

Original Article

SINONASAL OUTCOME TEST (SNOT-22) SCORES AS A PREDICTOR OF OUTCOME IN PATIENTS UNDERGOING FUNCTIONAL ENDOSCOPIC SINUS SURGERY (FESS) FOR CHRONIC RHINOSINUSITIS (CRS) AT A TERTIARY CARE CENTRE IN EASTERN NEPAL

Sanjeev Kumar Thakur¹, Apar Adhikari¹, Tekendra Khanal¹, Rajesh Kumar Ray¹, Nisha Ghimire²

¹Department of ENT, ²Department of Physiology, Nobel Medical College, Morang, Nepal

Submitted: 10th-January-2023, Revised: 15th-March-2023, Accepted: 15th-April-2023

DOI:

ABSTRACT**Background**

Sino nasal outcome test (SNOT) is a subjective tool in which both nasal and health-related symptomatic improvements are assessed in cases of Chronic Rhinosinusitis (CRS). We aim to report the demography of CRS patients and magnitude of symptoms, along with its improvement over time after the surgery, using SNOT questionnaire.

Methods

A hospital based prospective, descriptive study was done in 35 patients with medically refractory CRS cases who underwent Functional endoscopic sinus surgery (FESS), over one year. All patients were routinely examined the 1st week, the 4th week, and 3 months after surgery.

The cases were assessed preoperatively and then after surgery, using the Sino-nasal Outcome Test-22 (SNOT-22) questionnaire, for a maximum of 3 months period. The results were expressed in number and percentage. Mean and standard deviation were used to describe the findings and compare the initial and follow up values. Association between preoperative and postoperative symptoms was analyzed using paired sample t-test and p value less than 0.05 were considered significant.

Results

The age range was 14-64 years, with a mean age of $33.11 \pm$ years. 12(34.28%) were male and 23(65.71%) were female. Polyps were present in 12 (34.28%). 23 (65.71%) cases were without polyp. The mean SNOT score overall preoperatively was $33.94 \pm$ SD, while postoperative SNOT score was $19.05 \pm$ SD. There was a significant improvement in nasal, ear and facial symptoms, quality of life symptoms and psychological symptoms.

Conclusion

There was an overall improvement in all the symptoms postoperatively, though the Cough and dizziness improvement was not statistically significant.

Keywords: Nasal polyps, Rhinosinusitis, SNOT-22

	©Authors retain copyright and grant the journal right of first publication. Licensed under Creative Commons Attribution License CC - BY 4.0 which permits others to use, distribute and reproduce in any medium, provided the original work is properly cited.	*Corresponding Author: Sanjeev Kumar Thakur Email: sanjeevkr055@gmail.com Orcid ID: https://orcid.org/0000-0002-2855-1766
---	---	---

Citation

Thakur SK, Adhikari A, Khanal T, Ray RK, Ghimire N, Sinonasal outcome Test (SNOT-22) Scores as a Predictor of outcome in Patients Undergoing Functional Endoscopic Sinus Surgery (FESS) for Chronic Rhinosinusitis (CRS) at a Tertiary Care Centre in Eastern Nepal, MJEN. 2023 June; 2(1):5-9.

INTRODUCTION

Chronic rhinosinusitis is group of disorders characterized by inflammation of the mucosa of nose and the paranasal sinuses of 12 consecutive weeks duration and more.¹ Centre for disease control in their report indicated that 16.3% of the adult population is affected by this condition in United States and 5% to 15% population in Europe.² The disease burden, in developing country, was stated to be of the magnitude of 15% of the population, suffering at least once in their lifetime.³ Chronic rhinosinusitis (CRS) is a common and debilitating condition with a significant economic impact.⁴

Chronic rhinosinusitis (CRS) is diagnosed by two or more of the following signs and symptoms, persisting for more than 12 consecutive weeks: nasal obstruction and/or congestion, nasal discharge (anterior and/or posterior), facial pain and/or pressure, and reduction or loss of smell.^{5,6} Approximately 20% of patients with chronic sinusitis have nasal polyposis.⁷

Uncontrolled CRS symptoms may lead to impaired quality of life such as absence from work up to 6.5% of the time, a 38% loss of productivity, and a 36% reduction in on-the-job.^{8,9} If the medical therapy of the condition fails, functional endoscopic sinus surgery (FESS) is indicated for ventilation and drainage of sinuses.^{8,9,10}

A European position paper on rhinosinusitis and nasal polyps recommends the subjective assessment of symptoms using validated questionnaires.⁶ Sino nasal outcome test (SNOT) is a subjective tool in which both nasal and health-related symptomatic improvements are assessed.^{11,12} It is a modification of Rhinosinusitis Outcome Measure (RSOM 31) that was developed in 1995 A.D.¹³

The SNOT-22 questionnaire has four main categories.¹ Nose related (need to blow nose, sneezing, runny nose, nasal obstruction, loss of smell/taste and post nasal drip).² Ear/Facial related (Ear fullness, dizziness, ear pain, facial pain and pressure).³ Quality of life-related (difficulty falling asleep, wake up at night, wake up tired, fatigue, reduced productivity and reduced concentration).⁴ Psychologically related (frustrated/restless, sad and embarrassed).⁴ In a recent study by Rudmik and co-authors, the 22 item SNOT questionnaire provided one of the best quality CRS specific PROMS (patient reported outcome measures).⁸

There are a few studies which describe the effect of FESS on CRS outcome, however, not many have reported the symptom wise improvement. We aim to report the demography of CRS patients and magnitude of symptoms, along with its improvement over time after the surgery. This will possibly help to find out the pattern of common presentations, monitor the improvement and to counsel the patient regarding

their expectation after surgery.

METHODS

This hospital based prospective, descriptive study was done in 35 patients presenting to ENT Out Patient Department (OPD) at Nobel Medical College & Teaching Hospital, Kanchanbari, Biratnagar with medically refractory CRS cases posted for Functional endoscopic sinus surgery (FESS). This study was carried from 15 October, 2020 to 15 October, 2021, after ethical clearance from institutional review committee (382/2020). The cases were included by convenient sampling method.

Diagnosed cases of CRS (with or without polyposis) with criteria according to EPOS 2012 (European position paper on rhinosinusitis and polyposis) undergoing FESS, with age above 12 years and who gave Informed consent were included for the study.⁶ Cases with history of previous nasal or sinus surgery, acute exacerbation of CRS, autoimmune diseases, granulomatous diseases, cystic fibrosis, malignancies, diabetes, tuberculosis; pregnancy, lactation and patients who were not willing to participate in the study were excluded. Those cases with preoperative SNOT-22 score between 0 and 9, were also excluded, to avoid the flooring effect.¹⁴

This was followed by a detailed diagnostic ear, nose, and throat (ENT) examination. Anterior rhinoscopy and posterior rhinoscopy along with paranasal sinus examination was carried out. Diagnostic nasal endoscopic (DNE) examination and confirmatory computed tomography scans (scored using the Lund-Mackay scoring system) was done.¹⁵ They were followed up for 3 months.

All FESS procedures were conducted by an expert surgeon, who used a standard Messerklinger's technique in an optimal setting. A standard medication protocol, which included hypertonic saline nasal irrigation and intranasal administration of corticosteroids and antibiotics, was prescribed for all patients.

All patients were routinely examined the 1st week, the 4th week, and 3 months after surgery.

The cases were assessed preoperatively and then after surgery, using the Sino-nasal Outcome Test-22 (SNOT-22) questionnaire "All rights reserved. Copyright 2006. Washington University in St. Louis, Missouri."¹⁶

The data were tabulated. The results were expressed in number and percentage. Mean and standard deviation were used to describe the findings and compare the initial and follow up values. Each symptom of SNOT-22 was graded from zero to five, preoperatively and at each following appointment. Analysis was done by Statistical Package for Social Sciences (SPSS) version 16. Association between preoperative and post-operative symptoms was analyzed using paired sam-

ple t test and p value less than 0.05 were considered significant.

RESULTS

Table 1: Age and Gender Distribution

Age groups	Male	Female	Total
Less than 25	5(14.28%)	4(11.42%)	9(25.71%)
26-35	2(5.74%)	12(34.28%)	14(40%)
36-45	2(5.74%)	4(11.42%)	6(17.14%)
46-55	2(5.74%)	2(5.74%)	4(11.42%)
56 and above	1(2.85%)	1(2.85%)	2(5.74%)
Total	12(34.28%)	23(65.71%)	35(100%)

A total of 35 patients were analysed. The age ranging was 14-64 years. Overall, the mean age was $33.11 \pm$ years. The mean age of male were 35.21 years and the mean age of female was 32.55 years. 12(34.28%) were male and 23(65.71%) were female. Most of the cases, 14 (40%) were between 26-35 years age group and least were those who were 56 above, 2(5.74%).

Table 2: The distribution of Cases with and without nasal polyps

Diagnosis	Frequency	Percentage
CRS with polyp	12	34.28%
CRS without polyp	23	65.71%

Out of 35 cases of CRS, polyps were present in 12 (34.28%). 23 (65.71%) cases were without polyp.

Table 3: The SNOT-22 Score of the Study Population

Symptoms	Mean $\pm$ SD Preoperative	Mean $\pm$ SD Postoperative	P-Value
Need to blow nose	2.94 ± 0.725	1.6 ± 0.812	<0.001
Nasal Blockage	3.34 ± 0.684	1.8 ± 0.994	<0.001
Sneezing	2.06 ± 0.998	1.37 ± 1.215	0.003
Runny Nose	2.94 ± 0.591	1.26 ± 0.919	0.006
Cough	2.00 ± 0.642	0.91 ± 0.507	0.368
Post nasal discharge	1.80 ± 0.901	1.31 ± 0.583	0.076
Thick nasal discharge	1.54 ± 0.611	0.86 ± 0.43	<0.001
Ear Fullness	1.14 ± 0.944	0.51 ± 0.507	0.003
Dizziness	0.29 ± 0.458	0.09 ± 0.284	0.070
Facial pain/pressure	2.11 ± 0.832	0.89 ± 0.404	<0.001
Decreased sense of smell	0.74 ± 0.919	0.46 ± 0.657	<0.001
Difficulty in Falling asleep	0.60 ± 0.775	0.23 ± 0.490	<0.001
Wake up at night	0.57 ± 0.778	0.31 ± 0.631	<0.001
Lack of good night sleep	0.57 ± 0.778	0.31 ± 0.631	<0.001
Wake up tired	1.34 ± 1.187	0.80 ± 0.964	<0.001
Fatigue	1.34 ± 1.187	0.80 ± 0.964	<0.001
Reduced productivity	1.89 ± 1.301	1.11 ± 0.900	<0.001
Reduced concentration	2.26 ± 0.247	1.51 ± 1.197	<0.001
Frustrated/restless/irritable	1.17 ± 1.17	0.66 ± 0.838	<0.001
Sad	1.71 ± 0.926	1.11 ± 0.796	<0.001
Embarrassed	1.57 ± 0.917	1.14 ± 0.912	<0.001

The mean SNOT score overall preoperatively was $33.94 \pm$ SD, while postoperative SNOT score was $19.05 \pm$ SD. There was a significant improvement in nasal, ear and facial symptoms, quality of life symptoms and psychological symptoms as shown in the table.

Nasal obstruction: Most of the patients complained of nasal obstruction preoperatively with mean SNOT score of 3.34 ± 0.684 . Following surgery the mean SNOT 22 was 1.8 ± 0.994 (p value <0.001).

Need to blow nose: It was the second most common symptom following nasal obstruction. The preoperative mean was 2.94 ± 0.725 and postoperative mean was 1.6 ± 0.812 . (p value <0.001).

Runny Nose: This was also quite common. The preoperative mean was 2.94 ± 0.591 , while, post op score was 1.26 ± 0.919 .

Sneezing: The preop score was 2.06 ± 0.998 , while, the postop score was 1.37 ± 1.215 , with a significant improvement in symptoms.

Facial pain: The mean preop score was 2.11 ± 0.832 and postop score was 0.89 ± 0.404 , with p value <0.001.

Though there was improvement in mean score for other symptoms like cough, post nasal discharge and Dizziness, these were however not statistically significant. There were statistically significant symptoms regarding quality of life and emotional symptoms, as shown in the table.

DISCUSSION

This study was done to analyse the outcome of functional endoscopic surgery (FESS) for CRS by comparing the pre-operative and postoperative Sino nasal outcome test (SNOT-22) score. Mean age of study participant in this study was found to be $33.11 \pm$ SD, years, with a range of 14-64 years. The mean age of cases in a study was found to be 35.4 ± 14.2 years.¹⁴ A similar study found a mean age of 40.7 ± 13.5 years.¹⁷

Most of the cases were female in our study, contrary to other studies where male was more common.¹⁸ This could be because of chronic rhinosinusitis being more common in female in eastern Nepal.¹⁹

The improvement of nasal obstruction found in our study is supported by various studies worldwide.^{20, 21}

There were significant improvement in other nasal symptoms like need to blow nose, runny nose, thick nasal secretions, and nasal obstruction, which was in agreement to those reported by other authors.²²

Our study also found improvement in other SNOT-22 scores regarding ear and facial symptoms, quality of life index like sleep, and emotional symptoms like reduced concentration, frustrated/restless, irritable, sad and dizziness. Our finding matched the findings of other studies.²³ Various studies have drawn the same inference, although in one study, patients with depression had worse pre and postoperative health related

quality of life scores.^{24,25}

Our study had 12 (34.28%) of cases who underwent surgery for polyp with CRS. The CRS patients with polyps had greater improvement than CRS patients without polyp, similar to other studies.^{26,27}

A study demonstrated that 23% of 206 cases experienced improvement in olfactory impairment, 68% experienced no change, and the CRS of 9% got worse after FESS.²⁸ The results suggested that the presence of nasal polyposis and eosinophilia predicted olfactory improvement. In contrast to the above studies, a recent study showed that FESS had no impact on olfactory improvement.²⁹

A study of similar type showed that the surgical cohort experienced greater improvement than the medical cohort across all domains ($P < 0.001$) with marginally lesser improvement in psychological and sleep domains.³⁰

In our study, cough symptom, though showed improvement, it was not significant statistically (p -value 0.368), similar to a study.³¹

A study of a cohort, showed, 80% patients achieved minimal clinically important difference (MCID) after FESS and on an average, patients achieved 46.4% improvement.¹⁶ Patients can be guided accordingly regarding relative improvement after ESS based on which they can take decisions whether to undergo surgery or not.

The impact of the overall SNOT-22 score was seen in

that those patients with the highest symptom scores experienced the largest degree of improvement in the symptoms. This corresponds with previous studies, which have cited the relatively greater improvement among more severely affected patients.^{20,21}

It is important to note that even the patients with the lowest preoperative symptoms scores did experience improvement, although the magnitude of the change was limited by the associated flooring effect.

CONCLUSION

Chronic rhinosinusitis (CRS) was more common in younger age group and in female. CRS without polyposis was commoner. There was an overall improvement in all the symptoms postoperatively, though the Cough and dizziness improvement was not statistically significant.

LIMITATION OF THE STUDY

This study was single centered with a small size study population, and the follow up duration was only of three months. A multicentric study with large number of study population with a long term monitoring and reporting of symptoms is recommended.

Funding: None

Conflict of Interest: None

Ethical Clearance: Yes

REFERENCES

- Benninger MS, Ferguson BJ, Hadley JA, Hamilos DJ, Jacobs M, Kennedy DW, et al. Adult chronic rhinosinusitis: Definitions, diagnosis, epidemiology and pathophysiology. *Otolaryngol Head Neck Surg.* 2003;129(3):S1-32.
- Blackwell DL, Collins JG, Coles R. Summary health statistics for US adults: National Health Interview Survey. *Vital Health Stat* 10. 2002;205:1-109.
- Sandhu S, Gupta V, Matreja PS. Clinico-therapeutic Profile of Patients Suffering from Sinusitis. *J Transm Dis Immun.* 2017;1:1-5.
- Kennedy JL, Hubbard MA, Huyett P, Patrie JT, Borish L, Payne SC, et al. Sino-nasal outcome test (SNOT-22): A predictor of postsurgical improvement in patients with chronic sinusitis. *Ann Allergy Asthma Immunol* 2013;111(1):246-51.
- Hastan D, Fokkens WJ, Bachert C, Newson RB, Bislimovska J, Bockelbrink A, et al. Chronic rhinosinusitis in Europe--an underestimated disease. A GA²LEN study. *Allergy.* 2011;66(9):1216-23.
- Fokkens WJ, Lund VJ, Mullol J, Bachert C, Alobid I, Baroody F, et al. EPOS 2012: European position paper on rhinosinusitis and nasal polyps 2012. A summary for otorhinolaryngologists. *Rhinology.* 2012;50(1):1-12.
- Settipane GA. Epidemiology of nasal polyps. *Allergy Asthma Proc.* 1996;17:231-6.
- Rudmik L, Smith TL, Schlosser RJ, Hwang PH, Mace JC, Soler ZM. Productivity costs in patients with refractory chronic rhinosinusitis. *Laryngoscope.* 2014;124(9):207-12.
- Stankiewicz J, Tami T, Truitt T, Atkins J, Winegar B, Cink P, et al. Impact of chronic rhinosinusitis on work productivity through one-year follow-up after balloon dilation of the ethmoid infundibulum. *Int Forum Allergy Rhinol.* 2011;1(1):38-45.
- Noon E, Hopkins C. Outcomes in endoscopic sinus surgery. *BMC Ear Nose Throat Disord.* 2016;16:1-10.
- Smith TL, Mendolia-Loffredo S, Loehrl TA, Sparapani R, Laud PW, Nattinger AB. Predictive factors and outcomes in endoscopic sinus surgery for chronic rhinosinusitis. *Laryngoscope.* 2005;115(12):2199-205.
- Kohli P, Naik AN, Farhood Z, Ong AA, Nguyen SA, Soler ZM, et al. Olfactory Outcomes after Endoscopic Sinus Surgery for Chronic Rhinosinusitis: A Meta-analysis. *Otolaryngol Head Neck Surg.* 2016;155(6):936-48.
- Halawi AM, Smith SS, Chandra RK. Chronic rhinosinusitis: epidemiology and cost. *Allergy Asthma Proc.* 2013;34:328-34.
- Krishnaswami B, Velayutham P, Pruthivirajan N, Murugesan S, Vellikkannu R. *Int J Otorhinolaryngol Head Neck Surg.* 2019;5(4):876-82.
- Lund VJ, Mackay IS. Staging in rhinosinusitis. *Rhinology.* 1993;31:183-4.
- Rudmik L, Hopkins C, Peters A, Smith TL, Schlosser RJ, Soler ZM. Patient-reported outcome measures for adult chronic rhinosinusitis: A systematic review and quality assessment. *J Allergy Clin Immunol.* 2015 Dec;136(6):1532-40.
- Marambaia PP, Lima MG, Santos KP, Gomes AD, Sousa MM, Marques ME. Evaluation of the quality of life of patients with chronic rhinosinusitis by means of the SNOT-22 questionnaire. *Brazilian J Otorhinolaryngol.* 2013;79(1):54-8.
- Sharhan SSA, Bar MHA, Assiril SY, AlOtiabil AR, Bin



- Nooh DM, AlSugair FK. et al. Pattern of symptom improvement following endoscopic sinus surgery for chronic rhinosinusitis. *BMC Surg* 2021(21)288:1-9.
19. Singh I, Shrestha A, Gautam D, Ojasjvini. Chronic Rhinosinusitis and Nasal Polyposis in Nepal. *Clinical Rhinology: An International Journal*.2010;3(2):87-91.
20. Dizdar D, Bozan A, Dizdar S, Göde S, Alpay H. Evaluation of nasal symptoms in septoplasty patients using SNOT-22. *Acta Otorhinolaryngologica Italica*. 2019;39(2):98.
21. Goodson A, Poirrier A-L, Ahluwalia S, Bentley M, Andrews P. Sino-Nasal Outcome Test (SNOT-22) in septorhinoplasty: a useful outcome measure? *British Journal of Oral and Maxillofacial Surgery*. 2012;50:S52.
22. Savastano V, Bertin S, Vittori T, Tripodi C, Magliulo G. Evaluation of chronic rhinosinusitis management using the SNOT-22 in adult cystic fibrosis patients. *Eur Rev Med Pharmacol Sci* 2014;18:1985-9.
23. Satish H, Sreedhar K. Septoplasty outcome using SNOT-22 questionnaire study. *IOSR J Dental Med Sci*. 2013;6(5):34-8.
24. Litvack JR, Mace J, Smith TL. Role of depression in outcomes of endoscopic sinus surgery. *Otolaryngol Head Neck Surg* 2011;144:446-51.
25. Mace J, Michael YL, Carlson NE, Litvack JR, Smith TL. Effects of depression on quality of life improvement after endoscopic sinus surgery. *Laryngoscope* 2008;118:528-34.
26. Hopkins C, Rudmik L, Lund VJ. The predictive value of the preoperative sinonasal outcome test-22 score in patients undergoing endoscopic sinus surgery for chronic rhinosinusitis. *Laryngoscope* 2015;125:1779-84.
27. Sharma V, Rajbhandari S, Sathian B. Functional endoscopic sinus surgery comparison in a tertiary care hospital. *Am J Public Health Res* 2015;3:44-7.
28. Pade J, Hummel T. Olfactory function following nasal surgery. *Laryngoscope* 2008;118:1260-4.
29. Jiang RS, Lu FJ, Liang KL, Shiao JY, Su MC, Hsin CH, et al. Olfactory function in patients with chronic rhinosinusitis before and after functional endoscopic sinus surgery. *Am J Rhinol* 2008;22:445-8.
30. DeConde AS, Mace JC, Bodner T, Hwang PH, Rudmik L, Soler ZM, et al. SNOT-22 quality of life domains differentially predict treatment modality selection in chronic rhinosinusitis. *Int Forum Allergy Rhinol* 2014;4:972-9.
31. Singla G, Singh M, Singh A, Kaur I, Harsh K, Jasmeen K. Is sino-nasal outcome test-22 reliable for guiding chronic rhinosinusitis patients for endoscopic sinus surgery?. *Niger J Clin Pract* 2018;21:1228-33.

