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# **Original Research Article**

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# A clinicopathological study on fungal infection in nasal polyposis

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#### **ABSTRACT**

**Background:** Nasal polyposis is a multifactorial disease. Despite the presence of numerous theories proposed towards the aetiology of nasal polyp, inflammation is the main causative factor. Fungi can impair the local immune system and bring about an inflammatory response causing polyp formation. The aim and objective of the research was to know the prevalence of fungal infection in nasal polyposis and to assess the microbiological and pathological features of fungi in nasal polyposis.

**Methods:** A total of 100 patients operated for nasal polyposis were included in the study excluding immune-compromised patients. All the nasal polyposis cases were subjected to clinical examination, diagnostic nasal endoscopy and medical treatment before undergoing surgical treatment. Polyps removed were subjected to histopathological examination (HPE) and potassium hydroxide (KOH) wet mount examination under microscope.

**Results:** Out of the 100 patients studied 66 patients (66%) were in the age group between 31 to 60 years. 85 patients had bilateral polyps, in which fungal element was isolated in 11 patients and among 15 patients with antrochoanal polyp 1 patient had fungal isolates. Of the 17 patients who had previous history of surgery, fungi were isolated in 4 patients and the rest were from patient who got operated for the first time. 3 out of the 8 patients, who had recurrence, were positive for fungal infection.

**Conclusions:** Fungi are found to be more prevalent in nasal polyps and fungi can be considered as one of the main causative factor for formation of nasal polyposis and its recurrence after surgery. Anti-fungal agents could be a helping hand in the management of nasal polyposis to prevent its recurrence.

Keywords: Nasal polyp, Fungal infection, KOH mount

# INTRODUCTION

Nasal polyposis is a common clinical entity. These refer to the prolapsed lining of the sinus mucosa. In the general population the overall prevalence rate of nasal polyposis ranges from 1-4%. It is more common in adults than in children below 10 years of age. It is important to note that there is no single etiological factor responsible for the development of nasal polyposis. Allergy, infections (viral, bacterial and fungal) and environmental pollution have all been highlighted as possible triggering factors, that may up

regulate inflammation in the lateral wall of the nose resulting in polyposis.<sup>1</sup> Fungi are increasingly being implicated in the etio-pathogenesis of rhino sinusitis over the last few decades. Studies show that the patients developing fungal nasal polyposis are adults who get exposed to air pollutants and use antibiotics inadvertently.

The histology of nasal polyps show significant differences in particular cases. Due to the variety of nasal polyps, the choice of appropriate treatment is difficult. Aetiology of nasal polyposis is multi factorial and most of the theories

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consider polyps to be the final manifestation of chronic inflammation. Therefore, conditions that lead to chronic inflammation in the nasal cavity can lead to nasal polyposis. People who had fungal nasal polyps had history of exposure to dust at work or in their house for a long time. According to results, mechanism of nasal polyp formation could be due to local antifungal immune reactivity in nose, local imbalance of immunity in the nasal mucosa and hypersensitivity to fungus.<sup>2</sup>

Superficial and saprophytic fungi which cause imbalance in local immunity of nasal mucosa are more important than the invasive fungi. Hyper reactivity to fungal organisms is said to be one of the mechanisms underlying the development of nasal polyposis. Fungal colonization, infection and invasion in nasal polyposis should be taken into consideration to suggest a suitable treatment in addition to the routine management. Difficulties in treating the condition are due to the lack of complete knowledge regarding the etiopathogenesis of nasal polyps. Hence this study is conducted to find out the prevalence and histopathology of fungal infection in nasal polyposis.

#### **METHODS**

A prospective study was conducted among patients attending Sri Venkateshwara ENT Institute and Bowring and Lady Curzon Hospital, Bangalore Medical College and Research Institute, Bangalore, during a study period from October 2013 to May 2015.

## Inclusion criteria

All the individuals diagnosed as antrochoanal and ethmoidal polyposis, and willing to undergo surgery, individuals who previously underwent polypectomy/ surgery were included.

# Exclusion criteria

Immuno-compromised individuals and children below 15 years of age were excluded.

### Methodology

Institutional ethical committee clearance was obtained before starting this prospective study. The study subjects who were diagnosed with ethmoidal and antrochoanal polyp were included considering the inclusion and exclusion criteria after taking written informed consent. All the patients were subjected to medical therapy with antibiotics and steroids before undergoing surgical procedure. The resected polyps were sent to microbiology laboratory in normal saline for potassium hydroxide (KOH) mount examination. Other sample was sent in formalin for histopathological examination (HPE) to rule out benign/malignant lesions.

Direct microscopic examination was done after preparing 10% KOH mount with minced polyp material. The results

obtained were then analyzed to identify the presence of fungal elements in the samples. Various fungal organisms were isolated and the prevalence of fungal infections in nasal polyposis patients were calculated using statistical methods. Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements were presented on mean±standard deviation (SD) (minimum-maximum) and results on categorical measurements were presented in number and percentage (%).

#### **RESULTS**

Totally 100 patients were included in this study. The age and sex distribution was depicted in Table 1. In this present study, 51 were males and 49 were females. Majority of subjects were in the age group of 31-40 years. Nasal obstruction were seen in 97 subjects and nasal discharge in 77 patients. Impaired sense of smell, watering of eyes, headache and facial pain was seen in 25, 27, 59 and 12 patients. In the present study, patients' duration of symptoms were assessed. The symptoms duration ranged between 1 month to >24 months. Majority, 56 patients had symptom duration between 7-12 months. In this study, 17 patients underwent previous surgery for polyps. 3 patients were asthmatics and 8 patients were hypertensive. 6 patients had family history of polyposis. Cold spatula test was decreased bilaterally in 62 patients and absent completely in 10 patients. Anterior rhinoscopy examination showed bilateral polypoidal mass in 70 patients and 28 patients appeared to have unilateral polypoidal mass. 2% of the patients had discharge without any obvious mass. Posterior rhinoscopy of the study population showed mass in 7 patients and discharge in 20% and normal findings in 73% cases. Diagnostic nasal endoscopy of the study group showed multiple bilateral nasal polyps in 85 cases and unilateral polyp in 15 cases (Figure 1). 85 patients in this study were diagnosed with bilateral ethmoidal polyposis and 15 patients had antrochoanal polyp (Table 2). Inhalational and short course systemic steroids were given to all the 85 patients diagnosed with ethmoidal polyposis. 3 patients had intolerance to systemic steroids. 60 patients underwent functional endoscopic sinus surgery, 37 patients underwent endoscopic polypectomy and 3 underwent Caldwell Luc surgery. KOH examination of the polyps showed fungal elements in 12 cases with equal number of male and females (Figure 2). Out of 12 patients 11 had ethmoidal polyps and 1 had antrochoanal polyps. Out of 85 patients who had bilateral polyps, fungal elements were isolated in 10 patients and among 15 patients with unilateral polyps 2 patients had fungal elements isolated. Of the 17 patients who had previous history of surgery, fungi were isolated in 4 patients and the rest were from patient who got operated for the first time. Out of 100, 8 patients had disease recurrence. 3 out of these 8 patients were found to be positive for fungal infection. Histopathology of polyp showed 86 cases as inflammatory polyp and 14 cases allergic polyp (Figure 3). Allergic polyp showed relatively more number of eosinophils than the inflammatory polyps. Postop intra nasal steroid was given in 85 patients. Follow up of the patients for 6 months showed recurrence in 8% of the patients in the study group. 3 out of 8 patients had fungal elements.

Table 1: Age distribution of patients in relation to gender distribution.

Age in years	Gender		Total
	Male	Female	Total
	N (%)	N (%)	N (%)
<20	5 (9.8)	3 (6.1)	8 (8)
20-30	12 (23.5)	8 (16.3)	20 (20)
31-40	13 (25.5)	15 (30.6)	28 (28)
41-50	11 (21.6)	11 (22.4)	22 (22)
51-60	9 (17.6)	7 (14.3)	16 (16)
61-70	0	3 (6.1)	3 (3)
>70	1 (2)	2 (4.1)	3 (3)
Total	51 (100)	49 (100)	100 (100)

Table 2: The clinical diagnosis of study population and the prevalence of fungal infection in various studies depicted.

Diagnosis	Gender Males Females		Total
	N (%)	N (%)	N (%)
Bilateral ethmoidal polyposis	41 (80.4)	44 (89.8)	85 (85)
Antrochoanal polyp left	4 (7.8)	3 (6.1)	7 (7)
Antrochoanal polyp right	6 (11.8)	2 (4.1)	8 (8)
Total	51 (100)	49 (100)	100 (100)





Figure 1: Diagnostic nasal picture showing nasal polyposis.



Figure 2: KOH mount showing the fungal elements.

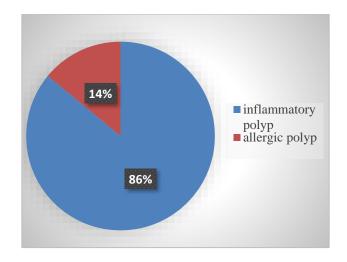


Figure 3: Picture representing histopathology of nasal polyposis.

#### **DISCUSSION**

Nasal polyp were first described about 4000 years ago. Hippocrates who is considered the father of rhinology coined the term polyp. The cause of nasal polyposis is not just a single factor. Many theories have been proposed regarding its pathogenesis. Adenoma fibroma theory, necrotizing ethmoiditis theory, mucosal exudates theory, periphlebitis and perilymphangitis theory, glandular hyperplasia theory, and epithelial rupture theory.<sup>3</sup> All these theories have chronic inflammation as the causative factor. Epithelial injury caused by bacterial or viral infection as well as prolonged inhalation of irritating substances activates cytokines in turn activating an inflammatory reaction resulting in polyp formation. Ethmoidal air cell system is the most common target for inflammatory response and polyps usually arise from this site. Nasal polyposis is considered the end stage of chronic inflammation.

Fungi are present in the mucus of chronic rhinosinusitis patients and normal healthy individuals. Fungi induce the production of cytokines - interleukin-13 (IL-13) and interleukin-15 (IL-5) required for the eosinophilic inflammation.4 This immune response occurs in chronic rhinosinusitis (CRS) patients but not in healthy controls. Fungi have also got the ability to induce symptoms of eosinophilic airway inflammation even in the absence of immunoglobulin E (IgE) mediated systemic reaction. Inhalation of fungal spores in the environment and their further entry into the mucosa of nose and paranasal sinuses results in the above said histological picture. Some suggest that they cause chronic irritation of osteomeatal complex leading onto mucosal oedema and obstruction of ostia. Mucociliary clearance is eventually reduced with bacterial overgrowth and release of inflammatory mediators.

Literatures state that inhaled fungal spores stimulate eosinophils which cluster around and attack the fungal elements causing release of toxic mediators and there by inducing a secondary inflammatory response. Role of fungi in causing imbalance in the local immunity of nasal mucosa is more important than the invasive forms as this mechanism is postulated to be the most common one. Hyper reactivity to fungal organism is one of the main causes for the development of nasal polyp. Polyp if not treated adequately can be devastating, causing bony erosion and involvement of orbit or even intracranial extension.

In our present study 100 immuno-competent patients diagnosed with nasal polyposis were included. The clinical features include nasal obstruction, nasal discharge, impaired sense of smell, headache, watering of eyes and facial pain. The most common presentation was nasal obstruction in our study. The minimum age of the patient included in the study was 17 and the maximum age was 75 years, of which 66 patients (66%) were in the age group between 31 to 60 years. This finding correlated with the other studies where, maximum number of patients belonged to the same age group. Almost equal number of males and females were present.

In our study direct microscopy was positive for 12% of patients. Out of 12 patients, 11 had ethmoidal polyps and 1 had antrochoanal polyps. In this present study, 85% of patients had bilateral polyps and only 15% patients had unilateral antrochoanal polyp, in which fungal elements were isolated in 2 patients. So according to our study, fungal infection occurs even in antrochoanal polyp. In our study, 8% had disease recurrence and fungal elements were seen in 3 patients in those 8 patients. Fungal infection is one of the reason behind recurrence of the nasal polyps.

In our study, prevalence of fungal infections in nasal polyposis patients was 12% which correlates with a similar study conducted by Telmesani had prevalence of fungal infection as 12.1%.<sup>5</sup> In a study by Santhi et al, the study population was 60 and prevalence was 15.<sup>6</sup> The prevalence was 9% and 60% in studies conducted by Kordbacheh and Satyanarayana.<sup>7,8</sup> In a similar study by Nezadkazem et al, the prevalence was 8 out of 98 patients studied.<sup>9</sup>

Sinonasal polyps are benign forms of mucosal swellings that occur in four different histological patterns. The most common type is the oedematous, eosinophilic (also called "allergic") nasal polyp, constituting 85-90% of nasal polyps. The oedematous polyp is characterized morphologically by the presence of oedema, goblet cell hyperplasia of the epithelium, basement membrane thickening, and of numerous leukocytes, predominantly eosinophils, chronic inflammation and metaplastic changes of the overlying epithelium. The second histological type: fibro inflammatory polyp, characterized by chronic inflammation and metaplastic changes of the overlying epithelium. Another rare variant presents with excessive hyperplasia of seromucinous glands, but otherwise shows several similarities with the oedematous type of polyp. The fourth type is very rare and is a polyp with atypical stroma.

In the present study, 86% of cases had inflammatory polyp and 14% had allergic polyp. In our study, all the cases were sent for HPE. The samples for histopathological examination was taken directly in 90% of the cases and in remaining 10% the debrider tissue samples were sent for examination. Irfan et al in their study stated that routine HPE should be done to provide the appropriate treatment and also to avoid medico legal issues. 10 They observed that 93.6% of the polyps turned out to be inflammatory polyp which was higher compared to our present study. Gustavo et al studied the histopathology of rhinosinusal polyps and found eosinophilic polyp to be around 73% and fibro inflammatory polyp in 18% of the patients which was contrast to our present study. 11 In a study conducted by Dafale et al, 88.57% polyps were simple polyp (nonneoplastic). Of these simple polyps 41.43% were allergic polyp and 58.06% were non allergic polyps. 12

Predominantly all the sinonasal polyps are inflammatory polyps based on their histopathological observations, but the delineation between allergic and inflammatory polyps is based on the number of eosinophils present in the tissue sections. Allergic polyps have more number of eosinophils compared to inflammatory polyp which has less number of eosinophils in their tissue sections.

## **CONCLUSION**

The prevalence of fungal infection in our study was 12%. In our study, 86% of the nasal polyps were inflammatory polyp confirming that inflammation is the main factor in polyp formation. Fungal elements were one of the cause for recurrence in nasal polyposis according to this study. Anti-fungal agents should be advised for all nasal polyps patients in which fungal elements were seen.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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