Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/17904
DOI URL: http://dx.doi.org/10.21474/IJAR01/17904

RESEARCH ARTICLE

PREVALENCE AND SYMPTOMS OF ASTHMA AND ALLERGIC RHINITIS IN ADULTS WITH CHRONIC RHINOSINUSITIS IN THE EASTERN REGION OF SAUDI ARABIA

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Manuscript Info

Manuscript History
Received: 16 September 2023
Final Accepted: 19 October 2023
Published: November 2023

Key words:-
Chronic Rhinosinusitis, Asthma, Allergic Rhinitis

Abstract

Background: This cross-sectional study explores the prevalence and symptoms of asthma and allergic rhinitis among adults diagnosed with Chronic Rhinosinusitis (CRS) in the Eastern Region of Saudi Arabia.

Methods: Involving 386 participants, the research employs demographic profiling and symptom analysis and explores the interplay of upper and lower airway conditions. This study investigates the prevalence of asthma and allergic rhinitis among 386 adults with chronic rhinosinusitis (CRS) in Eastern Saudi Arabia. Employing a cross-sectional design, participants from King Fahad Specialist Hospital and Jubail General Hospital were selected through random and stratified sampling.

Results: The study reveals a higher prevalence of asthma (40.6%) compared to allergic rhinitis (25.1%), emphasising the need for a comprehensive understanding of these respiratory conditions. Intriguing associations between asthma attacks and specific CRS symptoms, such as chest tightness and waking due to shortness of breath, provide insights into shared pathways. Demographically, higher prevalence is observed among females, individuals with lower educational attainment, and nonsmokers, highlighting socio-demographic influences on respiratory health.

Conclusion: The study discloses a noteworthy prevalence of asthma (40.6%) in comparison to allergic rhinitis (25.1%) among adults with Chronic Rhinosinusitis in Eastern Saudi Arabia. Asthma attacks showcase distinctive associations with specific CRS symptoms, emphasising the intricate interplay of these respiratory conditions. The demographic influences of education and smoking underscore the importance of lifestyle factors. Recommendations for future research include longitudinal studies and clinical validations to enhance the validity and depth of our findings.

Introduction:-

Chronic Rhinosinusitis (CRS) is a common inflammatory condition of the nasal and paranasal sinus mucosa, characterised by persistent symptoms such as nasal congestion, facial pain, and impaired sense of smell [1-2]. The European Position Paper on Rhinosinusitis (EPOS) defined criteria for CRS based on expert advice in order to maintain consistency among epidemiologic research [3]. The revised EPOS 2020 classification divides CRS into

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primary and secondary conditions based on anatomic distribution, and it also distinguishes between diffuse and localised illness [4]. By applying this definition, epidemiological studies have calculated the prevalence of chronic rhinosinusitis (CRS) to be approximately 10.9% in Europe, 8% in China, and 5.5% in Brazil [5-7]. The impact of CRS on the quality of life is substantial, as it can lead to chronic discomfort and affect daily activities. While the pathophysiology of CRS is complex and multifactorial, the coexistence of other respiratory conditions, such as asthma and nasal airway obstruction, has been a subject of growing interest in recent medical research.

Asthma, a chronic respiratory disease characterised by inflammation of the airways, is known to have connections with CRS. The two conditions often coexist, leading to a complex interplay of inflammatory processes in the upper and lower airways. The link between asthma and Chronic Rhinosinusitis (CRS) is widely recognised. A study found that 74% of individuals with severe asthma and 70% of those with mild-to-moderate asthma exhibited symptoms indicative of CRS [8]. Despite advances in medical understanding and treatment options, the global burden of asthma remains a significant concern, witnessing a continuous increase. Recent estimates indicate a staggering 262.41 million prevalent cases of asthma worldwide [9]. This persistent rise underscores the ongoing challenges in effectively managing and mitigating the impact of asthma on individuals and healthcare systems globally.

Moreover, the severity of CRS symptoms, as measured by symptom scores, was notably higher in the severe asthmatic group.Patients experiencing Chronic Rhinosinusitis with Nasal Polyposis (CRSwNP) alongside comorbid asthma commonly exhibit a distinct clinical profile. This includes an advanced age at presentation, an increased prevalence of allergic rhinitis, prolonged duration of nasal symptoms, elevated computed tomography (CT) and endoscopy scores, a higher frequency of sinonasal surgeries, and the presence of bronchial obstruction. This collective clinical picture signifies a more complex and severe disease presentation compared to those with isolated CRSwNP [8-10].

Allergic rhinitis (AR) and chronic rhinosinusitis (CRS) are common and often coexisting conditions that significantly impact the quality of life for affected individuals[11]. While both disorders manifest distinct pathophysiological mechanisms, their intersection in the adult population has garnered increased attention in recent years. Allergic rhinitis is characterised by inflammation of the nasal mucosa triggered by an immunoglobulin E (IgE)-mediated response to environmental allergens, such as pollen, dust mites, animal dander, and mould spores[12]. The global prevalence of allergic rhinitis (AR) presents a varied landscape, with an overall incidence of 18.1% [13]. However, this prevalence demonstrates substantial regional diversity. In Africa, the prevalence ranges from 3.6% to 22.8%, while the Americas exhibit an even broader spectrum, ranging from 3.5% to 54.5%. Across Asia, the prevalence varies from 1.0% to 47.9%, and in Europe, it spans from 1.0% to 43.9%. Oceania, on the other hand, experiences a prevalence fluctuating between 19.2% and 47.5% [13]. These disparities underscore the complex interplay of environmental, genetic, and socio-economic factors influencing the prevalence of allergic rhinitis across different regions worldwide. Various theories propose links between Allergic Rhinitis (AR) and Chronic Rhinosinusitis (CRS). One theory suggests allergies cause mucosal swelling, obstructing sinus ostia and inducing rhinosinusitis [14]. Another theory highlights increased eosinophils in the maxillary sinus during allergic exacerbations [15]. The interconnectedness of upper and lower airways is evident in simultaneous inflammation, especially in the coexistence of allergic rhinitis and asthma. Support for the Unified Airway Theory comes from epidemiological studies, shared pathophysiological mechanisms, and observed treatment effects [16].

Seybt et al. underwent a retrospective review of 145 adults treated for chronic rhinosinusitis (CRS); asthma was prevalent in 23.4%, significantly higher than the general adult population (5%). Asthmatic CRS patients showed higher rates of nasal polyps, olfactory dysfunction, and nasal congestion compared to nonasthmatic CRS patients. Nonasthmatic CRS patients had a higher prevalence of headache and rhinorrhea. While the primary sinus surgery requirement did not significantly differ, asthmatic CRS patients underwent significantly more revision sinus procedures on average [17].Jarvis et al. surveyed through the Global Allergy and Asthma Network of Excellence (GA2LEN) survey of 52,000 European adults and revealed varied asthma prevalence across regions, with the prevalence being lower in older adults. However, asthma exhibited a consistent association with chronic rhinosinusitis (CRS) across all age groups and genders. The asthma-CRS link was particularly strong in those reporting both CRS and allergic rhinitis. Notably, CRS without nasal allergies was linked to late-onset asthma. Overall, self-reported asthma was more common in young adults, women, and smokers, emphasising geographical differences in asthma prevalence [18].John et al. explore early-onset (<18 years) and late-onset (>18 years) asthma in chronic rhinosinusitis (CRS) patients. Late-onset asthmatics exhibited higher BMI, lower physical function, increased nasal polyposis, and received more oral steroids and endoscopic surgeries for CRS management compared

to nonasthmatics. Late-onset asthmatics also showed more severe CRS characteristics than early-onset asthmatics. While CRS- and asthma-specific patient-reported outcomes were similar, late-onset asthma may be associated with a more severe CRS profile [19].

Lin et al. reported that approximately 20% of the U.S. population has allergic rhinitis (AR), and 12.5% experience chronic rhinosinusitis (CRS), often overlapping. In a case-control study of 200 adult nonsmokers in Maryland, those with both AR and CRS had more severe symptoms, with CRS groups showing the greatest severity. Subjects with combined AR and CRS were more likely to have undergone nasal surgery, emphasising the heightened impact of coexisting disorders on symptom severity and healthcare interventions[9]. Ostovar et al. studied in Bushehr, southwestern Iran, involving 5420 adults (response rate: 96.1%); allergic rhinitis (AR) prevalence was 28.8%, with 25.9% classified as intermittent and 74.1% as persistent AR. Health workers and smokers had significantly higher AR prevalence. A strong association was found between AR and chronic rhinosinusitis (CRS) ($p<0.001$, aOR: 4.68, 95%CI: 4.07-5.39), particularly with moderate to severe persistent AR ($p<0.001$, aOR: 4.21, 95%CI: 3.40-5.22), emphasising the significant impact of AR on this population's health[20]. This study, based on Korean National Health and Nutrition Examination Survey (KNHANES) 2008-2012 data conducted by Ahn et al., revealed a prevalence of 2.6% for CRS with nasal polyps (CRSwNP) and 5.8% for CRS without nasal polyps (CRSsNP) in Korean adults. CRSwNP is associated with age, lower education, and obesity. Allergic rhinitis (AR) prevalence is 18.5%, with an increased risk in urban areas. The prevalence of nasal septal deviation (NSD) is 48.0%, which is associated with age and is a risk factor for CRSsNP but not for CRSwNP. Older age increases CRSwNP and NSD risks but decreases AR risk, while obesity is a risk factor for CRSwNP[21].

In Saudi Arabia, like many other regions, the prevalence of respiratory conditions in the E**a**stern region has been on the rise. Factors such as environmental exposures, genetic predispositions, and changing lifestyles contribute to the burden of respiratory diseases in the population. This research aims to explore the prevalence of asthma and allergic rhinitis among adults diagnosed with CRS in the E**a**stern region of Saudi Arabia. By shedding light on the coexistence of these conditions, we can enhance our understanding of the underlying mechanisms and risk factors. Furthermore, this information will contribute to the development of targeted interventions that address both upper and lower airway manifestations, ultimately improving the overall respiratory health and quality of life for individuals with CRS in the Saudi Arabian population.

Methodology:-

Study design:

This study utilised a cross-sectional design to determine the prevalence of asthma and allergic rhinitis among adults diagnosed with Chronic Rhinosinusitis (CRS) in the Eastern region of Saudi Arabia.

Study population:

The study included 386 participants with a diagnosis of chronic rhinosinusitis (CRS).

Inclusion criteria:

The study focused on adults within the age range of 18 to 65 years, considering this demographic as the target population for the investigation. Inclusion in the study was contingent upon a confirmed diagnosis of Chronic Rhinosinusitis (CRS) determined through a comprehensive assessment involving both clinical evaluation and imaging criteria. The clinical diagnosis was based on established criteria for CRS, taking into account the persistence and severity of characteristic symptoms, such as nasal congestion, facial pain, and impaired sense of smell. Additionally, imaging modalities, such as computed tomography (CT) scans, were utilised to further validate the presence of sinonasal inflammation and assess the extent and severity of the condition. This combined clinical and imaging approach ensures a robust and accurate identification of individuals with CRS within the specified age range for inclusion in the study.

Exclusion criteria:

Exclusion criteria were applied to individuals with specific medical histories to ensure the study's focus on uncomplicated cases of Chronic Rhinosinusitis (CRS). Participants with a history of sinonasal malignancy were excluded from the study, as the presence of malignancy can significantly alter the clinical presentation and may require different treatment approaches. Additionally, individuals who have undergone sinonasal surgery within the last six months were excluded to minimise the potential influence of recent surgical interventions on the study

outcomes. Pregnant individuals were also excluded from the study to avoid potential confounding factors related to pregnancy that may impact the assessment of CRS and associated conditions.

Sampling method:
The sampling strategy for this study involved a two-tiered approach to recruit participants from the Eastern region of Saudi Arabia, thereby enhancing the generalizability of the findings. The primary sources for participant recruitment were identified as King Fahad Specialist Hospital and Jubail General Hospital. A combination of random sampling and stratified sampling was employed to ensure a diverse and representative sample. Random sampling was utilised to select individuals from a larger pool without bias, ensuring that each potential participant had an equal chance of being included. This method aimed to capture a broad spectrum of characteristics within the population.

Additionally, stratified sampling was implemented to target specific subgroups based on predefined criteria such as age, gender, and medical condition. By stratifying the sample, the study aimed to account for potential variations within these demographic and health-related factors, thus facilitating a more nuanced analysis of the research variables. The integration of both random and stratified sampling techniques aimed to strike a balance between inclusivity and specificity in participant selection, ultimately contributing to the robustness and reliability of the study's findings.

Data collection:
The data collection method for examining the prevalence of asthma and allergic rhinitis in adults diagnosed with Chronic Rhinosinusitis (CRS) in the Eastern region of Saudi Arabia will primarily involve the distribution of structured questionnaires. Visitors diagnosed with CRS during their hospital visits at King Fahad Specialist Hospital and Jubail General Hospital were invited to participate. The questionnaire encompassed inquiries related to the presence and history of asthma and allergic rhinitis, including the severity and duration of symptoms. Participants were provided self-reported information on any treatments received for these conditions. Demographic details, such as age, gender, and relevant medical history, were also included in the questionnaire to facilitate a comprehensive analysis. This streamlined method aims to efficiently capture self-reported data, contributing to a focused examination of the co-occurrence of asthma and allergic rhinitis in the context of Chronic Rhinosinusitis within the specified geographic region.

Data analysis:
The analysis employed descriptive statistics to present the prevalence of asthma and nasal airway obstruction. Subgroup analyses were delved into variations based on demographics, geographical regions, and Chronic Rhinosinusitis (CRS) severity. Statistical software facilitated the data analysis, incorporating suitable tests for prevalence estimates and subgroup examinations. This approach ensures a comprehensive exploration of the prevalence patterns and associated factors in the studied population.

Ethical consideration:
Ethical considerations were paramount throughout the study. Informed consent was diligently obtained from all participants, ensuring their voluntary participation and understanding of the study's purpose and procedures. Additionally, the study protocol was undergone thorough scrutiny and was submitted for ethical approval to the relevant institutional review boards in Saudi Arabia. This stringent ethical oversight aims to safeguard participants' rights, privacy, and well-being, adhering to established ethical guidelines and regulations.

Results:-

The table presents demographic information for a sample of 386 participants across various variables. In terms of gender distribution, the females' ratio was more (51.5%) than the males' (48.4%). Age-wise, the majority falls within the 15–24 (20%) and 25–34 (25%) age groups, with varying proportions across other age categories. Education levels indicate diverse representation, with the highest percentage having a university education (40%). In terms of nationality, a significant majority are Saudi (78%). Regarding smoking habits, 39% of participants indicated smoking, while 61% reported not smoking. The table provides a comprehensive overview of the distribution of participants based on these key demographic factors (see Table **1)**

Table 1:- Demographic characteristics of responders with Chronic Rhinosinusitis (CRS).

Variation	**Variation subgroup**	**Frequency (n =386)**	**percentage (%)**

Sex	Female	199	51.5
	Male	187	48.4
Age group	15–24	77	20
	25–34	96	25
	35–44	64	17
	45–54	64	17
	54-64	85	22
Education level	No education	10	3
	Primary school	30	8
	Secondary school	92	24
	High school	100	26
	University	154	40
Nationality	Saudi	300	78
	Non-Saudi	86	22
Smoking	Yes	150	39
	No	236	61

The table provides insights into the distribution of symptoms among patients diagnosed with Chronic Rhinosinusitis (CRS), stratified by the occurrence of asthma attacks. Notable differences in symptom prevalence emerge between the two groups, suggesting potential associations. Wheeze is reported by 47.15% of CRS patients who experienced asthma attacks compared to 52.85% without, with an associated p-value of 0.05, indicating a marginally significant difference. Chest Tightness demonstrates a more pronounced distinction, with 58.76% prevalence in the asthma attack group and 41.24% in the non-asthma attack group (p-value = 0.03), suggesting a significant association between chest tightness and asthma attacks in CRS patients. Being Woken by Shortness of Breath also displays a significant difference, with 60.36% prevalence in the non-asthma attack group compared to 39.64% in the asthma attack group (p-value = 0.07). Conversely, Woken by Coughing shows a relatively equal distribution between the two groups, with 49.74% in the asthma attack group and 50.26% in the non-asthma attack group (p-value = 0.12), indicating no significant difference in the prevalence of this symptom. Phlegm, however, exhibits a statistically significant association with asthma attacks, with 48.19% prevalence in the asthma attack group compared to 51.81% in the non-asthma attack group (p-value = 0.02) (see Table 2).

Table 2:- The occurrence of symptoms among individuals with a history of asthma attacks compared to those without asthma attacks.

Symptoms	**CRS patients with Asthma Attack N (%)**	**CRS patients without Asthma Attack N (%)**	**P-value**
Wheeze	182 (47.15%)	204 (52.85%)	0.05
Chest Tightness	227 (58.76%)	159 (41.24%)	0.03
Woken by Shortness of Breath	233 (60.36%)	153 (39.64%)	0.07
Woken by Coughing	192 (49.74%)	194 (50.26%)	0.12
Phlegm	186 (48.19%)	200 (51.81%)	0.02

The table illustrates distinctive patterns in symptom prevalence among Chronic Rhinosinusitis (CRS) patients, differentiating those with and without concurrent Allergic Rhinitis. Adjusted for a total of 386 participants, the findings reveal statistically significant differences in several symptoms. Notably, CRS patients with Allergic Rhinitis display a higher prevalence of watery rhinorrhea (51.8%), while those without exhibit a greater occurrence of nasal blockage (66.3%). The prevalence of sneezing is significantly associated with the presence of Allergic

Rhinitis (p-value = 0.01), emphasising the interconnectedness of these conditions. Itchy nose demonstrates a considerable variation, with 79.0% prevalence in CRS patients with Allergic Rhinitis compared to 20.9% without, although falling just above the conventional significance threshold (p-value = 0.08). Additionally, a statistically significant association is observed between eczema and Allergic Rhinitis in CRS patients (p-value = 0.03). These insights underscore the intricate interplay of symptoms in individuals with both Chronic Rhinosinusitis and Allergic Rhinitis, warranting further investigation to elucidate the clinical implications of these associations (see Table 3).

Table 3:- Examining Chronic Rhinosinusitis Patients with and without Allergic Rhinitis Symptom Prevalence.

Symptoms	CRS patients with Allergic Rhinitis N (%)	CRS patients without Allergic Rhinitis N (%)	p-value
Watery Rhinorrhea	200 (51.8%)	186 (48.2%)	< 0.001
Nasal Blockage	130 (33.7%)	256 (66.3%)	0.05
Sneezing	180 (46.6%)	206 (53.4%)	0.01
Itchy Nose	305 (79.0%)	81 (20.9%)	0.08
Eczema	225 (58.2)	161 (41.7)	0.03

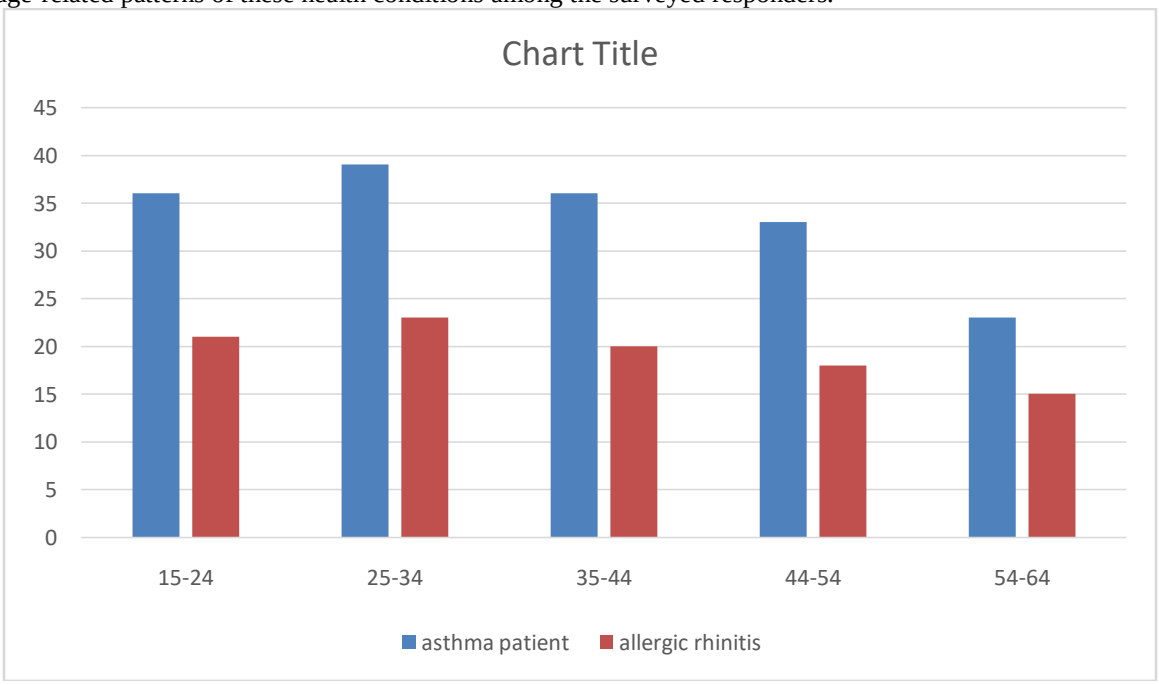
The table used multiple regression tests to present a comprehensive overview of the prevalence of asthma and allergic rhinitis within a diverse sample population organised by demographic factors. Notably, gender appears to play a role, with a marginally significant difference in asthma prevalence between females and males (P = 0.050). Age group analysis suggests no significant variation in respiratory conditions across different age categories (P = 0.558). However, education level emerges as a substantial determinant, revealing higher rates of asthma and allergic rhinitis among individuals with lower educational attainment (P < 0.001). Nationality does not exhibit a significant impact on prevalence (P = 0.23), contrasting with the substantial influence of smoking status, where nonsmokers are more prone to these conditions (P < 0.001). In summary, the findings underscore the importance of education and smoking habits in understanding respiratory health disparities among the examined groups (see Table 4).

Table 4:- Demographic characteristics of Chronic Rhinosinusitis diagnosed responders with the prevalence of asthma and allergic rhinitis.

Variation	Variation subgroup	Asthma (n =157)	No asthma (n = 229)	Allergic Rhinitis (n = 97)	No Allergic Rhinitis (n = 289)	P value
Sex	Female	81 (51.5%)	151 (65.9%)	51 (52.6%)	100 (34.6%)	0.050
	Male	76 (48.4%)	78 (34.1%)	46 (47.4%)	189 (65.4%)	
Age group	15–24	36 (22.9%)	56 (24.5%)	21 (21.6%)	35 (12.1%)	0.558
	25–34	39 (24.8%)	56 (24.5%)	23 (23.7%)	33 (11.4%)	
	35–44	36 (22.9%)	65 (28.4%)	20 (20.6%)	45 (15.6%)	
	45–54	33 (21.0%)	52 (22.7%)	18 (18.6%)	34 (11.8%)	
	54-64	23 (14.6%)	39 (17.0%)	15 (15.5%)	24 (8.3%)	
Education level	No education	24 (15.3%)	38 (16.6%)	15 (15.5%)	9 (3.1%)	*< 0.001*
	Primary school	59 (37.6%)	75 (32.8%)	36 (37.1%)	39 (13.5%)	
	Secondary school	117 (74.5%)	154 (67.2%)	49 (50.5%)	109 (37.7%)	
	High school	133 (84.7%)	156 (68.1%)	54 (55.7%)	102 (35.3%)	
	University	181 (115.3%)	170 (74.2%)	43 (44.3%)	127 (44.0%)	
Nationality	Saudi	153 (97.4%)	221 (96.5%)	57 (58.8%)	137 (47.4%)	0.23
	Non-Saudi	4 (2.54%)	8 (3.49%)	40 (41.2%)	152 (52.6%)	

Smoking	Yes	88 (56.0%)	94 (41.0%)	*22 (22.6%)*	*105 (36.3%)*	*< 0.001*
	No	69 (43.9%)	135 (58.9%)	*75 (77.3%)*	*184 (63.6%)*	

The following bar chart illustrates the distribution of respondents in two distinct categories: those with asthma and those with allergic rhinitis across different age groups. Notably, the highest percentage of responders with asthma is observed in the 25–34 age group, accounting for 24.8% of the total Asthma cases. This is followed closely by the 35–44 age group, representing 22.9%. Conversely, in the Allergic Rhinitis category, the highest percentage is seen in the 25–34 age group at 23.7%, closely followed by the 35–44 age group at 20.6%. Overall, the chart provides a clear comparison of the prevalence of Asthma and Allergic Rhinitis across various age groups, offering insights into the age-related patterns of these health conditions among the surveyed responders.



Discussion:-

Our study delves into the intricate landscape of Asthma and Allergic Rhinitis prevalence and symptoms among adults diagnosed with Chronic Rhinosinusitis (CRS) in the Eastern Region of Saudi Arabia. The multifaceted analysis encompasses demographic factors, symptom distributions, and associations, providing a comprehensive understanding of the respiratory health profile in this population. Results showed a 40.6% prevalence of asthma and 25.1% prevalence of Allergic Rhinitis in the patients with diagnosed CRS.

The demographic profile of our 386 participants reveals a slightly higher prevalence of CRS among females (51.5%) compared to males (48.4%). Chowdhury et al. mentioned that in adults, the prevalence of asthma is higher among women, with rates reaching 65%, compared to men [22]. Age-wise, the 15–34 age groups constitute a significant portion, with the 25–34 age group having the highest representation at 25%. This age distribution aligns with existing literature highlighting the susceptibility of young adults to respiratory conditions. Leynaert et al. confirmed that at follow-up, 43% of men and 63% of women diagnosed with asthma by a doctor reported that the onset of asthma occurred in adulthood [23]. A noteworthy finding is the dominance of participants with university education (40%), underscoring the relevance of educational attainment in understanding respiratory health. The majority being Saudi nationals (78%) indicates the study's focus on the local population, providing insights tailored to the Eastern Region. The study's emphasis on smoking habits elucidates that 39% of participants smoke, highlighting the need to consider lifestyle factors in respiratory health research. In a prospective epidemiological cardiopulmonary study spanning from 1976 to 2004 among the Copenhagen population, there was a notable decline in the prevalence of smokers among individuals with asthma. The percentage decreased significantly over the study period, dropping

from approximately 60% to around 30% [24]. While Bellou et al. reported that prevalence rate estimates suggest that the smoking prevalence among individuals with asthma ranges from 20% to 35% [25].

Stratifying CRS patients based on asthma attacks reveals intriguing associations. Notably, chest tightness and being woken by shortness of breath exhibit significant differences, with 58.76% and 60.36% prevalence, respectively, in the asthma attack group compared to 41.24% and 39.64% in the non-asthma attack group. These findings underscore potential shared pathways in these conditions, contributing to a nuanced understanding of the interplay between asthma attacks and specific CRS symptoms. Habib et al. documented that symptoms of asthma encompass shortness of breath, chest tightening, wheezing, and coughing [26]. In a 2012 survey involving 3037 participants evaluating asthma prevalence among adolescents aged 16 to 18 in Riyadh city, findings indicated a lifetime wheeze prevalence of 25.3%, a 12-month wheeze prevalence of 18.5%, and a physician-diagnosed asthma prevalence of 19.6% [27].Examining CRS patients with and without concurrent Allergic Rhinitis unveils distinctive symptom patterns. CRS patients with Allergic Rhinitis show a higher prevalence of watery rhinorrhea (51.8%), while those without exhibit increased nasal blockage (66.3%). Furthermore, the significant association of sneezing (46.6%), itchy nose (79.0%), and eczema (58.2%) with Allergic Rhinitis emphasises the interconnectedness of these respiratory ailments, providing valuable data points for a more comprehensive understanding of the conditions. Ostovae et al. presented the prevalence rates of allergic rhinitis symptoms, with 60.2% experiencing watery rhinorrhea, higher in persistent cases (76.2%). Nasal blockage rates were 38.8%, notably higher in persistent cases (78.9%). Sneezing was prevalent in 51.1%, while itchy noses showed a difference, with 30.7% in intermittent cases and 60.2% in persistent cases [20].

Analysing the prevalence of asthma and allergic rhinitis across demographic factors,it was concluded that the prevalence of asthma (40.6%) is significantly higher than that of allergic rhinitis (25.1%). In a longitudinal study involving 6,461 individuals, Shaaban et al. found that the likelihood of developing asthma was higher in individuals with allergic rhinitis compared to those with nonallergic rhinitis or atopy alone [28]. On the other hand, Studies have indicated varying prevalence rates for intermittent and persistent Allergic Rhinitis (AR), ranging from 1% to 40% for intermittent AR and 1% to 13% for persistent AR [20-29]. According to findings from a telephone interview study employing an adapted European Community Respiratory Health Survey (ECRHS) questionnaire, the prevalence of Allergic Rhinitis (AR) was documented at 26.7% in Tehran and 22.4% in Mashhad, Iran [30-31].

Our study holds certain strengths. It boasts comprehensive demographic profiling of 386 participants, offering detailed insights into gender, age, education, nationality, and smoking habits. The stratified symptom analysis, particularly focusing on asthma attacks, reveals notable associations, enriching our understanding of specific respiratory symptoms in Chronic Rhinosinusitis (CRS) patients. Additionally, our exploration of symptom patterns in CRS patients with and without Allergic Rhinitis adds depth to the study, uncovering marked differences in manifestation. Furthermore, socio-demographic influences on respiratory health emphasise the role of educational attainment and smoking habits in Asthma and Allergic Rhinitis prevalence. Limitations of this study include the use of cross-sectional design hinders causal inference, urging a shift to longitudinal research. Self-reported data introduces potential recall bias, suggesting a need for clinical assessments to enhance validity. The regional focus on Eastern Saudi Arabia limits generalizability; broader geographic scopes are recommended for future studies.

Future research should adopt longitudinal designs for a dynamic exploration of the progression of asthma and allergic rhinitis. Clinical validation through objective measures is crucial for robust findings. Geographic expansion beyond Eastern Saudi Arabia would offer a more comprehensive understanding of regional variations in the prevalence of asthma and allergic rhinitis.

Conclusion:-

In conclusion, this study provides a comprehensive exploration of the prevalence and symptoms of asthma and allergic rhinitis among adults diagnosed with Chronic Rhinosinusitis (CRS) in the Eastern Region of Saudi Arabia. The findings illuminate key demographic factors influencing respiratory health, emphasising the interconnectedness of upper and lower airway conditions. The prevalence of asthma (40.6%) surpasses that of allergic rhinitis (25.1%), underscoring the significance of exploring these conditions collectively. The study identifies intriguing associations between asthma attacks and specific CRS symptoms, notably chest tightness and being woken by shortness of breath, shedding light on potential shared pathways between these conditions. Moreover, the analysis of symptom patterns in CRS patients with and without allergic rhinitis contributes nuanced insights into the intricate interplay of these respiratory ailments. Demographically, the study reveals a higher prevalence among females, individuals with

lower educational attainment, and nonsmokers. These findings underscore the importance of considering socio-demographic factors in understanding respiratory health disparities. Despite these valuable insights, limitations such as the cross-sectional design and self-reported data introduce potential biases. Future research should adopt longitudinal designs, incorporate clinical assessments for validation, and broaden the geographic scope for enhanced generalizability.

References:-

1. Alnemare AK, Almutairi AB, Almutairi AF, et al. Prevalence of Risk Factors of Chronic Rhinosinusitis With Nasal Polyps Among the Saudi Population. *Cureus*. 15(9):e45420. doi:10.7759/cureus.45420
2. Tan BK, Schleimer RP, Kern RC. Perspectives on the aetiology of chronic rhinosinusitis. *Curr Opin Otolaryngol Head Neck Surg*. 2010;18(1):21-26. doi:10.1097/MOO.0b013e3283350053
3. Fokkens WJ, Lund VJ, Mullol J, et al. EPOS 2012: European position paper on rhinosinusitis and nasal polyps 2012. A summary for otorhinolaryngologists. *Rhinology*. 2012;50(1):1-12. doi:10.4193/Rhino12.000
4. Yang QT, Sun YQ, Wu QW, Shi JB. [Interpretation of 2020 European Position Paper on Rhinosinusitis and Nasal Polyps]. *Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi*. 2020;55(3):304-308. doi:10.3760/cma.j.issn.1673-0860.2020.03.024
5. Hastan D, Fokkens WJ, Bachert C, et al. Chronic rhinosinusitis in Europe--an underestimated disease. A GA^{2}LEN study. *Allergy*. 2011;66(9):1216-1223. doi:10.1111/j.1398-9995.2011.02646.x
6. Pilan RR, Pinna FR, Bezerra TF, et al. Prevalence of chronic rhinosinusitis in Sao Paulo. *Rhinology*. 2012;50(2):129-138. doi:10.4193/Rhino11.256
7. Shi JB, Fu QL, Zhang H, et al. Epidemiology of chronic rhinosinusitis: results from a cross-sectional survey in seven Chinese cities. *Allergy*. 2015;70(5):533-539. doi:10.1111/all.12577
8. Pearlman AN, Chandra RK, Chang D, et al. Relationships between severity of chronic rhinosinusitis and nasal polyposis, asthma, and atopy. *Am J Rhinol Allergy*. 2009;23(2):145-148. doi:10.2500/ajra.2009.23.3284
9. Lin SY, Reh DD, Navas-Acien A. Allergic rhinitis, chronic rhinosinusitis, and symptom severity: a population-based study. *Int Forum Allergy Rhinol*. 2012;2(1):51-56. doi:10.1002/alr.20102
10. Lehrer E, Mullol J, Agredo F, Alobid I. Management of chronic rhinosinusitis in asthma patients: is there still a debate? *Curr Allergy Asthma Rep*. 2014;14(6):440. doi:10.1007/s11882-014-0440-x
11. Katelaris CH, Lee BW, Potter PC, et al. Prevalence and diversity of allergic rhinitis in regions of the world beyond Europe and North America. *Clin Exp Allergy*. 2012;42(2):186-207. doi:10.1111/j.1365-2222.2011.03891.x
12. Hoffmans R, Wagemakers A, Drunen C van, Hellings P, Fokkens W. Acute and chronic rhinosinusitis and allergic rhinitis in relation to comorbidity, ethnicity and environment. *PLOS ONE*. 2018;13(2):e0192330. doi:10.1371/journal.pone.0192330
13. Savouré M, Bousquet J, Jaakkola JJK, Jaakkola MS, Jacquemin B, Nadif R. Worldwide prevalence of rhinitis in adults: A review of definitions and temporal evolution. *Clin Transl Allergy*. 2022;12(3):e12130. doi:10.1002/clt2.12130
14. Rimmer J, Hellings P, Lund VJ, et al. European Position Paper on Diagnostic Tools in Rhinology. *Rhinology*. 2019;57(Suppl S28):1-42. doi:10.4193/Rhin19.410
15. Fokkens WJ, Lund VJ, Mullol J, et al. European Position Paper on Rhinosinusitis and Nasal Polyps 2012. *Rhinol Suppl*. 2012;23:3 p preceding table of contents, 1-298.
16. Giavina-Bianchi P, Aun MV, Takejima P, Kalil J, Agondi RC. United airway disease: current perspectives. *J Asthma Allergy*. 2016;9:93-100. doi:10.2147/JAA.S81541
17. Seybt MW, McMains KC, Kountakis SE. The Prevalence and Effect of Asthma on Adults with Chronic Rhinosinusitis. *Ear Nose Throat J*. 2007;86(7):409-411. doi:10.1177/014556130708600719
18. Jarvis D, Newson R, Lotvall J, et al. Asthma in adults and its association with chronic rhinosinusitis: The GA2LEN survey in Europe. *Allergy*. 2012;67(1):91-98. doi:10.1111/j.1398-9995.2011.02709.x
19. John Staniorski C, Price CPE, Weibman AR, et al. Asthma onset pattern and patient outcomes in a chronic rhinosinusitis population. *Int Forum Allergy Rhinol*. 2018;8(4):495-503. doi:10.1002/alr.22064
20. Ostovar A, Pordel S, Movahed A, et al. The Prevalence of Allergic Rhinitis in Southwestern Iran and Its Association with Chronic Rhinosinusitis: A GA2LEN Study. *Iranian Journal of Allergy, Asthma and Immunology*. Published online June 8, 2021. doi:10.18502/ijaai.v20i3.6342
21. Ahn JC, Kim JW, Lee CH, Rhee CS. Prevalence and Risk Factors of Chronic Rhinosinusitis, Allergic Rhinitis, and Nasal Septal Deviation: Results of the Korean National Health and Nutrition Survey 2008-2012. *JAMA Otolaryngology–Head & Neck Surgery*. 2016;142(2):162-167. doi:10.1001/jamaoto.2015.3142
22. Chowdhury NU, Guntur VP, Newcomb DC, Wechsler ME. Sex and gender in asthma. *Eur Respir Rev*. 2021;30(162):210067. doi:10.1183/16000617.0067-2021

23. Leynaert B, Sunyer J, Garcia-Esteban R, et al. Gender differences in prevalence, diagnosis and incidence of allergic and nonallergic asthma: a population-based cohort. *Thorax*. 2012;67(7):625-631. doi:10.1136/thoraxjnl-2011-201249
24. Browatzki A, Ulrik CS, Lange P. Prevalence and severity of self-reported asthma in young adults, 1976-2004. *Eur Respir J*. 2009;34(5):1046-1051. doi:10.1183/09031936.00177908
25. Bellou V, Gogali A, Kostikas K. Asthma and Tobacco Smoking. *J Pers Med*. 2022;12(8):1231. doi:10.3390/jpm12081231
26. Habib AR, Javer AR, Buxton JA. A population-based study investigating chronic rhinosinusitis and the incidence of asthma. *The Laryngoscope*. 2016;126(6):1296-1302. doi:10.1002/lary.25831
27. Al Ghobain MO, Al-Hajjaj MS, Al Moamary MS. Asthma prevalence among 16- to 18-year-old adolescents in Saudi Arabia using the ISAAC questionnaire. *BMC Public Health*. 2012;12:239. doi:10.1186/1471-2458-12-239
28. Shaaban R, Zureik M, Soussan D, et al. Rhinitis and onset of asthma: a longitudinal population-based study. *Lancet*. 2008;372(9643):1049-1057. doi:10.1016/S0140-6736(08)61446-4
29. Ozdoganoglu T, Songu M. The burden of allergic rhinitis and asthma. *Ther Adv Respir Dis*. 2012;6(1):11-23. doi:10.1177/1753465811431975
30. Varasteh AR, Fereidouni M, Shakeri MT, et al. Prevalence of allergic disorders among the population in the city of Mashhad, Northeast Iran. *J Public Health*. 2009;17(2):107-112. doi:10.1007/s10389-008-0217-6
31. Fazlollahi MR, Souzanch G, Nourizadeh M, et al. The Prevalence of Allergic Rhinitis and Its Relationship With Second-Hand Tobacco Smoke Among Adults in Iran. *Acta Med Iran*. 2017;55(11):712-717.