Original Article

Fungal Infection Exacerbate Nasal Polyposis: A study conducted at KGN Teaching Hospital Bannu-KPK. Mohammad Iqbal¹, Sahibzada Fawad Khan²,

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Abstract

Background: Nasal polyps were believed to be small tumours of nasal or sinus mucosa. With progressing research, they are associated with enlargement or swelling of nasal or sinus mucosa, allergy, asthma, any infection, sensitivity to aspirin, and/or cystic fibrosis unclear etiology. The present study aims to evaluate the prevalence of fungal infections that can result in the onset of nasal polyposis in the residents of district Bannu, Pakistan.

Methodology: A cross-sectional study was conducted at the ENT Department of Khalifa Gul Nawaz (KGN) teaching hospital in Bannu from March 2018 to February 2020, including 180 polyposis patients with the presence or absence of any fungal infestation. The subjects possessing mass other than nasal polyp based on clinical diagnosis were excluded from the study. The fungal infestation was observed with nasal endoscopy, and the patients were hospitalized for functional endoscopic sinus surgery (FESS). The staging of the nasal polyposis was based on the CT scan findings. The condition was classified into three grades, i.e., grade I, II and III. The data was statistically analysed on SPSS version 20.0.

Results: Out of 180 patients diagnosed clinically for nasal polyposis, 97(53.88%) were males. The fungal infestation was positive in 73(41%) specimens. Around 52.72% of patients were found with bilateral involvement. Of which, 31.57% were diagnosed with an allergic event. The fungus *Aspergillus* was observed in 40.55% of specimens. The one-year follow-up displayed an overall recurrence rate of 40%, i.e., 38(52.05%) patients from the fungal group and 34(47.22%) from the non-fungal group.

Conclusion: It is concluded from the study outcomes that the incidence of nasal polyposis with or without fungal infection is associated with the environment and the discrete host response. Moreover, individuals living with lower socioeconomic conditions in crowded and humid areas tend to suffer more.

Keywords

Polyposis, Fungal infection, Computerized Topography, Functional Endoscopic Sinus Surgery.





Doi: 10.29052/IJEHSR.v9.i2.2021.170-175

Corresponding Author Email: vazim4847@gmail.com Received 29/01/2021 Accepted 30/03/2021 First Published 24/04/2021



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Introduction

Nasal polyposis is an inflammatory condition that is associated with the paranasal sinus and mucous membrane of the nasal area. This chronic condition is characterized by the projection of mass having a smooth and jelly-like nature, pear or round and partially glowing in their look¹. In the beginning, researchers reported these polyps as tiny tumours of the sinus and nose. Persistent swelling of paranasal sinus or mucosa of the nose results in the onset of nasal polyposis¹. With time, swelling of the sub-mucosa causes an increase in polyps' size, becoming symptomatic. However, the etiology of the condition is still unknown². Various reasons that contribute to the onset and progression of nasal polyps have been identified. One of the most relevant reasons that play an essential role in their progression is the long-lasting inflammation of the nasal cavity³.

Studies suggest that fungal infections are potential mediators exacerbating nasal polyposis^{4,5}. The patients having anatomical anomalies of the nasal area are more susceptible to fungal colonization, and this is because these aberrations result in an impairment of the nasal drainage⁶. Moreover, some studies also suggested that most benign fungal infections are localized in fungal colonization in the nasal superficial crust, and nasal polyposis is one of the causative factors for the fungal infestations of the sino-nasal mucosa^{7,8}. Hence, the onset and progression of the nasal polyposis might originate from inflammation and fungal contagions or vice versa^{9,10}. It may result from both allergic reactions and fungal colonization. Still, in some cases, the allergic events can also be an individual cause of their onset¹¹.

Fungal contagions of the paranasal sinus and nose indicate a range of illnesses extending from colony formation to rhinosinusitis. Non-invasive situations comprise fungus ball, asymptomatic fungal colony formation and allergic fungal rhinosinusitis. Invasive illnesses include acute fulminant fungal rhinosinusitis, idle chronic rhinosinusitis and granulomatous fungal sinusitis¹². Reports suggest that the majority of the fungal sinus infestations are non-malignant and non-invasive. Invasive fungal infestations are suggested to occur in some nonimmunocompromised subjects¹³⁻¹⁵.

Due to the ubiquitous nature of fungal spores, the prevalence of fungal spores causing the onset of formation of nasal polyps is yet to be determined. Therefore, the current study aims to analyze the prevalence of fungal infections that can cause the onset of nasal polyposis in the residents of district Bannu, Pakistan.

Methodology

A cross-sectional study was conducted at the ENT Department of KGN teaching hospital in District Bannu-Pakistan, from March 2018 to February 2020. The sample size of 180 was calculated using the World Health Organization (WHO) criteria for sample size determination in health studies¹⁶⁻¹⁷. All the subjects with a clinical finding of polyposis were included in the study and the subjects possessing mass other than nasal polyp were excluded. The fungal infestation was diagnosed with nasal endoscopy, and the patients were admitted for functional endoscopic sinus surgery (FESS). The staging of the nasal polyposis was based on CT scan findings, where grade I polyps extended below the lining of the middle turbinate, grade II polyps were medium-sized and reached between the higher and lesser ends of the lower turbinate, and grade III included the large-sized polyps below the inferior edge of the lower turbinate.

A specifically designed proforma was used, and data including the patient's age, sex, disease duration, and socioeconomic condition were acquired. Face examination was performed to identify possible deformity in the facial area, and the nasal examination was carried out to diagnose obstruction in the nasal area. For assessing visual impairment, an eye examination was facilitated by а veteran ophthalmologist. Radiological assessment, including X-rays of the paranasal sinus with CT scans, was recommended before the surgical procedure, and the surgical procedure was planned accordingly. The specimen was sent for histopathological examination after the surgical procedure to observe any fungal colonization.

The study was conducted in accordance with the Declaration of Helsinki, and approval was obtained from the ethical review board of Bannu Medical College (Reference no. BMC/ENT/088; Dated 11/02/2018). The study objective was explained to each enrolled patient, or the next of kin and consent was obtained prior to inclusion in the study. The statistical analysis was carried out via SPSS version 20.0, and data were displayed as frequencies and percentages.

Results

Out of 180 subjects clinically diagnosed for nasal polyposis, 97 (53.88%) were male, and 83 (46.11%) were female. The study shows that the majority of the patients were > 35 years old and belonged to poor socioeconomic status (Table 1). Figure 1 shows that 41% patients had nasal polyposis with fungus, while 59% had nasal polyposis without fungus. Moreover, 52.72% of patients had bilateral involvement; of these, 31.57% reported an allergic event. The fungus *Aspergillus* was found to be involved in 40.55% of cases.

Variables		n(%)		
Age Distribution	< 35 years	75(41.6)		
Age Distribution	> 35 years	105(58.3)		
Gender	Male	97(53.88)		
	Female	83(46.11)		
Socioeconomic Status	Good	32(17.7)		
	Average	24(13.3)		
	Poor	134(74.4)		





Figure 1: Nasal Polyposis with and without fungus

Based on CT scan grading, 67.28% of patients had grade III polyps without fungus, while 49.31% had polyps (grade III) with fungus. One-year follow-up suggest that the overall recurrence rate was 40% (Table 2).

Table 2: Grading based on CT scan findings (Initial & One-year Follow-up).					
No. of Subjects	Grade I	Grade II	Grade III	Total	
	Init	ial Findings			
Non-Fungal Polyposis	4(3.73)	31(28.97)	72(67.28)	107(59.44)	
Fungal Polyposis	3(4.10)	34(46.57)	36(49.31)	73(40.55)	
On	e year follow u	p, Recurrence of	Polyposis		
Non-Fungal Polyposis	-	8(25.80)	34(47.22)	42(58.33)	
Fungal Polyposis	-	14(41.17)	16(44.44)	30(41.66)	
*) (al. and a ' and a (0())					

*Values are given as n(%)

Discussion

Although the interconnection of nasal polyposis progression and fungal infestations has been studied earlier^{9,10}, the pervasive nature of fungal spores makes it quite challenging to investigate the role of fungus as a contributing factor. The incidence and recurrence of fungal infection in nasal polyposis has augmented in the current decade^{18,19}. Hence new research showed that the formation of nasal polyps might result from the fungal infestation of the mucosa⁷.

The study revealed that the majority of the patients with nasal polyposis belonged to a poor socioeconomic class. Moreover, other provoking factors included co-morbidities, living styles, overcapacity, and limited knowledge about the disease. It was also observed that most patients with prolonged symptomatic history reported to the ENT department but were not treated appropriately at the early onset of the disease. Hence, the condition progressed. Consistent with our findings, other studies also reported that the patients received early treatment not from the ENT consultants but from other health care professionals, including general practitioners, homeopaths, philosophers and guacks, etc²⁰⁻²². There was a male preponderance in the studied sample (53.88%). In contrast to our findings, local research results showed no gender-based variation in the prevalence of nasal polyposis²³. Another study from Karachi showed female dominance²⁴. Furthermore, the patients aged > 35 years of age displayed the highest frequency of nasal polyposis, which is also supported by a similar study reporting the high prevalence among patients ageing 31 to 40 years²⁵.

Fungal infestation report showed that 41% of patients with nasal polyposis had fungus colonization in the nose and paranasal sinus. Parallel to our findings, in a research report published in 2007, the fungal colonization was found to be 42%²⁶. While another study, including 200 patients, displayed only 14% polyposis patients with fungal infestations²⁷. However, the reported and published results have not been very consistent. *Aspergillus* species were isolated in

40.55% of cases in the present study, which is also similar to the results reported from Lahore²⁵. Furthermore, one-year follow-up revealed an overall 40% recurrence rate, which is inconsistent with the published literature^{25,28}. The most extensive study conducted by Hopkins and his colleagues, including 1848 patients with nasal polyps and rhinosinusitis, showed a positive association between the two²⁹. Patients in our study underwent nasal endoscopy and FESS. By far, endoscopic surgery is the most advanced surgical way to treat nasal polyposis. However, it might not be very cost-effective at the moment for the people living in low-income, developing countries with restricted health budgets and facilities. Awareness sessions and future research exploring the treatment modalities of the disease will be beneficial to find out more about the cause and mechanisms.

Conclusion

It is concluded based on the study findings that the incidence of nasal polyposis with or without fungal infection is associated with the environment and the discrete host response. Moreover, it is observed that the individuals living with lower socioeconomic conditions in overcrowded places and humid areas tend to suffer more. *Aspergillus* species were isolated in the majority of the cases. Furthermore, CT scan findings were helpful in separating fungal and non-fungal infestations and intracranial delay of the illness. The surgical procedures might be chosen based on the prior assessment of the subjects. The use of Itraconazole was imperative in all post-operative subjects.

Conflicts of Interest

The authors have declared that no competing interests exist.

Acknowledgment

The authors would like to acknowledge the Medical Affairs department of Getz Pharma for their technical support and assistance in the publication process.

Funding

The author(s) received no specific funding for this work.

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