

Original Article Research

## Radiological Correlation Of Chronic Rhinosinusitis With Snot-22 Questionnaire

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### Abstract

**Background:** Chronic rhino sinusitis (CRS) is a common medical condition of a multi-factorial origin that can severely affect the quality of life (QoL). It poses a considerable burden to health care providers and the patients.

**Objectives: Materials and Methods:** The present study was conducted at single-center, Cross sectional observational Study conducted on patients admitted with Chronic rhino sinusitis, irrespective of treatment and in the department of Otorhinolaryngology, NRI Institute of Medical Sciences, Visakhapatnam, from February 2021 to June 2022.

**Results:** Majority subjects were having the moderate radiological grading (54 %). Majority subjects were having the moderate SNOT-22 grading (44 %). Majority subjects were belonging to Lund-Mackay score IV (44 %). There was a positive co-relation between radiological grades (0.85), Lund-Mackay score (0.71) and Snot-22 grades. There was a highly significant statistical difference between the radiological and SNOT-22 grades (p: 0.001) and a significant statistical difference between the Lund-Mackay score and SNOT-22 grades (p: 0.01). The co-relation coefficient between mild, moderate and severe radiological grades and Snot-22 grades were 0.88, 0.91 and 0.76 respectively indicating that the radiological grades increase with a increase in SNOT-22 grades.

**Conclusion:** clinical symptoms, radiological grades and Lund-Mackay score have positive correlation with SNOT-22 grades thus emphasizing the point that Snot-22 questionnaire can be best used to study clinical severity of CRS with additional benefits of being easily administered, cost effective and less time consuming.

**Keywords:** Chronic rhino sinusitis, radiological grades, Lund-Mackayscore correlation, SNOT-22 grades, SNOT-22 questionnaire

## Introduction

Chronic rhino sinusitis (CRS) is the most prevalent chronic illness in the US, affecting 15% of adults there. 134 million Indians are thought to be CRS, according to the Indian National Institute of Allergy and Infectious Diseases (NIAID). Treatment is frequently symptomatic and may require ongoing nasal steroids and recurrent procedures. There is difference between occurrence of symptoms and development of disease. Not all the symptoms can be precisely defined by the patients. Hence a need arises for a quantifiable scale for nasal symptoms as is the VAS (visual analog scale) for pain<sup>1</sup>

The European publication on chronic rhinosinusitis and nasal polyps recommends utilising validated questionnaires to assess symptoms subjectively.

As a result, we require a straightforward, trustworthy, system-specific standardised outcome that will enable us to examine CRS in a more consistent manner, assess patient quality of life, and avoid needless surgery. This results in the creation of several CRS-specific assessment instruments.

The physical issues, functional restrictions, and emotional issues are all covered by Snot-22. Validated patient-reported assessments for symptom severity and health-related quality of life in sinonasal disorders include Snot-20 and The Snot-22, the most recent iteration of the SNOT Questionnaires, is based on the Snot 20 but lacks the importance rating and includes two new questions about the effects of chronic rhinosinusitis patients' symptoms of nasal obstruction and loss of smell.

The Snot-22 is frequently utilised by medical professionals for the evaluation of CRS, as well as for assessing the effectiveness of treatment for nasal polyposis, and nasal septal surgery. After examining reliability, validity, and responsiveness indices, Morley AD, Sharp HR, and colleagues came to the conclusion that SNOT may be used as a tool for QoL. Gillett, Hopkins. Slack R, Lund VJ, and Browne JP<sup>11</sup> came to the conclusion that there were disparities in SNOT scores between the healthy and the ill, as well as in the subgroups of CRS. The benefits of nasal septal surgery on nasal symptoms and general health were documented by Pannu KK et al<sup>2</sup>, who also demonstrated the value of the SNOT-22 score as a helpful and trustworthy tool in nasal septal surgery (20.67 to 10.48). Avoiding needless procedures is crucial for individuals with CRS, and the SNOT 22 may offer a reliable instrument for the subjective evaluation of patients and symptoms.<sup>3</sup>

Computed Tomography (CT) scan of the paranasal sinuses is the gold standard diagnostic radiological tool for chronic rhinosinusitis. Because CT scan is not widely available in resource poor countries, it is often indicated after failed medical treatment, when surgical treatment is planned and if there is complication. CT scan has been shown to have the advantage of concurrent evaluation of the nasal cavities, osteomeatal complex and paranasal sinuses. It is also reliable, accurate and effective at demonstrating the extent of disease spread and its associated complications.<sup>4</sup> Although publications on the correlation of symptoms of CRS to CT findings exist in the literature<sup>5,6</sup> but there is none on the diagnostic value of CT Scan in CRS in our environment where the weather is hot and highly humid with probable increased predisposition to the disease<sup>7</sup>. Studies have shown that clinical symptoms of CRS do not have good correlation with the CT scan stage while a study has shown that preoperative CT scan may predict symptom improvement after endoscopic sinus surgical intervention<sup>9</sup>. This study therefore aimed to evaluate the value of CT scan in the management of chronic rhinosinusitis by correlating pre-operative symptoms severity score as well as overall disease severity score of CRS with radiological findings on CT scan. Hence this study was conducted to assess severity of chronic rhinosinusitis using both Snot-22 questionnaire and CT

PNS.

## Materials and Methods

The present study was conducted at single-center, Cross sectional observational study conducted on patients admitted with Chronic rhino sinusitis, irrespective of treatment and in the department of Otorhinolaryngology, NRI Institute of Medical Sciences, Visakhapatnam from February 2021 to June 2022. Prior initiation of the study, we obtained Ethical and Research Committee clearance from NRI Institute of Medical Sciences, Visakhapatnam. During present study total 75 Chronic rhino sinusitis were reviewed in OPD, among 50 (66.67%) patients were enrolled into the study according present study inclusion criteria and 25 (33.33%) patients were excluded according to exclusion criteria.

### Inclusion Criteria

- Age group >12 Years and < 70 Years.
- Patient diagnosed clinically as chronic rhinosinusitis using SNOT 22 Questionnaire as per annexure 1
- Patients who are giving consent for study.

### Exclusion criteria

- Patient in whom CT Scan is contraindicated.
- Patients with previous nasal surgeries, growth in nasal cavity benign or malignant, polyps.

### Sample size:

Using the following formula for calculation of sample size for prevalence studies using confidence level of 95% and precision of 10%  $n = 2 * [Z((1-\alpha/2) + z(1-\beta))]^2 * \sigma^2 / d^2$  Where n is the sample size, Z value for 5% significance ( $z(1-\alpha/2)$ ) = 1.96, Z value for 80% power  $z(1-\beta)$  = 0.84, Pooled standard deviation = 5.765 dBs Effective size  $d = 4.4$  dBs.  $n = 50$ ,

### Method of Collection of Data:

After obtaining consent, cases chosen from those with chronic rhino sinusitis were examined clinically and radiologically. All of the patients chosen for the study were assessed in accordance with the protocol, and both clinical and laboratory tests were done.

### Informed Consent

All the patients fulfilled selection criteria were explained about the details of the disease process, options of treatment, ultimate outcome, possible effects, complications and chances of recurrence in both procedure and a written informed consent was obtained before enrollment. They were informed of their right to withdraw from the study at any stage.

### Data Collection

All the data was collected from the patients admitted in the department of ENT and those patients who attended in-patients and out-patient department with detailed history & thorough physical examinations. It included age, sex, nationality, complaints, and duration of symptoms. Telephone contact numbers and detailed address were collected for followup.

## Statistical Analysis

The collected data was entered into Microsoft Excel Worksheet-2010 and data was taken into IBM SPSS Statistic for windows, version 24 (IBM Corp., Armonk, N.Y., USA) software for calculation of frequency, percentage, mean, standard deviation and Probability value. **Qualitative data** was represented in the form of frequency and percentage. Association between qualitative variables was assessed by Chi Square test with continuity correction for 2 x 2 tables and Fisher's exact test for all 2 x 2 tables, where P value of chi square test was not valid due to small counts.

**Quantitative data** was represented using mean & Standard deviation. Analysis of quantitative data within the groups was done using paired t test if data passes 'Normality test'. One Way Analysis (ANOVA) was used to compare more than two groups. A '**P**' value of <0.05 was considered statistically significant.

## Results

Most subjects were belonging to the age group of 31-40 years, i.e., 16 subjects (32 %); followed by 14 subjects were belonging to the age group of 41-50 years (28 %); 8 subjects were belonging to the age group of 51-60 years (16 %); 6 subjects were belonging to the age group of 20-30 years (12 %); 5 subjects were belonging to the age group of 61-70 years (10 %) and finally 3 subjects were belonging to the age group of less than 20 years (6 %).

Females were mostly suffering with chronic rhinosinusitis 31 (62 %) when compared with males 19 (38 %). The ratio of which is 1:1.6.

Most subjects were overweight, i.e., 23 (46 %); followed by 14 subjects in normal category (28 %); 8 subjects were obese (16 %) and finally 5 were underweight (10 %).

**Table 1: Subjects were distributed according to radiological grades:**

Radiological grades	Frequency	Percentage
Mild (8-15)	19	38
Moderate (16-23)	27	54
Severe (>23)	4	8
<b>Total</b>	<b>50</b>	<b>100</b>

The above table represents distribution of subjects according to radiological grades. Majority subjects were having the moderate grading, i.e., 27 (54 %); followed by 19 subjects in the mild grading (38 %) and finally 4 subjects with severe grading (8 %).

**Table 2: Subjects were distributed according to SNOT-22 grades**

SNOT-22 grades	Frequency	Percentage
Mild (0-26)	14	28
Moderate (27-58)	22	44
Severe ( $\geq 59$ )	14	28
<b>Total</b>	<b>50</b>	<b>100</b>

The above table represents distribution of subjects according to SNOT-22 grades. Majority subjects were having a moderate grading, i.e., 22 (44 %); followed by equal distribution in the mild and severe categories, i.e., 14 each (28 %).

**Table 3: Subjects were distributed according to Lund-Mackay score**

Lund-Mackay score	Frequency	Percentage
I	2	4
II	12	24

<b>III</b>	14	28
<b>IV</b>	22	44
<b>Total</b>	50	100

The above table represents distribution of subjects according to Lund-Mackay score. Majority subjects were belonging to stage IV, i.e., 22 (44 %); followed by 14 in stage III (28 %); 12 subjects in stage II (24 %) and finally 2 subjects in stage I (4 %).

Majority subjects were experiencing nasal blockage / obstruction / congestion, i.e., 28 (56 %); followed by 19 subjects with nasal discharge (38 %); 17 subjects with facial pain/pressure (34 %); and finally 4 subjects with reduction/loss of smell (8 %).

**Table 4: Correlation between radiological grades, Lund-Mackay score and SNOT-22 grades**

<b>SNOT-22 grades</b>	<b>Correlation Coefficient</b>	<b>P-Value</b>
<b>Radiological</b>	0.85	0.001
<b>Lund-Mackay score</b>	0.71	0.01

The above table gives data on co-relation between radiological grades, Lund- Mackay score and SNOT-22 grades.

There was a positive co-relation (0.85) indicating that the radiological grades increase with a increase in SNOT-22 grades. The p-value calculated was 0.001 indicating a highly significant statistical difference between the radiological and SNOT-22 grades.

There was a positive co-relation (0.71) indicating that the Lund-Mackay score increase with a increase in SNOT-22 grades. The p-value calculated was 0.01 indicating a significant statistical difference between the Lund-Mackay score and SNOT-22 grades.

**Table 5: Correlation between Radiological grades and SNOT-22 grades**

<b>Radiological grades</b>	<b>Correlation Coefficient</b>	<b>P-Value</b>
<b>Mild (8-15)</b>	0.88	0.001
<b>Moderate (16-23)</b>	0.91	0.001
<b>Severe (&gt;23)</b>	0.76	0.001

The co-relation coefficient between mild, moderate and severe radiological grades and SNOT-22 grades were 0.88, 0.91 and 0.76 respectively indicating that the radiological grades increase with a increase in SNOT-22 grades. The p value calculated at all the grades was 0.001 indicating a highly significant statistical difference between the radiological and SNOT-22 grades.

## Discussion

Most subjects were belonging to the age group of 31-40 years, i.e., 32 %; followed by 28 % subjects were belonging to the age group of 41-50 years; 16 % subjects were belonging to the age group of 51-60 years; 12 % subjects were belonging to the age group of 20-30 years; 10 % subjects were belonging to the age group of 61-70 years and finally 6 % subjects were belonging to the age group of less than 20 years. The results of our study were in accordance with the past studies conducted by **Lanza DC et al<sup>9</sup>**, **Gliklich RE et al<sup>1</sup>** and **Blackwell DL et al<sup>10</sup>**.

It was found that females were mostly suffering with chronic rhinitis (62 %) when compared with males (38 %). The ratio of which is 1:1.6. The results of our study were in accordance with the past studies conducted by **Lanza DC et al<sup>9</sup>**, **Gliklich RE et al<sup>1</sup>** and **Blackwell DL et al<sup>10</sup>**.

It was found that most subjects were overweight (46 %); followed by 28 % subjects in normal

category; 16 % subjects were obese and finally 10 % were underweight. The results of our study were in accordance with the past studies conducted by **LanzaDC et al<sup>9</sup>**, **Gliklich RE et al<sup>1</sup>** and **Blackwell DL et al<sup>10</sup>**. Majority subjects were having the moderate grading, i.e., 54 %; followed by 38 % subjects in the mild grading and finally 8 % subjects with severe grading. The results of our study were in accordance with the past studies conducted by Phillips CD et al<sup>2</sup>, Bhattacharyya N et al<sup>4</sup> and Bhattacharyya N et al<sup>6</sup>

Majority subjects were having a moderate grading, i.e., 44 %; followed by equal distribution in the mild and severe categories, i.e., 28 % each. The results of our study were in accordance with the past studies conducted by Piccirillo JF et al<sup>11</sup> Browne JP et al<sup>12</sup>, Buckland JR et al<sup>13</sup> and Aditya M et al<sup>14</sup>

Majority subjects were belonging to stage IV, i.e., 44 %; followed by 28 % in stage III; 24 % subjects in stage II and finally 4 % subjects in stage I. The results of our study were in accordance with the past studies conducted by **BrowneJP et al<sup>15</sup>**, **Hopkins C et al<sup>5</sup>** and **Kalogjera Let al<sup>7</sup>**.

Majority subjects were experiencing nasal blockage / obstruction / congestion, i.e., 56 %; followed by 38 % subjects with nasal discharge; 34 % subjects with facial pain/pressure; and finally 8 % subjects with reduction/loss of smell.

The results of our study were in accordance with the past studies conducted by Bhattacharyya N et al<sup>6</sup>, Kenny TJ et al<sup>16</sup>, Hoehle LP et al<sup>17</sup> and Husain Q et al<sup>18</sup>.

There was a positive co-relation (0.85) indicating that the radiological grades increase with an increase in SNOT-22 grades. The p-value calculated was 0.001 indicating a highly significant statistical difference between the radiological and SNOT-22 grades. There was a positive co-relation (0.71) indicating that the Lund-Mackay score increase with an increase in SNOT-22 grades.

The p-value calculated was 0.01 indicating a significant statistical difference between the Lund-Mackay score and SNOT-22 grades. The results of our study were in accordance with the past studies conducted by **BrowneJP et al<sup>15</sup>**, **Hopkins C et al<sup>5</sup>** and **Kalogjera Let al<sup>7</sup>**.

The co-relation coefficient between mild, moderate and severe radiological grades and SNOT-22 grades were 0.88, 0.91 and 0.76 respectively indicating that the radiological grades increase with an increase in SNOT-22 grades. The p value calculated at all the grades was 0.001 indicating a highly significant statistical difference between the radiological and SNOT-22 grades. The results of our study were in accordance with the past studies conducted by **PhillipsCD et al<sup>2</sup>**, **Bhattacharyya N et al<sup>4</sup>** and **Bhattacharyya N et al<sup>6</sup>**.

The co-relation coefficient between radiological grades and SNOT-22 grades in subjects with nasal polyps was 0.72 indicating an increase in the radiological grades with an increase in SNOT-22 grades. The p value calculated was 0.01 indicating a significant statistical difference between the radiological and SNOT-22 grades in subjects with nasal polyps.

The co-relation coefficient between radiological grades and SNOT-22 grades in subjects without nasal polyps was 0.95 indicating an increase in the radiological grades with an increase in SNOT-22 grades. The p value calculated was 0.001 indicating a highly significant statistical difference between the radiological and SNOT-22 grades in subjects without nasal polyps. The results of our study were in accordance with the past studies conducted by **Fokkens W et al<sup>3</sup>**, **Asif H. Khan et al<sup>19</sup>** and **Fokkens W et al<sup>20</sup>**.

## Conclusion

Our study has shown that clinical symptoms, radiological grades and Lund-Mackay score have positive correlation with SNOT-22 grades thus emphasizing the point that SNOT-22 questionnaire can be best used to study clinical severity of CRS with additional benefits of being easily administered, cost effective and less time consuming. Therefore, is of very benefit in developing countries like India.

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