



RESEARCH ARTICLE

PREVALENCE OF CHRONIC RHINO SINUSITIS AND IT'S RECURRENT AFTER TREATMENT COMPARE TO ITS RECURRENT AFTER SURGERY AT SAUDI ARABIA , 2016.

Dr. Shahad Abdulelah Abualnasr, Dr. Abdullah Mohammed Alattas, Dr. Abdullah Abdulelah Abualnasr, Dr. Haifa Abdulmohsen Alsrisri and Dr.Talal Aljeraisi.

Otorhinolarygology , Head & Neck Surgery Department, Faculty Of Medicine, Taibah University, KSA.

Manuscript Info

Manuscript History

Received: 29 November 2016

Final Accepted: 27 December 2016

Published: January 2017

Abstract

Objectives: To assess the prevalence of Chronic Rhinosinusitis in Saudi Arabia, identify the most affected age group and Gender, assess the most common risk factors for Rhinosinusitis and determine recurrent of Rhinosinsitis after treatment and after surgery and to compare them.

Methods: A cross-sectional study which was conducted electronically through a random sampling includes 434 person from Saudi Arabia during 2016. The used questionnaire includes 20 questions and was formulated to include demographic aspects, clinical features, risk, medical and surgical history. The questionnaire items were designed and written to suit the tradition and the Islamic culture.

Results: about half had infected with chronic sinusitis. 61.6% were females. 55.6% were between (21- 30) years old. 31.9% of infected respondents still having the inflammation without complications for more than three months. 97.6% of infected respondents are treated using medical drugs. 96.9% of the infected ones have the inflammation many times after having drugs as a way of treatment, while 3.1% of them have the inflammation many times after having surgical treatment but it is very important to clarify that the first case's percentage is much higher than the second; because most of the infected people use the medical drugs as a way of treatment not the surgical treatment. The most of our infected respondents weren't smokers. 61.6% of infected respondents suffer from sensitivity. 82.9% of infected respondents hadn't nasal polyps.

Conclusion: High prevalence of Chronic Rhinosinusitis in Saudi Arabia. The prevalence of chronic rhinosinusitis among females was higher than that among males, the most affected age group were between (21- 30) years old. Generally The presence of risk factors which may cause Chronic Rhinosinusitis was moderate

Copy Right, IJAR, 2016., All rights reserved.

Abbreviations Table.

Abbreviation	Description
CRS	Chronic rhinosinusitis
FESS	functional endoscopic sinus surgery

Corresponding Author:-Dr.Talal Aljeraisi.

Address:-Otorhinolarygology , Head & Neck Surgery Department, Faculty Of Medicine, Taibah University, KSA.

NHIS	National Health Interview Survey
CRSwNP	CRS with nasal polyps
CRSSNP	CRS without nasal polyps

Introduction:-

Chronic rhinosinusitis (CRS) is one of the most common chronic diseases which is defined as inflammation of the nose and paranasal sinuses that persists for 12 weeks or longer with two or more of the following symptoms: nasal congestion or blockade, anterior or posterior nasal discharge, facial pain or pressure, reduction or loss of smell, and complementary endoscopic signs and CT changes. Disturbing the quality of life of the affected people and causing a high financial burden on society. The ostiomeatal complex plays a fundamental role in the pathogenesis of rhinosinusitis (Fokkens, 2012).⁽¹⁻²⁾ In Saudi Arabia, chronic rhinosinusitis is prevalent in the eastern province and affects people from all age groups. In the past few years, there has been an increase in the chronic rhinosinusitis incidences in Saudi Arabia (El-Banna&Jiman-Fatani, (2013)).⁽³⁾

Chronic rhinosinusitis has several subtypes, such as where it can exist with or without nasal polyps. There is also fungal sinusitis, dental sinusitis, pediatric CRS, biofilms as well as MRSA among others. There is a large incidence of allergies in people suffering from chronic rhinosinusitis, particularly those for dust mites, molds, cockroaches and animal dander. Poorly controlled allergies can cause the deterioration of chronic rhinosinusitis symptoms. According to Dutre, Al Dousary, Zhang and Bachert (2013).⁽⁴⁾ Exposure to airborne irritants such as formaldehyde or tobacco smoke increases the risk of chronic rhinosinusitis. People with particular problems in their immune systems have increased risk of getting chronic rhinosinusitis. One of the most common problems with regard to chronic sinusitis is hypogammaglobulinemia or antibody deficiency.

People with subtle issues with their immune defenses mainly affecting the lungs, noses and sinuses also face a greater risk of acquiring chronic rhinosinusitis. Repeated infections by viruses increase the risk of getting chronic rhinosinusitis like common cold. However, it is unclear whether or not the infections are responsible for the rhinosinusitis. A deviated septum also increases the risk of getting chronic sinusitis (Hamid, Joseph & Al-Qahtani, 2015).⁽⁵⁾ A deviated septum may be present since birth or develop in later years of life because of a nasal injury. A deviated septum results in nasal blockage causing the blockage of one or both nostrils. People with chronic rhinosinusitis usually need lifelong treatment to keep the symptoms in check. Several treatment options are available for people with chronic rhinosinusitis. Yet there are many challenges to the management of CRS especially in the case of the more severe and refractory forms of the disease. As a consequence a wide range of medical and surgical therapies have been used to treat CRS.⁽⁶⁻⁷⁾ researches evaluating the comparative efficiency of various treatments for chronic rhinosinusitis (CRS) is scanty.

This study aimed to assess the prevalence of Chronic Rhinosinusitis in Saudi Arabia, identify the most affected age group and Gender, and assess the most common risk factors for Rhinosinusitis. Determine Recurrent of Rhinosinusitis After Treatment and After Surgery and to Compare them.

Objectives:-

1. To assess Prevalence of Chronic Rhinosinusitis in Saudi Arabia.
2. To identify the most affected age group and Gender.
3. Determine Recurrent of Rhinosinusitis After Treatment and After Surgery and to Compare them
4. To assess the most common risk factors.

Methodology:-

This is a cross-sectional study which was conducted through a random sampling. The population was people lives in Saudi Arabia during 2016. All recruited subjects of this study were from Saudi Arabia. Subjects who are not were excluded from the study analysis.

A pre-designed structured English and Arabic languages questionnaire was used in this cross-sectional survey. The used questionnaire includes 20 questions and was formulated to include demographic aspects, clinical features, risk, medical and surgical history. The questionnaire items were designed and written to suit the tradition and the Islamic culture. The questionnaires were electronically on a large scale to get the effective sampling. The questionnaires with missing data more than 50% were excluded from the study analysis. The final study sample size 434 person.

Approval was taken from the ethics committee at faculty of medicine, Taibah University. Ethical consideration was considered to avoid physical or emotional harm in the study questionnaire. The confidentiality and privacy of the collected data were ensured through the use of anonymous questionnaire and during data entry and analysis. People were provided with information on the study aims and methods.

Population & Sample of the Study:-

The study population includes all residents in the Kingdom of Saudi Arabia till the research year (2016), a random sample of (438) participants was selected, they answered the questionnaire electronically, (216) persons of them were infected with chronic sinusitis, they are nearly half of the selected sample, while (222) aren't infected with sinusitis, table (1) shows the participants properties according to their personal information:

Table 1:- The participant's personal data.

		All participants		Infected with sinusitis		Uninfected with sinusitis	
		#	%	#	%	#	%
Gender	Female	250	57.1	133	61.6	117	52.7
	Male	188	42.9	83	38.4	105	47.3
Age	(11-20)	72	16.4	27	12.5	45	20.3
	(21-30)	271	61.9	120	55.6	151	68.0
	(31-40)	54	12.3	39	18.1	15	6.8
	(41-50)	30	6.8	21	9.7	9	4.1
	(51-60)	10	2.3	9	4.2	1	.5
	More than 60	1	.2	27	12.5	1	.5
Nationality	Saudi	400	91.3	200	92.6	200	90.1
	Other	38	8.7	16	7.4	22	9.9
Total		438	100.0	216	100.0	222	100.0

From the previous table we notice that 61.6% of the infected people were females, while 38.4% of the infected ones were males.

We also can notice that 55.6% of the ages of those who suffer chronic sinusitis were between (21- 30) years old, while 18.1% of them were between (31- 40) years old, 12.5% of them were between (11- 20) years old, 9.7% of them were between (42- 50) years old, and 4.2% of them were between (51- 60) years old.

The next diagram concludes the previous results.

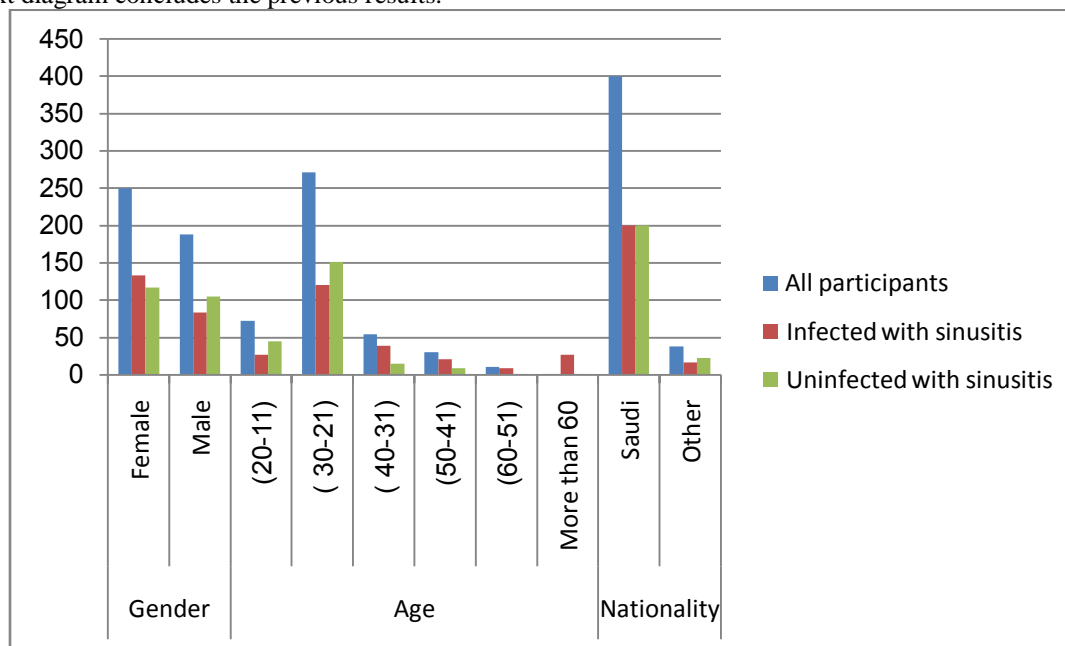


Figure 1:- The participants personal data.

The infected persons' answers descriptive show:-

Through the image Is it possible to determine the exact site of inflammation:-



	Frequency	Percent	Valid Percent
A	55	25.5	26.6
B	84	38.9	40.6
C	68	31.5	32.9
Missing	9	4.2	
Total	216	100.0	

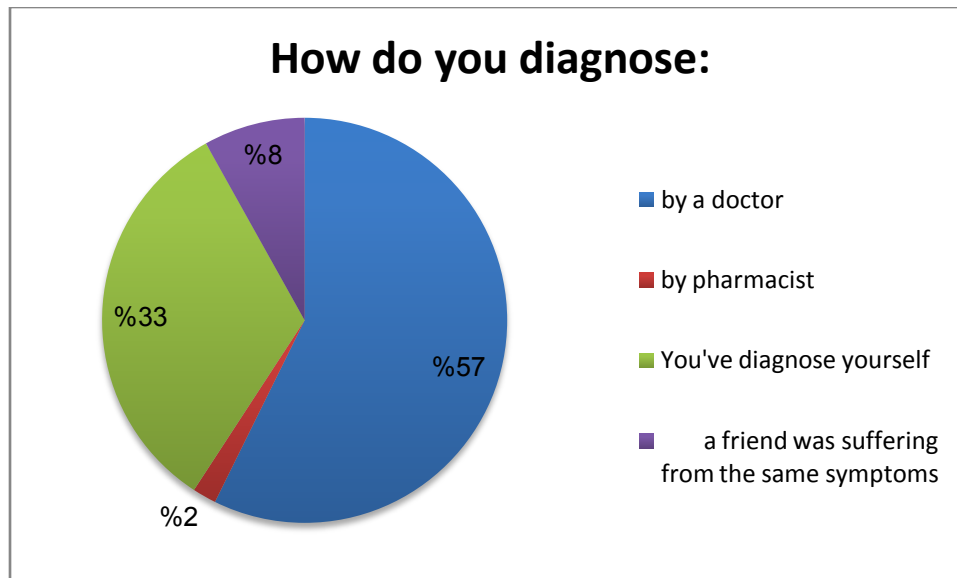
It is clear from the previous table that 40.6% of them suffer from Ethmoid Sinuses (location B), while 32.9% of them suffer from maxillary sinuses (location C), and 26.6% of them suffer from front nasal sinuses (location A).

And according to the side of disease, 87.1% answered that it is in both their face sides, while 6.7% of them told that it is in their left side of their faces, and 6.2% of them suffer from the right side of their faces.



How do you diagnose?

And according to the way they have their disease diagnosis, 57% of the infected ones were diagnosed by the doctor, while 33% of them diagnosed themselves, 8% of them were diagnosed by a friend who is suffering from the same symptoms, and 2% of them were diagnosed by a pharmacist.



What is the period of inflammation with or without acute exacerbations?

	Frequency	Percent	Valid Percent
Less than 3 months	143	66.2	68.1
More than 3 months	67	31.0	31.9
Missing	6	2.8	
Total	216	100.0	

It is clear from the previous table that 68.1% of the infected ones still have the inflammation for less than three months without having any complications, and 31.9% of them still having the inflammation without complications for more than three months.

How many times have you suffered from sinusitis on one year?

	Frequency	Percent	Valid Percent
less than 4 times in year	107	49.5	51.0
more than 4 times in year	103	47.7	49.0
Missing	6	2.8	
Total	216	100.0	

It is clear from the previous table that 51% of the sinusitis infected ones suffer the inflammation less than four times a year, while 49.1% of them suffer from the inflammation for more than four times a year.

What is the method of treatment?

	Frequency	Percent	Valid Percent
medication	200	92.6	97.6
surgical treatment	5	2.3	2.4
Missing	11	5.1	
Total	216	100.0	

It is clear from the previous table that 97.6% of the infected ones are treated using medical drugs, while only 2.4% are treated through surgical operations.

Have you had any sinus or nasal surgery after sinusitis:

	Frequency	Percent	Valid Percent
No	199	92.1	93.9
Yes	13	6.0	6.1
Missing	4	1.9	
Total	216	100.0	

The previous table shows that 93.9% of the sinusitis infected ones had no surgical operations for sinusitis or for their noses after the infection, while 6.1% of them had surgical operations after the infection.

Sinusitis return after which treatment:-

	Frequency	Percent	Valid Percent
medication	190	88.0	96.9
surgical treatment	6	2.8	3.1
Missing	20	9.3	
Total	216	100.0	

It is noticed from the previous table that 96.9% of the infected ones have the inflammation many times after having drugs as a way of treatment, while 3.1% of them have the inflammation many times after having surgical treatment but it is very important to clarify that the first case's percentage is much higher than the second; because most of the infected people use the medical drugs as a way of treatment not the surgical treatment, the researcher think that result to that the sinusitis is a chronic disease and it is not easy to be completely cared.

How many times sinusitis return after treatment?

	Frequency	Percent	Valid Percent
Once	48	22.2	24.5
Twice	35	16.2	17.9
three times	24	11.1	12.2
more	89	41.2	45.4
Missing	20	9.3	
Total	216	100.0	

From the previous table we can conclude to that 45.4% of the infected ones have the inflammation for more than three times after having the surgical treatment, while 24.5% have the inflammation just once after the surgical treatment, 17.9% have the inflammation twice after the surgery, and 12.2% of them have the inflammation repeated three times after the surgical treatment.

The question	Yes		No		Missing	
	#	%	#	%	#	%
Have you ever smoked?	43	19.9	169	78.2	4	1.9
Do you suffer sensitivity?	133	61.6	79	36.6	4	1.9
Have you ever been tested for allergies?	49	22.7	157	72.7	10	4.6
Have you ever been on antihistamines?	113	52.3	95	44.0	8	3.7
In the past year do you use nasal steroid sprays or oral steroids?	146	67.6	61	28.2	9	4.2
In the past year do you suffer from nasal polyps?	30	13.9	179	82.9	7	3.2

From the previous table we can conclude to that:-

- Most of the infected ones are nonsmokers, as their percentage was 78.2% of the participants.
- 61.6% of the sinusitis infected ones suffer from sensitivity, 36.6% of them don't suffer it.
- 72.7% of sinusitis infected ones have never been tested for allergies, while 22.7% had.
- 52.3% of sinusitis infected ones have used treatment for general sensitivity, while 44% of them haven't.
- 28.2% of sinusitis infected ones didn't use nasal steroid sprays or oral steroids, while 67.6% of them did.
- 82.9% of sinusitis infected ones didn't suffer from nasal polyps, while 13.9% suffered from it.

The most important symptoms of sinuses inflammations and it's degrees can be seen in the next table:-

Symptoms	Absent		Mild		Moderate		Severe	
	#	%	#	%	#	%	#	%
Sneezing	43	19.9	76	35.2	40	18.5	37	17.1
Cough	38	17.6	70	32.4	42	19.4	40	18.5
Nasal congestion	50	23.1	68	31.5	50	23.1	23	10.6

Runny Nose	44	20.4	66	30.6	49	22.7	31	14.4
Nasal Obstruction	95	44.0	46	21.3	25	11.6	7	3.2
Loss of Smell or Taste	78	36.1	58	26.9	30	13.9	13	6.0
Thick Nasal Discharge	59	27.3	63	29.2	45	20.8	15	6.9
Post-Nasal Discharge	71	32.9	56	25.9	32	14.8	18	8.3
Ear Fullness or pain	56	25.9	60	27.8	40	18.5	31	14.4
Facial Pain/Pressure	63	29.2	69	31.9	27	12.5	28	13.0
Difficulty Falling Asleep or Wake Up At Night	42	19.4	67	31.0	47	21.8	32	14.8
Fatigue	84	38.9	57	26.4	26	12.0	16	7.4

From the previous table we can conclude to:-

- 17.1% of sinusitis infected ones suffer from severe Sneezing, while 35.2% of them suffer mildly from Sneezing.
- 18.5% of sinusitis infected ones suffer from severe Cough, while 32.4% of them suffer mildly from it.
- 10.6% of sinusitis infected ones suffer from severely Nasal congestion, while 31.5% of them suffer mildly from it.
- 14.4% of sinusitis infected ones suffer from severely Runny Nose, while 30.6% of them suffer mildly from it.
- 3.2% of sinusitis infected ones suffer from severely Nasal Obstruction, while 44% of them never suffer from it.
- 6% of sinusitis infected ones suffer from severely Loss of Smell or Taste, while 36.1% of them never suffer from it.
- 6.9% of sinusitis infected ones suffer from severely Post-Nasal Discharge, while 29.2% of them suffer mildly from it.
- 8.3% of sinusitis infected ones suffer from severely Post-Nasal Discharge, while 32.9% of them never suffer from it.
- 14.4% of sinusitis infected ones suffer from severely Ear Fullness or pain, while 27.8% of them suffer mildly from it.
- 13% of sinusitis infected ones suffer from severely Facial Pain/Pressure, while 31.9% of them suffer mildly from it.
- 14.8% of sinusitis infected ones suffer from severely Difficulty Falling Asleep or Wake Up At Night, while 31% of them suffer mildly from it.
- 7.4% of sinusitis infected ones suffer from severely Fatigue, while 38.9% of them never suffer from that.

Discussion:-

Chronic rhinosinusitis (CRS), one of the most common chronic diseases, CRS is associated with a substantially impaired quality of life.⁽⁸⁾ reduced workplace productivity and serious medical treatment costs.^(9,10)

Identified several risk factors for CRS, including influenza vaccination, septal deviation and allergic rhinitis. Moreover, there were significantly increased prevalence of chronic rhinosinusitis in plant and machinery operators and assemblers, craft and related trade workers and the unemployed.⁽¹¹⁾

Therefore this study aimed to assess the prevalence of Chronic Rhinosinusitis in Saudi Arabia, identify the most affected age group and Gender, and assess the most common risk factors for Rhinosinusitis.

In the present study about half of the respondents had infected with chronic sinusitis. This considered a very high prevalence. This rate is higher than in many previous studies in different countries, it was 12% in the USA.⁽¹²⁾ 10.9% in Europe.⁽¹³⁾ this difference in results may be because CRS is difficult to study as the disease is difficult to define and diagnose. Without neglect the role of weather at this difference, there is some evidence that CRS is more prevalent in the warm than in the colder places.⁽¹⁴⁾

Regarding to demographic data the majority of infected respondents 61.6% were females. confirming earlier data from the US National Health Interview Survey (NHIS),⁽¹³⁾ and Canada.⁽¹⁴⁾ but this finding unlike results of study in china which reported that The prevalence chronic rhinosinusitis among males was higher than that among females in the general population.⁽¹⁵⁾ More than half 55.6% of infected respondents were between (21- 30) years old. this finding conform with Kim et al. whose found that A relatively higher prevalence was seen in those aged 15–34.⁽¹⁶⁾

This could be due to this age group are the most vulnerable to risk factors of chronic rhinosinusitis.

The majority of our respondents suffer from Sinuses Safavid, regarding side of disease the most had it in both their face sides. But just about half of the respondents diagnosed their infection by the doctor, this may be one of the reasons of the behind the answer of large number of participants that they were infected with the disease, because not all of them diagnosed their infection by the doctor.

Chronic rhinosinusitis (CRS) is one of the most common chronic diseases which is defined as inflammation of the nose and paranasal sinuses that persists for 12 weeks or longer with two or more of the following symptoms: nasal congestion or blockade, anterior or posterior nasal discharge, facial pain or pressure, reduction or loss of smell, and complementary endoscopic signs and CT changes.⁽¹⁻²⁾ But in our study just 31.9% of infected respondents still having the inflammation without complications for more than three months.

97.6% of infected respondents are treated using medical drugs, while 6.1% of them had surgical operations after the infection. Due to recurrent symptoms, many patients presenting with CRS require repeated medical treatment and even surgical interventions. So in our study 96.9% of the infected respondents have the inflammation many times after having drugs as a way of treatment, and 3.1% of them have the inflammation many times after having surgical treatment.

Previous studies found that smoking and allergies are potent risk factors for CRS.⁽¹⁴⁾ Lieu and Feinstein found a significant association between current smoking and rhinosinusitis in women but not men.⁽¹⁰⁾ Lotvall J, et al. found revealed a 20 % increased risk of rhinosinusitis in current smokers.⁽¹⁷⁾ The most of our infected respondents weren't smokers, but this does not negate the possibility of exposure to secondhand smoke.

In Shi et al., cross-sectional investigation, they reported that having asthma or a nasal allergy significantly increased the risk of CRS.⁽¹⁵⁾ which was consistent with some studies discovering positive associations between sinus disease or CRS and asthma.^(18,19) This conform our finding 61.6% of infected respondents suffer from sensitivity.

CRS is classified into two types based on the presence or absence of nasal polyps: CRS with nasal polyps (CRSwNP) and CRS without nasal polyps (CRSSNP).^(20,21) In this study 82.9% of infected respondents hadn't nasal polyps, while 13.9% suffered from it.

The Canadian Clinical Practice Guidelines for Acute and Chronic Rhinosinusitis recommend the presence of at least two major symptoms (nasal congestion, facial pain or pressure, nasal obstruction, anterior or posterior nasal discharge, and loss of sense of smell).⁽²²⁾ our study showed that for symptoms among the majority of infected respondents were absent or mild.

Acknowledgment:-

The first one we would like to thanks Allah the cherisher and sustainer of the world for his blessing. We would like to thanks Dr. TalalAljeraisi who supervised my work for his major effort in reaching and guidance . And we would like to thanks: Dr. Abdullah HasanAlhojaili, Dr. Alhassan Ali Alghamdi, and Dr. Khalid Ahmed Amara; to assist us in collecting study data

Conclusion:-

the present study showed high prevalence of Chronic Rhinosinusitis in Saudi Arabia. The prevalence of chronic rhinosinusitis among females was higher than that among males, the most affected age group were between (21- 30) years old. Generally The presence of risk factors which may cause Chronic Rhinosinusitis was moderate.

Recommendation:-

1. Further studies on the same topic to include the largest number of participants These studies include a medical examination in order to confirm the diagnosis of participants.
2. Community awareness of how to avoid infection of Chronic Rhinosinusitis.
3. The government should do practical procedures to decrease infection risk factors like such as smoking prevention in crowded public places.
4. Be sure to follow safety procedures in the professional business that may increase the chances of disease infection.

References:-

1. Kern RC, Conley DB, Walsh W, et al. Perspectives on the etiology of chronic rhinosinusitis: an immune barrier hypothesis. *Am J Rhinol.* 2008;22:549–559.
2. Fokkens WJ, Lund VJ, Mullol J, Bachert C, Alobid I, Baroody F, et al. EPOS: European position paper on rhinosinusitis and nasal polyps 2012. A summary for otorhinolaryngologists. *Rhinology* 2012; 50: 1-12.
3. Dutre, T., Al Dousary, S., Zhang, N., & Bachert, C. (2013). Allergic fungal rhinosinusitis—more than a fungal disease? *Journal of Allergy and Clinical Immunology*, 132(2), 487-489.
4. El-Banna, H., & Jiman-Fatani, A. (2013). Bacteriology of chronic maxillary sinusitis in Jeddah, Saudi Arabia. *African Journal of Microbiology Research*, 7(33), 4276-4283.
5. Hamid, M. E., Joseph, M. R. P., & Al-Qahtani, A. S. (2015). Chronic rhinofacial basidiobolomycosis caused by *Basidiobolus ranarum*: Report of a case from Aseer Region, Kingdom of Saudi Arabia. *Journal de Mycologie Médicale/Journal of Medical Mycology*, 25(4), 306-309.
6. Bachert C1, Pawankar R2, Zhang L , et al. ICON: chronic rhinosinusitis. *World Allergy Organ J.* 2014;7;25.
7. Ragab SM1, Lund VJ, Scadding G. Evaluation of the medical and surgical treatment of chronic rhinosinusitis: a prospective, randomised, controlled trial. *Laryngoscope.* 2004;114(5):923-30.
8. Fu, Qing-Ling, et al. "Influence of self-reported chronic rhinosinusitis on health-related quality of life: a population-based survey." *PloS one* 10.5 (2015): e0126881.
9. Hamilos, Daniel L. "Chronic rhinosinusitis: epidemiology and medical management." *Journal of allergy and clinical immunology* 128.4 (2011): 693-707.
10. Gao, Wen-Xiang, et al. "Occupational and environmental risk factors for chronic rhinosinusitis in China: a multicentre cross-sectional study." *Respiratory research* 17.1 (2016): 1.
11. Thilsing, Trine, et al. "Chronic rhinosinusitis and occupational risk factors among 20-to 75-year-old Danes—A GA2LEN-based study." *American journal of industrial medicine* 55.11 (2012): 1037-1043.
12. Kobayashi, Miwako, et al. "Intervals between PCV13 and PPSV23 vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP)." *MMWR Morb Mortal Wkly Rep* 64.34 (2015): 944-947.
13. Hastan, D. F. W. J., et al. "Chronic rhinosinusitis in Europe—an underestimated disease. A GA2LEN study." *Allergy* 66.9 (2011): 1216-1223.
14. Chen, Yue, Robert Dales, and Mei Lin. "The epidemiology of chronic rhinosinusitis in Canadians." *The Laryngoscope* 113.7 (2003): 1199-1205.
15. Shi, J. B., et al. "Epidemiology of chronic rhinosinusitis: results from a cross-sectional survey in seven Chinese cities." *Allergy* 70.5 (2015): 533-539.
16. Kim, Yoo Suk, et al. "Prevalence and risk factors of chronic rhinosinusitis in Korea." *American journal of rhinology & allergy* 25.3 (2011): e117-e121.
17. Lötvall, Jan, Linda Ekerljung, and Bo Lundbäck. "Multi-symptom asthma is closely related to nasal blockage, rhinorrhea and symptoms of chronic rhinosinusitis-evidence from the West Sweden Asthma Study." *Respiratory research* 11.1 (2010): 1.
18. Dunlop, Gillian, Glenis K. Scadding, and Valerie J. Lund. "The effect of endoscopic sinus surgery on asthma: management of patients with chronic rhinosinusitis, nasal polyposis, and asthma." *American journal of rhinology* 13.4 (1999): 261-265.
19. Bresciani, Megon, et al. "Rhinosinusitis in severe asthma." *Journal of allergy and clinical immunology* 107.1 (2001): 73-80.
20. Rosenfeld, Richard M., et al. "Clinical practice guideline: adult sinusitis." *Otolaryngology-Head and Neck Surgery* 137.3 (2007): S1-S31.
21. Vives, Michael, Lyle Young, and Sanjeev Sabharwal. "Readability of spine-related patient education materials from subspecialty organization and spine practitioner websites." *Spine* 34.25 (2009): 2826-2831.
22. Desrosiers, Martin, et al. "Canadian clinical practice guidelines for acute and chronic rhinosinusitis." *Allergy, Asthma & Clinical Immunology* 7.1 (2011): 1.