
The Correlation Between SNOT-22 and Visual Analogue Scale in the Assessment of Symptom Severity in Chronic Rhinosinusitis

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Abstract: Chronic rhinosinusitis is an inflammatory process involving the sinonasal mucosa, lasting 12 weeks or longer. It is often characterized by a complex of debilitating symptoms usually classified into minor and major symptoms. Estimating symptom/ disease severity using structured questionnaires can be challenging. This is especially so in rural areas where a combination of low literacy levels and language barrier may present communication difficulties. In view of the aforementioned challenges, it has become imperative to explore the correlation between the 22- item sino-nasal outcome test (SNOT-22) and a simpler means of evaluating symptom severity in chronic rhinosinusitis; hence this study. To determine the correlation between SNOT-22 and visual analogue scale (VAS) questionnaire scoring of symptom severity in chronic rhinosinusitis. This was a twelve month prospective cross sectional study of fifty- two consecutive newly diagnosed adult patients with chronic rhinosinusitis. Age of patients ranged from 19 – 91 years. Male to female ratio was 1: 1.26. There was a significant positive correlation between VAS and SNOT-22 in moderate and high symptom severity in patients with CRS. This study found a positive correlation between SNOT-22 and VAS scoring of disease severity in moderate and severe diseases and an insignificant correlation between these two instruments in mild disease. VAS can be used as a guide to symptom severity in the pre-treatment patients with CRS.

Keywords: Chronic Rhinosinusitis, Sinonasal Outcome Test-22, Visual Analogue Scale, Symptoms, Severity, Low Literacy, Language Barrier

1. Introduction

Chronic rhinosinusitis (CRS) is an inflammatory process involving the sinonasal mucosa. It is defined as the presence of two or more symptoms one of which should be either nasal blockage/obstruction/congestion or nasal discharge (anterior or posterior) with or without facial pain (pressure), hyposmia for more than 12 weeks, together with pathologic endoscopic findings in the middle nasal meatus and or computerized tomography scan changes within the osteomeatal complex (OMC) and or sinuses [1]. The mean medical cost of CRS per patient was reported to be \$921 with an average of 4.8 missed workdays annually in the United

States [2]. In north-western Nigeria, Iseh et al [3] reported a prevalence of 7.3% of CRS in a population of children and adults, which is consistent with studies on CRS in otolaryngology practice from various regions in Nigeria with a similar population [4-9].

Although the symptoms of rhinosinusitis are not life threatening, they are associated with a dramatic reduction in quality of life and causes emotional distress among sufferers. It often results to reduced work and school attendance, sleep disturbance, sexual and olfactory dysfunction [10]. These symptoms and signs of CRS which includes facial congestion or fullness, nasal obstruction or blockage, anterior rhinorrhoea or post-nasal discharge, hyposmia, headache, fever, halitosis,

fatigue, dental pain, cough and ear pressure or pain lasting are often troubling and refractive [11, 12].

Disease-specific questionnaires are frequently used to assess symptom severity in patients with CRS. Compared with general instruments they are able to capture symptoms in greater detail and are more sensitive in detecting changes after therapeutic intervention [13]. The severity of CRS symptoms often called a symptom score are measured using a disease specific health-related quality of life questionnaire [14-16].

One of the most validated instrument / questionnaire for evaluating disease severity and quality of life in CRS is the 22-item Sinonasal Outcomes Test (SNOT-22). It combines the assessment of nasal, paranasal, and psychological symptoms, as well as those associated with sleep. It is a questionnaire which is broadly used in literature and is considered the most adequate questionnaire to assess the severity of CRS as well as the quality of life of patients with the disease [17]. It has 22 questions about sinonasal symptoms and general status aspects, rated on a 5 point scale (0-5) and has been used to grade CRS. A low/mild symptom severity equates to a SNOT-22 score of 0 to 26 (mild disease), an intermediate/moderate severity score to 27 to 58 (moderate disease) and high/severe symptom severity score equates to 59 and above (severe disease). Another one of such instrument that could be used in evaluation of CRS is the visual analogue scale questionnaire (VAS). The VAS is a validated psychometric response scale usually represented by a horizontal line, 10cm in length, anchored by word descriptors at each end. The patient indicates the position on the line that they feel represents their perception of their current state [16]. Though it is a straightforward assessment tool widely employed in many disciplines to subjectively estimate the degree or strength of pain, its application in estimation of overall symptom severity in CRS is still vastly unexplored.

While it is true that structured self-administered questionnaires such as SNOT-22 has given patients the medium to finally express the level of debilitation or discomfort they suffer as a result of the disease, understanding the terminologies of some of these questionnaires can be challenging for some patients, especially in rural areas where literacy levels are low. Completion of these questionnaires usually takes a longer time, often requiring the assistance of medical personnel. This study aims to explore the correlation between SNOT-22 and a simpler, easy to administer alternative in VAS.

2. Method

This was a one year prospective cross-sectional study (April 2014 – March, 2015) of consecutive newly diagnosed adult patients with CRS presenting at the otorhinolaryngology clinic of Obafemi Awolowo University Teaching Hospitals complex, Ile-Ife, a tertiary institution in

the south-west region of Nigeria.

Ethical clearance was sought and obtained for this work from the hospital Ethics review committee (Obafemi Awolowo University Teaching Hospital Complex IRB/IEC/0004553, Protocol number: ERC/2013/11/10) after which a written informed consent was obtained from individual participants in this study.

Exclusion criteria: Patients diagnosed with acute rhinosinusitis, asthma, depression as well as other chronic ailments (co-morbidities) were excluded from this study.

After a clinical and radiological confirmation of CRS, SNOT-22 questionnaire was administered to each patient upon their first clinical visit. This was to estimate the overall symptoms severity score and grade the disease. The maximum score obtainable from the SNOT-22 questionnaire was one hundred and ten (110) and the minimum score was zero (0). A low/mild symptom severity equated to a SNOT-22 score of 0 to 26 (mild disease), an intermediate/moderate severity score to 27 to 58 (moderate disease) and high/severe symptom severity score equated to 59 and above (severe disease) [14]. After completing the SNOT-22 questionnaire, a second questionnaire (VAS) was handed to these patients. Prior to this, each patient was asked how they perceived their general health and overall sino-nasal symptoms in particular in the last two weeks before presentation. They were instructed to rate the severity of their overall sino-nasal symptoms on a scale of 1 to 10 (The visual analogue scale (VAS) was also deployed to determine the overall symptoms severity score and grade the disease). VAS is calibrated from 0 to 10 where 0 means not troublesome and 10 means most troublesome. A VAS score of 0 to 3 was regarded as a mild disease, a score of 4 to 6 was regarded as moderate disease and a score of 7 to 10 was regarded as a severe disease [16]. Data obtained from both questionnaires were then subjected to a correlation test. The correlation between SNOT-22 and VAS scores was done using Spearman correlation test. Statistical significance was inferred at $p < 0.05$.

3. Results

Fifty-two adult patients with CRS were recruited into this study, 23 (44.2%) males and 29 (55.8%) females, giving a male to female ratio of 1: 1.26. Their ages ranged from 19 – 91 years (mean 45.0 ± 5.5) as shown in Figure 1.

Mean symptom severity score using SNOT-22.

Postnasal discharge (dripping at the back of the nose) had the highest severity score among patients at 3.04 ± 0.14 . Dizziness was the symptom with the least mean severity score at 0.71 ± 0.31 .

The rhinological symptom domain had the highest severity score distribution and mean total score (2.39 ± 0.44) followed by the psychological symptom domain (1.42 ± 0.43). The symptom domain titled “others” had the least mean severity score of 1.06 ± 0.40 as shown in table 1.

Age Distribution of Patients

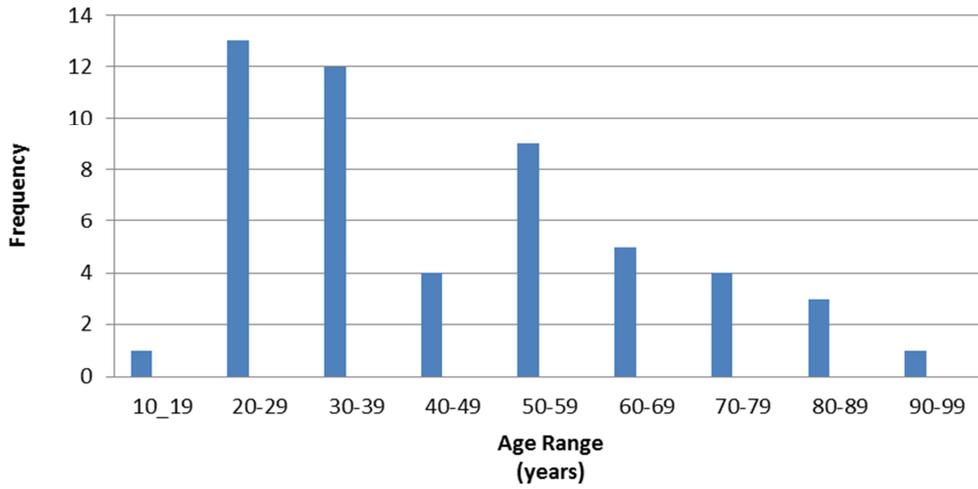


Figure 1. Age distribution of patients.

Distribution of SNOT-22 and VAS scores

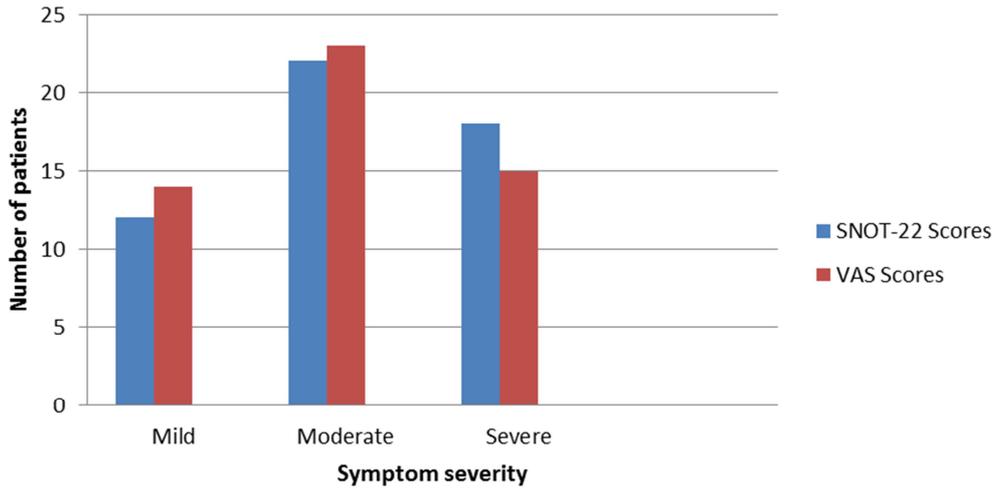


Figure 2. Distribution of SNOT-22 and VAS scores.

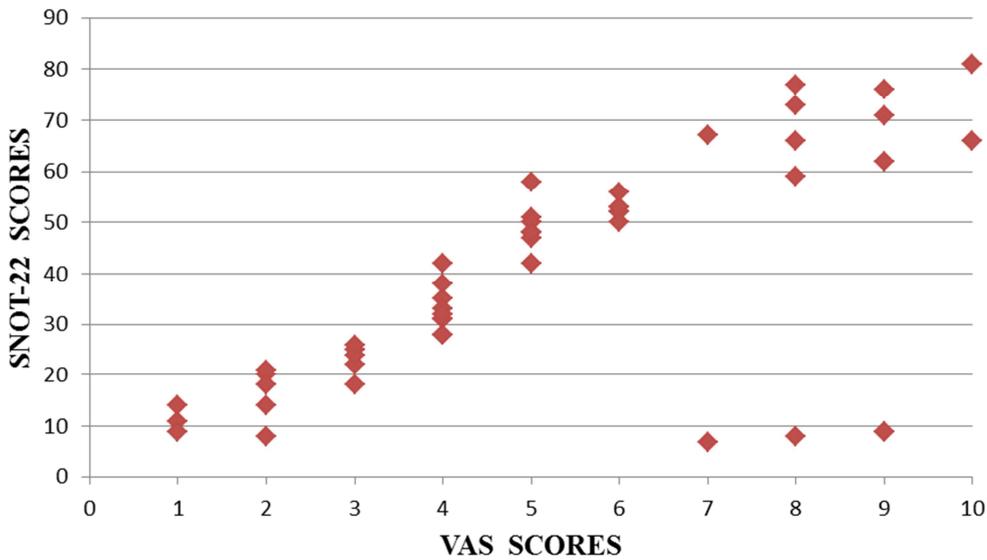


Figure 3. Scatter plot of SNOT-22 scores and VAS scores.

Table 1. Mean symptom severity score of CRS (Peak score = 5).

Symptom Domain	Sino-Nasal Outcome test	Number of patient	Mean severity score	STD severity score
Rhinological Symptoms	Need to blow nose	42	2.17±0.41	1.52
	Sneezing	41	2.21±0.43	1.59
	Runny Nose	41	2.46±0.45	1.66
	Post nasal discharge (dripping at back of nose)	46	3.04±0.41	1.53
	Thick nasal discharge	41	2.29±0.40	1.65
	Sense of taste/smell	30	1.67±0.49	1.81
	Blockage /congestion of nose	45	2.88±0.49	1.79
Total			2.39±0.44	1.62
Ear/facial symptoms	Ear fullness	31	1.15±0.32	1.19
	Dizziness	18	.71±0.31	1.14
	Ear pain/pressure	25	.88±0.64	1.20
	Facial pain/pressure	35	2.13±0.48	1.77
Total			1.21±0.44	1.32
Sleep symptoms	Difficulty falling asleep	31	2.00±0.52	1.92
	Waking up at night	35	1.98±0.46	1.67
	Lack of a good night's sleep	31	1.69±0.45	1.66
	Waking up tired	32	1.79±0.47	1.75
Total			1.24±0.48	1.75
Psychological symptoms	Fatigue during the day	31	1.42±0.40	1.47
	Reduced productivity	28	1.40±0.42	1.58
	Reduced concentration	25	1.23±0.41	1.52
	Frustrated /restless/irritable	28	1.40±0.42	1.55
	Sad	30	1.56±0.45	1.66
	Embarrassed	28	1.52±0.45	1.69
Total			1.42±0.43	1.58
Others	Cough	24	1.06±0.40	1.49

Distribution of SNOT-22 and VAS scores.

Descriptive statistics of total SNOT-22 scores.

The mean total SNOT-22 of the patients in this study was 38.67 with standard deviation of 17.20. The median was 41.50, mode was 42.00, minimum score was 4.0 and maximum score was 76.0. The total SNOT-22 score was not skewed but approximately normally distributed.

A moderate/intermediate severity of CRS was the most prevalent finding among patients administered both questionnaires as shown in figures 2 and 3.

Correlation between SNOT-22 scores and VAS.

There was a significant positive correlation between a high/severe SNOT-22 score and severe VAS scores ($r = +0.497$, $p < 0.05$), a significant positive correlation between intermediate SNOT-22 scores and moderate VAS scores ($r = +0.392$, $p < 0.05$) and an insignificant positive correlation between a low SNOT-22 score and mild VAS scores ($r = +0.285$, $p > 0.05$) as shown in table 2.

Table 2. Correlation between Overall SNOT-22 and VAS scores.

Variables correlated	Correlation coefficient (r)	P-value
Low symptom scores: SNOT-22 VAS	+0.285	0.118
moderate symptom scores: SNOT-22 VAS	+0.392	0.021
High symptom scores: SNOT-22 VAS	+0.497	0.008

4. Discussion

Chronic rhinosinusitis (CRS) is a common medical condition of multi-factorial origin that can severely affect the quality of life of individuals who suffer from it. Not all the symptoms of CRS can be precisely described by patients;

hence the need arises for a quantifiable, very simple and easily admissible instrument such as VAS; an instrument most commonly used for pain.

There was a slight female preponderance for CRS in our study and the mean age of patients was 45 years, signifying that the disease is more common in middle aged adults. This is in consonance with reports from a similar work by da

Lilly-Tariah et al [18] but differs from that of Sogebi et al [19] who reported that CRS was more common in the pediatric age group and in young adults with no sex predilection. Our study found the most severe symptoms of CRS in order of decreasing mean severity scores were postnasal dripping (3.04 ± 0.41), nasal blockage/congestion (2.88 ± 0.49) and runny nose (2.46 ± 0.45). This is similar to what was reported by Bhattacharyya et al [20], differing slightly from another contemporary work by Abdalla et al [21] where nasal blockage/congestion, altered taste/smell and need to blow nose were reported as the most severe symptoms of CRS in that order.

The distribution of symptom severity score among the five major symptom domains in this study showed that the rhinological symptom domain had the highest severity scores followed by the psychological symptom domain. However Bhattacharyya et al [22] reported a different outcome, with rhinological symptom domain having the highest severity scores followed by the facial symptom domain. His work was carried out on a population being evaluated for potential chronic rhinosinusitis which also included patients with acute rhinosinusitis. This perhaps explains the difference in outcome.

According to VAS classification of disease severity more than half of the patients in this study adjudged their disease to be moderate or severe. This finding is in consonance with reports from a similar local study by Olowosusi et al [23] where 60.5% of patients adjudged their disease to be moderate or severe. Although the measure of disease severity using VAS is subjective and open to individual variability, it does provides a quick and simple understanding of an individual's overall disease condition as it affects functionality and also helps to evaluate response to therapy.

This study found a positive correlation between SNOT-22 and VAS scoring of disease severity in moderate and severe diseases and an insignificant correlation between these two instruments in mild disease. This finding demonstrates that a simple, easily administered questionnaire like VAS can achieve the same result as a relatively more complex questionnaire like snot-22. Hence VAS can be used as a guide to symptom severity in the pre-treatment patient.

5. Conclusion

VAS can be used as a guide to symptom severity in the pre-treatment patients with CRS, especially in high and moderate severity/ disease where there is a moderate to strong correlation between these two instruments. Though further research on this subject using a larger sample size is advocated for, VAS can be employed to estimate symptom/disease severity in areas that presents low literacy and language barriers as challenges.

List of Abbreviations

CRS	Chronic rhinosinusitis
SNOT-22	Sinonasal outcome test 22
VAS	Visual analogue score
OMC	Osteomeatal complex

Declarations

Ethical approval: Ethical clearance was sought and obtained for this work from the hospital Ethics review committee (Obafemi Awolowo University Teaching Hospital Complex IRB/IEC/0004553, Protocol number: ERC/2013/11/10) after which a written informed consent was obtained from individual participants in this study.

Availability of data and materials: Data and materials used for this work is readily available and can be found in the result section of this manuscript. The authors will gladly provide any further data required during evaluation of this work at any time.

Competing Interests

The authors declare that they have no competing interests.

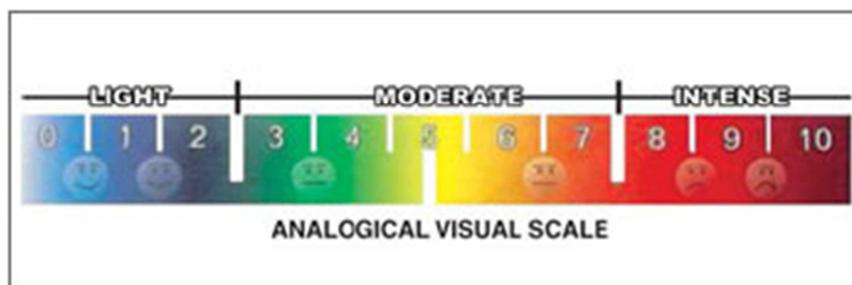
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Appendix

Appendix I

QUESTIONNAIRE 1
VISUAL ANALOGUE SCALE (VAS)



Appendix II**SNOT -22 QUESTIONNAIRE.**

A: Considering how severe the problem is when you experience it and how frequently it happens, please rate each item below on how 'bad' it is by circling the number that corresponds with how you feel using this scale →

	No problem	Very mild problem	Mild or slight problem	Moderate problem	Severe problem	Problem as bad as it can be
1. Need to blow nose	0	1	2	3	4	5
2. Sneezing	0	1	2	3	4	5
3. Runny nose	0	1	2	3	4	5
4. Cough	0	1	2	3	4	5
5. Post nasal discharge (dripping at the back of your nose)	0	1	2	3	4	5
6. Thick nasal discharge	0	1	2	3	4	5
7. Ear fullness	0	1	2	3	4	5
8. Dizziness	0	1	2	3	4	5
9. Ear pain	0	1	2	3	4	5
10. Facial pain/pressure	0	1	2	3	4	5
11. Difficulty falling asleep	0	1	2	3	4	5
12. Waking up at night	0	1	2	3	4	5
13. Lack of a good night's sleep	0	1	2	3	4	5
14. Waking up tired	0	1	2	3	4	5
15. Fatigue	0	1	2	3	4	5
16. Reduced productivity	0	1	2	3	4	5
17. Reduced concentration	0	1	2	3	4	5
18. Frustrated/restless/irritable	0	1	2	3	4	5
19. Sad	0	1	2	3	4	5
20. Embarrassed	0	1	2	3	4	5
21. Sense of taste/smell	0	1	2	3	4	5
22. Blockage/congestion of nose	0	1	2	3	4	5

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