International Journal of Biotechnology and Clinical Medicine ISSN 2583-4665
Vol.3, No.4, Oct - Dec 2024, pp. 109~115

PREVALENCE AND CHARACTERISTICS OF ALLERGIC FUNGAL RHINOSINUSITIS IN SINONASAL POLYPOSIS

H. Prayank[1], G. Jayalakshmi[1*]
[1]Department of Microbiology, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry - 605502, India.

Article Info

Article history:

Received November 14th, 2024
Revised November 28th, 2024
Accepted December 5th, 2024

Keyword:

Allergic fungal rhinosinusitis
sinonasal polyposis
prevalence,
Aspergillus
Allergy

ABSTRACT

Nasal polyps are associated with various etiologies, including allergic fungal rhinosinusitis (AFRS). Differentiating AFRS from ethmoidal polyposis preoperatively is critical as it influences surgical and perioperative medical management. This prospective cross-sectional study investigated the prevalence of AFRS among 84 patients with sinonasal polyposis undergoing surgery and aimed to identify associated fungal elements. Patients underwent clinical evaluation, diagnostic nasal endoscopy, CT imaging, and laboratory investigations, including absolute eosinophil count and serum total IgE levels. Surgical specimens were subjected to histopathological examination and fungal culture. AFRS was diagnosed in 20 (23.8%) patients with positive cultures for Aspergillus species. Unilateral sinonasal disease predominance was observed in 66.7% of AFRS cases. Asthma prevalence was higher in AFRS patients (25%) than in non-AFRS patients (7.8%; p=0.046). Prior nasal surgery was more frequent in AFRS patients (75%) than in non-AFRS cases (9.4%; p=0.025). Patients with AFRS exhibited significantly elevated eosinophil counts and IgE levels (p<0.001). AFRS accounted for 24% of sinonasal polyposis cases in this study, emphasizing the importance of fungal evaluation in patients presenting with sinonasal polyposis.

Corresponding Author:

Dr. G. Jayalakshmi,
Department of Microbiology, Sri Lakshmi Narayana Institute of Medical Sciences, Puducherry - 605502, India.
Email: jayalakshmi.2k15@gmail.com

How to Cite:

Prayank H & Jayalakshmi G. Prevalence and characteristics of allergic fungal rhinosinusitis in sinonasal polyposis. IJBTCM. 2024; Volume 3 (Issue 4): Page 109-115.

1. INTRODUCTION

Robson and colleagues coined the name "Allergic Fungal Rhinosinusitis" (AFRS) in 1989 to characterize a group of individuals with chronic sinusitis that had a constellation of abnormal findings.1 Similar to bronchopulmonary aspergillosis, allergic rhinitis syndrome (AFRS) is thought to be caused by the same factors. As the name suggests, AFRS refers to a condition where a patient has an allergy to fungus and develops an allergic mucous reaction. Patients with AFRS have a high level of immunity. IgE hypersensitivity to the fungus produces mucin eosinophilic allergic mucin because of the patient's condition. As public awareness and understanding of AFRS has increased, Bent and Kuhn's five diagnostic criteria have become the most frequently accepted ones. Some indications of a fungal sinus infection include Type 1 hypersensitivity, nasal polyps, distinctive CT scan abnormalities, and a positive fungal stain or culture.3 Nasal polyps, which mask fungal disease, can cause routine nasal endoscopy and CT scan of the paranasal sinuses to fail to detect these fungi preoperatively.4 Histopathological features alone have been emphasized in recent literature as the sole criterion for diagnosing AFRS.

Patients with AFRS are treated by removing as much fungal-containing mucin as possible while preserving as much healthy mucosa as possible. Before and during the procedure, systemic corticosteroids are an essential part of the treatment regimen. With the help of a mix of relevant fungal and nonfungal antigens, the need for corticosteroids was drastically decreased, as was the risk of illness recurrence and subsequent surgery, thanks to antigen-specific immunotherapy. One of the

most common causes of allergic fungal sinusitis in patients with chronic rhinosinusitis or sinonasal polyposis has not been determined. According to research, the prevalence of AFRS varies greatly among parts of the world.5,6,7,8 Patients with sino-nasal polyposis are included in this study to see if they are more likely to develop allergic fungal rhinosinusitis.

2. METHODS

A prospective cross-sectional study evaluating the prevalence of allergic fungal rhinosinusitis in patients with sinonasal polyposis. The study was duly submitted before the Institutional Ethical Committee, and approval was obtained before the commencement of the study. The current study has a time-bound facility-based cross-sectional descriptive study design. The study was conducted in Sri Lakshmi Narayana Institute of Medical Sciences & Hospital, a tertiary care teaching hospital in Puducherry, South India. The study was conducted for 18 months, from January 2020 to August 2021. This study collected data from patients presenting with sinonasal polyposis to the Otorhinolaryngology OPDs of Sri Lakshmi Narayana Institute of Medical Sciences & Hospital, Puducherry, from January 2020 to August 2021. Patients with the following criteria were included in this study: Patients between 20 to 70 years of age and of either sex. A patient presents with Symptoms of nasal obstruction, headache, mass in the nose, and hyposmia/anosmia. On Anterior rhinoscopic examination, the nasal cavity showed a polypoidal glistening mass on either or both sides, which were soft and insensitive to probing. Patients with the ability to understand and sign the informed consent. Patients with the following criteria were excluded from the study: Pregnant, lactating mother, Patients <15 years of age, Presence of nasal or sinus tumor, and Known case of immunodeficiency. Assuming that 9% of the subjects in the population have the factor of interest and a population size of 100, the study would require a sample size of 89 to estimate the expected proportion with 2% absolute precision and 95% confidence. In other words, if you select a random sample of 89 from a population and determine that 9% of subjects have the factor of interest, you would be 95% confident that between 7% and 11% of subjects in the population have the factor of interest. ALLERGIC FUNGAL RHINOSINUSITIS(AFRS): According to Bent and Kuhn, the Criteria for the Diagnosis of AFRS 20

Eighty-four patients with sinonasal polyposis who were candidates for surgical intervention were enrolled in a prospective cross-sectional study from January 2020 to August 2021. A comprehensive history was taken. Each patient had a proforma filled out with their name, age, gender, address, and clinical information, including chief complaints and duration of symptoms. On anterior rhinoscopic examination, a clinical diagnosis of sinonasal polyposis was made following the visualization of a pale, grey, glistening mass that was soft in consistency and insensitive to probing. Diagnostic nasal endoscopy also provisionally confirmed the diagnosis. A non-contrast CT scan of the paranasal sinuses, total leucocyte count (TLC), differential leucocyte count (DLC), absolute eosinophil count (AEC), and total serum IgE were all performed in addition to a thorough otorhinolaryngological history and examination. At our facility, all of the patients had endoscopic sinus surgery. Histopathological examination and fungal culture were performed on the surgical specimens. The nasal polyps and caseous debris (if any) were fixed separately in 10% buffered formalin for histological evaluation. H&E, periodic acid Schiff, and Gomori methenamine silver stains were used to stain fine micron-thick sections cut from paraffin blocks. Specimens for microbiological evaluation were transported to the mycology laboratory in sterile normal saline without delay. Aseptically homogenized the specimen in 2 mL sterile normal saline and centrifuged at 2000 rpm for 10 minutes. The specimen was prepared in a direct 20 percent KOH mount and examined. The tissue pellet was cultured in multiple tubes of Sabouraud's dextrose agar (SDA) with antibiotics and incubated at 25 and 37 degrees Celsius in a humidified environment. The culture was checked every day for four weeks. A lactophenol cotton blue (LCB) mount was used to identify a growth on such a culture (Figure 1).

(a) (b)

Figure 1: Growth on SDA Agar identified by lactophenol cotton blue mount

The data obtained from the patients were entered in Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 16. The categorical data such as age category, gender, symptoms, signs, co-morbidities, history of recurrent surgeries, CT scan, and Histopathological and endoscopy findings were summarized as frequency and percentage. In contrast, the continuous variables, such as AEC and total serum IgE levels, were summarized as mean and standard deviation. The chi-square test was done to compare the categorical variables, while an independent t-test was done to compare the continuous variables. The data was graphically represented as bar diagrams and pie charts among the two groups. A p-value of less than 0.05 was considered significant in all cases.

3. RESULTS

Figure 2 presents a bar chart illustrating the distribution of symptoms among patients with sinonasal polyposis. The most common symptoms reported are nasal obstruction and nasal discharge, both affecting the highest number of cases, nearly 85 individuals. Smell abnormalities are the third most prevalent symptom, with approximately 70 cases. Sneezing is also a significant complaint, affecting around 60 individuals. In contrast, headache is the least frequent symptom, reported in about 50 cases. This chart underscores the predominance of nasal obstruction and discharge as hallmark symptoms of sinonasal polyposis, followed by varying degrees of olfactory dysfunction, sneezing, and headaches. The data provide insight into the condition's clinical presentation, emphasizing the need for targeted diagnostic and therapeutic strategies to manage these common symptoms effectively.

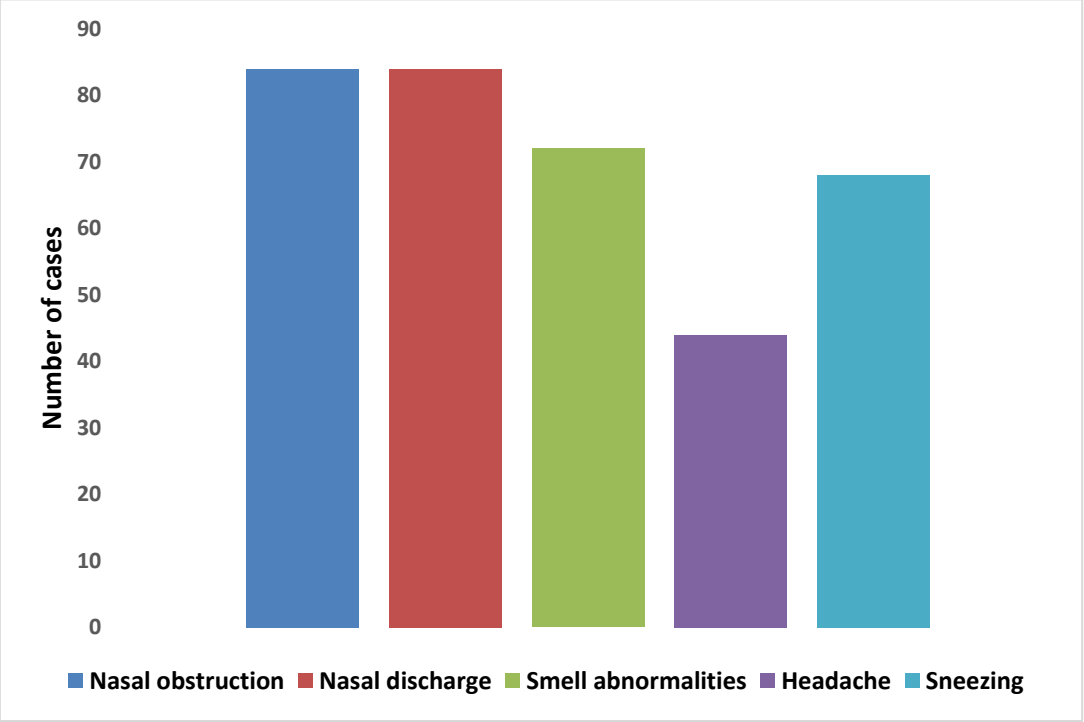

Figure *2*: Nasal symptoms

Figure 3 depicts a horizontal bar chart summarizing specific clinical histories among patients with sinonasal polyposis. The most common history observed is recurrent nasal surgery, reported in approximately 12 cases, reflecting the chronic and recurrent nature of the condition in specific individuals. This is followed by a history of asthma, noted in around eight instances, highlighting a possible association between respiratory conditions and sinonasal polyposis. The least frequent history is allergy, reported in about 3 cases, suggesting that while allergies may contribute, they are less commonly documented in this cohort. The data emphasize the importance of considering patient histories, particularly recurrent surgeries and asthma, in evaluating and managing sinonasal polyposis.

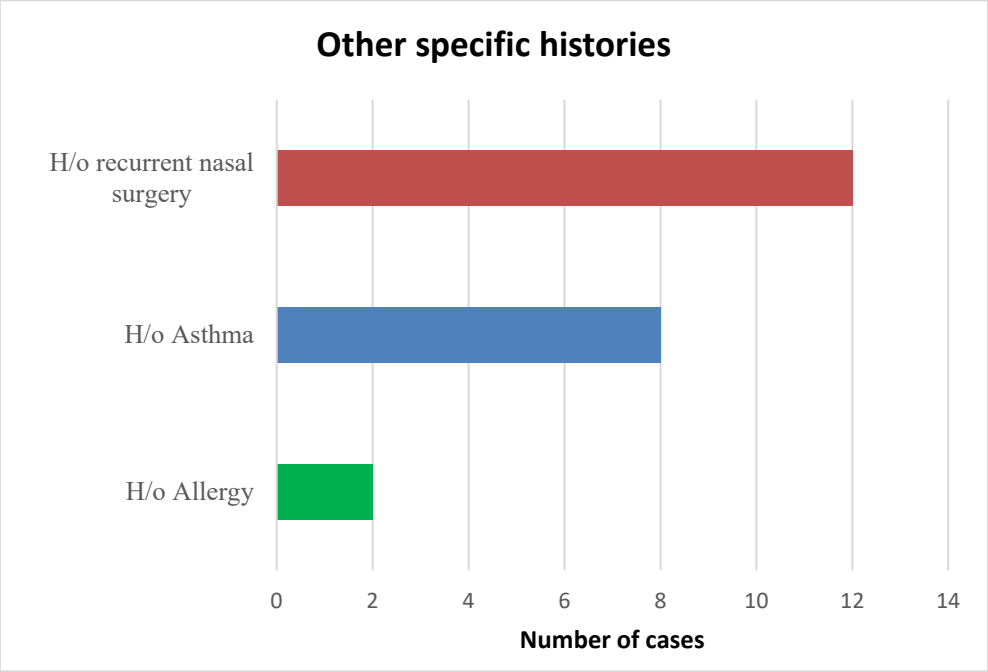

Figure 3: Other specific histories (n=84)

Figure 4 illustrates a donut chart representing the proportion of allergic fungal rhinosinusitis (AFRS) cases compared to non-AFRS cases among patients with sinusitis. AFRS accounts for 24% of the total cases, as indicated by the blue segment, while the remaining 76% are non-AFRS cases, represented by the orange segment. This distribution highlights that although AFRS constitutes a minority of sinusitis cases, it remains a significant clinical entity that warrants careful diagnosis and management due to its distinct etiological and therapeutic considerations. The chart emphasizes the need for differentiation between AFRS and non-AFRS sinusitis to tailor appropriate treatment strategies.

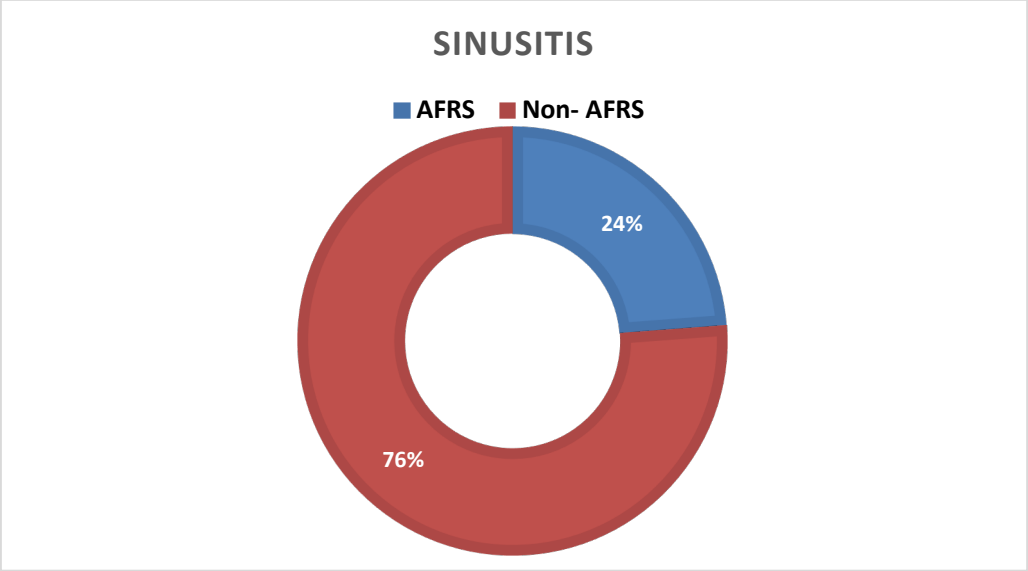

Figure *4*: Type of sinusitis

About 10 (11.9%) of 84 patients with sinonasal polyposis were asthmatics in this study. Five (25%) out of 20 AFRS patients had a history of asthma. Five out of 64 non-AFRS patients (7.8%) were asthmatics. This difference was statistically significant (p-0.046) compared to non-AFRS patients (Figure 5).

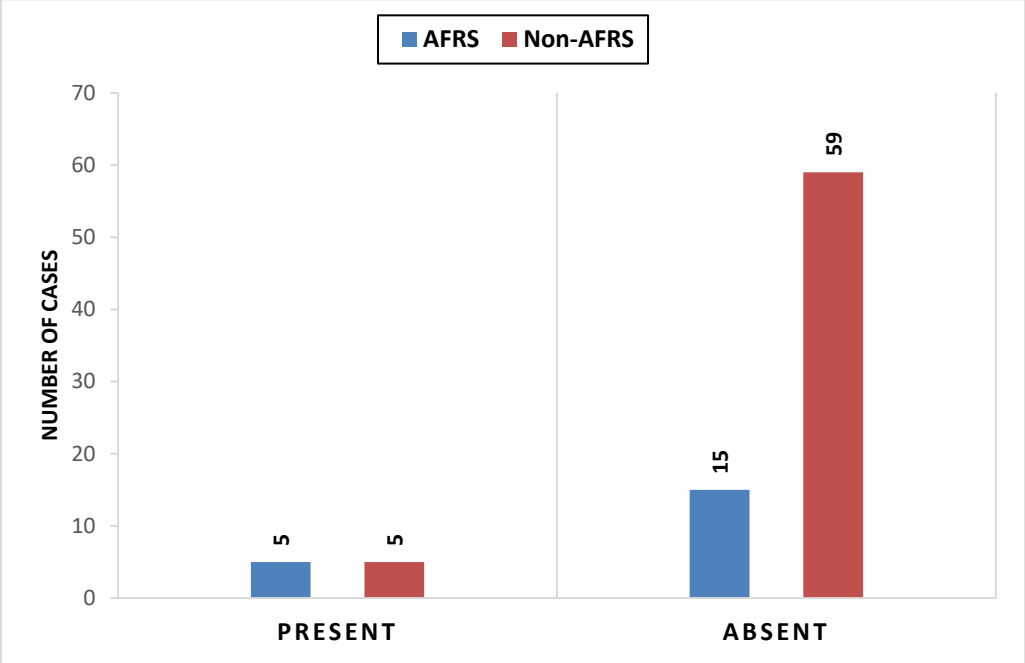

Figure 5: Asthma versus type of sinusitis

4. DISCUSSION

The findings of this study provide significant insights into the prevalence and characteristics of allergic fungal rhinosinusitis (AFRS) among patients presenting with sinonasal polyposis. With a prevalence rate of 24%, AFRS emerges as a substantial subset of sinonasal polyposis cases. This is consistent with previous studies that have reported AFRS as a distinct clinical entity with unique diagnostic and therapeutic implications. The high prevalence of Aspergillus species in culture-positive cases reinforces the fungal etiology underlying AFRS and highlights the importance of routine fungal investigations in patients with sinonasal polyposis. One of the notable observations in this study is the unilateral predominance of sinonasal disease in 66.7% of AFRS cases. This finding aligns with the well-documented tendency of AFRS to present with unilateral involvement due to its characteristic hypersensitivity response to fungal antigens. Additionally, the significantly higher prevalence of asthma in AFRS patients compared to non-AFRS patients underscores the strong association between AFRS and systemic allergic conditions. This finding aligns with the existing literature, which suggests that atopic diseases, including asthma and allergic rhinitis, often accompany AFRS.

The elevated absolute eosinophil counts and serum total IgE levels observed in AFRS patients further support the allergic pathophysiology of this condition. These biomarkers not only serve as diagnostic aids but also have potential prognostic implications in the management of AFRS. The significant association of AFRS with a history of previous nasal surgeries, observed in 75% of AFRS cases, suggests that AFRS may contribute to a more aggressive disease course and higher recurrence rates. This finding highlights the need for meticulous surgical planning and postoperative management to reduce recurrence risk. The clinical presentation of AFRS patients in this study, characterized by nasal obstruction, nasal discharge, and smell abnormalities, aligns with the typical symptoms described in the literature. However, the higher prevalence of headaches in non-AFRS patients raises intriguing questions about the differential symptomatology of AFRS and non-AFRS sinonasal polyposis. Further research is warranted to elucidate the underlying mechanisms driving these differences.

From a surgical perspective, the preoperative distinction between AFRS and ethmoidal polyposis is crucial. AFRS often necessitates extensive surgical debridement to effectively remove fungal debris and polyps, coupled with adjunctive medical therapy such as corticosteroids and antifungal agents. The findings of this study underscore the importance of a multidisciplinary approach in managing AFRS, involving otolaryngologists, allergists, and immunologists to address the multifactorial nature of the disease. While this study provides valuable insights, it is not without limitations. The relatively small sample size may limit the generalizability of the findings. Additionally, relying on histopathological and culture-based methods for fungal identification may not capture all cases of AFRS, particularly those with negative cultures, but clinical and radiological evidence is suggestive of the condition. Future studies incorporating advanced diagnostic modalities, such as molecular techniques and immunological assays, could provide a more comprehensive understanding of AFRS.

5. CONCLUSION

In conclusion, this study highlights the significant burden of AFRS in sinonasal polyposis and emphasizes the need for heightened clinical suspicion and comprehensive diagnostic evaluation. The association of AFRS with systemic allergic conditions, elevated biomarkers, and prior surgical history underscores its distinct clinical profile. A tailored approach to diagnosing and managing AFRS can improve patient outcomes and reduce disease recurrence, making it an essential focus of research and clinical practice in otolaryngology.

FUNDING

Nil

ETHICAL APPROVAL

Nil

COMPETING INTEREST

The authors declare no conflict of interest.

REFERENCES

[1]. Dhanani R, Khalid S, Salam B, Pasha HA, Yousuf FH, Ikram M. Prevalence of allergic fungal sinusitis among patients with nasal polyposis. JPMA. The Journal of the Pakistan Medical Association. 2021;71(6):1605.

[2]. Shetty S, Chandrashekar S, Aggarwal N. A study on fungal sinusitis's prevalence and clinical features in chronic rhinosinusitis. Indian Journal of Otolaryngology and Head & Neck Surgery. 2020 Mar;72(1):117-22.

[3]. Qureshi SR, Siddiqui AH, Mehboob S, Ahmed N, Imtiaz A. Prevalence of Allergic Fungal Rhinosinusitis Among Patients with Nasal Polyps. ANNALS OF ABBASI SHAHEED HOSPITAL AND KARACHI MEDICAL & DENTAL COLLEGE. 2020 Apr 6;25(01):44-50.
[4]. Shafick PB, El Bahrawy AT, Abd El Fattah MM, Nasr WF. Presentation of Allergic Fungal Rhinosinusitis in Sinonasal polyposis. Zagazig University Medical Journal. 2020 Mar 1;26(2):255-61.
[5]. Chua AJ, Jafar A, Luong AU. Update on allergic fungal rhinosinusitis. Annals of Allergy, Asthma & Immunology. 2023 Sep 1;131(3):300-6.
[6]. Gowthame K, Prabakaran S, Namasivaya Navin RB, Rajasekaran S, Muthukumar R, Balaji D, Sarath Kumar B, Lakshana R. Prevalence of Fungal Sinusitis in Cases of Allergic Rhinitis: A Cross-Sectional Study. Indian Journal of Otolaryngology and Head & Neck Surgery. 2024 Dec 5:1-4.
[7]. Julka BS, Patil SB, Chandrakiran C. Incidence and Prevalence of Fungal Sinusitis in Cases of Chronic Rhinosinusitis. Indian Journal of Otolaryngology and Head & Neck Surgery. 2023 Apr;75(Suppl 1):1041-6.
[8]. Salamah MA, Alsarraj M, Alsolami N, Hanbazazah K, Alharbi AM, Khalifah Sr W. Clinical, radiological, and histopathological patterns of allergic fungal sinusitis: a single-center retrospective study. Cureus. 2020 Jul;12(7).
[9]. Vo AB, Thai TT, Le Pham D, Pham HK. Manifestation and associated factors of systemic and local allergy among patients with allergic fungal rhinosinusitis: An observational study. Medicine. 2024 May 10;103(19):e38084.
[10]. Simpson T, Talati V, Baird AM, Gattuso P, Allen-Proctor MK, Papagiannopoulos P, Batra PS, Filip P, Tajudeen BA. Histopathology of Allergic Fungal Rhinosinusitis Versus Chronic Rhinosinusitis with Nasal Polyps. The Laryngoscope. 2024 Jun;134(6):2617-21.
[11]. Didehdar M, Khoshbayan A, Vesal S, Darban-Sarokhalil D, Razavi S, Chegini Z, Shariati A. An overview of possible pathogenesis mechanisms of Alternaria alternata in chronic rhinosinusitis and nasal polyposis. Microbial Pathogenesis. 2021 Jun 1;155:104905.
[12]. Balaji AP, Bhuvaneswari S, Raj LS, Bupesh G, Meenakshisundaram KK, Saravanan KM. A review on the potential species of the zingiberaceae family with anti-viral efficacy towards enveloped viruses. J Pure Appl Microbiol. 2022 Jun 1;16(2):796-813.
[13]. Sreeraman S, Kannan MP, Singh Kushwah RB, Sundaram V, Veluchamy A, Thirunavukarasou A, Saravanan KM. Drug design and disease diagnosis: the potential of deep learning models in biology. Current Bioinformatics. 2023 Mar 1;18(3):208-20.
[14]. Zhang H, Saravanan KM. Advances in Deep Learning Assisted Drug Discovery Methods: A Self-review. Current Bioinformatics. 2024 Dec;19(10):891-907.
[15]. Senthil R, Anand T, Somala CS, Saravanan KM. Bibliometric analysis of artificial intelligence in healthcare research: Trends and future directions. Future Healthcare Journal. 2024 Sep 1;11(3):100182.