

# Influence of Chronic Rhino sinusitis on Quality of Life and Risk of Depression and Lost Productivity: Population Based Survey

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## Abstract

**Abstract Objectives;** to evaluate the quality of life among patients with chronic rhino sinusitis and the risk of developing depression. **Design;** An observation cross section study. **Setting;** the quality of life was assessed using 2-item sinonasal outcome test (SNOT-22) while Patient Health Questionnaire-2 (PHQ-2) used for screen of depression and Stress was analyzed using the Kessler Psychological Distress Scale (10 items representing five psychological distress traits were assessed with a five-point scale) **Participants;** 1072 patients with chronic rhino sinusitis. **Main outcome measures;** Influence of Chronic Rhino sinusitis on Quality of Life and Risk of Depression and Lost Productivity. **Results;** the level of quality of life affection was moderate in 159 (24.77%) and severe in 483 (75.23%) of participants with CRS. The mean score of PHQ-2 for assessing the risk of major depression was  $4.17 \pm 1.74$  in participants with CRS. 135 (21.03%) were normal (not at risk of major depression) and 507 (78.97%) were at risk of major depression. According to the Kessler Psychological Distress Scale: 759 patients (70.8%) were positive with a mean total perceived stress score of  $16.92 \pm 7.34$ , whereas 313(29.2%) were negative with a mean total perceived stress score of  $6.08 \pm 2.7$ . The difference was statistically significant **Conclusions;** Patients with CRS are at risk of depression, poor quality of life and bad work performance. Despite the supportive treatment that used to provide to such patients, a clinical comprehensive approach should be considered to relief the impact on patients' quality of life.

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**Level of evidence :** IV

**Keywords:**

Rhino sinusitis, Chronic, Depression, Quality of life, Psychological stress.

**Data availability statement,** the data that support the findings of this study are available from the corresponding author upon reasonable request.

**Key points:**

- Chronic rhino sinusitis had a significant negative influence on patient's daily activities.
- The quality of life was assessed using 2-item sinonasal outcome test (SNOT-22).
- Patient Health Questionnaire-2 (PHQ-2) used for screen of depression and Stress was analyzed using the Kessler Psychological Distress Scale.
- Patients with CRS are at risk of depression, poor quality of life and bad work performance.
- Despite the supportive treatment that used to provide to such patients, a clinical comprehensive approach should be considered to relief the impact on patients' quality of life.

## Introduction

Chronic rhino sinusitis is defined as inflammation of the mucosa of the nose and paranasal sinuses which lasts for 12 weeks or longer without completes resolution. <sup>(1)</sup> Chronic rhino sinusitis is one of the most common chronic diseases with an estimated prevalence of 10.4% and usually had a significant impact on patients' quality of life.<sup>(2)</sup> There are several subtypes of chronic rhino sinusitis with two major phenotypes: CRS with or without polyps (CRSwNP or CRSsNP, respectively) with a complex and multifactorial for example dental sinusitis, pediatric sinusitis as well as fungal sinusitis among others and people with allergic rhinitis .<sup>(3)</sup> The impairment of paranasal sinus ventilation and drainage disorders with interacting triad of intrinsic mucosal inflammation; local microbial community; and mucociliary dysfunction leading to a blockage of the osteo-meatal complex in the middle nasal meatus.<sup>(4)</sup> The chronicity of rhino sinusitis can be aggravated with deviated nasal septum , smoking and impaired immune defense mechanism .<sup>(5)</sup> Although the chronic rhino sinusitis is not life threatening disease but has significant negative influence on patient's daily activities and emotions and the impact on health related quality of life including physical, social, emotional, cognitive and work has to be proved to be greater than other condition like angina pectoris and chronic obstructive pulmonary disease. <sup>(6-7)</sup> the chronicity and frequency of classic sino-nasal symptoms play the main reason of decrease in work performance with loss of productivity and impairment of quality of life of the patients. <sup>(8-9)</sup> In recent years assessment of CRS related quality of life from the patient's perspective and the way of affection is more important than other procedures such as CT scan. Therefore, evaluation of the impact of chronic rhinosinusitis on the quality of life has become an integral part of the diagnostic protocol and management plan.<sup>(10)</sup> In regard to its psychiatric effect, two illnesses are associated, depression and generalized anxiety disorder, approximately 30% of the patients with CRS are suffering from these psychiatric conditions, due the chronicity and frequency of the symptoms .<sup>(11-12)</sup>

The correlation between chronic rhino sinusitis and depression with psychological disorders such as anxiety and mood disorders may be the result of several factors such as the effects of either syndrome on immunity and immune- related illnesses leads to a great burden on quality of life (QOL) mainly due to disturbed sleep , nasal congestion, facial pain and long term medication. <sup>(13-14)</sup>

Our present study aims to evaluate the quality of life among patients with chronic rhino sinusitis and the risk of developing depression and psychological stress disorder.

## Methods

### Ethical consideration:

This study was approved by the Institute Review Board (IRB) of <Blinded for review>. Participation was voluntary and consent was acquired from all participants. Confidentiality of all participants was maintained as no names were mentioned in the questionnaires. Data collected from study participants are only used for scientific purposes. All participants agreed for the study with written informed consent obtained from them.

### Strategy details:

This is an observation cross section study conducted in Jazan tertiary referral hospital in Saudi Arabia from May 2018 to July 2020 . The inclusion criteria of our study were all the patients above 18 years old to attending the outpatient clinic in the study period with chronic rhino sinusitis (inflammation of the mucosa of the nose and paranasal sinuses which lasts for 12 weeks or longer) <sup>(2)</sup> , we exclude patients with history for previous management protocol in addition to any facial anomalies, nasopharyngeal mass, cystic fibrosis, immunodeficiency syndrome, and immotile cilia syndrome or tumors were excluding them from our study.

**Main outcome measures** ; Influence of Chronic Rhino sinusitis on Quality of Life and Risk of Depression and Lost Productivity.

### Setting;

1072 patients with chronic rhino sinusitis were subjected to demographic data, symptoms of CRS((persist nasal discharge, nasal obstruction, headache or facial pain , anosmia or other related symptoms such as ear infection, low grade fever, snoring, chronic cough ), Complete ENT examination including cranial nerves examinations , Nasal endoscopic examination ,Computed tomography PNS and nasal swab for culture & sensitivity were included into our study .

All the patients were subjected to a validated questionnaire which developed in Arabic language and reviewed as expected in this area. The questionnaire divided into four sections which begin with questions about socio-demographic characteristics of participants' age group, gender, residency and level of education. The questionnaire also, include questions about the specific symptoms of chronic rhino-sinusitis according to the symptom-based definition of CRS provided in European Position Paper on Rhino sinusitis and Nasal Polyps (EP3OS) and has been validated and is suitable for use in epidemiological and clinical research with the presence of more than two of the symptoms : 1- nasal blockage 2- nasal discharge 3- facial pain/pressure or 4- reduction in smell, for more than three months in the last year with at least one of symptoms being number 1 or 2. <sup>(4)</sup> The new definition of (EP3OS) added 5- self reported doctor diagnosed CRS. A common grading tool will be used to assess the quality of life by the 22-item Sinonasal Outcomes Test (SNOT-22) which is disease specific stratified as mild (8-20), moderate ( >20-50) and severe (>50).<sup>(15)</sup> The risk of depression screened by PHQ-2 with Lost productivity was assessed by asking participants how many days of work and/or school they missed in the last three months because of CRS.<sup>(16)</sup>

All patients were required to complete a questionnaire assessing their subjective nasal symptoms using a visual analogue scale (VAS), with 0 indicating no symptoms and10 indicating severe and/or constant symptoms.

Stress was analyzed using the Kessler Psychological Distress Scale to determine the effect of stress on severity of allergic rhinitis (10 items representing five psychological distress traits were assessed with a five-point scale).<sup>(17)</sup>

### Statistical analysis

The statistical package for the social science (SPSS- version25) is used to analyze the data. Socio-demographic variables of participants were assessed using descriptive statistics, including mean, frequency count and per-

centage for binary and categorical variables. The mean and standard deviation (S.D.) was used for normally distributed continuous variables, while median and interquartile range (IQR) for not normally distributed variables. The chi-square test was used in assessing the presence of any influence study demographics and clinical presentation on mortality and complications of patients. P value <0.05 is considered statistically significant.

## Results

A total of 1072 patients, 674 males (62.9%) and 398 females (37.1%), were included in the study. The age distribution, the largest proportion of participants were between 18-30 years 493 (46%) followed by those between 31-40 years 318 (29.7%), those between 41 – 50 years 198 (18.5%) and the least responses 63 (5.9%) came from participants aging more than 50 years. 384 (35.8%) lived in an urban areas and 688 (64.2%) lived in a rural areas. As for the marital status the majority 633 (59%) were married, 413 (38.5%) were single a minority of participants were divorced (1.4%) and widowed (1%).

All patients had history of chronic rhino sinusitis (nasal obstruction, mucopurulent discharge, headache, fever, post nasal discharge and anosmia) for more than 12 weeks. There was no significant association between having CRS and gender, place of residency, marital status nor educational level.

Nasal endoscopic examinations revealed 718 patients (69.9%) had CRS with nasal polyps (CRS<sub>NP</sub>) while 309 patients (30.1%) had CRS without nasal polyps (CRS<sub>NP</sub>). CT showed opacification of at least one sinus in all of the patients and pan sinusitis was found in all of the patients.

Culture using Kirby Bauer technique for aerobic and anaerobic showed the most mixed bacterial infections in all of culture and sensitivities tests collected from middle meatus in all of the patients including Strept. Pneumoniae , Moraxella catarrhalis , Anaerobic streptococci , Pseudomonas aeruginosa , Haemophilus influenzae , Staphylococci , Klebsiella pneumonia , Diphtheroid bacilli and Staphylococci.

The scores and levels of quality of life affection as well as scores of PHQ2 tool for assessing the risk of major depression and actual risk of depression. The average SNOT-22 score for quality of life affection was 69.14 +- 24.6. The level of quality of life affection was moderate in 265 (24.77%) and severe in 803 (75.23%) of participants with CRS. The mean score of PHQ-2 for assessing the risk of major depression was 4.17 +- 1.74 in participants with CRS. 216 (21.03%) were normal (not at risk of major depression) and 856 (78.97%) were at risk of major depression as showed in table (1).

The mean number of lost days of work in the preceding three months due to CRS was 3.30 and used to assess loss of productivity. 427 (66.5%) were never absent from work due to CRS, 111 (17.3%) were absent for less than 3 days due to CRS, 104 (16.2%) were absent for 3 days and more due to CRS.

The tested whether the severely impaired quality of life in CRS patients were associated with increased risk depression and lost productivity as showed in table (2). A significant difference in risk of depression was present between levels of quality of life affection ( $p < 0.001$ ), where it has been observed that people with severely affected quality of life are at higher risk of depression than those with moderately affected quality of life (88% vs 12%). There was also an observed significant difference in the absences from work due to CRS within the levels of quality of life affection ( $p < 0.001$ ). Higher rates of absences were found in the group with severely affected quality of life compared to the moderately affected quality of life (19.7% and 19.9% vs 10.1% and 5%).

According to the Kessler Psychological Distress Scale (10 items representing five psychological distress traits were assessed with a five-point scale) we found 759 patients (70.8%) were positive with a mean total perceived stress score of 16.92 +- 7.34, whereas 313(29.2%) were negative with a mean total perceived stress score of 6.08 +- 2.7. The difference was statistically significant ( $p < 0.001$ ).

## Discussion

Chronic rhino sinusitis appears to be prevalent in the Middle East regions more than others across the world. This study reported high prevalence of CRS (59.9%) using EP3OS, which is relatively close and a little higher

than that observed in previous Saudi study 2017 which reveal a prevalence of 50%<sup>(18)</sup>, and the self-reported previously doctor diagnosed chronic rhinosinusitis in our study represented 25.4% of the study population. This reported prevalence are higher than that observed in a USA study which revealed prevalence of 11.9% in 2017, and two Canadian studies that also showed a lower prevalence of CRS in comparison to our study (5% and 18.8-23.3% respectively).<sup>(19-20-21)</sup> However, an Iranian study reported a prevalence of 28.4% according to the criteria of EPOS, and 20% based on the clinical diagnosed CRS.<sup>(22)</sup> This relatively high prevalence of CRS in our region could be attributable to Jazan weather that has a dusty season each year.

Our results found that CRS was significantly associated with age group difference ( $p < 0.05$ ), which is similar to a Korean study in 2011, and other two Chinese and Canadian studies that showed significant association between the distribution of age and having CRS.<sup>(20- 23)</sup> No significant association between gender, residency, marital status or level of education and CRS was observed in contrast to that in China 2012, that revealed CRS is differ significantly with gender in agreement also with the Canadian and Korean results.<sup>(23)</sup>

CRS significantly impair health related quality of life of patients that lead to lost productivity secondary to absenteeism and subsequent risk of depression.<sup>(24)</sup> Many international studies have shown that CRS impair quality of life. However, to the best of our knowledge, this is first population-based study in Jazan Province evaluating health related quality of life, loss of productivity and risk of depression in patients with CRS. In the present study, MMS classification of quality of life affection by using (SNOT-22) show 159 (24.77%) of patients in moderate category with 483 (75.23%) which form the majority of patients classified as severe. A study by Sahlstrand-Johnson et al. revealed that CRS severity and quality of life affection in patients as 9.8% mild, 37.6% moderate and 52.7 and the patients in our study had statistically significantly higher SNOT-22 score (mean  $69.14 \pm 24.6$  vs  $51.8$ ).<sup>(25)</sup> Depression is the second most common mental health in patients with CRS as previous studies on relationship between CRS and depression has shown a significant association between the two diseases, Schlosser et al., found that 24.4% of patients with CRS at risk of developing depression using PHQ-2.<sup>(9)</sup>

The prevalence of depression in patient with CRS is approximately between 9% and 40%.<sup>(12)</sup> In our study we found that 507 (78.97%) of CRS patients are at risk of depression.

This prevalence is very similar to that reported in Taiwan population-based cohort study conducted by Nyaiteera et al.<sup>(14)</sup>, which demonstrated that the overall prevalence of depression was 77% using a different validated screening instrument. There have been reports on cost effect of lost productivity secondary to CRS. A study conducted by Beswick et al., found that the mean of loss productivity was 5.1 days as a result of allergic rhinitis and common cold.<sup>(16)</sup>

Another recent study published by Wasan et al. , reported the mean of lost days of productivity in last three months was 3.1 due to CRS which is consistent with the result in this study that show the mean number of absence days and lost productivity in the preceding three months was 3.30 due to CRS.<sup>(11)</sup> Sahlstrand-Johnson et al., found that over half of participants 57% reported absenteeism secondary to sinus problems.<sup>(25)</sup> In our study only 215 (33.5%) of patients report absenteeism due to CRS which is lower in comparison with previous literature. In the present study we are interested to measure the association of risk of major depressive disorders and loss of productivity with the affection quality of life of CRS patients. A significant difference in risk of depression was present between levels of quality of life affection where, it has been observed that 425 (88%) patients with severely affected quality of life (SNOT-22 score  $> 50$ ) are at higher risk of depression. Our study is consistent with many previous studies that reported a strong association between the total SNOT-22 score and depression scores.<sup>(9-13)</sup> there was also an observed significant difference in the absences from work due to CRS within the levels of quality of life affection in the present study as higher rates of absences were found in the group with severely affected quality of life. Hoehle et al., reported that the significant lost productivity was associated with worsening of CRS symptoms severity and QoL.<sup>(8)</sup>

## Conclusion

Patients with CRS are at risk of depression, poor quality of life and bad work performance. Despite the supportive treatment that used to provide to such patients, a clinical comprehensive approach should be

considered to relief the impact on patients' quality of life.

### Conflict of Interest:

We conclude that there is no conflict of interest in writing this manuscript.

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### Tables

Table (1): Showed level and scores of Quality of Life Affection and Risk of Depression (n =1072) .

<b>SNOT-22 Score</b>	<b>mean = 69.14</b>	<b>SD ± 24.60</b>
<b>Level of Quality of Life Affection</b>	<b>Level of Quality of Life Affection</b>	<b>Level of Quality of Life Affection</b>
Moderately Affected	265	24.77%
Severely Affected	808	75.23%
<b>PHQ-2 Score</b>	<b>mean = 4.17</b>	<b>SD ± 1.74</b>
<b>Depression Screening</b>	<b>Depression Screening</b>	<b>Depression Screening</b>
Normal (Healthy)	216	21.03%
At Risk of Major Depression	856	78.97%

Table (2): Showed the Association between Quality of Life Affection with Risk of Depression and Yearly absences from work Due to CRS.

### Quality of Life Affection

	<b>Moderate Risk of Depression</b>	<b>Severe Risk of Depression</b>
<b>Risk of Depression</b>		
Normal (Healthy)	77 (48.4%)	82 (51.6%)
At risk of major depression	58 (12%)	425 (88%)
<b>Yearly absences from work Due to CRS</b>	<b>Yearly absences from work Due to CRS</b>	<b>Yearly absences from work Due to CRS</b>
Was not Absent due to CRS at All	135 (84.9%)	292 (60.5%)
Was Absent Due to CRS for less than 3 days	16 (10.1%)	95 (19.7%)
Was Absent Due to CRS for 3 days and more	8 (5%)	96 (19.9%)

\* Significant at level [?] 0.05.