Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

SINO-NASAL OUTCOME TEST (SNOT-22) CHANGE IN CHRONIC RHINOSINUSITIS WITH NASAL POLYPOSIS(CRSWNP) AFTER ENDOSCOPIC SINUS SURGERY (ESS)

Dr. Warzan Faris Hasan[1]
1-M.B.Ch.B, Otolaryngology, Head and Neck Surgery
Kurdistan Board Candidate; Erbilcity-Kurdistan Region/Iraq
E-mail: warzan.bani87@gmail.com
phone number:009647504835041

Dr. Moyaser Abdulrahman Yaseen[2]
2-MBChB, FICMS (ENT); Consultant in Otolaryngology,
Head and Neck surgery, Erbil city-Kurdistan region/Iraq
E-mail: Moyaseryaseen@yahoo.com
phone number:009647504534736

Abstract

Background: The chronic rhinosinusitis with nasal polyps is commonly predominant problem in outpatients' clinics. The evaluation of endoscopic sinus surgery is essential in detecting the short and long outcomes.

Objective: To determine the change in patient symptoms having chronic rhinosinusitis with nasal polyps (CRSwNP) before and after endoscopic sinus surgery (ESS) by using22-item Sino-Nasal Outcome Test (SNOT-22).

Methodology: This study wasa prospective cross sectionalstudy implemented in RizgaryTeaching Hospital and private hospitals in Erbil city-Kurdistan region/Iraq during the period of twelve months from 1st of June, 2021 to 31st of May, 2022 onconvenient sample of fifty six patients with chronic rhinosinusitis with nasal polyps.The SNOT-22 score was assessed by the researcher through using SNOT-22 questionnaire with assessment of 22 items evaluating quality of life [14]. The patients were followed up regarding SNOT-22 in different period(preoperativelyor as a baseline and postoperatively after one month, 3 months and 6 months).

Results: Mean ageof patients with CRSwNP was (39.34 years)with predominance of male gender(58.93%). The mean SNOT-22 score of patients with CRSwNP was significantly reduced postendoscopic sinus surgery ($p<0.001$).The mean SNOT-22 score of patients with CRSwNP at baseline was significantly reduced after one, three and six monthspostoperatively ($p<0.001$). SNOT-22 score was not significantly related to age and gender of patients. The ear pain/pressure and facial pain/pressure symptoms were not significantly reduced in different study durations.

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

Conclusions: The SNOT-22 score is a reliable tool used for evaluating short and long term outcomes of endoscopic sinus surgery in patients with chronic rhinosinusitis with nasal polyps.

Keywords: Chronic rhinosinusitis, Nasal polyps, Endoscopic Sinus surgery.

Introduction

The chronic rhinosinusitis (CRS) is defined as mucosal inflammation of nose and paranasal sinuses in duration of more than three months with prevalence of 5-12% all over the world and an obvious burden on quality of life[1-3]. The nasal polyps are defined as inflammatory swellings of nasal and paranasal mucosal sinuses. The CRS is classified into two major phenotypes according to presence of nasal polyps (NPs);either chronic rhinosinusitis with nasal polyp (CRSwNP) or chronic rhinosinusitis without nasal polyps (CRSsNP) [1].It was found that about twenty percent of patients with chronic rhinosinusitis have nasal polyps[4]and it was more prevalent in men, while the CRSwNP when affect women, it presented with highly severe inflammation and it is associated with many complications[5].Although full mechanism of CRSwNP etiology is not fully understood till now, many authors found that the chronic inflammation which is accompanied by eosinophilic infiltration, local IgE formation, and cytokine production are the main causes of chronic rhinosinusitis with nasal polyp in addition to relationship between type 2 inflammation and chronic rhinosinusitis with nasal polyps[1]. Nowadays, the major interest is focused on CRSwNP disease characterization in regard to pathophysiologic endotypes instead of clinical phenotypes which is helpful in designing management strategies depending on immunological targeting[6].

The endoscopic sinus surgery (ESS) was regarded as first-line treatment for CRS. However, many literatures revealed that it is standard to treat CRS primarily with medical treatment,in addition to irrigation, steroids, and maximal medical therapy[7]. The ESSwas shown 90-95% surgical success rates[1]. The ESS is indicated in patients with CRS not responding to the medical management. The ESS technique is concerned in removal of pathologic tissues inside the osteomeatal complex and restoring the mucociliary clearance and sinus ventilation without harming the normal physiology and anatomy [8].Since discovery of nasal endoscopy, treatment outcomes evaluation was under discussion. After use of ESS in previous century, there was a scarcity of literatures evaluating long term outcomes and surgical techniques effects [9]. Additionally, techniques used in evaluating ESS outcomes are based only on qualitative scales or sometimesrecordingthe change in some items of chronic rhinosinusitis symptoms criteria with absence of general assessment of improvement [10]. Unfortunately, these old assessment techniques were not designed for homogenous patients, but included different cases of acute rhinosinusitis, massive nasal polyposis, or recurrent sinusitis after external procedures [11]. After that, the biopsychosocial model was used clinically in evaluation of patient suffering, biological, psychological and social outcomes[12]. This model recorded the subjective experience of patients, which help also in diagnosis, assessment of outcomes and prolonged care. Similarly, the quality of life questionnaire was applied in assessment of outcome of many management strategies[13]. In same way, many Rhinologists used some symptom-based scores in evaluation ofmanagement outcomes of CRS

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

likeSinonasal Outcome Test 22 (SNOT-22) [14]. The SNOT-22 is avalidated,self-administered questionnaire that is used to assess CRS patients , It consists of 22 items, rated from 0 (no problem at all) to 5 (worst possible symptom). Possible SNOT-22 total scores range from 0 to 110, with higher SNOT-22 total scores indicating worse. It was shown by using SNOT-22, approximately 20% to 30% of CRS patients were not completely improvedpostoperatively, although their quality of life was high [15]. Additionally, some authors reported that some patients had 10-20% 5-year risk of revision surgery, while presence of other risk factors like asthma or aspirin sensitivity, high baseline computerized tomography stage or incomplete sinus dissection, are significantly increased 5-year risk of revision surgery to reach 25% to 40%. Despite the presence of these risk factors of revision surgery, sometimes they failed to predict ESS outcomes precisely [15]. On other hand, the SNOT-22 is regarded as one of the most important ESS outcome assessmenttechniques[10] and a significant predictorof CRS improvement and revision surgery [16].

The chronic rhinosinusitis is a prevalent disease in Iraqi population[17]. The endoscopic sinus surgery was commonly used in Iraqi patients with CRS after failure of medical management or with severe resistant cases. However, some complications were reported after implementing ESS which was commonly minor[18]. In Kurdistan region, the patients with chronic rhinosinusitis are the common outpatients with nasal endoscopy as the common diagnostic technique[19].The aim of current study was to determine the change in patient symptoms having chronic rhinosinusitis with nasal polyps (CRSwNP) before and after endoscopic sinus surgery (ESS) by using22-item Sino-Nasal Outcome Test (SNOT-22).

Methodology

This study was a prospectivecross sectionalstudyimplementedin RizgaryTeaching Hospital and private hospitals in Erbil city-Kurdistan region/Iraq duringthe period of twelve monthsfrom 1st of June, 2021 to 31st of May, 2022.The studied population was all patients with chronic rhinosinusitis with nasal polypadmitted for endoscopic sinus surgeryduring study period. Inclusion criteria were patients (any age) having chronic rhinosinusitis with nasal polyps (bilateral) admitted for Endoscopic sinus surgery.Exclusion criteria were patients with unilateral nasal polyp and patientsrefused to participate in the study. The study ethics were implemented in regard to Helsinki Declaration byapproval of Ethical Committee of Kurdistan Board, documented approval of healthauthorities and informed oral consent of selected patients. A convenient sample of fifty six patients with CRSwNPwas enrolled in currentstudy after eligibility to inclusion and exclusion criteria.

Data of patientswas collected directly from patients by researchers through a prepared questionnaire designed by the researchers.The questionnaire included demographic characteristics of patients with CRSwNP(age and gender) and levels of quality of life for patients with CRSwNPpre- and postoperatively (SNOT-22 score at baseline, after one month, 3 months and 6 months).The diagnosis of CRS is mainly clinical requires two major symptoms(nasal obstruction, facial pain,nasal discharge and smell disorder) or one major and two minor symptoms(headache,halitosis,dental pain,cough, ear problem and fatigue). The endoscopic sinus surgery was implemented by seniors' surgeons and followed by post operative

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

medical treatment (Antibiotics: Amoxicillin/Clavulanic acid tablet, Otosan nasal wash,topical nasal steroid: Mometasone spray and Analgesics). The SNOT-22 score was assessed by the researcher through using SNOT-22 questionnaire with assessment of 22 items evaluating quality of life [14].

The general information of the patients with **chronic rhinosinusitis was presented in mean (SD) or number (%).** The comparisons of the quality of life of patients with **chronic rhinosinusitis before and after electing endoscopic sinus surgery were examined in the Bonferroni correction test. The c**omparisons of total quality of life among **chronic rhinosinusitis** patients with different characteristics at the final point of follow-up were examined in an independent t-test or NOVA one-way tests.

The comparisons of quality of life of SNOT-22 items between periods among **chronic rhinosinusitis** patients were examined in the Bonferroni correction test. The significant difference was confirmed in a p-value <0.05. The statistical calculations were performed by JMP Pro 14.3.0.

Results

This study included 56 patients with chronic rhinosinusitis with nasal polyp (CRSwNP) presented with mean age of (39.34 years) and range of (14-64 years); prevalent age groups of patients were 31-40 years (35.71%) and 41-50 years (23.21%). Male patients with CRSwNP were more than female patients (58.93% vs. 41.07%). (**Table 1**)

Table 1: General information of patients with chronic rhinosinusitis**.**

Characteristics (n=56)	Statistics	
	Number	Percentage
Age (Range: 14-64) Mean (SD)	39.34	11.82
Age category		
15-20	3	5.36
21-30	9	16.07
31-40	20	35.71
41-50	13	23.21
51-60	9	16.07
71-80	2	3.57
Gender		
Male	33	58.93
Female	23	41.07

The mean SNOT-22 score of patients with CRSwNP at baseline was (43.47), while it was (21.7) after one month postoperatively, (11.56) after 3 months postoperatively and (7.02) after 6 monthspostoperatively.Lowering the SNOT-22 score it means improving in patient symptoms. (**Table 2 and Figure 1**)

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

Table 2: Levels of quality of life of patients with chronic rhinosinusitis**.**

SNOT score (n=56)	Statistics		
	Mean	Standard Deviation	Range
Baseline	43.47	12.12	19-65
1 month	21.70	7.07	8-34
3 month	11.56	4.11	4-21
6 month	7.02	2.45	2-13

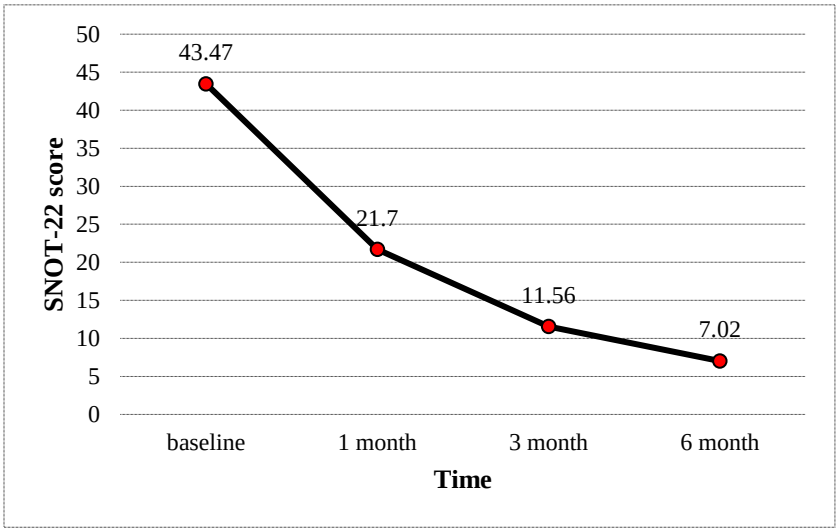

Fig 1: Levels of quality of life of patients with chronic rhinosinusitis over time**.**

The mean SNOT-22 score of patients with CRSwNP at baseline was significantly reduced after one monthpostoperatively (p<0.001).The mean SNOT-22 score of patients with CRSwNP at baseline was significantly reduced after three monthspostoperatively (p<0.001). The mean SNOT-22 score of patients with CRSwNP at one month postoperatively was significantly reduced after three monthspostoperatively (p<0.001).The mean SNOT-22 score of patients with CRSwNP at baseline was significantly reduced after six monthspostoperatively (p<0.001). The mean SNOT-22 score of patients with CRSwNP at one month postoperatively was significantly reduced after six monthspostoperatively (p<0.001).The mean SNOT-22 score of patients with CRSwNP at three months postoperatively was significantly reduced after six monthspostoperatively (p<0.001). In general, the mean SNOT-22score of patients with CRSwNP was significantly reduced postendoscopic sinus surgery (p<0.001). (**Table 3 and Figure 2**)

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

Table 3: Comparisons of quality of life of patients with chronic rhinosinusitis before and after electing endoscopic sinus surgery.

Time periods mean (SD)			
SNOT score -	**SNOT score**	**Mean diff (95% CI)**	**P-value (two-sided)**
1 month 21.70 (7.07)	**baseline** 43.47 (12.12)	-21.77 (-24.94 to -18.60)	**<0.0001**
3 month 11.56 (4.11)	**baseline** 43.47 (12.12)	-31.91 (-35.44 to -28.37)	**<0.0001**
3 month 11.56 (4.11)	**1 month** 21.70 (7.07)	-10.14 (-11.71 to -8.57)	**<0.0001**
6 month 7.02 (2.45)	**baseline** 43.47 (12.12)	-36.44 (-40.08 to -32.80)	**<0.0001**
6 month 7.02 (2.45)	**1 month** 21.70 (7.07)	-14.67 (-16.50 to -12.85)	**<0.0001**
6 month 7.02 (2.45)	**3 month** 11.56 (4.11)	-4.53 (-5.53 to -3.54)	**<0.0001**

Bonferroni correction was performed for statistical analyses.
The red bold numbers show the significant differences.

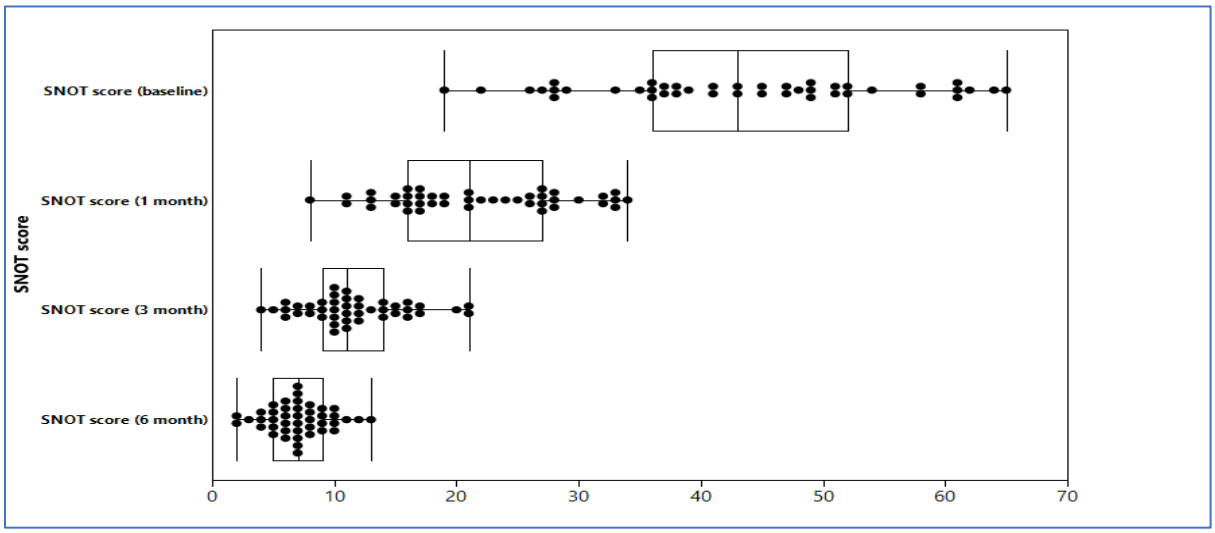

Fig 2: Comparisons of quality of life of patients with chronic rhinosinusitis before and after electing endoscopic sinus surgery.

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

The mean SNOT-22 score of patients with CRSwNP after 6 months postoperatively was not significantly different in regard to different age groups of patients (p=0.2968). Similarly, the mean SNOT-22 score of patients with CRSwNP after 6 months postoperatively was not significantly different between male and female patients (p=0.4727). (**Table 4 and Figure 3**)

Table 4: Comparisons of total quality of life among chronic rhinosinusitis **patients with different characteristics at the final point of follow-up.**

Characteristics (n=56)	**SNOT-22 score**		**p-value (two-sided)**
	Mean	**Std Dev**	
Age groups			
15-20	10.67	4.16	
21-30	6.89	1.76	
31-40	8.75	4.56	0.2968[a]
41-50	11.31	7.96	
51-60	9.11	5.01	
71-80	15.5	10.61	
Gender			
Male	7.45	3.19	0.4727[b]
Female	8.1	2.95	
[a] ANOVA one-way and [b] an independent t-test were performed for statistical analyses.			

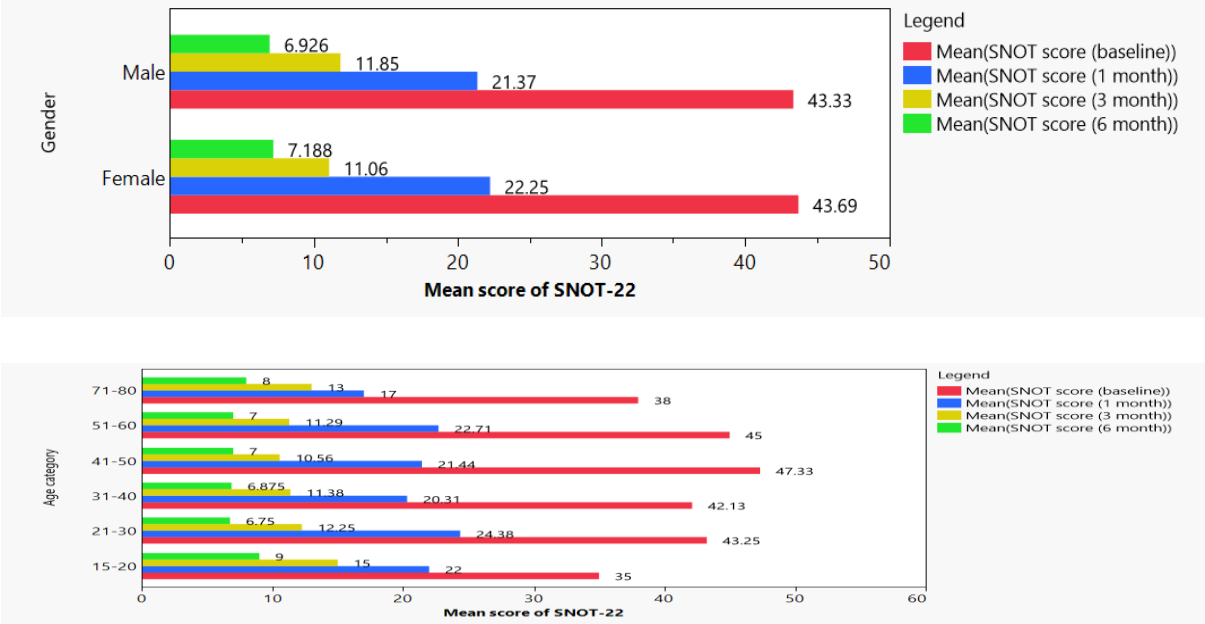

Fig 3: Total quality of life of **chronic rhinosinusitis** patients at different point of follow-up

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

The SNOT-22 items which were significantly reduced in all evaluation periods were need to blow nose, sneezing, thick nasal discharge, ear fullness, difficulty feeling asleep, walking up at night, lack of good night's sleep, walking up tired, reduced productivity, embarrassed, sense of taste/smell and blockage/congestion of nose ($p \leq 0.05$), while the common SNOT-22 items that were not significantly reduced in all evaluation periods were ear pain/pressure and facial pain/pressure ($p > 0.05$). (**Table 5**)

Table 5: Comparisons of quality of life of SNOT-22 items between time periods among chronic rhinosinusitis **patients**

SNOT items	Comparisons between study periods (mean vs. mean)					
	1 month vs. baseline	3-month vs. baseline	3-month vs. 1-month	6-month vs. baseline	6-month vs. 1-month	6-month vs. 3-month
Need to blow nose	2.11 vs. 3.07 <0.0001	1.61 vs. 3.07 <0.0001	1.61 vs. 2.11 0.0006	0.91 vs. 3.07 <0.0001	0.91 vs. 2.11 <0.0001	0.91 vs. 1.61 <0.0001
Sneezing	2.32 vs. 4.07 <0.0001	1.72 vs. 4.07 <0.0001	1.72 vs. 2.32 <0.0001	0.96 vs. 4.07 <0.0001	0.96 vs. 2.32 <0.0001	0.96 vs. 1.73 <0.0001
Runny nose	1.09 vs. 1.64 0.0010	0.98 vs. 1.64 0.0001	0.98 vs. 1.09 **0.0832**	0.73 vs. 1.64 <0.0001	0.73 vs. 1.09 <0.0001	0.73 vs. 0.98 0.0006
Cough	1.2 vs. 2.15 <0.0001	0.98 vs. 2.15 <0.0001	0.98 vs. 1.2 0.0129	0.87 vs. 2.15 <0.0001	0.87 vs. 1.2 0.0006	0.87 vs. 0.98 **0.0570**
Post nasal discharge	0.74 vs. 1.04 0.0281	0.48 vs. 1.04 0.0022	0.48 vs. 0.74 0.0069	0.35 vs. 1.04 0.0001	0.35 vs. 0.74 <0.0001	0.35 vs. 0.48 **0.0513**
Thick nasal discharge	1.2 vs. 2.22 <0.0001	0.67 vs. 2.22 <0.0001	0.67 vs. 1.2 0.0003	0.24 vs. 2.22 <0.0001	0.24 vs. 1.2 <0.0001	0.24 vs. 0.67 <0.0001
Ear fullness	1.15 vs. 1.98 <0.0001	0.42 vs. 1.98 <0.0001	0.42 vs. 1.15 <0.0001	0.2 vs. 1.98 <0.0001	0.2 vs. 1.15 <0.0001	0.2 vs. 0.42 0.0092
Dizziness	0.52 vs. 1.30 0.0001	0.31 vs. 1.30 <0.0001	0.31 vs. 0.52 0.0472	0.20 vs. 1.30 <0.0001	0.20 vs. 0.52 0.0158	0.20 vs. 0.32 **0.2037**
Ear pain/pressure	0.13 vs. 0.17 **0.4202**	0.13 vs. 0.17 **0.5694**	0.13 vs. 0.13 **1.0000**	0.06 vs. 0.17 **0.1332**	0.06 vs. 0.13 **0.3227**	0.06 vs. 0.13 **0.2613**
Facial pain/pressure	0.22 vs. 0.33 **0.2774**	0.20 vs. 0.33 **0.1803**	0.20 vs. 0.22 **0.7990**	0.17 vs. 0.33 **0.1066**	0.17 vs. 0.22 **0.5178**	0.17 vs. 0.20 **0.6417**
Difficulty falling asleep	1.95 vs. 3.0 <0.0001	1.33 vs. 3.0 <0.0001	1.34 vs. 1.95 0.0008	0.86 vs. 3.0 <0.0001	0.86 vs. 1.95 <0.0001	0.86 vs. 1.34 0.0009
Waking up at night	2.91 vs. 3.45 0.0020	2.10 vs. 3.45 <0.0001	2.10 vs. 2.91 <0.0001	1.71 vs. 3.45 <0.0001	1.71 vs. 2.91 <0.0001	1.71 vs. 2.10 0.0114
Lack of a good night's sleep	0.98 vs. 1.89 <0.0001	0.66 vs. 1.89 <0.0001	0.66 vs. 0.98 0.0056	0.36 vs. 1.89 <0.0001	0.36 vs. 0.98 <0.0001	0.36 vs. 0.66 0.0011
Waking up tired	1.11 vs. 1.95 <0.0001	0.52 vs. 1.95 <0.0001	0.52 vs. 1.11 <0.0001	0.30 vs. 1.95 <0.0001	0.30 vs. 1.11 <0.0001	0.30 vs. 0.52 <0.0001
Fatigue during the day	0.85 vs. 1.81 <0.0001	0.22 vs. 1.81 <0.0001	0.22 vs. 0.85 <0.0001	0.06 vs. 1.81 <0.0001	0.06 vs. 0.85 <0.0001	0.06 vs. 0.22 0.0112
Reduced productivity	0.82 vs. 1.71 <0.0001	0.25 vs. 1.71 <0.0001	0.25 vs. 0.82 <0.0001	0.04 vs. 1.71 <0.0001	0.04 vs. 0.82 <0.0001	0.04 vs. 0.25 0.0009

Academicia Globe:
Inderscience Research

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

Reduced concentration	0.80 vs. 1.72 <0.0001	0.22 vs. 1.72 <0.0001	0.22 vs. 0.80 <0.0001	0.09 vs. 1.72 <0.0001	0.09 vs. 0.80 <0.0001	0.09 vs. 0.22 **0.0513**
Frustrated/restless/irritable	0.93 vs. 1.87 <0.0001	0.24 vs. 1.87 <0.0001	0.24 vs. 0.93 <0.0001	0.2 vs. 1.87 <0.0001	0.2 vs. 0.93 <0.0001	0.2 vs. 0.24 **0.5685**
Sad	0.89 vs. 1.86 <0.0001	0.25 vs. 1.86 <0.0001	0.25 vs. 0.89 <0.0001	0.18 vs. 1.86 <0.0001	0.18 vs. 0.89 <0.0001	0.18 vs. 0.25 **0.1592**
Embarrassed	0.8 vs. 2.53 <0.0001	0.33 vs. 2.53 <0.0001	0.33 vs. 0.8 <0.0001	0.13 vs. 2.53 <0.0001	0.13 vs. 0.8 <0.0001	0.13 vs. 0.33 0.0150
Sense of taste/smell	1.31 vs. 2.45 <0.0001	0.51 vs. 2.45 <0.0001	0.51 vs. 1.31 <0.0001	0.15 vs. 2.45 <0.0001	0.15 vs. 1.31 <0.0001	0.15 vs. 0.51 <0.0001
Blockage/congestion of nose	1.19 vs. 2.94 <0.0001	0.48 vs. 2.94 <0.0001	0.48 vs. 1.86 <0.0001	0.19 vs. 2.94 <0.0001	0.19 vs. 1.86 <0.0001	0.19 vs. 0.48 0.0007

Bonferroni correction were performed for statistical analyses.
The blue bold numbers show non-significant differences.

Discussion

The surgical option of endoscopic sinus surgery is found to be effective in acquiring better life quality for patients with CRS. Successful short and long surgical outcomes of CRS are affected by different factors which must be considered during the evaluation.The SNOT-22 score is designed to assess these outcomes and helping in detecting of risk factors [20].

The present study showed that mean age of patients with CRSwNP was (39.34 years) with prevalent age group (31-50 years). These findings are similar to results of Vaitkus et al [21] study in Lithuania which reported that CRSwNP is commonly occurred in middle age patients (31-50 years) with high severity of symptoms in this age group. Our study showed the predominance of male gender in CRSwNP. This finding is consistent with results of Hussein and Jaf study [19] in Erbil city-Kurdistan region/Iraq which revealed the predominance of male gender with chronic rhinosinusitis. However, this finding is inconsistent with reports of Ference et al [5]review study in United States of America which stated the women were more prevalent in chronic rhinosinusitis. This inconsistency might be attributed to differences in smoking status, anatomical features and patients' characteristics between different societies.

The current study found that mean SNOT-22 score of patients with CRSwNP was significantly reduced postendoscopic sinus surgery ($p<0.001$).This finding is similar to results of Gallo et al [22]prospective study in Italy on 457 patients with CRS which found that SNOT-22 score is a significant predictor of short and long term outcomes of endoscopic sinus surgery especially in CRS patients with nasal polyps. Another prospective observational cohort study in Canada by Rudmik et al [23] on 327 patients with CRS revealed that preoperative SNOT-22 score was a prognostic for quality of life following ESS and it was highly predictors for postoperative outcomes in CRS patients with nasal polyps. Our study found that mean SNOT-22 score of patients with CRSwNP at baseline was significantly reduced after one monthpostoperatively ($p<0.001$). Similarly, Khan et al [24] randomized, placebo-controlled, double-blinded, multicenter clinical trial study in United Kingdom reported that SNOT-22 score was predictive of post-ESS outcomes after one month. In our study, the mean SNOT-22 score of patients with CRSwNP at baseline was significantly reduced after three monthspostoperatively ($p<0.001$). Consistently, Lal et

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

al [25] study in United Kingdom found that the SNOT-22 score is a significant predictor of ESS outcomes in patients with chronic rhinosinusitis and nasal polyp. In current study, the mean SNOT-22 score of patients with CRSwNP at baseline was significantly reduced after six monthspostoperatively ($p<0.001$). This finding coincides with results of Mascarenhas et al [26] prospective cross sectional study in Brazil which reported that SNOT-22 score was effective in prediction of long term outcomes of ESS for patientswith chronic rhinosinusitis and nasal polyp.

The present study found that mean SNOT-22 score of patients with CRSwNP after 6 months postoperatively was not significantly different in regard to different age groups of patients ($p=0.2968$).This finding is similar to results of Aziz study [27] study in Sulaimani city-Kurdistan region/Iraq which revealed no significant effect of age groups for patientswith chronic rhinosinusitis on quality of lifetest after ESS.Similarly, our study found that mean SNOT-22 score of patients with CRSwNP after 6 months postoperatively was not significantly different between male and female patients ($p=0.4727$). This finding is parallel to results of Bartosik et al [28] retrospective single-center study in Austria which found that SNOT-22 score of patients with CRSwNP following ESS is not affected by gender of patients.

In current study,the common SNOT-22 items that were not significantly reduced in all evaluation periods were ear pain/pressure and facial pain/pressure ($p>0.05$). This finding is inconsistent with results of Al Sharhan et al [29] study in Saudi Arabia which revealed that only psychological dysfunction symptoms had least difference postoperatively.

The differences in SNOT-22 items effectiveness between different studies might be related to differences in anatomical patterns and other patients' characteristics between different societies. The significant SNOT-22 symptoms which reduced significantly were need to blow nose, sneezing, runny nose, cough, post nasal discharge, thick nasal discharge, ear fullness, dizziness, difficulty falling asleep, walking up at night, **lack of a good night's sleep**, **waking up tired, fatigue during the day, reduced productivity, reduced concentration**, **frustrated/restless/irritable**, sad, embarrassed, **Sense of taste/smell** and **Blockage/congestion of nose.** These findings are in agreement with results of Lange et al [30] study in Denmark which stated that sneezing, runny nose, cough, post nasal discharge, **frustrated/restless/irritable**, sad, embarrassed, **Sense of taste/smell** and **Blockage/congestion of nose were the commonest symptoms involved within SNOT-22 score in evaluation outcomes of ESS. Furthermore,** Georgalas **et al [31] study in Cyprus reported that following ESS in** patients with CRSwNP lead to improving both nasal and generic symptoms**, however, effect** size was higher for the following symptoms: being frustrated/restless/irritable, nasal blockage, reduced concentration, fatigue, runny nose and need to blow nose. A study conducted in Singapore by Teo et al [32] found that ESS improves the otologic symptoms of CRS, but in patients with CRSwNP the improvement in ear fullness was greater than CRSsNP patients.

This study concluded that SNOT-22 score is a reliable tool used for evaluating short and long term outcomes of endoscopic sinus surgery in patients with chronic rhinosinusitis with nasal polyps. The SNOT-22 score is not affected by age and gender of patients with chronic rhinosinusitis with nasal

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

polyp. This study recommended encouraging the surgeons to use of SNOT-22 in evaluatingendoscopic sinus surgery.

Financial source
Only by researcher

Conflicts of interest
None

Acknowledgment
Gratitude and thanks for the staffofRizgary Teaching Hospital.

References

1. Chaaban MR, Walsh EM, Woodworth BA. Epidemiology and differential diagnosis of nasal polyps. Am J Rhinol Allergy 2013; 27:473-478.
2. Fokkens WJ, Lund VJ, Hopkins C, Hellings PW, Kern R, Reitsma S, et al. European Position Paper on Rhinosinusitis and Nasal Polyps 2020. Rhinology 2020; 58:1-464.
3. Orlandi RR, Kingdom TT, Smith TL, Bleier B, DeConde A, Luong A, et al. International Consensus Statement on Rhinology and Allergy: Rhinosinusitis. Int Forum Allergy Rhinol 2021; 11:213-739.
4. Benjamin MR, Stevens WW, Li N, Bose S, Grammer LC, Kern RC, et al. Clinical characteristics of patients with chronic rhinosinusitis without nasal polyps in an academic setting. J Allergy Clin Immunol Pract 2019; 7:1010-1016.
5. Ference EH, Tan BK, Hulse KE, Chandra RK, Smith SB, Kern RC, et al. Commentary on gender differences in prevalence, treatment, and quality of life of patients with chronic rhinosinusitis. Allergy Rhinol (Providence) 2015; 6: 82-8.
6. Ahern S, Cervin A. Inflammation and endotyping in chronic rhinosinusitis-a paradigm shift. Medicina (Kaunas) 2019; 55:95.
7. Dejaco D, Riedl D, Giotakis A, Bektic-Tadic L, Kahler P, Riechelmann H. Treatment Outcomes in Chronic Rhinosinusitis Refractory to Maximal Medical Therapy: A Prospective Observational Study Under Real-World Conditions. Ear, Nose & Throat Journal 2021; 100(2):NP77-NP86.
8. Smith TL, Batra PS, Seiden AM. Evidence supporting endoscopic sinus surgery in the management of adult chronic rhinosinusitis. Am J Rhinol 2005; 19:537-543.
9. Rice DH. Endoscopic sinus surgery: results at 2-year follow up. Otolaryngol Head Neck Surg 1989; 101:476-479.
10. Chester AC, Sindwani R. Symptom outcomes in endoscopic sinus surgery: a systematic review of measurement methods. Laryngoscope 2007; 117:2239-2243. Available from: https://doi.org/10.1097/MLG.0b013e318149224d

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

11. Stammberger H, Posawetz W. Functional endoscopic sinus surgery. Concept, indications and results of the Messerklinger technique. Eur Arch Otorhinolaryngol 1990; 247:63-76. Available from: https://doi.org/10.1007/bf00183169 10.1007/bf00183169
12. Engel GL. The need for a new medical model: a challenge for biomedicine. Science 1977; 196:129-136. Available from: https://doi.org/10.1126/science.847460 10.1126/science.847460
13. Smith TL. THE 2017 13TH ANNUAL DAVID W. KENNEDY, MD, LECTURE. The evolution of outcomes in sinus surgery for chronic rhinosinusitis: past, present, and future. Int Forum Allergy Rhinol 2017; 7:1121-1126. Available from: https://doi.org/10.1002/alr.22026 10.1002/alr.22026
14. Soler ZM, Smith TL. Quality of life outcomes after functional endoscopic sinus surgery. Otolaryngol Clin North Am 2010; 43:605-612.
15. Smith TL, Litvack JR, Hwang PH, Loehrl TA, Mace JC, Fong KJ, et al. Determinants of outcomes of sinus surgery: a multi-institutional prospective cohort study. Otolaryngol Head Neck Surg 2010; 142(1):55-63.
16. Rudmik L, Soler ZM, Hopkins C. Using postoperative SNOT-22 to help predict the probability of revision sinus surgery. Rhinology 2016; 54:111-116.
17. Salman Jasim H, Abed Saoud SAJ, Almuslamawy H. Study of Acute and Chronic Sinusitis – Symptoms, Diagnosis and Treatment: A Review article. Ibn AL-Haitham Journal for Pure and Applied Sciences 2022; 35(3): 83–90. Available from: https://doi.org/10.30526/35.3.2819
18. Ahmed S, Mohammed A. Complications of Endoscopic Sinus Surgery: A Case Series Study from Mosul City: Complications of Endoscopic Sinus Surgery: A Case Series Study from Mosul City. Iraqi National Journal of Medicine 2022; 4(1): 80–91. Available from: https://doi.org/10.37319/IQNJM.4.1.9
19. Hussein RK, Jaf SM. A comparative study of diagnostic nasal endoscopy and computed tomography in chronic rhinosinusitis. Med J Babylon 2019; 16:199-202.
20. SimmondsJC, Paz-LansbergM,ScangasG,Metson R. Endoscopic sinus surgery for chronic rhinosinusitis: 22-item Sino-Nasal Outcome Test 5-year results. Int Forum Allergy Rhinol 2022; 12(3):257-265.
21. Vaitkus J, Vitkauskienė A, Simuntis R, Vaitkus Ž, Šiupšinskienė N, Vaitkus S. Chronic Rhinosinusitis with Nasal Polyps: Age and Disease Severity Differences in the Levels of Inflammatory Markers. Medicina (Kaunas) 2021; 57(3):282.
22. Gallo S, Russo F, Mozzanica F, Preti A, Bandi F, Costantino C, et al. Prognostic value of the Sinonasal Outcome Test 22 (SNOT-22) in chronic rhinosinusitis. Acta Otorhinolaryngol Ital 2020; 40(2):113-121.
23. Rudmik L, Soler ZM, Mace JC, DeConde AS, Schlosser RJ, Smith TL. Using preoperative SNOT-22 score to inform patient decision for Endoscopic sinus surgery. Laryngoscope 2015; 125(7):1517-1522.
24. Khan AH, Reaney M, Guillemin I, Nelson L, Qin S, Kamat S, et al. Development of Sinonasal Outcome Test (SNOT-22) Domains in Chronic Rhinosinusitis With Nasal Polyps. Laryngoscope 2022; 132(5):933-941.

ISSN: 2776-1010 Volume 3, Issue 12, Dec., 2022

25. LalD, HopkinsC,Divekar RD. SNOT-22-based clusters in chronic rhinosinusitis without nasal polyposis exhibit distinct endotypic and prognostic differences. Int Forum Allergy Rhinol 2018; 8(7):797-805.
26. Mascarenhas JG, da Fonseca VM, Chen VG, Itamoto CH, Silva CA, Gregório LC, et al. Long-term outcomes of endoscopic sinus surgery for chronic rhinosinusitis with and without nasal polyps. Braz J Otorhinolaryngol 2013; 79(3):306-311.
27. Aziz MI. Improvement of quality of life after endoscopic sinus surgery for chronic rhino-sinusitis. JSMC 2015; 5 (1): 27-32. Available from: https://doi.org/10.17656/jsmc.10064
28. Bartosik TJ, Liu DT, Campion NJ, Villazala-Merino S, Janik S, Dahm V, et al. Differences in men and women suffering from CRSwNP and AERD in quality of life. Eur Arch Otorhinolaryngol 2021; 278(5):1419-1427.
29. Al Sharhan SS, Al Bar MH, Assiri SY, AlOtiabi AR, Bin-Nooh DM, AlSugair FK, et al. Pattern of symptom improvement following endoscopic sinus surgery for chronic rhinosinusitis. BMC Surg 2021; 21(1):288.
30. Lange B, Thilsing T, Al-kalemji A, Baelum J, Martinussen T, Kjeldsen A. The Sino-Nasal Outcome Test 22 validated for Danish patients. Dan Med Bull 2011; 58(2):A4235.
31. Georgalas C, Detsis M, Geramas I, Terzakis D, Liodakis A. Quality of Life Outcomes in Frontal Sinus Surgery. Journal of Clinical Medicine 2020; 9(7):2145. https://doi.org/10.3390/jcm9072145
32. Teo NW, Mace JC, Smith TL, Hwang PH. Impact of endoscopic sinus surgery on otologic symptoms associated with chronic rhinosinusitis. World J Otorhinolaryngol Head Neck Surg 2017; 3(1):24-31.