

Histopathological Spectrum of Nasal Mass Lesions: A Three-Year Study of 138 Cases at a Tertiary Care Center of Rajasthan

Shahida Riyaz¹, Ila Sharma¹, Deepti Sukheeja¹¹Department of Pathology, Government Medical College, Kota, Rajasthan, India*Correspondence: deeptisukheeja2001@yahoo.co.in**DOI**[10.21276/apalm.3779](https://doi.org/10.21276/apalm.3779)**Article History**

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Abstract

Background: Nasal mass lesions represent a heterogeneous group of pathologies ranging from non-neoplastic inflammatory conditions to benign and malignant neoplasms. This study aimed to evaluate the histopathological spectrum of nasal masses over three years.

Methods: A retrospective analysis of one thirty eight consecutive cases clinically diagnosed as nasal masses was conducted. Specimens were processed and evaluated histologically. Cases were categorized into non-neoplastic, benign neoplastic, and malignant groups. Demographic data were recorded and analyzed.

Result: Non-neoplastic lesions formed the majority, with inflammatory and allergic polyps being the most common. Benign tumors included inverted papilloma and juvenile nasopharyngeal angiofibroma. Malignant tumors, though fewer, included squamous cell carcinoma, nasopharyngeal carcinoma, and sarcomas. Male predominance was noted, with age distribution varying across categories.

Conclusion: Histopathology remains indispensable in distinguishing nasal masses, guiding treatment, and identifying malignant lesions early. Institution-based data add valuable insights into regional patterns of sinonasal pathology.

Keywords: Nasal mass lesions; Paranasal Sinuses; Histopathology; Squamous Cell Carcinoma; Angiofibroma

Introduction

Nasal mass lesions encompass a heterogeneous group of conditions ranging from non-neoplastic inflammatory disorders to benign and malignant neoplasms [1, 2]. These lesions often present with overlapping clinical features such as nasal obstruction, epistaxis, rhinorrhea, facial swelling, and anosmia, which makes accurate diagnosis challenging based on clinical and radiological findings alone. Histopathological examination remains the gold standard for definitive diagnosis, guiding both prognosis and management [3].

The sinonasal tract is anatomically complex and functionally exposed to a wide range of environmental agents including allergens, infectious organisms, and carcinogens. Consequently, it serves as the site of diverse pathological processes.

Non-neoplastic masses, such as inflammatory and allergic nasal polyps, are the most common and account for the majority of surgical specimens in otorhinolaryngology practice [4, 5]. Infectious lesions such as fungal rhinosinusitis and rhinosporidiosis are also important in endemic regions, particularly in immunocompromised individuals [6].

Benign tumors of the nasal cavity, though less frequent, include a variety of entities such as inverted papilloma, hemangioma, juvenile nasopharyngeal angiofibroma, pleomorphic adenoma, and neurofibroma [7, 8]. These tumors, while non-malignant, can be locally aggressive, recurrent, and occasionally associated with malignant transformation, making their recognition crucial.

Malignant tumors of the sinonasal tract are relatively rare but carry significant morbidity and mortality. Squamous cell carcinoma is the most common, followed by nasopharyngeal carcinoma, adenocarcinoma, and a spectrum of other neoplasms including sarcomas, melanomas, and hematolymphoid malignancies [9, 10].

Globally, the incidence and distribution of nasal mass lesions vary according to geographic, environmental, and genetic factors. In India, climatic diversity, high prevalence of allergic disorders, widespread use of traditional medicines, and regional exposure to specific infectious agents contribute to a distinctive spectrum of sinonasal pathology [2, 5]. Despite the clinical significance of nasal masses, there is a paucity of large-scale histopathological studies that document their diversity in this setting.

The present study was undertaken to analyze the histopathological spectrum of nasal mass lesions over a period of three years. A total of one thirty eight consecutive cases were examined, and lesions were categorized as non-neoplastic, benign neoplastic, and malignant. Correlation with age, sex, and clinical presentation was performed to provide a comprehensive overview of the patterns encountered in our region. By generating institution-based data, this study seeks to enhance diagnostic awareness, facilitate early recognition of uncommon entities, and contribute to the literature on sinonasal pathology [11, 12].

In India, the histopathological spectrum of nasal mass lesions shows considerable regional variation influenced by climatic conditions, endemic infections, environmental exposures, and healthcare accessibility. Rajasthan, with its distinct arid climate, referral patterns, and disease epidemiology, remains underrepresented in published sinonasal pathology data. The present study provides institution-based histopathological data from a tertiary care center in Rajasthan over a three-year period, highlighting the relative frequencies of non-neoplastic, benign, and malignant nasal mass lesions in this region. By documenting both common and uncommon entities, including infectious and malignant lesions, this study adds region-specific evidence that may aid clinicians and pathologists in improving diagnostic suspicion, prioritizing histopathological evaluation of unilateral nasal masses, and strengthening early detection strategies in routine practice. [2, 4, 5, 6]

Materials and Methods

Study Design and Setting

This was a retrospective observational study carried out in the Department of Pathology, Government Medical College, Kota, over a period of three years from January 2021 to December 2024. Specimens were received from the Department of Otorhinolaryngology following surgical excision or biopsy of clinically suspected nasal masses.

Study Population

The study comprised 138 consecutive cases of nasal mass lesions. All cases referred with a clinical diagnosis of nasal mass or polyp and submitted for histopathological examination during the study period were included.

Inclusion Criteria

All excised or biopsied masses arising from the nasal cavity, paranasal sinuses and nasopharynx. Specimens with adequate tissue preservation and clinical details.

Exclusion Criteria

Inadequately preserved or autolyzed specimens. Incomplete clinical data preventing correlation.

Specimen Processing

All tissue samples were fixed in 10% neutral buffered formalin and processed by standard histopathological techniques, and stained with hematoxylin and eosin (H&E) for histopathological evaluation. Special stains such as Periodic Acid–Schiff (PAS) were performed in selected cases showing histomorphological features suspicious for fungal or infectious pathology on routine H&E sections. These features included necrotic debris, granulomatous inflammation, eosinophil-rich inflammatory infiltrates, poorly defined refractile structures suggestive of fungal elements, or clinicoradiological suspicion of fungal sinusitis.

Histopathological Evaluation

Each case was evaluated systematically for: Epithelial changes including hyperplasia, metaplasia, or dysplasia. Stromal characteristics including edema, fibrosis, vascularity, and cellularity. Inflammatory cell profile (lymphocytes, plasma cells, eosinophils, neutrophils). Presence of infectious agents such as fungi or sporangia. Tumor architecture, cytological atypia, mitotic activity, and evidence of invasion. Based on histopathological findings, cases were categorized into non-neoplastic lesions.

Data Collection and Analysis

Demographic details such as age, sex, and clinical presentation were noted. Site and laterality of the lesion were recorded wherever available. Data were entered and analyzed using descriptive statistics with Microsoft Excel (Microsoft Corporation, USA). Results were expressed as frequencies and percentages. Results were represented in tables and charts for clarity.

Ethical Considerations

Ethical committee approval was not sought, as this was a retrospective study based exclusively on archived histopathological material and anonymized records, with no direct patient contact and no access to identifiable patient information.

Results

A total of 138 cases of nasal mass lesions were studied over a three-year period. All specimens were subjected to routine histopathological evaluation, and findings were correlated with demographic and clinical details. The lesions were broadly categorized into non-neoplastic, benign neoplastic, and malignant groups.

Distribution of Lesions

Out of the 138 cases, non-neoplastic lesions accounted for the majority, followed by benign tumors and malignant tumors. Non-neoplastic masses comprised more than half of the total cases, while malignant tumors, though fewer in number, represented an important subset due to their aggressive nature [2, 4, 5].

Age Distribution

Patients ranged from the first to the eighth decade of life. Non-neoplastic lesions were most common in the second to fourth decades, with a peak incidence in young adults. Benign tumors were predominantly encountered in adolescents and young adults, particularly juvenile nasopharyngeal angiofibroma, which was restricted to male patients in the second decade [9]. Malignant tumors were observed mainly in the fifth to seventh decades, highlighting their predilection for older age groups. Pediatric malignant cases, though rare, were also recorded, including rhabdomyosarcoma and Ewing's sarcoma [11].

Table 1: Age distribution of nasal mass lesions (n = 138).

	0-20	20-40	40-60	60-80
Non neoplastic	21	31	25	7
Benign	7	15	6	6
Malignant	3	6	4	7
Total	31	52	35	20

Sex Distribution

Overall, males outnumbered females in this series. Male predominance was marked among benign tumors, particularly angiofibroma [9], and also among malignant lesions such as squamous cell carcinoma [10]. Non-neoplastic lesions, however, showed a relatively balanced distribution between the sexes, with a slight male preponderance.

Table 2: Sex distribution of nasal mass lesions (N=138).

	Female	Male
Non neoplastic	31	53
Benign	17	17
Malignant	6	14
Total	54	84

Non-Neoplastic Lesions

Inflammatory nasal polyps were the single most common diagnosis, characterized by edematous stroma and mixed inflammatory infiltrate. Allergic polyps, defined by eosinophil-rich inflammation, formed the second largest category. Fungal lesions, primarily aspergilloma, were also noted, with hyphae demonstrable on special stains. Rhinosporidiosis was encountered in a few cases, presenting with characteristic sporangia. Granulomatous lesions were rare but included chronic granulomatous inflammation consistent with tuberculosis [4, 6].

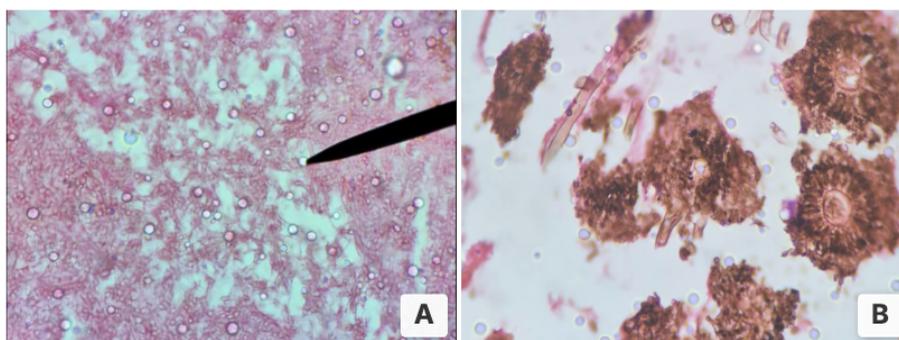


Figure 1: Non neoplastic lesions: A. Biopsy shows dense aggregates of septate fungal hyphae with acute-angle branching, consistent with Aspergilloma (H&E Stain,100X). B. Biopsy shows thick-walled sporangia filled with numerous endospores within a vascular stroma, consistent with rhinosporidiosis (H&E stain, 400X).

Benign Tumors

Benign tumors accounted for a substantial proportion of nasal masses. Inverted papilloma and septal papilloma were the predominant epithelial tumors. Vascular tumors included hemangioma and juvenile nasopharyngeal angiofibroma, the latter seen exclusively in adolescent males. Mesenchymal and salivary gland tumors such as neurofibroma, pleomorphic adenoma, and ameloblastoma were also documented, though infrequent [7, 8].

Malignant Tumors

Malignant tumors formed an important component of the spectrum. Squamous cell carcinoma was the most common malignant tumor, followed by nasopharyngeal carcinoma. Other malignant lesions included adenocarcinomas, rhabdomyosarcoma, Ewing's sarcoma, sinonasal melanoma, plasmacytoma, chordoma, and malignant fibrous histiocytoma. These tumors predominantly occurred in older adults, except sarcomas, which presented in pediatric or young adult patients. The overall frequency of malignancy, though less than non-neoplastic lesions, underscored the need for thorough histopathological evaluation of all nasal masses [9, 10, 11, 12].

Table 3: Histopathological spectrum of nasal mass lesions (N=138).

	Nasal cavity	Paranasal sinus	Nasopharynx
Non neoplastic lesions			
Inflammatory nasal polyp (incl. Angiectatic)	31	19	1
Allergic nasal polyp	21	3	0
Aspergilloma	3	0	0
Fungal granuloma	0	2	0
Rhinosporidiosis	2	0	0
Plasma cell granuloma	0	1	0
Benign tumours			
Hemangioma	15	0	0
Angiofibroma	5	1	0
Inverted Papilloma	5	0	0
Septal papilloma	1	0	0
Adenomatous polyp	1	0	0
Neurofibroma	0	1	0
Pleomorphic adenoma	1	0	0
Ameloblastoma	1	0	0
Malignant tumours			
Squamous cell carcinoma (incl in situ)	3	1	1
Nasopharyngeal ca	0	0	3
Rhabdomyosarcoma	1	1	1
Papillary adenocarcinoma	2	0	0
Sinonasal adenocarcinoma	2	0	0
Chordoma	1	0	0
Ewing's sarcoma	1	0	0
MFH	0	1	0
Melanoma	1	0	0
Plasmacytoma	1	0	0

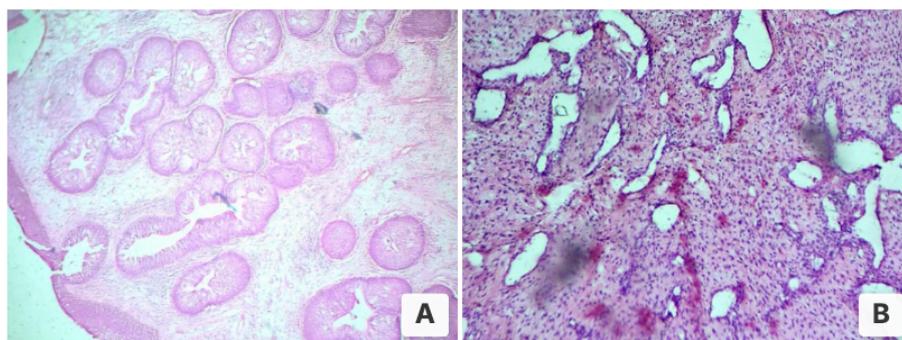


Figure 2: Benign neoplastic lesions A. Biopsy shows endophytic growth of multilayered respiratory epithelium forming invaginated gland-like structures within a fibrous stroma, consistent with Schneiderian papilloma (H&E Stain,100X). B. Nasal mass shows a fibrovascular lesion composed of stellate to spindle stromal cells within a collagenous matrix and numerous thin-walled, variably sized vascular channels, consistent with angiofibroma (H&E Stain,100X).

Laterality and Site Distribution

Most non-neoplastic lesions presented bilaterally, particularly nasal polyps [5]. Benign and malignant tumors, however, were more frequently unilateral. The nasal cavity was the most common site, followed by the nasopharynx and paranasal sinuses. Angiofibromas were localized to the nasopharynx, while malignant tumors demonstrated wider distribution including paranasal sinuses and nasopharynx.

Discussion

Nasal mass lesions represent a diverse spectrum of pathological entities, ranging from simple inflammatory conditions to aggressive malignant neoplasms. Their clinical presentation is often nonspecific, with nasal obstruction, rhinorrhea, epistaxis, facial pain, and anosmia being common features irrespective of underlying pathology. This overlap underscores the essential role of histopathology in establishing a definitive diagnosis [3]. The present study of 138 cases over a three-year period

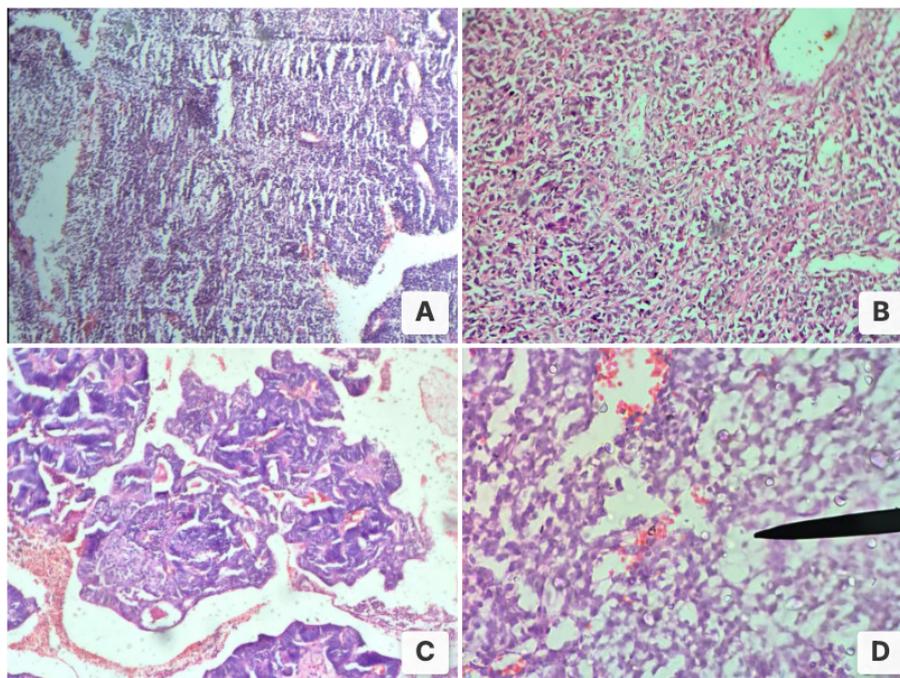


Figure 3: Malignant neoplastic lesions. A. Biopsy shows a highly cellular malignant small round cell tumor arranged in sheets and fascicles, composed of primitive rhabdomyoblasts with eccentric nuclei and eosinophilic cytoplasm, consistent with rhabdomyosarcoma (H&E Stain,100X). B. Nasal mass biopsy shows a highly pleomorphic spindle-cell sarcoma with storiform pattern and marked atypia, consistent with malignant fibrous histiocytoma (H&E Stain,100X). C. Biopsy shows infiltrative atypical glandular structures with pleomorphic columnar cells and cribriform architecture, consistent with sinonasal adenocarcinoma (H&E Stain,100X). D. Nasal mass biopsy shows physaliphorous cells with bubbly cytoplasm arranged in cords and lobules within a myxoid matrix, consistent with chordoma (H&E Stain,100X).

highlights the relative frequency, demographic distribution, and histopathological spectrum of nasal masses in our institution.

Non-Neoplastic Lesions

In the present study, non-neoplastic lesions constituted the majority of nasal masses, with inflammatory and allergic polyps being the most frequent. This observation is consistent with numerous studies across India and abroad, which have documented nasal polyps as the predominant sinonasal mass [2, 4, 5]. Their pathogenesis is multifactorial, involving chronic inflammation, mucosal edema, allergy, infection, and structural abnormalities such as impaired mucociliary clearance [1, 4]. The peak incidence of polyps in the second to fourth decades noted in this study parallels previous findings, suggesting that sinonasal mucosal hyperreactivity is most pronounced in young and middle-aged adults.

A slight male predominance in polyps was observed in our study, which is in agreement with several published reports [5]. Bilateral presentation was common, particularly in inflammatory and allergic types, reflecting their diffuse mucosal involvement. Allergic polyps, characterized by eosinophil-rich infiltrates, may benefit from adjunct corticosteroid therapy, while infectious or inflammatory lesions often require surgical excision and eradication of underlying causes [6].

Fungal lesions accounted for a smaller proportion of non-neoplastic masses in our study. Aspergilloma was the predominant subtype, with characteristic fungal hyphae confirmed by special stains. The occurrence of fungal sinusitis has shown an increasing trend worldwide, possibly due to rising numbers of immunocompromised patients and greater awareness [6]. Rhinosporidiosis, although rare globally, was identified in our series, consistent with its endemicity in certain regions of India and neighboring countries. The hallmark sporangia seen histologically remain pathognomonic for diagnosis. Granulomatous lesions such as tuberculosis were infrequently encountered, but they highlight the need to consider infectious etiologies in the differential diagnosis of nasal masses, particularly in regions with high prevalence of chronic infections [11].

Benign Neoplastic Lesions

Benign tumors formed a significant subset of nasal masses in this study. Among them, inverted papilloma and septal papilloma were the most common epithelial tumors. Inverted papilloma, though histologically benign, is of particular clinical importance due to its tendency for recurrence and risk of malignant transformation [7, 8]. Our findings align with global

literature documenting its predilection for middle-aged males and frequent unilateral presentation [7].

Vascular tumors, notably juvenile nasopharyngeal angiofibroma (JNA), were also identified. As expected, JNA occurred exclusively in adolescent males, presenting with nasal obstruction and recurrent epistaxis. This unique demographic profile, coupled with its vascularity, makes preoperative diagnosis crucial to prevent intraoperative hemorrhage. Our data reinforce the well-established clinical and pathological features of JNA [9].

Other benign tumors identified included hemangioma, pleomorphic adenoma, neurofibroma, and ameloblastoma. These tumors were rare but highlight the broad spectrum of sinonasal pathology. While generally non-aggressive, their recognition is essential due to potential for recurrence or, in rare cases, malignant transformation. For instance, pleomorphic adenoma of the nasal cavity is much less common than its salivary gland counterpart but poses similar risks if not excised completely [12].

Malignant Neoplastic Lesions

Although malignant tumors were less frequent than non-neoplastic lesions in our study, their clinical significance cannot be overstated. Squamous cell carcinoma (SCC) was the most common malignant tumor encountered, consistent with global trends where SCC accounts for the majority of sinonasal malignancies [9, 10]. SCC typically presents in older adults, as observed in our study, and carries a poor prognosis due to late presentation and difficulties in achieving complete surgical clearance [10].

Nasopharyngeal carcinoma was the second most common malignancy in our series. This tumor has a distinct epidemiological distribution, being more prevalent in certain Asian populations [10]. Its occurrence in our cohort emphasizes the need for vigilance in diagnosing posterior nasal and nasopharyngeal masses, particularly in adults presenting with nasal obstruction and cervical lymphadenopathy.

Other malignant tumors documented in this study included adenocarcinoma, rhabdomyosarcoma, Ewing's sarcoma, sinonasal melanoma, plasmacytoma, chordoma, and malignant fibrous histiocytoma (MFH). The presence of sarcomas in pediatric and young adult patients highlights the wide age spectrum affected by sinonasal malignancies [11]. Rhabdomyosarcoma and Ewing's sarcoma, though rare, should always be considered in children presenting with nasal masses, given their aggressive nature and need for multimodal therapy. Sinonasal melanoma and MFH, while uncommon, carry poor prognosis due to their aggressive biological behavior [12].

The diversity of malignant lesions in this series reflects the diagnostic challenges posed by nasal mass lesions. Many of these tumors mimic benign or inflammatory masses clinically, and only histopathological evaluation with ancillary immunohistochemistry can establish the correct diagnosis. Early and accurate recognition is critical, as management strategies vary widely — from surgery alone in some localized cases to multimodal treatment involving surgery, radiotherapy, and chemotherapy in aggressive or advanced lesions.

Comparison with Other Studies

The findings of the present study demonstrate substantial concordance with previously published Indian literature on sinonasal mass lesions. Non-neoplastic lesions constituted the largest category in our series, with inflammatory and allergic nasal polyps being the most frequent diagnoses. Similar observations have been reported by Dasgupta *et al.* in their histopathological analysis of nasal polyps, as well as by Garg and Mathur and Kulkarni *et al.*, who documented a predominance of non-neoplastic lesions in Indian tertiary-care settings [1, 2, 4]. Satarkar and Srikanth, in their study of 206 cases, also reported inflammatory and tumor-like lesions as the most common sinonasal masses, followed by benign and malignant tumors [5]. The proportional distribution of non-neoplastic, benign, and malignant lesions in our study closely mirrors these Indian series, suggesting a consistent pattern of sinonasal pathology across different regions of the country.

The age distribution observed in the present study, with non-neoplastic lesions occurring predominantly in the second to fourth decades and malignant tumors presenting more commonly in older age groups, is comparable to findings reported by Jain *et al.* and Satarkar and Srikanth [3, 5]. The slight male predominance noted across lesion categories in our cohort further aligns with most Indian studies, which have attributed this trend to differential environmental exposure and healthcare-seeking behavior.

With regard to benign neoplastic lesions, inverted papilloma was the most common epithelial tumor in our series. This finding is in agreement with Indian and Asian studies that emphasize the clinical importance of inverted papilloma because of its recurrent nature and potential for malignant transformation [7, 8]. Juvenile nasopharyngeal angiofibroma in the present study was confined to adolescent males, which mirrors the classical demographic profile described in Indian clinicopathological studies [5, 9].

Among malignant lesions, squamous cell carcinoma emerged as the most frequent malignancy in our study, consistent with reports by Satarkar and Srikanth and other Indian series identifying squamous cell carcinoma as the predominant sinonasal malignancy [5, 10]. The occurrence of pediatric and young-adult malignancies such as rhabdomyosarcoma and Ewing's sarcoma in our cohort is comparable to observations from Indian tertiary-care centers and underscores the need for careful evaluation of nasal masses in younger patients [11, 12].

The identification of infectious and granulomatous lesions, including fungal sinusitis, rhinosporidiosis, and tuberculosis, reflects regional epidemiological patterns seen in Indian studies and highlights a key difference from Western literature, where such lesions are infrequently encountered [6, 11]. These findings emphasize the value of region-specific histopathological studies in capturing local disease patterns and informing diagnostic practice.

Clinical and Diagnostic Implications

The study underscores the pivotal role of histopathology in evaluating nasal masses. While clinical and radiological findings provide valuable guidance, they are often insufficient to distinguish between the varied pathologies that may present as nasal masses. The consequences of misdiagnosis are clinically significant, as delayed recognition of malignant lesions may adversely affect patient outcomes.

Histological categorization into non-neoplastic, benign, and malignant groups not only provides diagnostic clarity but also influences therapeutic decisions. Non-neoplastic lesions may be managed surgically with medical adjuncts, benign tumors often require complete excision to prevent recurrence, and malignant tumors necessitate multimodal treatment. Thus, pathologists play a central role in guiding the clinical management of these patients.

In this context, an understanding of the regional histopathological spectrum of nasal mass lesions becomes particularly relevant. The findings of the present study reinforce the importance of routine histopathological evaluation of nasal masses and suggest that awareness of local disease patterns may assist clinicians in refining diagnostic protocols, optimizing pathological assessment, and facilitating timely and appropriate patient management. Such institution-based data may also support the development of context-specific diagnostic approaches in similar healthcare settings.

Strengths and Limitations

A major strength of the present study is the inclusion of a relatively large number of cases over a defined period, providing a comprehensive snapshot of the spectrum of nasal mass lesions in our institution. The systematic categorization and correlation with demographic features enhance the relevance of the findings.

However, certain limitations must be acknowledged. Being a retrospective study, clinical follow-up data and treatment outcomes were not available for analysis. Immunohistochemistry, though performed in few selected cases, was not applied uniformly across all tumors, which may limit subclassification in certain rare malignancies. Finally, as the study was institution-based, the findings may not fully reflect the community prevalence of nasal masses.

Conclusion

Nasal mass lesions represent a broad pathological spectrum, ranging from simple inflammatory polyps to aggressive malignant tumors. In the present study of 138 cases, non-neoplastic lesions formed the majority, with inflammatory and allergic polyps being the most common. Benign tumors such as inverted papilloma and juvenile nasopharyngeal angiofibroma were also encountered, each with distinct clinical implications owing to their recurrence potential or demographic specificity. Malignant tumors, although less frequent, included a wide variety of entities, with squamous cell carcinoma emerging as the predominant type, followed by nasopharyngeal carcinoma and rare sarcomas and melanomas. The findings reinforce the indispensable role of histopathology in the accurate diagnosis of nasal masses. Given the clinical overlap among non-neoplastic, benign, and malignant lesions, histopathological evaluation remains the gold standard for distinguishing these entities and guiding appropriate therapy. Early recognition of neoplastic lesions, especially malignant tumors, is crucial for improving patient outcomes. This study contributes institution-based data to the existing literature on sinonasal pathology and highlights the need for continued surveillance and reporting of regional patterns. Future prospective studies incorporating clinical follow-up, molecular profiling, and outcome analysis would provide deeper insights into the biological behavior and optimal management of nasal mass lesions.

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