

Prevalence of fungal infection in nasal polyposis - A cross-sectional study, conducted at a tertiary care hospital in Karachi

Syed Muhammad Qaisar Sajjad¹, Zahid Suhail², Raziuddin Ahmed³

Abstract

Objective: To determine the prevalence of fungal infections causing nasal polyposis (AFRS-Allergic fungal rhino sinusitis) in the local population.

Method: It is a cross sectional study, carried out from October 2010 to January 2015 on 221 patients in the ENT Department of Abbasi Shaheed Hospital and Karachi Medical & Dental College in collaboration with the microbiology department. This study included patients who had a clinical diagnosis of nasal polyposis with or without fungal infection on the basis of nasoendoscopic examinations. All patients underwent Functional Endoscopic Sinus Surgery (FESS) and the diagnosis of (AFRS-Allergic fungal rhino sinusitis) was considered after histopathological confirmation of eosinophilic mucous containing hyphae.

Numerator included the total number of patients who presented to the ENT out-patient clinic of Abbasi Shaheed Hospital suffering from nasal polyposis secondary to fungal infection during the follow-up period of the study. On the other hand, denominator included all the patients who attended the ENT out-patient clinics during the same follow-up period. This determined the period prevalence of fungal infections in nasal polyposis at a tertiary care centre in Karachi.

Results: Data was collected, a descriptive analysis was performed and a Computed Tomography (CT) grading was done. On the basis of histopathology, 90 (40.7%) patients were found to have fungal infection.

Conclusion: The prevalence of fungal infections was 40.7% (90 patients) in nasal polyposis.

Keyword: Fungal Infections, nasal polyposis, nasal obstruction. (JPMA 70: 48; 2020).

<https://doi.org/10.5455/JPMA.300509>

Introduction

Nasal polyposis is a chronic inflammation of the mucous membrane of the nose and para nasal sinuses. Pedunculated, semi translucent, gelatinous and smooth rounded or pear shaped masses projecting into the nose are common signs of nasal polyposis.¹

Previously, polyps were taken as small tumours of the nose, sinus or mucosa of the sinus. Nasal polyps are formed as a result of frequent swelling of the mucosa of the nose and para nasal sinuses.¹ It gradually enlarges in size due to an increase in the swelling of sub-mucosa and later becomes symptomatic. In fact, the aetiology that leads to the formation of a nasal polyp are poorly understood.² Several theories have been postulated in which polyps

¹ENT Department, Karachi Medical & Dental College and Abbasi Shaheed Hospital, Karachi, Pakistan, ²ENT Department, Ziauddin Medical University, Karachi, Pakistan, ³Department of Pathology, Sahara Medical College, Narowal, Pakistan

Correspondence: S.M. Qaisar Sajjad. e-mail: qaisarsajjad@gmail.com

are considered to be an ultimate expression of chronic inflammation. Therefore, chronic inflammation in the nasal cavity can result in the formation of nasal polyps.³ Fungal elements were suspected to be the causative agent of chronic rhinosinusitis and a fungal aetiology was found to be the underlying cause of severe nasal polyp formation.⁴ Fungal infection of the nose and sinuses once an uncommon condition, is now on rise and its incidence has increased dramatically in recent years.⁵ Patients with anatomic abnormalities of the paranasal sinuses which impair the drainage, such as nasal polyps or chronic inflammatory states are vulnerable to fungal colonization. Areas of mucosal injury may cause pooling of the mucous and subsequent colonization by the fungus.⁶

Recent studies have shown that these polyps can also be caused by fungal infection of the sinonasal mucosa.^{7,8} Therefore, nasal polyp formation and growth may be

initiated by both fungal infections and non-infectious inflammation^{9,10}

Both fungal infection and a local allergic process can lead to fungal colonization of sinonasal mucosa which may result in the nasal polyp formation⁵ and it is also thought that 'allergy' itself can predispose to nasal polyp occurrence.¹¹

Fungal infections of the nose and paranasal sinuses represent a spectrum of diseases ranging from colonization to invasive rhinosinusitis. Non-invasive conditions include asymptomatic fungal colonization, fungus ball and allergic fungal rhinosinusitis. An invasive disease includes, indolent chronic rhinosinusitis, granulomatous fungal sinusitis and acute fulminant fungal rhinosinusitis.¹²

Most fungal sinus infections are benign or non-invasive, except when they occur in individuals who are immunocompromised. Several reports are available that show invasive fungal infections in immunocompetent individuals.¹³⁻¹⁵

Patients and Methods

The cross sectional study was carried out from October 2010 to January 2015 on 221 patients in the ENT department of Abbasi Shaheed Hospital and Karachi Medical and Dental College in collaboration with the microbiology department.

Included were patients with a clinical diagnosis of nasal polyposis with or without fungal infection on the basis of nasoendoscopic examination who were admitted for Functional Endoscopic Sinus Surgery (FESS). Computed Tomography (CT) scan staging of nasal polyps was based on the staging conducted by Lild holdt et al.¹⁶ in which nasal polyps were classified according to a fixed anatomical landmark namely the middle and inferior turbinate (Grade 1: small sized polyps extend just below the free edge of the middle turbinate; Grade 2: medium size polyps reaching between the upper and lower edges of the inferior turbinate and Grade 3: large polyps reaching below the lower edge of the inferior turbinate). Sample size calculation was done using a WHO software edited by Lemeshow and Lwanga.¹⁷ Reference study used for sample size calculation was that of Razmpa et al.² Results of our study were valid and which were also confirmed by WHO software for sample calculation; where, $\alpha = 0.05$, $1 - \beta = 90$, $p_1 = 0.05$, $p_2 = 0.10$ and n (sample size) = 221.

All patients who had a clinical diagnosis of nasal polyposis on the basis of naso-endoscopic examination were included in this study. Any nasal mass other than nasal polyp (diagnosed clinically) was excluded. Patients diagnosed clinically with nasal polyposis but no fungal infections were considered as "controls".

All patients who presented to the ENT out-patient clinics of Abbasi Shaheed Hospital, Karachi, suffering from nasal polyposis with fungal infection during follow-up period of the study were taken as the "numerators". The "denominators" were all those cases who attended the ENT out-patient clinics of Abbasi Shaheed Hospital in the same follow-up period. This helped in the determination of the period prevalence of fungal infections in nasal polyposis at a tertiary care centre in Karachi. Data was collected on variables related to complete history along with detail clinical examination of the ear, nose, throat and general examination.

Face was examined to identify any apparent deformity (e.g. asymmetry, swelling in the sinus region, cheek, and nasal deformity). Nose and throat were examined to observe the effects of nasal obstruction. Eyes were examined for any orbital involvement (proptosis, hypertelorism, telecanthus and impaired vision). If eyes were involved, an ophthalmologist was consulted for a detailed ophthalmological review.

Laboratory investigations included complete blood picture, clotting profile, urine examination, blood glucose levels and immunoglobulin estimation, especially, the level of IgE.

Radiological examination included X-rays of paranasal sinuses with a Water's view. CT scan was done to look for the sinuses, bony erosion or any orbital involvement. Magnetic Resonance Imaging (MRI) was done in cases of suspected intracranial extension.

Surgeries were performed according to the need of the patients, specimens obtained after surgery were sent to the histopathology department (for a tissue diagnosis) and to the microbiology department for fungal stain and culture.

Results

A total of 221 clinically diagnosed cases of nasal polyposis were included in the study of which 117 (52.95%) were males and 104 (47.05%) were females.

The age range was between 10-84 years The age group distribution is shown in Table 1.

Table-1: Age group distribution.

Age (in years)	n (%)
<18	14 (06.33)
18-20	10 (04.52)
21-30	78 (35.30)
31-40	66 (29.86)
41-50	41 (18.55)
51-60	06 (02.72)
61-70	03 (01.36)
>70	03 (01.36)
Total	221 (100)

Table-2: Socioeconomic condition.

Socioeconomic condition	Nasal Polyps n=221	Nasal polyp with fungus n=90	Nasal polyp without fungus n=131	Total patients n=221
Good	74	18	46	74
Average	24	13	11	24
Poor	123	59	74	123
Total patients	221	90	131	221

Table-3: CT scan Grading.

Patients	CT Scan Grading, n (%)			Total
	I	II	III	
All	2 (0.90)	112 (50.67)	107 (48.41)	221 (100)
Non Fungal Polyps	2 (1.52)	46 (35.11)	83 (63.35)	131 (59.22)
Allergic Fungal Sinusitis	1 (1.11)	38 (42.22)	51 (56.66)	90 (40.72)

Table-4: Recurrence after a follow up minimum one year.

Patients	CT Scan Grading			Total
	I	II	III	
All	0	34 of 112 30.35%	58 of 107 54.20%	100 45.24%
Non Fungal Polyposis	0	9 of 46 19.56%	45 of 83 54.21%	54 41.86%
Allergic Fungal Polyposis	0	18 of 38 47.36%	28 of 51 54.90%	46 51.68%

Socioeconomic condition was assessed by using citation of National Institute of Population Studies,¹⁸ which was based on income, main sources of income, education, health, occupation, the number of employed people and their employment status, household size, consumption patterns, level of savings, consumption of the major food items, household assets and amenities.

Among the 221 patients, fungal involvement was observed in 90 cases and of these 59 (65.55%) belonged to lower socioeconomic group, 13 (14.45%) were under the average socioeconomic group, while 18 (20%) patients belonged to an acceptable socioeconomic class (Table 2).

Histopathology of the nasal polyps reflected the presence of allergic elements in 139 specimens while an inflammatory element was observed in 41 specimens.

Bilateral involvement was observed in 159 (71.94%) patients from a total of 221 patients. Among the 159 cases of bilateral presentation, an allergic element was found in 95 (59.74%) samples; among 139 specimens with allergic element on histopathology, 95 (87.42%) had bilateral involvement. *Aspergillus* was seen in 90 patients (40.70%) in a total of 221 clinically diagnosed cases of nasal polyposis.

As per CT scan grading, out of 131 patients (59.27%) of non-fungal polyposis two patients (1.52%) were placed in the category of grade I; while 46 patients (35.11%) and 83 patients (63.35%) in grade II and grade III respectively. In 90 patients of allergic fungal polyposis, one patient (1.11%) was placed in the category of grade I; while 38 patients (42.22%) and 58 patients (56.66%) were placed in grade II and grade III respectively (Table 3).

The overall incidence of recurrence of polyps after a follow-up for a minimum period of one year was 100 (45.24%) patients. Rate of recurrence in patients with AFRS was 46 (51.68%) patients and that of non-fungal polyps was 54 (41.86%) patients. Patients with CT scan grading III of nasal polyps has a recurrence rate in 73 (54.47%) patients. The recurrences were more in AFRS, 46 (51.68%) patients as compare to non-fungal polyposis, 54 (41.68%) patients (Table 4).

Discussion

Non-infectious inflammation and fungal infection can develop into nasal polyps and growths.^{9,10} The ubiquitous nature of fungal spore makes it difficult to determine the role of fungal infection as a cause or an effect in nasal polyp formation. Recent studies have shown that these polyps may also be caused by fungal infection of the sinus mucosa.⁷

The incidence of fungal infections has increased dramatically in recent years¹⁹ which is followed by recurrence.²

In our study, 221 patients with nasal polyposis were included. Amongst these, 131 patients did not reveal any fungal infection either on microscopy or on culture. Fungal element was observed in 90 cases; in which 59 were culture positive and 31 samples were diagnosed on microscopy.

Most of the patients belonged to a lower socioeconomic class. Predisposing factors found in patients of fungal nasal polyp include overcrowding, unhealthy living

environment and lack of awareness regarding the disease. A vast majority of the patients attended the department with a prolonged history of symptoms as they did not get proper medical treatment during the initial period. Unjustified delays were noted due to consultation with hakims, quacks, homeopaths and general physicians for primary treatment of the disorder.

Marginal male preponderance was observed in our study, as 117 (52.95%) were male while 104 (47.95%) were female which is in accordance with a study conducted by Waxman, et al.²⁰ in 1987. Another study conducted by P. Karthikeyan and V. Nirmal Coumare²¹ in 2010, is also consistent with the current study showing a marginal male preponderance. Kordbacheh P et al⁵ in 2006, observed 65% male and 35% female patients with a marked male preponderance which is incomparable to the current findings.

In a local study conducted by Huq, et al.²² in 2014, there was a marked male preponderance as also observed by Waxman, et al.²⁰ involving 67% males and 33% females. Our study had a small male preponderance (52.95%).

In Huq et al's²⁰ study, the age range was 11-20 years in 33.3% patients. Only 10.85% patients belonged to this age group in our study.

As opposed to our findings, another local study conducted by Malik and Pal²³ in 2014 showed no sex preponderance. Most frequently involved age group in their study was 31-40 years (30%) which is consistent with our study showing an involvement of 29.86% in the same age group.

A local study conducted in Karachi by Siddiqui, et al.²⁴ in 2014, observed female preponderance (54.86%), which is not comparable to our study. Prevalence of underlying fungus in the nose and para-nasal sinuses in patients presenting with nasal polyposis in this study was 69.75% against our results of 40.7%.

A study conducted on 200 cases by Iqbal, et al.²⁵ in 1993 showed 14% of the patients to have a fungal aetiology. This finding is also not congruous to our study. Razmpa et al² observed equal gender frequency in a study conducted in 2007 and the involvement of fungus was observed in 42% of the cases which is similar to the current study.

The prevalence of the disease appears to vary in different geographic regions and is related to individual host conditions.²⁶ Although, fungal infection in nasal polyposis

is an uncommon condition but a rise in the incidence has been observed during the past few years.⁵

People of low socioeconomic group suffered the most and bilateral involvement is a common presentation. The overall incidences of recurrences were 46 (45.68%) patients. Recurrences were more in (AFRS- Allergic fungal rhino sinusitis) 46 (51.68%) patients as compared to non-fungal polyposis 54 (41.86%) patients. Recurrences were more in (AFRS- Allergic fungal rhino sinusitis), 46 (51.58%) patients as compared to non-fungal polyposis, 54 (41.86%) patients. This is in accordance with the study conducted by Laila M.Telmesani.²⁷

Conclusion

Prevalence of the disease is related to environment as well as individual host conditions. People of low socioeconomic group living in overcrowded and damp environment, suffer the most. It involves both sexes and all age groups but is seen more commonly in males among the ages of 22-50 years. Aggressive nasal polyposis and multi-sinus involvement is a hallmark of fungal sinusitis. *Aspergillus* species found in 90 (40.70%) cases reflected a higher incidence of fungal sinusitis in our community. CT findings of intra-sinus calcification proved helpful in differentiating fungal from non-fungal entities and it is also a better way to assess the extent of the disease. MRI is helpful if there is a suspicion of intracranial extension of the disease.

Although, pre-operative assessment regarding surgical planning is necessary but the final decision regarding surgery is based on per-operative assessment. Post-operative Itraconazole is necessary in all cases with culture positive fungal infection.

Inform Consent Form: Informed consent was obtained from every participant of the study.

Disclaimer: The article is the part of the thesis of the first author.

Conflict of Interest: None to declare.

Funding Sources: None to declare.

References

1. Bachert C, Wagenmann M, Rudack C, Hopken K, Hillebrandt M, Wang D, et al. The role of cytokines in infectious sinusitis and nasal polyposis. *Allergy* 1998; 53:2-13.
2. Razmpa E, Khajavi M, Kordbacheh MHJP. The prevalence of fungal infections in nasal polyposis, *Acta Medica Iranica* 2007; 45: 46-50.
3. Bateman ND, Fahy C, Wollford TJ. Nasal polypos: still more questions than answers. *J Laryngol Owl* 2003; 117: 1-9.

4. Nicolai P, Lombardi D, Tomenzoli D. Fungus ball of the paranasal sinuses: experience in 160 patients treated with endoscopic surgery. *Laryngoscope* 2009; 119: 27.
5. Kordbacheh P, Zaini F, Sabokbar A, Borghei H, Safara M. Fungi as Causative Agent of Nasal Polyps. *Iranian J Publ Health* 2006; 35: 53-7.
6. Joshi RR, Bhandary S, Khanal B, Singh RK. Fungal maxillary sinusitis: a prospective study in a tertiary care hospital of eastern Nepal. *Kathmandu Uni Med J (KUMJ)* 2007; 5: 195-8.
7. Fadl FA, Hassan KM, Faizuddin M. Allergic fungal rhinosinusitis: report of 4 cases from Saudi Arabia. *Saudi Med J* 2000; 21: 581-4.
8. Blitzer A, Lawson W. Fungal infections of the nose and paranasal sinuses. Part I. *Otolaryngol Clin North Am* 1993; 26: 1007-35.
9. Ricchetti A, Landis BY, Maffioli A, Giger R, Zene C, Lacroix JS. Effect of anti-fungal nasal Image with amphotericin B on nasal polyposis. *J Laryngol Otol* 2002; 116: 261-3.
10. Weschta M, Rimek D, Formanek M, Polzehl D, Podbielski A, Riechelmann H. Topical antifungal treatment of chronic rhinosinusitis with nasal polyps: a randomized, double-blind clinical trial. *J Allergy Clin Immunol* 2004; 113:1122-8.
11. Caplin I, Haynes JT, Spahn J. Are nasal polyps an allergic phenomenon? *Ann Allergy* 1971; 29: 631-4.
12. Thompson GR, Patterson TF. Fungal disease of the nose and paranasal sinuses. *Allergy Clin Immunol* 2012; 129: 321-6.
13. Hussain S, Salahuddin N, Ahmad I, Salahuddin I, Jooma R. Rhinocerebral invasive mycosis: occurrence in immunocompetent individuals. *Eur J Radiol* 1995; 20:151-5.
14. Scharf JL, Soliman AM. Chronic rhizopus invasive fungal rhinosinusitis in an Immunocompetent host. *Laryngoscope* 2004; 114: 1533-5.
15. Siddiqui AA, Shah AA, Bashir SH. Craniocerebral aspergillosis of sinonasal origin in immunocompetent patients: clinical spectrum and outcome in 25 cases. *Neurosurgery* 2004; 55: 602-11.
16. Lildholdt T, Rundcrantz H, Bende M, Larsen K. Glucocorticoid treatment for nasal polyps. The use of topical budesonide powder, intramuscular betamethasone, and surgical treatment. *Arch Otolaryngol Head Neck Surg* 1997; 123: 595-600.
17. Lwanga SK, Lemeshow S. Sample size determination in health studies. A practical manual. Geneva, Switzerland: WHO Press, 1999; pp 5.
18. National Institute of Population Studies. Pakistan Demographic and Health Survey 2012-13. Islamabad, Pakistan, and Calverton, Maryland, USA: NIPS and ICF International. [Online] 2013 [Cited 2019 January 14]. Available from: URL: <https://dhsprogram.com/pubs/pdf/fr290/fr290.pdf>
19. Joshi RR, Bhandary S, Khanal B, Singh RK. Fungal Maxillary sinusitis: A prospective study in a tertiary care hospital of eastern Nepal. *Kathmandu University Medical Journal (KUMJ)* 2007; 5:195-9.
20. Waxman JE, Spector JG, Sale SR, Katzenstein AL. Allergic Aspergillus sinusitis: concepts in diagnosis and treatment of a new clinical entity. *Laryngoscope* 1987; 97: 261-6.
21. Karthikeyan P, Coumare VN. Incidence and Presentation of Fungal Sinusitis in Patient Diagnosed with Chronic Rhinosinusitis. *Indian J Otolaryngol Head Neck Surg* 2010; 62: 381-5.
22. Irshad-ul-Haq M, Farooq M, Qadri SH. Prevalence of Allergic Fungal Sinusitis among patients with nasal polyps. *JSZMC* 2014; 5:690-2.
23. Malik TL, Pal MB. Prevalence of Fungal Infection in Nasal Polyps. *Pak J Med Health Sci* 2014; 8: 1077-81.
24. Siddiqui AH, Sheikh AA, Khan TZ, Marfani MS, Ali A. Sinonasal polyposis and fungus: A growing relationship. *Int J Endorsing Health Sci Res* 2014; 2: 58-61.
25. Iqbal K, Saqlain G, Jalisi M. Nasal Polyposis and fungal sinusitis. *Pak J Otolaryngol* 1993; 9: 173-6.
26. Lanza DC, Dhong HJ, Tantilipikorn P, Tanabodee J, Nadel DM, Kennedy DW. Fungus and Chronic Rhinosinusitis: From Bench to Clinical Understanding. *Ann Otol Rhinol Laryngol* 2006; 115:27-30.
27. Telmesani LM. Prevalance of allergic fungal sinusitis among patients with nasal polyps. *Ann Saudi Med* 2009; 29: 212-4.