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Original Research Article

Histopathological Study of Lesions in Nasal Cavity and Paranasal Sinuses

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Abstract:

Background: Lesions of the nasal cavity and paranasal sinuses encompass a wide histopathological spectrum ranging from simple inflammatory polyps to malignant neoplasms. Their overlapping clinical presentations often make histopathological evaluation indispensable for accurate diagnosis and management.

Aim: To evaluate and classify the histopathological spectrum of nasal and paranasal sinus lesions, and to study their distribution with respect to age, sex, and site.

Materials and Methods: A prospective observational study was conducted on 50 cases of nasal and paranasal sinus lesions. Routine haematoxylin–eosin-stained sections were studied, and lesions were categorized into non-neoplastic and neoplastic (benign and malignant) types.

Results: Out of 50 cases, 32 (64 %) were non-neoplastic, 11 (22 %) benign neoplastic, and 7 (14 %) malignant neoplastic. Inflammatory nasal polyp was the most common lesion (46 %), followed by chronic sinusitis (12 %). Among benign tumors, nasopharyngeal angiofibroma was most frequent (8 %), and squamous cell carcinoma was the predominant malignant tumour (10 %). The majority of patients were in the fourth to fifth decade with a male-to-female ratio of 1.6:1. The nasal cavity was the most common site involved (70 %).

Conclusion: Inflammatory lesions constitute the bulk of nasal and paranasal sinus pathologies. Histopathological examination remains the gold standard for distinguishing between benign and malignant conditions, enabling appropriate therapeutic planning and prognostic assessment.

Keywords: Nasal cavity, Paranasal sinuses, Histopathology, Nasal polyps, Angiofibroma, Squamous cell carcinoma.

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Introduction

The nasal cavity and paranasal sinuses are vital components of the upper respiratory tract responsible for respiration, humidification, and olfaction. Because of their exposure to environmental irritants, allergens, and pathogens, they are prone to a diverse group of pathological processes. These range from non-neoplastic inflammatory lesions to aggressive malignant neoplasms [1,2]. Clinically, patients often present with nonspecific symptoms such as nasal obstruction, discharge, epistaxis, or facial swelling, which may obscure the underlying pathology [3,4].

Accurate differentiation between inflammatory, benign, and malignant lesions is crucial for effective management. Radiological evaluation provides supportive information, but the definitive diagnosis relies on histopathological study, which elucidates cellular architecture and tissue morphology [5,6].

The present study was undertaken to analyze the histopathological patterns of nasal and paranasal sinus lesions, and to determine their incidence and demographic distribution in patients presenting to our institution.

Materials and Methods

Study Design and Duration: A prospective, cross-sectional histopathological study was carried out.

Sample Size: 50 surgical specimens and biopsies of nasal and paranasal sinus lesions were included.

Inclusion Criteria: All surgically excised masses and biopsies from the nasal cavity and paranasal sinuses of patients of any age and sex.

Exclusion Criteria

- Poorly preserved or autolyzed specimens.
- Lesions extending from adjacent regions not originating in the nasal cavity or sinuses.

Methodology

Specimens were fixed in 10 % neutral buffered formalin, processed routinely, and stained with haematoxylin and eosin. Special stains such as PAS

and GMS were used when fungal or granulomatous infection was suspected.

Each lesion was evaluated for epithelial, stromal, and vascular components. Cases were classified into:

1. Non-neoplastic lesions (inflammatory, infective, granulomatous)
2. Benign neoplastic lesions
3. Malignant neoplastic lesions

Results

Table 1: Distribution of Lesions by Category

Non-neoplastic	**32 cases**	**64 %**
Benign neoplastic	**11 cases**	**22 %**
Malignant neoplastic	**7 cases**	**14 %**
Total	**50**	**100 %**

Among the 50 cases, non-neoplastic lesions constituted 32 (64 %), benign neoplasms 11 (22 %), and malignant neoplasms 7 (14 %). Thus, inflammatory and infective conditions far outnumbered neoplastic processes.

Table 2: Age and Sex Distribution

Age Group (yrs)	Cases	%	Male	Female
0–20	**3**	**6**	**2**	**1**
21–40	**15**	**30**	**10**	**5**
41–60	**22**	**44**	**14**	**8**
> 60	**10**	**20**	**6**	**4**
Total	**50**	**100**	**32**	**18**

Patients ranged in age from 8 to 75 years, with maximum incidence in the 41–60-year age group (44 %). Males (32 cases) were more frequently affected than females (18 cases), giving a male-to-female ratio of 1.6:1. Non-neoplastic lesions predominated in the younger to middle-aged groups, while malignant neoplasms were observed mainly after the fifth decade.

Table 3: Site of Involvement

Nasal cavity	**35**	**70 %**
Maxillary sinus	**9**	**18 %**
Ethmoid sinus	**4**	**8 %**
Frontal / Sphenoid	**2**	**4 %**

The nasal cavity was the most commonly affected site, accounting for 35 (70 %) cases, followed by the maxillary sinus (18 %), ethmoid sinus (8 %), and other sinuses (4 %). This distribution reflects the extensive surface area and exposure of the nasal cavity to environmental irritants.

Table 4: Spectrum of Non-Neoplastic Lesions

Inflammatory polyp	**23**	**46 %**
Chronic sinusitis	**6**	**12 %**
Fungal sinusitis	**2**	**4 %**
Rhinosporidiosis	**1**	**2 %**

Out of 32 non-neoplastic lesions: Inflammatory nasal polyps were most frequent (23 cases, 46 %). They exhibited oedematous stroma with mixed inflammatory infiltrate of eosinophils, lymphocytes, and plasma cells. Chronic sinusitis accounted for 6 cases (12 %) with mucosal thickening and glandular hyperplasia. Fungal sinusitis was observed in 2 cases (4 %), one showing Aspergillus and one mucormycotic hyphae with necrosis. Rhinosporidiosis was noted in 1 case (2 %) showing characteristic sporangia containing spores.

Table 5: Spectrum of Benign Neoplastic Lesions

Nasopharyngeal angiofibroma	**4**	**8 %**
Inverted papilloma	**3**	**6 %**
Capillary haemangioma	**2**	**4 %**
Schwannoma	**1**	**2 %**
Ossifying fibroma	**1**	**2 %**

Benign tumors comprised 11 cases (22 %). The commonest was nasopharyngeal angiofibroma (4 cases, 8 %), seen exclusively in adolescent males and characterized by vascular proliferation in a fibrous stroma. Inverted papilloma accounted for 3 cases (6 %), with endophytic growth of squamous

epithelium and inflammatory stroma. Other benign tumors included capillary haemangioma (2 cases, 4 %), schwannoma (1 case, 2 %), and ossifying fibroma (1 case, 2 %).

Table 6: Spectrum of Malignant Neoplastic Lesions

Squamous cell carcinoma	**5**	**10 %**
Adenocarcinoma	**1**	**2 %**
Olfactory neuroblastoma	**1**	**2 %**

Seven cases (14 %) were malignant. Squamous cell carcinoma was the most frequent malignancy (5 cases, 10 %), predominantly affecting older males. Histology revealed invasive epithelial nests with keratin pearl formation. Adenocarcinoma occurred in 1 case (2%) showing glandular pattern and mucin secretion. Olfactory neuroblastoma was seen in 1 case (2 %) composed of small round cells with rosette formation.

Overall Trends

Non-neoplastic lesions predominated across all age groups, whereas malignant tumors increased with age. The overall incidence pattern was: Inflammatory > Benign Neoplastic > Malignant Neoplastic, reflecting the high burden of inflammatory nasal pathology in the community.

Discussion

The nasal cavity and paranasal sinuses are subject to a wide range of pathological conditions owing to their anatomical location and functional exposure. The findings of the present study emphasize the predominance of inflammatory lesions over neoplastic conditions [7].

Non-neoplastic lesions (64 %) formed the majority, a pattern consistent with most Indian and international studies [1,2,7,8]. The high frequency of inflammatory nasal polyps may be related to chronic allergy, infection, and environmental pollution [9]. Polyps showed the typical microscopic picture of oedematous stroma, Sero mucinous glands, and eosinophilic infiltration. Chronic sinusitis presented with mucosal fibrosis and glandular hyperplasia, often secondary to prolonged inflammation [10].

Fungal sinusitis in the current series comprised mainly Aspergillus and Mucor species, in line with the increasing recognition of fungal infections in immunocompromised or diabetic individuals [11,12]. Recognition of these infections histologically is essential, as delayed diagnosis can lead to invasive complications. Among benign tumors (22 %), nasopharyngeal angiofibroma was the most common. It is classically a tumor of adolescent males, believed to be androgen-dependent [13,14]. Histologically, it demonstrated numerous thin-walled vessels embedded in collagenous stroma. Complete surgical excision is curative, though recurrence can occur due to residual vascular tissue [15]. Inverted papilloma constituted the next major group. Its tendency for recurrence and occasional malignant transformation necessitates complete resection and histological follow-up [16]. Other benign entities such as haemangioma, schwannoma, and ossifying fibroma were relatively infrequent but illustrate the diversity of sinonasal neoplasms [17].

Malignant neoplasms (14 %) in the present study were dominated by squamous cell carcinoma. This corresponds with global data identifying SCC as the most common malignancy of the sinonasal tract [5,18]. The older age group, male predominance, and history of exposure to tobacco or industrial dusts are well-recognized risk factors [19,20].

Adenocarcinoma and olfactory neuroblastoma formed a small subset but carry significant clinical importance owing to their local aggressiveness and potential for cranial extension [21,22]. The incidence of sinonasal malignancies in this series underscores the need for early detection through biopsy of any persistent nasal mass, particularly in middle-aged and elderly men [23].

Comparing the distribution with previous literature, most studies have documented inflammatory nasal polyp as the leading lesion, followed by angiofibroma among benign tumors and squamous cell carcinoma among malignant ones [1,2,18]. The demographic trends and lesion profile in our population align closely with these observations.

Histopathology remains indispensable not only for diagnosis but also for assessing tumor differentiation, depth of invasion, and surgical margins [5,24]. With the availability of advanced immunohistochemical and molecular techniques, further subtyping and prognostic assessment have become possible, but the routine H&E examination continues to serve as the cornerstone of evaluation, especially in resource-limited settings [25].

Conclusion:

In the present study, inflammatory nasal polyp emerged as the most common lesion, emphasizing the predominance of chronic inflammatory pathology in the sinonasal region. Non-neoplastic lesions were found to outnumber neoplastic ones, with benign tumors occurring more frequently than malignant counterparts. Among the malignant lesions, squamous cell carcinoma was the most prevalent, predominantly affecting older male patients. The nasal cavity was identified as the most

commonly involved site across all lesion types. Overall, histopathological examination continues to serve as the gold standard for accurate diagnosis, allowing clear differentiation between inflammatory, benign, and malignant conditions, thereby guiding appropriate clinical management. Furthermore, early biopsy of any persistent or recurrent nasal mass is strongly recommended to facilitate timely diagnosis and intervention, ultimately improving patient outcomes.

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