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Dyad of Pain and Depression in Chronic Rhinosinusitis

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Abstract

Background—Pain and depression often coexist as comorbidities in patients with chronic disease and exert a major impact on quality of life (QOL). Little is known about the relationship between pain and depression in chronic rhinosinusitis (CRS). Our objective was to investigate this relationship and to analyze the effect of pain and depression on QOL in CRS.

Methods—Patients with CRS were prospectively recruited as part of an observational cohort study. A total of 70 participants provided pain scores using both the Brief Pain Inventory Short Form (BPI-SF) and the Short Form McGill Pain Questionnaire (SF-MPQ). Patients at risk for depression were identified using the Patient Health Questionnaire -2 (PHQ-2). CRS-specific QOL was determined using the Sinonasal Outcome Test-22 (SNOT-22).

Results—Significant positive correlations were found between depression scores and all pain measures ($R = 0.475\text{--}0.644$, $p < 0.001$). Patients with a PHQ-2 score ≥ 1 had significantly higher scores on all reported pain measures. Significant positive correlations were found between all pain measures, the total SNOT-22 score, and three SNOT-22 subdomains (sleep, psychological dysfunction, and ear/facial symptoms; $R = 0.323\text{--}0.608$, $p < 0.05$).

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Conclusions—Adult patients with CRS at risk for depression experience more pain and have overall worse disease-specific QOL. Further research investigating the complex interactions between depression and pain and the role it plays in CRS disease-specific QOL is warranted.

MeSH Key Words

Pain; depression; sinusitis; quality of life; data collection

INTRODUCTION

Pain and depression are two important factors impacting quality of life (QOL) for patients suffering from chronic illness. Both pain and depression are highly prevalent in the general population, resulting in significant morbidity and exerting a major impact on healthcare utilization and expenditure in the United States.^{1–3} The estimated lifetime prevalence of pain symptoms is approximately 24–37%, and pain is the number one presenting complaint for patients seeking medical care.¹ Major depressive disorder affects millions of Americans annually with an estimated prevalence of 10%², and there are certainly many more whom experience depressive symptoms without meeting diagnostic criteria for major depressive disorder. Depression is estimated to be responsible for greater than 80 billion dollars in healthcare expenditure in the US annually.³

Pain and depression are often found to coexist in patients with chronic disease, and there is an increasing body of evidence in the literature suggesting that the two are interrelated.¹ The close relationship between the two has been demonstrated in many chronic illnesses including multiple sclerosis, rheumatoid arthritis, heart failure, cancer, and others.^{4–8} In fact, it has been suggested that the combination of pain and depression may be viewed as part of a depression-pain syndrome or dyad, rather than as completely separate entities.^{1,9}

Despite abundant evidence that pain and depression are related in patients with chronic illness, the underlying mechanism responsible for this phenomenon has not been completely elucidated. It is known that pain and depression share some common neurobiological pathways and neurotransmitters.^{1,10} For patients with chronic illness, inflammation is often a component of the disease process, and an association between pain, depression, and inflammation has been demonstrated⁶ although the mechanism for this has also not been determined.

As with other chronic illnesses, pain and depression are often seen in patients with chronic rhinosinusitis (CRS).^{11,12} The available literature on the pain-depression dyad in patients with CRS is limited. The purpose of the present study is to further analyze the relationship between pain and depression in CRS using a validated screening instrument to identify patients at risk for major depression or depressive symptoms. We also sought to examine the effect of pain and depression on CRS-disease severity and QOL in patients with CRS.

MATERIALS & METHODS

Subjects and Data Collection

Study participants were enrolled from the University of Utah Sinus and Skull base clinic, which is located in an academic, tertiary care setting. Adult patients who were determined to have the diagnosis of CRS according to the 2007 American Academy of Otolaryngology Adult Sinusitis Guideline were considered possible candidates and were approached about enrollment.¹³

Study participants were required to complete all necessary enrollment procedures including providing informed consent. Participants completed all study-related questionnaires including the Sinonasal Outcome Test-22 (SNOT-22), the Patient Health Questionnaire-2 (PHQ-2), the Brief Pain Inventory Short Form (BPI-SF), and the Short-Form McGill Pain Questionnaire (SF-MPQ).

Demographic information and medical/social history were obtained from each study participant, including: age, gender, asthma, acetylsalicylic acid (ASA) sensitivity, allergy, current tobacco use, alcohol consumption, prior sinus surgery and obstructive sleep apnea (OSA). CT and endoscopy scores were also recorded. Approval from the University of Utah Institutional Review Board (IRB #61810) was obtained for all study protocols.

Exclusion criteria

Participants with a current diagnosis of an autoimmune and/or inflammatory disease such as rheumatoid arthritis or systemic lupus erythematosus (SLE) were excluded from the final analysis due to the potential for confounding, given that depression and pain have been shown to correlate in these conditions.^{6,7} Similarly, patients with underlying severe or debilitating illnesses such as multiple sclerosis, cancer, cystic fibrosis (CF), or heart failure were also excluded given the high likelihood of comorbid depressive symptoms and pain in this population.^{4,5,8,11} Patients with chronic pain conditions including fibromyalgia and chronic migraines were excluded. In addition, all study participants who failed to complete all study-related questionnaires during the initial enrollment meeting were excluded. Patients with a pre-existing diagnosis of depression were not excluded from the analysis.

Research Instruments

PHQ-2—The Patient Health Questionnaire-2 (PHQ-2) has been validated as a screening tool for patients who are at-risk for depression.¹² It is comprised of the first two questions of the longer Patient Health Questionnaire-9 (PHQ-9), and inquires about depressed mood and anhedonia. Participants are asked to report how frequently they have experienced 1) little interest or pleasure in doing things and 2) feeling down, depressed, or hopeless in the past two weeks on a scale from 0 (not at all) to 3 (nearly every day). Using a cutoff score of 1 or greater, the PHQ-2 has a sensitivity and specificity of 97.6% and 59.2%, respectively, for detection of major depressive disorder, and a sensitivity and specificity of 90.6% and 65.4%, respectively, for detection of any depressive disorder. A score threshold of 1 or greater, instead of the traditional cutoff of 3, was used to decrease the likelihood of misclassifying at-risk patients.

BPI-SF—The Brief Pain Inventory Short Form (BPI-SF) is an instrument used to measure pain intensity and the extent to which pain interferes with daily activities. Although primarily used to assess pain in cancer patients, the instrument has been validated for use in chronic non-malignant pain and has been used to examine facial pain in patients with CRS.¹⁶ Participants are asked to rate their current pain level on a 0–10 scale with larger numbers representing more severe pain. Participants are also asked to rate their pain at its “worst,” “least,” and “average” on a 0–10 scale. The final pain severity score is reported as the mean of the four values (range 0–10). The extent of pain interference is assessed by asking participants to rate the level of interference their pain causes in 7 different categories including: general activity, walking ability, work, mood, enjoyment of life, relations with other people, and sleep. These are also rated on a 0–10 scale with higher scores representing more interference. Pain interference is reported as the mean of the interference items (range: 0–10).

SF-MPQ—The Short-Form McGill Pain Questionnaire (SF-MPQ) was also used to evaluate the pain experience of study participants. The questionnaire consists of 15 items describing pain quality, and patients are asked to rate their pain experience with regard to each descriptor on a scale of 0 (none) to 3 (severe).¹³ The first 11 items refer to the sensory dimension of pain, while the remaining 4 represent the affective dimension. The sum totals in each dimension represent overall pain severity (ranges: sensory 0–33, affective 0–12, total 0–45). In addition, participants are asked to rate their current pain (Present Pain Inventory, PPI) on a 0–5 scale with 5 representing more severe pain. The final total score of the SF-MPQ is the sum of the PPI and the initial total score (range 0–50). Finally, the SF-MPQ includes a visual analogue scale (VAS) to provide an overall pain intensity measure. This was modified to a Likert scale from 0–10 and participants were asked to refer only to sinus pain.

SNOT-22—The Sinonasal Outcome Test-22 (SNOT-22; ©2006, Washington University, St. Louis, MO) has been validated as a measure of disease severity in patients with CRS.¹⁴ It consists of 22 sinus-related symptoms, and patients are asked to assign a score to each symptom from 0 (“not a problem”) to 5 (“problem as bad as it can be”). Higher total scores (range 0–110) correspond to worse disease severity. The symptoms have been divided into 5 distinct subdomains including rhinologic, extra-nasal, ear/facial, psychological dysfunction, and sleep dysfunction.¹⁵ Scores are calculated and recorded for each of the sub-domains.

CT and Endoscopy—All patients underwent high-resolution maxillofacial computed tomography (CT) scans with 1 mm contiguous slices. The images were then evaluated by the enrolling physicians and given a score based on the Lund-Mackay scoring system.¹⁶ Final scores range from 0–24, with higher scores representing more severe disease.

At the initial encounter, study patients also underwent endoscopic sinus evaluations. The Lund-Kennedy scoring system was used to assign scores to each individual ranging from 0–20 with higher scores corresponding to worse disease severity.¹⁷

Data Management, Sampling Size Estimations, and Statistical Analysis

Standardized research instruments were used for all data collection. Each participant was assigned a unique study identifier to ensure confidentiality. Data were manually entered into an electronic database (Microsoft Access; Microsoft Corp., Redmond, WA) by a trained research coordinator. SPSS (IBM Corp., Armonk, NY, Version 22) statistical software was used for data analysis.

An estimated sample size was calculated for bivariate correlation coefficients (R) between two continuous outcome variables (Table 1). Calculations assumed 80% power ($1-\beta$ error probability) and a 0.050 alpha level. This power calculation is only an estimate for any two continuous variables and may not apply to other outcomes.

Simple descriptive statistics were calculated to summarize patient characteristics (i.e., age, gender), clinical CT and endoscopy scores, as well as patient scores on administered pain and depression questionnaires (Table 2). The Wilcoxon-Mann-Whitney test was used to assess differences in pain between patients considered to be at risk versus those not at risk for depression. Two-sided Spearman's rank (R_s) correlations were used to determine the association between pain, depression risk, and the SNOT-22. Significant results were indicated by a p -value less than a 0.050 alpha level.

RESULTS

A total of 70 patients met inclusion criteria and were prospectively enrolled. Demographic characteristics of the study group are summarized in Table 2. Patients were divided into two groups based on PHQ-2 score. Patients with a PHQ-2 score of >1 were designated as being at risk for any depressive disorder ($n=47$), and those with a PHQ-2 score of 0 were designated as not at risk for any depressive disorder ($n=23$).

Pain severity scores were evaluated using the BPI-SF (Table 3) and the SF-MPQ (Table 4). Patients at risk for depressive disorder had significantly higher scores on both pain intensity and pain interference measures on the BPI-SF ($p<0.001$). Similarly, patients at risk for depressive disorder had significantly higher pain severity based on the SF-MPQ. Overall scores were significantly higher ($p<0.001$), as were sensory and affective dimensions, VAS, and PPI scores.

Associations between PHQ-2 scores and pain severity measures were calculated (Table 5). Significant positive correlations were found between PHQ-2 scores and all pain measures ($R=0.475-0.644$, $p<0.001$).

We next elucidated the association between SNOT-22, SF-MPQ, and the BPI-SF (Table 6). This revealed significant positive correlations between total SNOT-22 scores and all pain measures for patients at risk for depression ($R=0.455-0.608$, $p<0.050$). For patients not at risk for depression, only a correlation between BPI-SF pain interference and total SNOT-22 score was seen ($R=0.435$, $p<0.050$). SNOT-22 subdomain analysis revealed correlations between all pain measures and 3 subdomains (Ear/face symptoms, psychological dysfunction, and sleep dysfunction) for patients at risk for depressive disorder ($R=0.410-$

0.599, $p < 0.050$). There was a positive correlation seen between the ear/facial symptoms domain and all pain measures for patients not at risk for depression ($R = 0.535$ – 0.653 , $p < 0.050$). No correlations were seen between pain measures and the rhinologic and extra-nasal symptoms domains.

Mean SNOT-22 scores for patients at risk and not at risk for depression were compared (Table 7). Patients at risk for depressive disorder had significantly higher mean SNOT-22 total scores as well as significantly higher psychological and sleep dysfunction subdomain mean scores ($p < 0.050$).

Bivariate analysis of Lund-Mackay CT scores and pain measures failed to reveal positive correlations for patients at risk or not at risk for depressive disorder ($p = 0.193$ – 0.519 , data not shown). No correlations between Lund-Kennedy endoscopy scores and pain measures were seen for either group ($p = 0.450$ – 0.791).

DISCUSSION

Pain and depression are highly prevalent in patients with CRS. Remenschneider et. al., showed that patients with CRS experience pain/discomfort approximately 32% more frequently and depression roughly 24% more frequently compared to the general US population.¹⁸ We elucidated a robust relationship between pain and depression in patients with CRS. We found that patients with a PHQ-2 score ≥ 1 had significantly higher average scores on two separate validated pain instruments. This was true for both overall pain severity scores and for all subdomain scores within each instrument. In addition, we found a correlation between PHQ-2 score and all pain measures. These findings suggest an association between pain and depressive symptoms in CRS. This study also demonstrated associations between pain and SNOT-22 scores in patients at risk for depression, suggesting that pain exerts a larger impact on QOL in patients with comorbid depressive symptoms. Finally, we found that patients at risk for depressive disorder had worse mean disease-specific QOL as measured by the SNOT-22 survey. These findings all support what has been previously published in the literature regarding the complex interaction between pain and depression in patients with other chronic illnesses.

The pathophysiologic mechanism responsible for the interaction between pain and depression in chronic illness is poorly understood, however this is an area of active research and several possibilities have been suggested. It is known that nociceptive and affective neurobiological pathways overlap. For example, the amygdala, which has long been known to play a role in emotion and affective disorders, has more recently been recognized to possess a nociceptive center responsible for integrating pain information and modulating pain behavior¹⁰. In addition to overlapping neurologic pathways, pain and depression share some common neurotransmitters including norepinephrine and serotonin. One proposed mechanism implicates the depletion of norepinephrine and serotonin in depression resulting in loss of descending pain modulatory signals responsible for dampening nociceptive input from the body.

Interestingly, there is large body of evidence that has linked the immune system including its inflammatory mediators and central behaviors including pain and depression, through what has been coined the “immune-brain pathway”.¹⁹ Associations between depression and inflammatory markers such as CRP, interleukin (IL) IL-6, and IL-1, have been demonstrated.²⁰ In a recent study of rheumatoid arthritis patients, depression severity and CRP levels were correlated, and each exerted an effect on pain severity independently.⁶ The effect of inflammatory cytokines on the central nervous system may prove to be an important component of the pain-depression association in CRS, as many of these cytokines are known to be up-regulated in CRS.¹⁹

Further research aimed at better understanding the relationship between pain and depression in CRS is important as it may help inform treatment paradigms and improve outcomes in the future. Depression has already been shown to impact outcomes in patients with CRS. In a recent study by Smith et al, depression was found to be an independent predictor of worse QOL outcomes after endoscopic sinus surgery.²¹ Brandsted et al reported similar findings.²² Taken together with the results of the current study, these findings raise questions about whether managing comorbid depressive symptoms separately as part of a multi-faceted treatment approach would improve outcomes in CRS. Although this has not been studied in CRS specifically, literature on other chronic inflammatory illnesses supports this idea. For example, antidepressant therapy has been shown to improve pain scores in patients with rheumatoid arthritis.^{23–25} Additional investigations are needed to determine if there is a benefit to managing depression in CRS.

In the current study, we used a validated screening questionnaire to identify patients at-risk for a depressive disorder. Many prior studies investigating the role of depression in CRS have relied upon patient reported diagnosis of depression.^{21,26} This approach excludes a significant number of patients who have either not yet been evaluated for depression or who experience depressive symptoms but do not meet Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria for diagnosis of major depression. In a recent study published by Litvack et al., only 9.2% of patients with CRS endorsed a history of depression, however 25% of patients scored positively for depression on the Patient Health Questionnaire-9 (PHQ-9).²⁷ The PHQ-2 is an ultra short screening tool that can be administered quickly and easily as part of the intake process. It consists of the first two questions of the PHQ-9, and its purpose is to identify patients with depressive symptoms who are at risk for major depression and other depressive disorders. Historically, a score of 3 or greater has been used to define patients who are at risk due to an instrument sensitivity of 83% and a specificity of 92% for major depression¹². More recently it has been suggested that a cutoff of 3 has an unacceptably high false negative rate as a screening instrument.³¹ In the current study, a cutoff of 1 or greater was used which has higher sensitivity (97%), decreasing the likelihood of overlooking at-risk patients. Despite the decreased specificity associated with using a lower cutoff, we still found highly significant correlations between PHQ-2 score, pain, and QOL. This suggests that a PHQ-2 score of 1 or greater may be the most appropriate cutoff for screening patients with CRS.

We did not find significant correlations between pain measures and CT or endoscopy scores, regardless of the presence or absence of depressive symptoms. Likewise, we did not find

any significant correlations between pain and the rhinologic and extra-nasal subdomains of the SNOT-22. Prior studies investigating pain and QOL in CRS have demonstrated similar findings.^{28,29} The reason for the apparent disconnect between objective and subjective disease severity measures in CRS is not fully understood, but it is becoming increasingly clear that the relationship between sinonasal inflammation, pain, depression, sleep, and psychological dysfunction is quite complex, and that managing mucosal inflammation alone may not be sufficient to optimize QOL outcomes in patients with CRS. This lends further strength to the idea that pain and depression may need to be treated in parallel as part of a multi-faceted approach to CRS management.

A major strength of the current study includes its prospective design and utilization of multiple validated instruments to assess patient's pain, depression, and QOL. However, it should be noted that patients enrolled are from a tertiary care sinus center. Thus, the findings of this study may not be generalizable to patients seen in a community setting or patients who have not previously undergone maximal medical management of CRS.

CONCLUSION

In patients with CRS, pain and depressive symptoms are correlated. Patients at risk for depressive disorder have more pain and have overall worse disease-specific QOL. In addition, strong correlations between pain and disease-specific QOL were seen for patients at risk for depression, suggesting that depression influences the impact of pain on QOL. Further research investigating the complex interactions between depression and pain and the role it plays in CRS disease-specific QOL is warranted.

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Table 1

Sample size estimations for correlation coefficients (R) between pain-scale scores and depression (PHQ-2).

R ²	Effect Size (R)	Sample Size
0.100	0.316	73
0.105	0.324	69
0.150	0.387	47
0.200	0.447	34
0.250	0.500	26
0.300	0.547	21
0.350	0.591	17
0.400	0.632	14
0.450	0.671	12
0.500	0.707	11

R²; coefficient of determination

Table 2

Comparison of baseline characteristics of study group

Demographics/History	CRS	
	Mean [SD]	N (%)
Age (years)	48.59 [16.06]	
Males		40 (57.1)
Females		30 (42.9)
Asthma		33 (47.1)
ASA sensitivity		9 (12.9)
Allergy		33 (47.1)
Current tobacco use		7 (10.0)
Alcohol consumption		22 (31.4)
Prior sinus surgery		41 (58.6)
Obstructive Sleep Apnea		8 (11.4)
Clinical Measures		
Lund-Kennedy Endoscopy Score	5.48 [2.98]	
Lund-Mackay CT score	12.73 [6.9]	
Pain Scores		
BPI-SF pain severity	3.46 [2.02]	
BPI-SF pain interference	3.30 [2.59]	
Total SF-MPQ	11.77 [9.16]	
Sensory dimension	9.33 [7.22]	
Affective dimension	2.64 [2.33]	
PPI	13.89 [10.37]	
Depression		
PHQ-2 score	1.63 [1.75]	

SD – standard deviation; BPI-SF = Brief Pain Inventory Short Form; SF-MPQ = Short-Form McGill Pain Questionnaire; PPI = Present Pain Inventory; PHQ-2 = Patient Health Questionnaire–2.

Table 3

Comparison of Brief Pain Inventory Short Form (BPI-SF) Scores between patients with CRS at risk and not at risk for depression based on PHQ-2 scores.

Pain severity measures	PHQ -2 1 or greater	PHQ-2 less than 1	p-value
	Mean [SD]	Mean [SD]	
BPI-SF Pain severity	4.08 [1.86]	2.22 [1.78]	< 0.001
BPI-SF Pain interference	4.23 [2.47]	1.21 [1.38]	< 0.001

SD – standard deviation; BPI-SF = Brief Pain Inventory Short Form; PHQ-2 = Patient Health Questionnaire–2.

Table 4

Comparison of the Short Form McGill Pain Questionnaire (SF-MPQ) Scores between patients with CRS at risk and not at risk for depression based on PHQ-2 scores.

Pain severity measures	PHQ -2 1 or greater	PHQ-2 less than 1	p-value
	Mean [SD]	Mean [SD]	
Total SF-MPQ	14.37 [9.07]	5.13 [5.32]	< 0.001
Sensory dimension	11.42 [7.04]	4.11 [4.63]	< 0.001
Affective dimension	3.17 [2.39]	1.35 [1.62]	0.007
PPI Score	16.66 [10.13]	6.33 [6.72]	0.001
VAS Score	4.07 [2.51]	1.90 [2.25]	0.001

SD = standard deviation, SF-MPQ = Short-Form McGill Pain Questionnaire; PPI = Present Pain Inventory; VAS = Visual Analogue Scale; PHQ-2 = Patient Health Questionnaire-2.

Table 5

Bivariate correlation coefficients between PHQ-2 scores and pain severity measures for patients with CRS.

Pain Severity Measures	PHQ-2 score
	Rs
BPI-SF Pain severity	0.494 ^{**}
BPI-SF Pain interference	0.644 ^{**}
Total SF-MPQ	0.564 ^{**}
Sensory dimension	0.570 ^{**}
Affective dimension	0.475 ^{**}
PPI Score	0.556 ^{**}
VAS Score	0.486 ^{**}

R=correlation coefficient;

^{**}
p-value 0.001;

BPI-SF = Brief Pain Inventory Short Form; SF-MPQ = Short-Form McGill Pain Questionnaire; PPI = Present Pain Inventory; VAS = Visual Analogue Scale; PHQ-2 = Patient Health Questionnaire-2.

Table 6

Bivariate analysis of SNOT-22 survey subdomain scores and pain severity measures in patients with CRS at risk and not at risk for depression based on PHQ-2 scores.

Pain Severity Measures: PHQ-2 of 1 or greater	Snot-22 Scores					Total Rs
	Rhinologic symptoms Rs	Extra-nasal symptoms Rs	Ear/facial symptoms Rs	Psychological dysfunction Rs	Sleep dysfunction Rs	
BPL-SF Pain severity	0.029	-0.005	0.491**	0.494**	0.430*	0.455*
BPL-SF Pain interference	0.216	0.080	0.472**	0.583**	0.498**	0.608**
Total SF-MPQ	0.227	0.145	0.566**	0.580**	0.489**	0.572**
Sensory dimension	0.188	0.181	0.599**	0.581**	0.410*	0.579**
Affective dimension	0.161	0.103	0.430*	0.535**	0.472*	0.468*
PPI Score	0.210	0.133	0.559**	0.579**	0.495**	0.556**
VAS Score	0.077	0.110	0.549**	0.581**	0.323*	0.493**
Pain Severity Measures: PHQ-2 of 0	Snot-22 Scores					Total Rs
	Rhinologic symptoms Rs	Extra-nasal symptoms Rs	Ear/facial symptoms Rs	Psychological dysfunction Rs	Sleep dysfunction Rs	
BPL-SF Pain severity	0.200	-0.011	0.565*	0.209	0.228	0.358
BPL-SF Pain interference	0.143	-0.025	0.606*	0.344	0.270	0.435*
Total SF-MPQ	0.381	0.278	0.582*	0.247	0.185	0.396
Sensory dimension	0.320	0.189	0.535*	0.092	0.107	0.271
Affective dimension	0.164	0.175	0.605*	0.435	0.277	0.451
PPI Score	0.397	0.230	0.586*	0.214	0.194	0.377
VAS Score	0.098	-0.006	0.653*	0.308	0.227	0.358

R=correlation coefficient;

* p-value <0.050;

** p-value 0.001;

BPL-SF = Brief Pain Inventory Short Form; SF-MPQ = Short-Form McGill Pain Questionnaire; PPI = Present Pain Inventory; VAS = Visual Analogue Scale; PHQ-2 = Patient Health Questionnaire-2; SNOT-22 = Sinonasal Outcome Test -22.

Table 7

Comparison of the SNOT-22 scores between CRS patients at risk and not at risk for depression based on PHQ-2 scores.

Snot-22 scores	PHQ -2 Score 1	PHQ-2 Score< 1	p-value
	Mean [SD]	Mean [SD]	
Rhinologic symptoms	18.74 [5.30]	17.55 [4.98]	0.585
Extra-nasal symptoms	8.51 [2.86]	7.17 [3.45]	0.089
Ear/facial symptoms	10.91 [5.03]	8.23 [5.17]	0.073
Psychological dysfunction	19.77 [6.46]	13.41 [8.22]	0.003
Sleep dysfunction	15.98 [5.36]	12.09 [7.22]	0.015
Total	61.47 [16.11]	48.73 [19.61]	0.009

SD = standard deviation; PHQ-2 = Patient Health Questionnaire-2; SNOT-22 = Sinonasal Outcome Test -22.