Prevalence, quality of life and risk factors of chronic rhinosinusitis in adults in Kingdom of Saudi Arabia 2021

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Abstract

Background: Chronic rhinosinusitis is one of the most prevalent chronic diseases worldwide, affecting all age groups. It is a condition leading to a significant decrease in the quality of life of patients, and requires a specific treatment approach. This study aims to assess the prevalence, quality of life and risk factors of chronic rhinosinusitis in order to develop and promote public health, wellbeing and awareness.

Methodology: This is a cross-sectional study which was conducted in the Kingdom of Saudi Arabia, from August to October 2021. We collected the data using a validated, self-administrated online sinonasal outcome test (SNOT-22) questionnaire in Arabic. The questionnaire was distributed through social media and aimed to assess the prevalence and risk factors of chronic rhinosinusitis in the Kingdom of Saudi Arabia in 2021.

Results: In the current study, we collected data from 4963 individuals in Saudi Arabia who responded to to our questionnaire. Participants had a mean age of 31.99 (SD=11.59) years old, 62.0% were females and 92.9% were Saudis. Among the total sample, the prevalence of chronic rhinosinusitis (CRS) was 22.5%. The prevalence of CRS was significantly lower in patients aged between 18-29 years old (19.4%) compared with the 30-49 age group (27.1%) and 50-69 age group (23.2%) (P=0.000). Moreover, we found that the prevalence of CRS was significantly higher among females (24.0% vs 20.2%, P=0.002) and among Saudis compared to non-Saudis (22.9% vs 17.6%, P=0.022). Furthermore, there was a significant reduction in the quality of life among patients with CRS where the mean score of SNOT-22 was 44.04 (SD=25.38) compared with 26.82 (SD=26.35) in non-patients.

Conclusion: The current study revealed a high prevalence of CRS among individuals in Saudi Arabia especially among older females, those with chronic conditions and those who had been exposed to different risk factors such as smoking. Moreover, CRS was found to have a significantly negative impact on the quality of life for those participants diagnosed with the condition.

Keywords: Quality of life, chronic sinusitis, adults, Saudi Arabia

Introduction

Chronic rhinosinusitis is a widespread chronic inflammation of paranasal sinuses.1 CRS affects 1% to 12% of persons worldwide [1]. CRS needs long-term treatment with medication with or without surgery for good outcomes [1]. That is why CRS impacts on the quality of life and is responsible for an increase in direct costs to hospitals and patients, and indirect costs such as a decrease in work activity and productivity [2,3]. CRS is defined according to EPOS criteria which needs two or more of 4 symptoms which are commonly nasal obstruction/blockage/ congestion, nasal discharge (anterior/ postnasal drip), facial pressure/pain, and anosmia/hyposmia) for more than 12 weeks [4]. The exact pathogenesis of CRS is unclear but may be related to decreasing ciliary clearance of the mucosa because of bacterial infection and an inflammatory condition [5]. Other risk factors are thought to be genetic such as cystic fibrosis, obstruction of the osteomatal complex or associated with comorbid diseases such as gastroesophageal reflux disease (GERD), asthma and allergic rhinitis or environmental factors such as tobacco exposure, allergens, toxins and pollutants [4,5]. Treatment of CRS consists of topical medications such as intranasal saline irrigation, intranasal steroid spray and antibiotics may play a role in treating any superimposed infection. The last option, after the failure of medical management, is endoscopic sinus surgery [4].

Many studies have looked at the prevalence, quality of life and risk factors of chronic rhinosinusitis globally. A study to establish the prevalence of chronic rhinosinusitis–related symptoms in the United States found that the most prevalent symptoms were dyssomnia (8.1%), nasal blockage (6.0%), sinus pain (2.1%), and discoloured mucous (1.1%). In total (13.0%) adults had precisely one sino-nasal symptom, and (2.1%) reported two or more primary symptoms for chronic rhinosinusitis. Regarding the gender of respondents, 1.9% males reported two or more symptoms consistent with chronic rhinosinusitis vs 2.2% females (P = .690), which is not statistically significant [6]. Another universal study was conducted in Korea to determine the prevalence and risk factors of CRS in elderly (≥65 years old) Koreans comparing the risk factors to those for younger adult participants (19-64 years old). The prevalence of CRS was significantly greater in the elderly group 6.55% vs 5.69%, P = .016. Some variation of socio-economic status and mental health status in the adult group was associated with an increased risk of CRS but showed no association in the elderly group [7]. Another study was conducted in Sao Paulo, Brazil, to estimate the prevalence of chronic rhinosinusitis. The study found that the mean age was 39.8 +- 21 years; 45.33% were male. The overall prevalence of CRS in the city of Sao Paulo was 5.51%. and researchers found a major connection between the diagnosis of CRS and the diagnosis of asthma, CRS and the diagnosis of rhinitis, and a notable association between the presence of CRS in the low-income subgroup.2 A global study conducted in China constituted a total of 10,636 respondents from seven cities. The CRS prevalence was 8.0% and varied from 4.8% to 9.7% in the locations. The estimated prevalence was slightly higher among males (8.79%) than in females (7.28%) (P = 0.004). The prevalence varied depending on age, ethnicity, marital status and educational level (P < 0.05), but not by household per capita income or living situation (P > 0.05). Both second-hand tobacco smoking and active smoking were independent risk factors for CRS (P = 0.001) [8]. A regional study was conducted in Bushehr, in the southwestern region of Iran. The study found that the prevalence of CRS was 28.4% based on the EPOS criteria, meanwhile the self-reported physician-diagnosed CRS prevalence was 20.0%. There was no gender difference but CRS was more prevalent in smokers aged between 25–34 years old, non-educated persons, and healthcare workers [9]. A total of 3,099 completed surveys were received (response rate 68.1%). Further research was completed in Denmark, which discovered that the overall prevalence of CRS was 7.8%, with no significant variations in age or gender. Female blue-collar employees had a higher risk of CRS than female white-collar workers, according to risk ratio estimations. The data on employed males was dependent on whether or not they smoked. The total risk of CRS was raised by occupational exposure to gases, fumes, dust, or smoke. CRS was observed four times more frequently in asthmatic and nasal allergy patients. The prevalence of CRS was doubled as a result of current smoking [10]. According to nationwide research completed in Korea, the prevalence of CRS in the country is 6.95%. Elderly males, and high stress levels were shown to be substantially linked to CRS among socio-demographic variables. Personal medical risk factors for CRS included the influenza vaccination, septal deviation, and chronic allergic rhinitis. Persistent/moderate to severe allergic rhinitis was shown to be the most significant risk factor for CRS at the population level among these risk variables [11]. Other research was carried out in Korea and chronic rhinosinusitis with nasal polyps (CRSwNP) and chronic rhinosinusitis without nasal polyps (CRSsNP) were found in 2.6% and 5.8% of 28 912 individuals respectively. CRSwNP was linked to age (odds ratio [OR], 1.03; 95% confidence interval [CI], 1.02-1.04; P =.001), education (OR, 1.40; 95% CI, 1.02-1.92; P =.04), and obesity (OR, 1.46; 95% CI, 1.16-1.84; P =.001).3 In terms of risk factors, a study was conducted in China to look at the occupational and environmental risk factors linked to CRS. The number of patients in the research was 10,633, with 850 (7.99%) of them being diagnosed with CRS using the EP3OS criteria. There were strong links between CRS and occupational and environmental variables. CRS was linked to having a cleaning-related job , occupational exposure to dust, occupational exposure to toxic gas, having a pet at home, and having a carpet at home or at work . Among participants with and without CRS, used to stay warm in the winter, manage the time using air conditioning in the summer, and the frequency of exposure to mouldy or damp surroundings were substantially different [12]. In other research carried out in the United Kingdom a study aimed to investigate the prevalence of CRS and to identify any links to demographic factors. The next objective was to evaluate the severity of the impairment, its influence on the quality of life, and any expenses incurred by the

patients. The study discovered that over 30% of the community suffers from upper respiratory tract symptoms and that this has an influence on many aspects of their quality of life, including emotional distress, financial expenses, and missed workdays. Compared to the Short Form 36 questionnaire, the MSNOT-20 gave a more sensitive evaluation of health-related quality of life [13]. Regarding the quality of life of CRS patients, a study of 131 adult patients with CRS in Boston using SNOT-22 scores confirmed the greatest effect was on the lives and and health of patients with facial/otology pain. Secondly, were symptoms related to sleep. Lastly, the least impacted were nasal symptoms [14]. Another Canadian cross-sectional study was performed on CRS patients awaiting endoscopic sinus surgery using the SNOT-22 score and patients with chronic bronchitis, emphysema or asthma had significantly higher SNOT-22 scores than those without. Among 91 out of 253 patients who had chronic pulmonary comorbidity reported higher clinically significant depression rates/scores than those without [15].

Methodology

This is a cross-sectional study that was conducted in the Kingdom of Saudi Arabia, from August to October 2021. We collected the data using a validated, self-administrated online sinonasal outcome test (SNOT-22) questionnaire in Arabic. [16]. The questionnaire was distributed through social media and aimed to assess the prevalence and risk factors of chronic rhinosinusitis in the Kingdom of Saudi Arabia in 2021.

The sample size was estimated as 384 participants depending on the EPI-Info app. We used a simple random sampling technique and selected participants from different cities in the Kingdom of Saudi Arabia who were older than 18 years. The study included all adult patients who fitted the diagnostic criteria of EPOS for CRS (with/without nasal polyps). Those who were under 18 years old or who were pregnant, or those who refused to participate in the study were excluded.

We collected the data using a validated, self-administrated online sinonasal outcome test (SNOT-22) questionnaire in Arabic[16]. We targeted different regions in the Kingdom of Saudi Arabia to increase the chance to generalise the findings. We obtained informed consent and ensured that confidentiality was clearly explained to participants and maintained.

The questionnaire consisted of three sections containing 36 questions: 1- Socio-demographic data which included age, gender, nationality, the region where they live,d education level, occupation, marital status and living location type. 2- Risk factors included lifestyle, family history, any chronic disease and EPOS criteria to include or exclude. 3- With exception of the name of participant , sinonasal outcome test (SNOT-22) questionnaire questions to diagnose and assess the symptoms and quality of life. Diagnosis was in line with participants who meet European position paper on rhinosinusitis and nasal polyps 2020 EPOS 2020. We investigated the symptoms and quality of life questions using a Likert scale (i.e. problem as bad as it can be, severe problem, moderate problem, mild or slight problem, very mild problem, and no problem).

MS Excel was used for data entry, cleaning, and coding while SPSS version 26.0 was used for data analysis. Quantitative data appeared as mean and standard deviation (mean+\-SD). Student t test was used for comparing the 2 quantitative variables and ANOVA test for comparing more than two variables with the significant level set at p-value >0.05. Qualitative data was expressed as numbers and percentages (NO&%). Chi square (x 2) was used to assess the relationship between two or more qualitative variables. The study was conducted securing ethical approval from the Qassim Research Ethics Committee

Results

In the current study, we were able to collect data from 4963 individuals in Saudi Arabia who responsed to our questionnaire with a mean age of 31.99 (SD=11.59) years old where 53.1% of the participants were aged between 18-29 years and 35.9% were between 30-49 years. 62.0% of participants were females and 92.9% were Saudis. The sample was collected from 12 regions in Saudi Arabia, predominantly in Riyadh (28.7%), Qassim 20.1%), and Mecca (18.5%). Regarding the educational level of participants, 67.9% reported having a college degree while 20.4% had secondary school education. 38.1% of the participants were employed, 35.6% were students, and 13.6% identified as housewives. 51.3% of participants were single and 47.5% were married. 62.0% of them reported living in a villa (Table 1).

56.9% of the participants reported having some lifestyle risk factors for CRS including smoking (43.6%), frequent exposure to detergents (40.4%), continuous exposure to dirt and plants (33.1%) and breeding pets (27.5 %) (Figure 1).

Among the participants, 46.9% reported having chronic conditions where the most common medical conditions were seasonal and non-seasonal sensitivity (28.3%), asthma (9.1%), nasal barrier deviation (8.6%), and gastroenterological disorders (8.1%). Other medical conditions including eczema (7.2%), depression (6.2%), and immune system disorders (1.3%) were also reported (Figure 2).

69.5% of the participants reported family history of chronic conditions including seasonal and non-seasonal sensitivity (32.5%), asthma (30.4%), sinusitis (22.8%), and eczema (15.9%) (Figure 3).

Among the study group, the prevalence of chronic rhinosinusitis was 22.5%. The prevalence of CRS was significantly lower in younger patients aged between 18-29 (19.4%) compared with the 30-49 age group (27.1%) and 50-69 age group (23.2%) (P=0.000). Moreover, we

found that the prevalence of CRS was significantly higher among females compared to males (24.0% vs 20.2%, P=0.002) and among Saudis compared to non-Saudis (22.9% vs 17.6%, P=0.022). No significant difference was found between the participants according to their educational level ((P=0.627) while housewives, the employed and unemployed showed the highest prevalence of CRS (27.0%, 25.3% and 25.8%, respectively P=0.000). Moreover, being single decreased the risk of having CRS (20.2% compared with 25.1% of married participants, P=0.000). The prevalence of CRS was significantly higher among participants who reported having lifestyle risk factors (28.5% vs 14.6%,P=0.000), a chronic condition (36.3% vs 10.4%, P=0.000), and family history of a medical condition (27.9% vs 10.4 %, P=0.0000) (Table 2)

According to Table 3, the most common symptoms of CRS reported by patients a 'bad' problem were waking up tired (17.9%), frustrated/restless/irritable (16.6%), reduced concentration (15.4%), lack of good sleep (15.3%), fatigue (15.2%), nasal obstruction (14.4%), and falling asleep (14.3%),. Additionally, sadness and embarrassment were reported by 13.4% and 13.2% respectively as being as bad as possible (Table 3).

As shown in Table 4, there is a significant reduction in the quality of life among patients with CRS where the mean score of SNOT-22 was 44.04 (SD=25.38) and in patients with CRS compared with 26.82 (SD=26.35) in non-patients considering that higher score of SNOT-22 indicates a poorer quality of life (Table 4).

Table 1: The demographic factors of the participants (N=4963)

		Count	Column N %
Age	18-29	2636	53.1%
	30-49	1783	35.9%
	50-69	535	10.8%
	>70	9	0.2%
Gender	Male	1887	38.0%
	Female	3076	62.0%
Nationality	Saudi	4611	92.9%
	Non-Saudi	352	7.1%
Region	Asir	561	11.3%
	Riyadh	1426	28.7%
	Al-Qassim	996	20.1%
	Northern Borders Region	20	0.4%
	Eastern	516	10.4%
	Mecca	917	18.5%
	Hail	28	0.6%
	Jouf	149	3.0%
	Jazan	84	1.7%
	Madina El Munawara	141	2.8%
	Najran	90	1.8%
	Tabuk	35	0.7%
Educational level	Uneducated	16	0.3%
	Primary	20	0.4%
	Average	89	1.8%
	Secondary	1012	20.4%
	Diploma	62	1.2%
	University	3368	67.9%
	Masters	396	8.0%

Table 1: The demographic factors of the participants (N=4963) (continued)

Occupation	**Unemployed**	**454**	**9.1%**
	Employee	**1893**	**38.1%**
	Student	**1765**	**35.6%**
	Retired	**122**	**2.5%**
	Housewife	**674**	**13.6%**
	Free business	**55**	**1.1%**
Marital status	**Single**	**2545**	**51.3%**
	Married	**2358**	**47.5%**
	Divorced/Widowed	**60**	**1.2%**
Housing	**Apartment**	**1777**	**35.8%**
	Villa	**3074**	**62.0%**
	Farm	**67**	**1.4%**
	House	**43**	**0.8%**

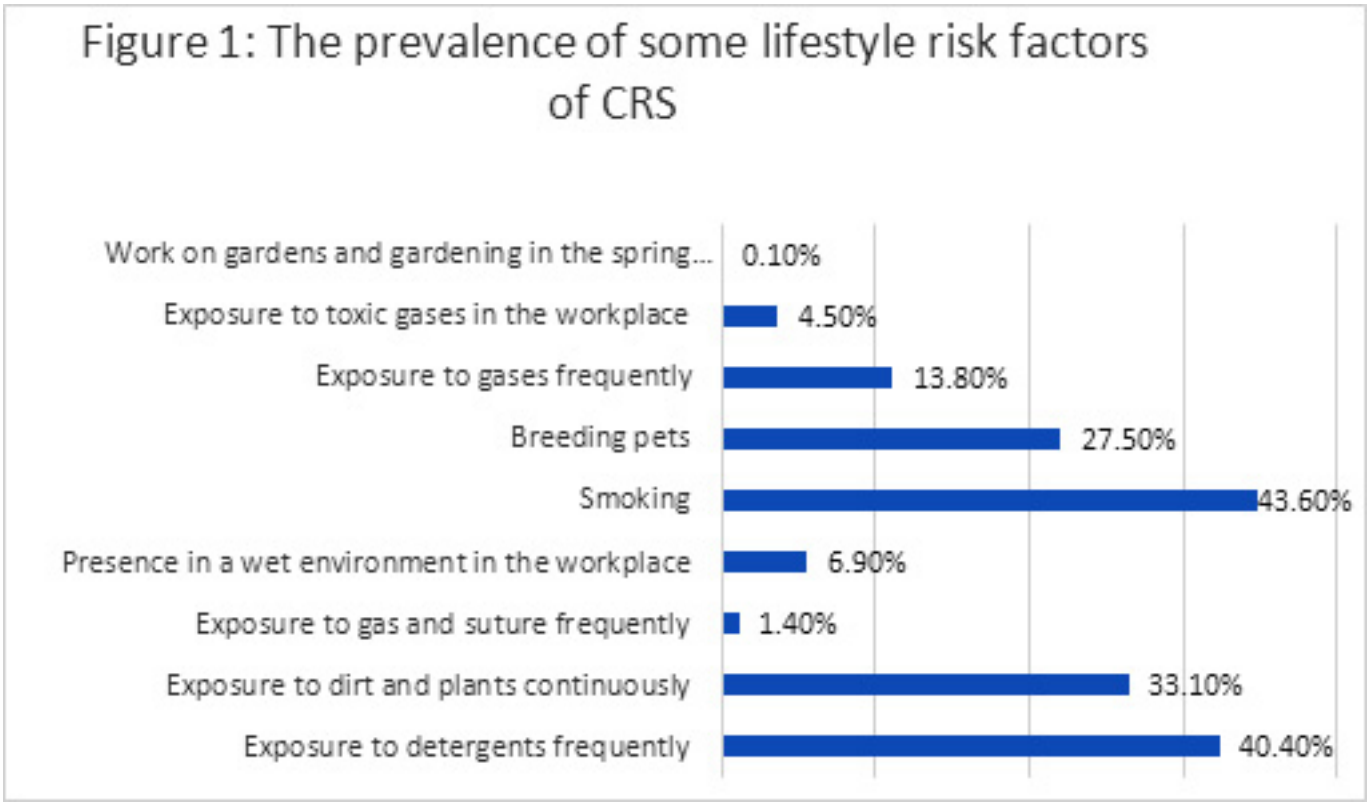

Figure 2: Prevalence of chronic conditions among the participants

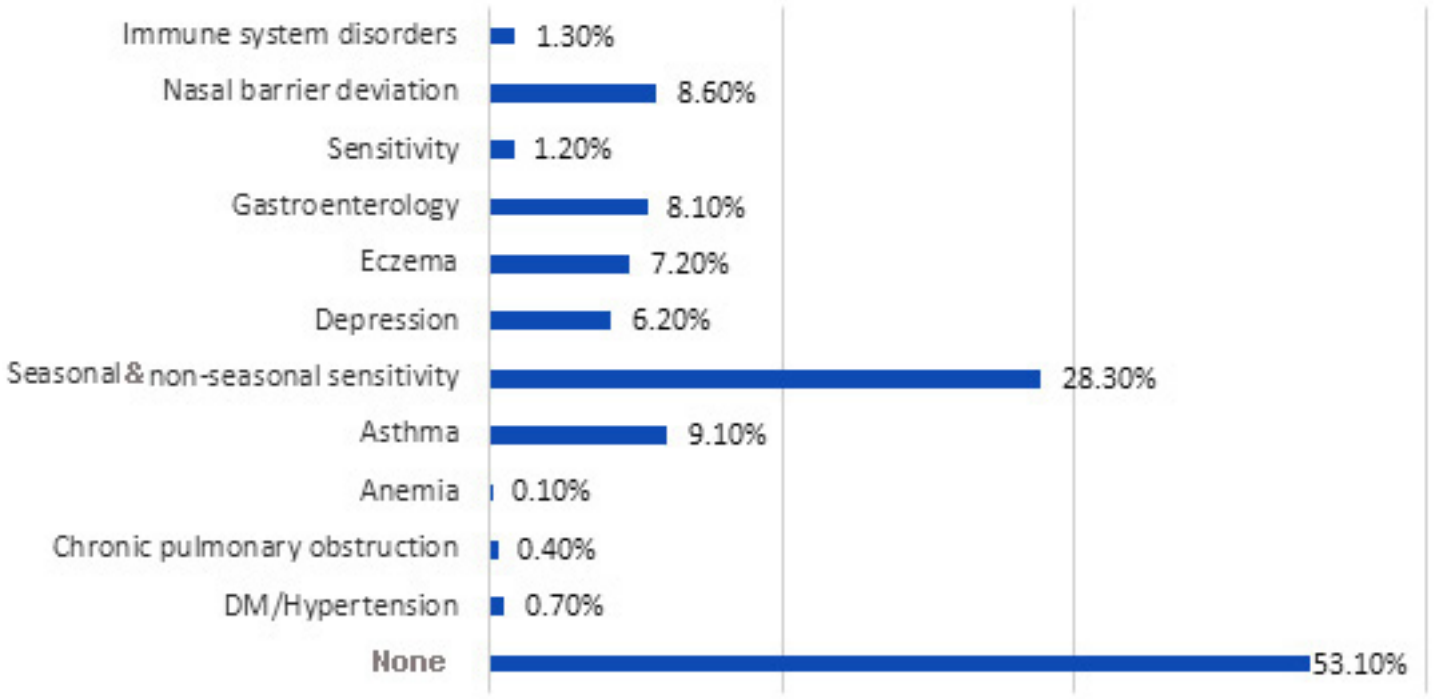

Figure 3: The prevalence of chronic conditions in famiies of the participants

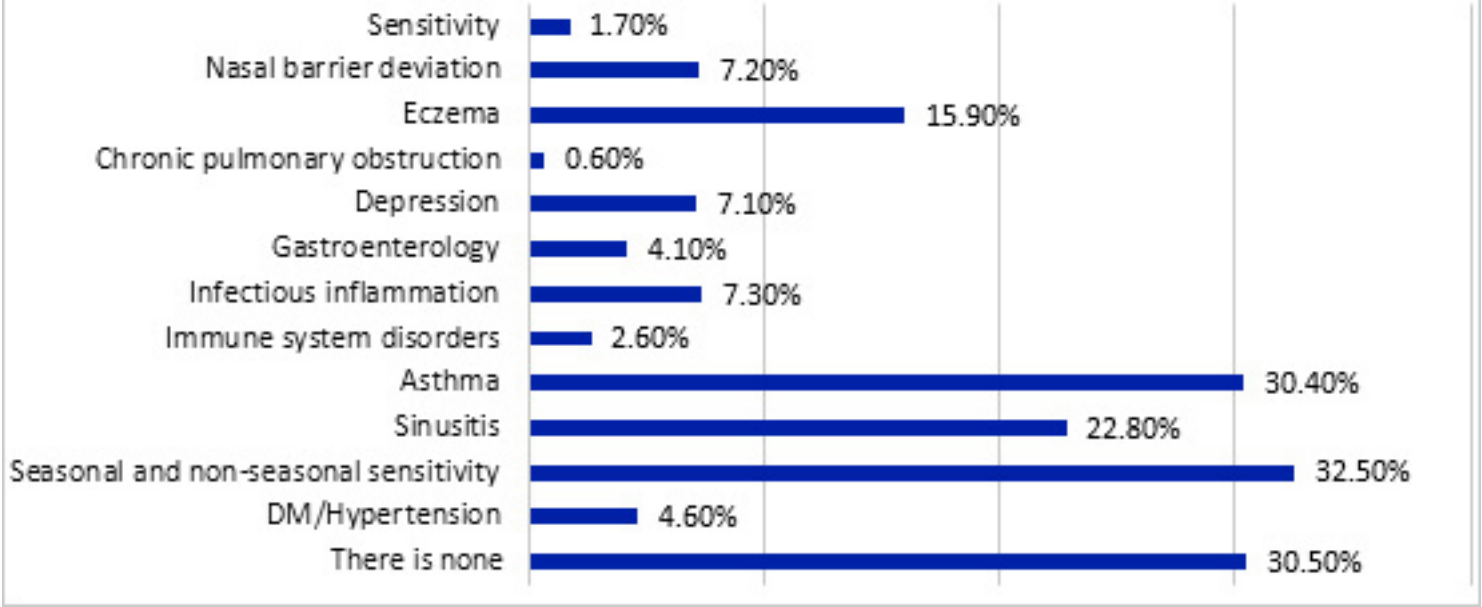

Table 2: The relation between incidence of chronic rhinosinusitis and demographic factors of the participants

		Chronic rhinosinusitis				P-value
		No		Yes		
		Count	Row N %	Count	Row N %	
Age	18-29	2125	80.6%	511	19.4%	0.000*
	30-49	1300	72.9%	483	27.1%	
	50-69	411	76.8%	124	23.2%	
	>70	8	88.9%	1	11.1%	
Gender	Male	1505	79.8%	382	20.2%	0.002*
	Female	2339	76.0%	737	24.0%	
Nationality	Saudi	3554	77.1%	1057	22.9%	0.022*
	Non-Saudi	290	82.4%	62	17.6%	
Educational level	Uneducated	12	75.0%	4	25.0%	0.627
	Primary	14	70.0%	6	30.0%	
	Average	68	76.4%	21	23.6%	
	Secondary	806	79.6%	206	20.4%	
	Diploma	47	75.8%	15	24.2%	
	University	2596	77.1%	772	22.9%	
	Masters	301	76.0%	95	24.0%	
Occupation	Unemployed	337	74.2%	117	25.8%	0.000*
	Employee	1415	74.7%	478	25.3%	
	Student	1461	82.8%	304	17.2%	
	Retired	96	78.7%	26	21.3%	
	Housewife	492	73.0%	182	27.0%	
	Free business	43	78.2%	12	21.8%	
Marital status	Single	2032	79.8%	513	20.2%	0.000*
	Married	1766	74.9%	592	25.1%	
	Divorced/ Widowed	46	76.7%	14	23.3%	
Housing	Apartment	1359	76.5%	418	23.5%	0.191*
	Villa	2390	77.7%	684	22.3%	
	Farm	54	80.6%	13	19.4%	
	House	39	90.7%	4	9.3%	

Table 2: The relation between incidence of chronic rhinosinusitis and demographic factors of the participants (continued)

Presence of lifestyle risk factors	Yes	2020	71.5%	806	28.5%	0.000*
	No	1824	85.4%	313	14.6%	
Presence of chronic conditions	Yes	1483	63.7%	844	36.3%	0.000*
	No	2361	89.6%	275	10.4%	
Family history of medical conditions	Yes	2488	72.1%	961	27.9%	0.000*
	No	1356	89.6%	158	10.4%	

Table 3: Symptoms and impact of CRS on quality of life among patients with CRS

	No problem	Very mild problem	Mild or slight problem	Moderate problem	Severe problem	Problem as bad as it can be
Need to blow the nose	23.8%	19.7%	16.9%	20.6%	12.2%	6.9%
Nasal obstruction	9.7%	17.8%	16.0%	25.9%	16.2%	14.4%
Sneezing	17.5%	20.0%	22.3%	23.1%	9.5%	7.6%
Runny nose	15.7%	20.3%	22.8%	19.6%	11.1%	10.5%
Cough	32.6%	20.6%	15.3%	15.3%	8.6%	7.6%
Postnasal discharge (postnasal drip)	25.5%	18.7%	18.1%	17.7%	9.4%	10.7%
Thick nasal discharge	35.6%	17.8%	16.4%	12.5%	9.2%	8.6%
Ear fullness	31.8%	19.7%	16.5%	14.0%	8.2%	9.7%
Dizziness	34.1%	20.3%	14.3%	13.1%	8.3%	9.8%
Ear pain	36.0%	18.7%	13.8%	13.8%	7.7%	10.1%
Facial pain or pressure	37.2%	16.7%	14.8%	13.0%	8.4%	9.8%
Loss of smell or taste	37.4%	19.0%	14.5%	12.7%	8.4%	8.0%
Difficulty falling asleep	25.6%	16.5%	17.3%	15.9%	10.4%	14.3%
Waking up at night	32.1%	17.2%	15.7%	14.5%	9.7%	10.8%
Lack of good sleep	24.7%	18.1%	14.7%	17.0%	10.4%	15.3%
Waking up tired	16.2%	19.2%	15.5%	19.0%	12.2%	17.9%
Fatigue	18.5%	18.6%	16.4%	18.2%	13.0%	15.2%
Reduced productivity	28.5%	17.9%	15.3%	15.3%	11.3%	11.8%
Reduced concentration	23.2%	20.0%	14.4%	17.0%	10.0%	15.4%
Frustrated/restless/ irritable	21.0%	16.8%	16.3%	17.7%	11.6%	16.6%
Sad	29.3%	16.4%	14.8%	15.5%	10.5%	13.4%
Embarrassed	32.5%	17.6%	13.6%	13.9%	9.2%	13.2%

Table 4: The impact of chronic rhinosinusitis on quality of life

SNOT-22 scores				
Chronic rhinosinusitis	Mean	N	Std. Deviation	P-value
No	26.8249	3844	26.35409	0.000*
Yes	44.0447	1119	25.38149	
Total	30.7074	4963	27.10817	

Discussion

CRS causes a significant impact on the quality of life (QoL) that leads to lost productivity at home and at work and which translates to billions of dollars in costs every year [17,18]. Many studies have shown that the severity of CRS-specific symptomatology, taken as a whole, is associated with diminished general health-related QoL [19]. Only few reports have evaluated its epidemiology and risk factors, especially in Asian countries, although the influence of the CRS on the population was significant. In the current study, the prevalence of CRS among the general population, depending on EPOS 2020 criteria, was 22.5%. This prevalence is significantly higher than reported in many studies including the study of Kim Y et al. which reported a prevalence of CRS of 6.95% depending on EPOS criteria. [11] However using clinical examinations, a study of Hastan D et al. which was conducted among 57,128 respondents living in 19 centres in 12 European countries reported a prevalence of CRS of 10.9% depending on EP³OS which ranged between 6.9-27.1% [20]. Moreover, the results of study of Pilan R et al., among the general population in Sao Paulo, showed a prevalence of CRS of 5.51% [2], and a study by Shi J et al., among 10,636 participants in China reported an overall prevalence of CRS of 8.0% which ranged from 4.8% to 9.7% in seven centres [8]. Furthermore, the prevalence of CRS was 11.9% among 23,700 participants in the study of Hirash A et al. [21], and 12-16% in different studies conducted in the USA [22–24]. Our results were similar to the results of a study conducted in Bushehr which reported a prevalence of 28.4% and which used a similar design to our study [9]. The high prevalence of CRS in the current study could be explained by some reasons. Firstly, results depended on participants' self-reporting which may overestimate the current prevalence as some participants who had previously suffered from CRS,though now recovered, may still report having CRS symptoms on the survey. Moreover, the predominantly hot and dry climate of the Saudi Arabia is known to increase the incidence of CRS and other allergic conditions [25–27]. In Saudi Arabia, previous studies confirmed our results and reported a prevalence of CRS of 25.3% [28]. One of the findings that confirmed the high prevalence in the current study relates to conditions in the country itself evidenced by a higher prevalence among Saudis than non-Saudis. Non-Saudis who may live in Saudi Arabia for only a short time might not be as affected by the climate.

The current study showed a significant higher prevalence of CRS among females than males and younger participants reported less prevalence of CRS. This is in disagreement with some previous studies which did not recognize any significant different in the prevalence of CRS depending on age or gender [2,9,10]. However, some other studies confirmed our results including the study by Min J. and Tan B. which showed that females develop CRS more than males [5,11]. On the other hand, other studies reported that the prevalence of CRS was significantly higher among males [29–32]. Moreover, the study of Cheul J et al. reported that aging was a risk factor for developing CRS [32] which is similar to our results.

The current study showed that exposure to risk factors including smoking, frequent exposure to detergents, continuous exposure to dirt and plants, and breeding pets was significantly associated with a higher prevalence of CRS. This also was reported in different studies including the study of Lieu and Feinstein which revealed a 20% increased risk of rhinosinusitis in current smokers [33], the study of Shi J et al., which showed that tobacco smoking was associated with a significantly increased risk of CRS [8] and the study by Thilsing T et al.[10]. Having other chronic conditions such as asthma and other allergic conditions were found to increase the risk for developing CRS in the current study which is similar to previous studies [8,34,35].

Furthermore, the current study showed a significant reduction in the quality of life as assessed by SNOT-22 in patients with CRS who reported significantly higher scores. This is similar to results of the previous study conducted by Asiri M. and Alokby G.who reported a SNOT-22 score of 64.2 among CRS patients compared to 19.5 in a control group [16]. Some studies also reported the negative impact of CRS of both types and causes on the quality of life [36,37]. The results of the current study indicate that there is a need to develop strategies to reduce the prevalence of CRS among Saudis.

In conclusion, the current study revealed a high prevalence of CRS among individuals in Saudi Arabia especially among older females, those with chronic conditions and those exposed to different risk factors such as smoking. Moreover, CRS was found to have a significantly negative impact on the quality of life.

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