate the effect of dyspnea, a primary respiratory symptom associated with many diseases, on pain and psychological functioning among adult African American patients with SCD. Our results indicated that dyspnea, after controlling for age and gender, did not exert influence on reports of pain

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as measured by several standard indicators. However, dyspnea produced greater levels of Somatization, Kinesiophobia, Interpersonal Sensitivity, Depression, Anxiety, Hostility, Paranoid Ideation, and Psychoticism as measured with the Symptoms Checklist 90, Revised (SCL-90-R). Patients with dyspnea also reported greater General Severity Index and Positive Symptom Total, summary indices of psychopathology. The results of the study suggest that dyspnea must be considered in the comprehensive conceptualization of factors that influence functioning among patients with SCD.

Key Words: Dyspnea, Sickle Cell Disease, Psychopathology

Respiratory illnesses affect millions of adults in the US each year (Disease Control Priorities Project, 2008). These illnesses are the results of environmental exposures to pollution, pathogens, pulmonary injury (Disease Control Priorities Project, 2008; Schwartz, 1993) as well as genetic predispositions (Phillips et al., 2008). For individuals who suffer from chronic diseases, respiratory illnesses are common and may account for increased disability as well as primary disease exacerbation (Rohde et al., 2003).

Sickle cell disease (SCD) is a genetic disorder of the blood that is characterized by painful crises (Edwards et al., 2009) and impairments in physical and psychological functioning (Harrison et al., 2005; Strickland et al., 2001). Respiratory illnesses are common among patients with SCD, but their impact on psychological functioning and pain in these patients is not well understood. Asthma, a common respiratory illness in the general population, is also common among patients with SCD (Morris, 2009; Klings et al., 2006). Current studies that explore respiratory disorders among patients with SCD have focused more on children than adults and have rarely explored the symptoms of respiratory illnesses on primary indices of SCD health (Morris, 2009; Boyd et al., 2004).

Dyspnea, an uncomfortable awareness of breathing-related sensations or focus on breathing mechanics as is indexed by feelings of

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shortness of breath or the sensation of pending suffocation, is a primary symptom associated with respiratory illness, and a common experience for patients with SCD (Mahler et al., 1996; Thomas, von Gunten, 2003; American Thoracic Society, 1990). Anxiety, airway obstructions, inflammatory processes, and pressures inside the airway and critical pulmonary vessels can also produce dyspnea (Morris, 2009; Boyd et al., 2004; Katon, Richardson, Lozano, McCauley, 2004; Carr, Lehrer, Rausch, Hochron, 1994). The influence of the presence of dyspnea on pain and psychological functioning in adult patients with SCD is virtually unknown (Wasserman, Cassaburi, 1988).

The aim of the current study was to explore the effects of the presence of dyspnea, associated with any respiratory or pulmonary disease, on psychological functioning and pain among patients with SCD. We hypothesized that the presence of dyspnea would adversely affect psychological functioning and pain among adults with SCD. More specifically, patients with SCD who self-report dyspnea would also report higher levels of pain and greater psychological distress as compared to patients with SCD who did not report the presence of dyspnea.

Method

Participants

The participants were 157 patients recruited from the Sickle Cell Clinic located at Duke University Medical Center in Durham, NC. Sixty-four of the 157 patients underwent dyspnea screening. The Sickle Cell Center provides inpatient and outpatient care to over 500 patients with SCD per year. All participants were 18 years of age or older. The study included 70 (45%) male and 86 female participants (one participant did not report gender) between the ages of 18 and 75 ($M = 35.59$, $SD = 12.73$). The participants were assessed during their scheduled clinic visits using a 700-item survey developed as part of the larger longitudinal study.

For the current analysis, only completed datasets were utilized. All of the participants signed informed consent forms. The study was

approved by the Duke Institutional Review Board. No compensation was provided for participation in the study. Subjects were excluded from the current analysis if they were actively in an acute episode of pain or other urgent medical crisis at the time of clinic visit, had a labeled eating disorder, or if they were unable to read and comprehend the written instructions for testing. Patients were also excluded from analysis if they had a diagnosis representative of a chronic illness not commonly associated with SCD (i.e. cancer, tuberculosis).

Instruments

Longitudinal Exploration of Medical and Psychosocial Factors in Sickle Cell Disease (LEMPFSCD)

The Longitudinal Exploration of Medical and Psychosocial Factors in Sickle Cell Disease (LEMPFSCD), is a multidimensional paper and pencil instrument designed specifically for examining this population. The LEMPFSCD is a 700-question tool consisting of pain, demographic, and 8 validated, content-driven instruments for the assessment of psychiatric, behavioral, and social functioning. For the purpose of the current study the following content areas were examined: parental alcohol abuse, demographics, pain, psychopathology, coping, and socially desirable responding (Edwards et al., 2006; Pells et al., 2007; Harrison et al., 2005).

Pain

Pain severity was measured with the Short Form McGill Pain Questionnaire (SF-MPQ), and a visual analogue scale (Melzack, 1987). The SF-MPQ is structured to assess qualitative and quantitative aspects of pain including location, intensity, quality, and temporal dimensions. Subjects were asked to rate the current intensity of each pain-related adjective by circling “none, mild, moderate, or severe.” Participants also rated the items on a 10-point scale. The visual analogue scale (VAS) consists of a 100-mm line with “no pain” written at one end and “worst imaginable pain” written at the opposite end and was used to assess spontaneous pain. The distance in millimeters from the no-pain end to the location of the mark gave a measurement of the pain. In the

current report, we present the results for all four composite items from the SF-MPQ. Two of the variables were subscales (sensory and affective) of the SF-MPQ. One variable was the VAS. The final variable, the present pain index (PPI), is a single question summarizing the patient’s pain experience.

The Multidimensional Pain Inventory (MPI-2) is a brief version of the West Haven-Yale Multidimensional Pain Inventory (WHYMPI; Kerns, Turk, & Rudy, 1985; Von Korff, 1992). The MPI-2 is a self-report measure developed by using items from four subscales of the long version and contains Section I of 28 questions assessing pain level and how it interferes with normal daily activities. Section II of the MPI-2 contains questions concerning perceptions of how a spouse or significant other responds to the individual when experiencing pain. Section III of the inventory asks that the individual rate the frequency of participating in 19 daily activities. The internal consistency of the WHYMPI has ranged from .56 to .86 (Kerns, et al., 1988).

Using portions of the LEMPFSCD, we collected information about the patients’ reports of pain. We used the LEMPFSCD to obtain information about the patients’ current pain, average weekly pain, average monthly pain, functionality, maximum pain intensity able to be tolerated, and amount of pain reduction needed for noticeable pain relief, as measured on a 10-point scale.

Psychopathology

The Symptom Checklist-90, Revised (SCL-90-R) was used to evaluate the magnitude of common psychopathologies including Somatization, Obsessive-compulsion, Interpersonal Sensitivity, Depression, Anxiety, Phobic Anxiety, Hostility, Paranoia, Psychosis, General Severity Index (GSI), Positive Symptom Distress Index (PSDI), and the Positive Symptom Total (PST; Derogatis, 1977). Response options range from 0 (not at all) to 4 (extremely). Internal consistency for the subscales ranges from .77 to .90.

Marlow-Crowne Social Desirability Scale (MCSD)

The MCS-D is often incorporated in studies to account for a study subject's tendency to respond to questions in a culturally desirable manner. The original instrument was developed by Marlow and Crowne in 1960. Our study employed a shortened version containing 20 questions with true-false answers (Crowne, 1960). The scale presents culturally approved behaviors with a low probability of occurrence. Higher scores represent an increased tendency to answer questions according to what the subject believes would likely please the proctor.

Dyspnea

Participants responded to a question designed to assess the presence of dyspnea. Patients were asked if they were currently experiencing shortness of breath and were given the options of choosing to answer "yes" or "no." The presence of dyspnea was defined as an endorsement of current shortness of breath by the participant.

Procedures

Study procedures are briefly described in Edwards et al., 2006, Pells et al., 2007, Harrison et al., 2005. All patients were consented and enrolled individually in the current study during routine visits to the hematology clinic. Patients were identified by the study hematologist as suitable for participation based upon the patients' ability to read and characteristics matched against inclusion and exclusion criteria. They were then approached by study personnel about participation. All patients were given a brief verbal overview of the study which also informed participants that we would be conducting a review of their medical records to ascertain a healthcare utilization history. They were then allowed to read the consent forms. Each subject was allowed to ask questions and gain clarification before signing consent.

Subjects were then provided a copy of the survey, moved to a relatively quiet or isolated portion of the waiting room when possible, and given instructions for completion of the survey by a member of the study team. Additional clarification or instructions were given to patients as requested. Once complete, the survey was collected and an informal debriefing was provided.

Study Design

The current study represents a cross-sectional analysis of first-year data collected as part of a longitudinal study of medical and psychosocial factors that impact pain in patients with SCD.

Statistical Analysis

Descriptive statistics were used to denote the sample characteristics. Analysis of Variance (ANOVA) was used to evaluate the differential effects of dyspnea on pain and psychopathology in adult patients with SCD. We note the potential increased internal validity of our results controlling for disease-severity related variables but our N, although sufficient for primary statistical pursuits, is associated with diminished statistical power as we add covariates. We did manage our analyses with and without control for social desirability given its borderline significance, but did not find any real changes in the pattern of variables that were significant. As such and given concern for statistical power, we only presented our analyses without control for such variables. T-tests were evaluated at the .05 level of significance given the novel nature of the study and our desire to explore all potential areas of significance for future exploration where we will deploy additional controls for error in prospective analyses.

Results

Of the 157 patients, one individual did not report gender. Therefore, using 156 adult patients (55% female; 86) with SCD, mean aged 35.59 +- 12.73, we explored the effects of pulmonary dysfunction as indexed by dyspnea on pain and psychopathology. Because questions about respiratory illnesses were added in a revised version of our questionnaire, only 64 patients (36 female) had full data to include this information. Forty-one of 64 patients (66%) acknowledged current dyspnea (24 females; 17 males) while 23 patients denied this symptom.

We found that dyspnea, controlling for age and gender, did not significantly exert influences on pain severity or interference from pain,

the sensory, affective, and summary indices of pain, current pain intensity, average daily, weekly, and monthly pain intensity, or pain frequency. Functionality associated with pain as measured by a 0-10 scale, or the maximum pain intensity patients believed they can tolerate, was also not significantly affected by the presence of dyspnea. Lastly and in the context of the patient's current pain ratings, dyspnea did not significantly affect the amount of pain needed for patients to experience noticeable relief. See Table 1 for means, Fs and P-values for pain variables.

In the next phase of the statistical exploration, we sought to understand if dyspnea affected psychological functioning among adult patients with SCD. We found that, controlling for age and gender, patients who reported dyspnea reported higher amounts of Somatization ($p=.03$), Kinesiophobia ($p=.003$), Interpersonal Sensitivity ($p=.01$), Depression ($p=.01$), Anxiety ($p=.007$), Hostility ($p=.009$), Paranoid Ideation ($p=.03$), and Psychoticism ($p=.05$). Patients with dyspnea also reported greater General Severity Index ($p=.004$), and Positive Symptom Total ($p=.002$), two summary indices of the pain experience. However, dyspnea did not significantly influence Obsessive-Compulsive thoughts and behaviors. Groups did not differ in the propensity for socially desirable responding. See Table 2 for means, Fs and P-values for psychological outcomes.

Discussion

The current study sought to explore the influence of dyspnea, a symptom common among adult patients with SCD, on pain and psychological function. We hypothesized that the presence of dyspnea would influence higher reports of pain and greater reports of psychological distress. Contrary to our hypothesis, dyspnea was not found to exert significant influence on reports of immediate pain intensity and severity, or interference from pain.

We note that studies that have demonstrated a relationship between pain and various pulmonary illnesses such as asthma (Boyd et al., 2006; Phillips et al., 2008) used majority samples with little or no

African American representation, did not include patients diagnoses with SCD, and did not explore the influence of the specific symptom dyspnea (Boyd et al., 2006; Boyd et al. 2007; Phillips et al., 2008). Genetic, coping, biological, social, cognitive, and affective differences between patients with SCD and other studied samples may account for substantial difference in pain thresholds and tolerances, and ultimately reports of factors that influence the experience of pain (Mechlin, Heymen, Edwards, Girdler, 2011; Whitfield, et al., 2006; Edwards, Scales, et al., 2005; Edwards, Fillingim, Keefe, 2001).

Although we did not find influences of dyspnea on reports of pain, we found that the presence of dyspnea exerted substantial influences on psychological distress. Consistently and across almost all indices of psychological functioning explored, patients with SCD who reported dyspnea also reported greater psychological distress-- dyspnea was not found to influence the presence of specific phobia. We were particularly attentive of the influence of dyspnea on indices of anxiety. Somatization, the tendency to worry about health concerns to the exclusion of other priorities, Kinesiophobia, the fear of movement, and general anxiety, the tendency to worry in a global and often non-specific manner, were all significantly intensified by the presence of dyspnea even after we controlled for the potential effects of gender and age.

We conceptualized our findings as suggesting that dyspnea likely exacerbates psychological distress and raises anxiety (Wright, Branscomb, 1955). Patients with SCD who struggle to breathe may also present with greater general worries and greater concerns about their overall health (Somatization). Additionally, these patients may present as more depressed, skeptical and distrusting (paranoia), hostile, and with greater feelings of disenfranchisement or unique and odd experiences (psychoticism). Although the Dyspnea-Anxiety cycle has been recognized and described in other populations, little is known about this phenomenon in patients with SCD (Bailey, 2011). These patients may be candidates for management with psychological interventions like relaxation training or psychiatric interventions like anxiolytics (Farquhar, Higginson, Fagan, Booth, 2010). Future studies should focus on the efficacy of mental health-related interventions in the management

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of psychological distress in patients with dyspnea as well as potentially reducing dyspnea among adults with SCD.

We highlight the significance of dyspnea in adults with SCD by noting that almost 7 in 10 patients we studied endorsed the symptom. Given that dyspnea appears to exert little influence on reports of pain, a primary symptom associated with acute crisis and need for intervention in this population, it's longer-term and potentially equally debilitating effects on mental health can't easily be ignored. The current study suggests that 7 of 10 adult patients with SCD may be at significant risk for mental health consequences associated with their disease. Based on the current findings, dyspnea may be dually conceptualized as a serious physical symptom as well as an index of increased risk for potential psychiatric morbidities. Future studies must begin to explore dyspnea as part of a constellation of symptoms that may cue additional or more intense medical management or more aggressive psychological and psychiatric interventions. Better understanding of the relationship of dyspnea to psychological distress may ultimately enhance clinical outcomes and improve the ecological validity of research studies and the effectiveness of clinical interventions.

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Table 1: A comparison of Means, F-Statistics, and P-values for Dyspnea Effects on Pain

Variable	Dyspnea		F-Stat	P-Values
	No	Yes		
	Means	Means		
MPI – Severity	30.22	35.87	0.85	0.471
MPI – Interference	32.04	34.51	1.35	0.267
Current Pain	2.59	3.32	0.67	0.575
Avg. Weekly Pain	3.95	4.99	0.97	0.411
Avg. Monthly Pain	4.39	5.83	1.30	0.282
MPQ - Sensory	15.58	18.16	0.91	0.443
MPQ - Affective	5.70	6.19	0.45	0.718
MFQ - PPI	3.37	3.47	0.10	0.959
MFQ - VAS	43.96	39.34	0.51	0.681
Functionality	6.67	6.69	0.52	0.673
Maximum Pain Intensity Tolerated	4.70	6.27	2.36	0.081
Amount of Pain Reduction for Noticeable Relief	3.27	3.66	0.72	0.543

Note. MPI= Multidimensional Pain Inventory; MPQ= McGill Pain Questionnaire.

Table 2: A Comparison of Means, F-Statistics, and P-values for Dyspnea Effects on Psychological Variables

Variable	Dyspnea		F-Stat	P-Values
	No	Yes		
	Means	Means		
Somatization	54.14	60.80	3.19	0.030
Obsessive-compulsive Interpersonal Sensitivity	51.04	57.85	2.24	0.093
Depression	47.14	54.68	3.97	0.012
Anxiety	49.80	58.11	3.89	0.013
Hostility	45.84	55.16	4.51	0.007
Phobic Anxiety	44.55	52.61	4.25	0.009
Paranoid Ideation	49.78	53.24	1.97	0.129
Psychoticism	49.13	55.03	3.14	0.032
General Severity Index	51.06	57.38	2.71	0.053
Positive Symptom Distress Index	49.89	59.15	4.94	0.004
Positive Symptom Total	50.14	53.68	1.55	0.211
Socially Desirable Responding	49.95	59.71	5.48	0.002
	20.06	22.92	2.66	0.056