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Original Research Article

Clinicopathological Study of Spectrum of Lesions in Nasal Cavity, Nasopharynx and Paranasal Sinuses: A Hospital-Based Cross-Sectional Study

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Abstract:

Background: Sinonasal and nasopharyngeal mass lesions comprise a heterogeneous spectrum of inflammatory, infective, benign neoplastic and malignant conditions. Because their clinical presentations often overlap, histopathological examination plays an important role in establishing the definitive diagnosis.

Aim: To evaluate the clinicopathological spectrum of lesions involving the nasal cavity, nasopharynx and paranasal sinuses and to correlate their clinical presentation with histopathological findings.

Methods: This single-centre, hospital-based, cross-sectional observational study was conducted in the Department of Pathology, Gandhi Medical College and associated Hamidia Hospital, Bhopal, from May 2024 to October 2025. A total of 120 patients with sinonasal or nasopharyngeal mass lesions were included. Demographic characteristics, presenting symptoms, anatomical site, and endoscopic findings were recorded and correlated with histopathological diagnosis. Lesions were categorized as non-neoplastic, benign neoplastic or malignant. Statistical analysis was performed using Stata version 17.0, with $p<0.05$ considered significant.

Results: Of the 120 patients, 72 (60.0%) had non-neoplastic lesions, 20 (16.7%) had benign neoplasms and 28 (23.3%) had malignant neoplasms. The 51–60-year age group was most frequently affected (32, 26.67%), and males constituted 73 (60.83%) cases. Nasal obstruction was the commonest presenting symptom (88, 73.33%), followed by epistaxis (36, 30.0%) and nasal discharge (32, 26.67%). Inflammatory polyp was the most common non-neoplastic lesion, capillary hemangioma the most common benign neoplasm and adenoid cystic carcinoma the most frequent individual malignant diagnosis. Among patients presenting with epistaxis, 20/36 (55.6%) had malignant lesions, while 5/7 (71.4%) of those with ocular symptoms had malignant lesions. Anaemia was more frequent in malignant than non-malignant cases (57.14% vs 30.43%; $p=0.027$). Endoscopic assessment correctly classified 94.4% of non-neoplastic, 90.0% of benign and 89.3% of malignant lesions, corresponding to an overall categorical agreement of 92.5%.

Conclusion: Non-neoplastic lesions constituted the majority of sinonasal and nasopharyngeal masses. Although clinical and endoscopic assessment provided valuable diagnostic information, histopathological examination remained essential for definitive diagnosis and differentiation of benign from malignant disease. Epistaxis and ocular manifestations were more frequently represented among patients with malignant lesions in this cohort.

Keywords: Sinonasal lesions; Nasal cavity; Paranasal sinus; Nasopharynx; Histopathology; Inflammatory polyp; Sinonasal neoplasm; Clinicopathological correla.

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Introduction

Mass lesions of the nasal cavity, paranasal sinuses and nasopharynx comprise a heterogeneous group of inflammatory, benign neoplastic and malignant conditions. Because these lesions often present with overlapping symptoms such as nasal obstruction, discharge, epistaxis, facial discomfort and altered smell, clinical examination alone may not reliably

distinguish their exact nature. Recent clinicopathological studies continue to demonstrate that non-neoplastic lesions constitute a substantial proportion of sinonasal masses, although benign and malignant tumours also contribute significantly to the disease spectrum.[1]

Rani et al.[2] similarly emphasized the wide histopathological diversity of sinonasal masses and the importance of correlating demographic, clinical and pathological findings. Chronic inflammatory lesions and sinonasal polyps remain common non-neoplastic entities, and their microscopic evaluation is important for distinguishing them from neoplastic mimics.[3]

Among malignant lesions, sinonasal squamous cell carcinoma is one of the important epithelial malignancies and is now increasingly understood in terms of distinct molecular and viral pathways.[4] Advances in molecular pathology have further refined the classification of sinonasal malignancies, with several entities now defined by characteristic molecular alterations in the current WHO framework.[5] Sinonasal papillomas are also clinically important because of their tendency for recurrence and, in selected cases, association with malignant transformation.[6] Despite advances in imaging and molecular diagnostics, histopathological examination remains fundamental for definitive diagnosis and appropriate classification of sinonasal tumours.[7]

Although several studies have described the histopathological spectrum of sinonasal lesions, variations in lesion distribution and clinical presentation have been reported across different geographical and institutional settings. Contemporary data integrating clinical presentation with histopathological categorisation from tertiary-care centres in central India remain limited. Therefore, evaluation of the local clinicopathological spectrum may provide useful region-specific information and help assess the extent to which common clinical features correspond with underlying pathology.

Therefore, the present study was undertaken to evaluate the clinicopathological spectrum of lesions involving the nasal cavity, nasopharynx and paranasal sinuses, with particular emphasis on demographic characteristics, clinical presentation, anatomical distribution, and histopathological diagnosis.

Materials and Methods

Study design and setting: The present study was a single-centre, hospital-based, cross-sectional observational study conducted in the Department of Pathology, Gandhi Medical College and associated Hamidia Hospital, Bhopal, Madhya Pradesh, India. Histopathological specimens of mass lesions of the nasal cavity, paranasal sinuses and nasopharynx were received from the Department of Otorhinolaryngology and other relevant clinical units.

Study duration: The study was conducted over a period of 18 months, from May 2024 to October 2025.

Study population: The study population comprised patients presenting with mass lesions of the nasal cavity, paranasal sinuses or nasopharynx whose biopsy or excision specimens were submitted to the Department of Pathology for histopathological evaluation during the study period.

Sample size and sampling technique: All eligible specimens received during the study period were consecutively included. A total of 120 cases fulfilled the predefined eligibility criteria and constituted the final study sample.

Inclusion criteria: All histopathological specimens of mass-occupying lesions involving the nasal cavity, paranasal sinuses or nasopharynx received in the Department of Pathology during the study period were eligible for inclusion.

Exclusion criteria: Patients who were undergoing chemotherapy or radiotherapy for the same lesion at the time of enrolment were excluded.

Study groups:

Based on final histopathological diagnosis, lesions were classified into:

1. **Non-neoplastic lesions**
2. **Benign neoplasms**
3. **Malignant neoplasms**

Clinical evaluation:

Relevant demographic and clinical details were obtained from the structured study proforma

and hospital records. Variables recorded included age, gender, symptoms, anatomical site, laterality, CBC, endoscopy, histopathology.

The presenting complaints evaluated included nasal obstruction, nasal discharge, epistaxis, hyposmia or anosmia, facial pain or swelling and other associated symptoms. Laterality was recorded as right-sided, left-sided or bilateral, where applicable. Duration of symptoms was also documented when available.

Radiological and endoscopic evaluation:

Available radiological reports, including X-ray of the paranasal sinuses, computed tomography and magnetic resonance imaging, were reviewed for site and extent of the lesion and evidence of bone involvement where documented. Nasal endoscopic findings recorded by the treating clinician were also noted.

Specimen processing and histopathological examination:

All biopsy and excision specimens were received in the Department of Pathology and fixed in 10% formalin. Gross examination was performed with documentation of size, shape, colour, surface, consistency, and the presence of haemorrhage or necrosis. Representative sections were taken and processed by routine paraffin-embedding techniques. Tissues were dehydrated through graded alcohol, cleared in xylene, embedded in paraffin wax and sectioned using a microtome. Sections were stained routinely with haematoxylin and eosin (H&E). After deparaffinisation and hydration, slides were stained with Harris haematoxylin, differentiated, blued, counterstained with eosin, dehydrated, cleared and mounted using DPX. All stained sections were examined under a light microscope. Histopathological diagnosis was established on the basis of morphological features, and lesions were categorised as non-neoplastic, benign neoplastic or malignant neoplastic. Grading was recorded for malignant tumours wherever applicable.

Outcome measures:

The **primary outcome** was the distribution of clinical presentations according to the final histopathological diagnosis. **Secondary outcomes** included the histopathological spectrum of lesions, age-wise and sex-wise distribution, site-specific distribution, frequency of non-neoplastic, benign and malignant lesions, and the distribution of presenting symptoms across histopathological categories.

Data quality control:

All completed study proformas were checked for completeness and internal consistency before data entry. Data were cross-checked with available hospital and laboratory records wherever required. Histopathological slides were re-evaluated in cases with inadequate or equivocal tissue, and additional sections were obtained where feasible. Selected cases were reviewed by supervising faculty to ensure diagnostic consistency.

Statistical analysis:

Categorical variables were summarised as frequencies and percentages. Associations between categorical variables were assessed using the Pearson chi-square test or Fisher's exact test, as appropriate. Continuous variables were summarised using mean ± standard deviation or median with interquartile range, depending on distribution. A two-sided p-value <0.05 was considered statistically significant. Statistical analyses were performed using Stata version 17.0.

Ethical considerations:

The study was approved by the Institutional Ethics Committee of Gandhi Medical College, Bhopal (Approval No. 16313, dated 06 May 2024). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and the relevant Indian Council of Medical Research guidelines. Written informed consent was obtained from all participants prior to enrolment. Participants were informed about the purpose of the study, the nature of data collection and their voluntary right to participate or withdraw without affecting their clinical care.

Results

A total of **120 patients** with mass-occupying lesions of the nasal cavity, paranasal sinuses, and nasopharynx were included. The lesions were evaluated according to demographic characteristics, anatomical site, clinical presentation, and final histopathological diagnosis.

Table 1: Demographic and clinical characteristics of the study population

Characteristics	Category	n	%
Age (years)	0–10	4	3.33
	11–20	20	16.67
	21–30	15	12.50
	31–40	17	14.17
	41–50	16	13.33
	51–60	32	26.67
	61–70	12	10.00
	71–80	4	3.33
Gender	Male	73	60.83
	Female	47	39.17
Laterality	Right	53	44.2
	Left	29	24.2
	Bilateral	38	31.6
Family history	Present	12	10.0
	Absent	108	90.0

The largest proportion of patients belonged to the 51–60-year age group (26.67%). Males constituted 60.83% of the study population, giving a male predominance. Right-sided involvement was most frequent (44.2%), followed by bilateral (31.6%) and left-sided (24.2%) lesions.

Table 2: Clinical presentation and anatomical distribution of lesions

Variables	Category	n	%
Presenting symptoms*	Nasal obstruction	88	73.33
	Epistaxis	36	30.00
	Nasal discharge	32	26.67
	Olfactory disturbance	13	10.83
	Respiratory/mouth breathing	13	10.83
	Ocular symptoms	7	5.83
	Headache/pain/other symptoms	12	10.00
Anatomical site	Right nasal cavity	41	34.17
	Left nasal cavity	35	29.17
	Bilateral nasal cavity	20	16.67
	Nasopharynx	14	11.67
	Right maxillary sinus	6	5.00
	Bilateral maxillary sinus	2	1.67
	Right ethmoid cavity	1	0.83
	Bilateral ethmoidal cavity	1	0.83

*Multiple symptoms could occur in the same patient; therefore, percentages do not total 100%.

Nasal obstruction was the most frequent presenting symptom, occurring in 88 (73.33%) patients, followed by epistaxis in 36 (30.0%) and nasal discharge in 32 (26.67%). The nasal cavity accounted for the majority of lesions, particularly the right nasal cavity (34.17%) and left nasal cavity (29.17%). Nasopharyngeal lesions accounted for 11.67% of cases.

Table 3: Histopathological spectrum of sinonasal and nasopharyngeal lesions

Histopathological category	Specific histopathological diagnosis	N	% of total (N=120)
Non-neoplastic	Inflammatory polyp	28	23.33
	Chronic polypoidal sinusitis	9	7.50
	Allergic polyp	8	6.67
	Mucormycosis	11	9.17
	Rhinosporidiosis	6	5.00
	Adenoid hypertrophy	3	2.50
	Sinonasal polyp	3	2.50
	Other non-neoplastic lesions†	4	3.33
Benign neoplastic	Capillary hemangioma	8	6.67
	Angiofibroma	5	4.17
	Inverted papilloma with dysplasia	3	2.50
	Other benign lesions‡	4	3.33
Malignant	Malignant neoplasms	28	23.33
Total		**120**	**100.00**

†Antrochoanal polyp, mixed mucormycosis/aspergillosis, rhinoscleroma and tuberculous lesion, one case each. ‡Juvenile angiofibroma, capillary hemangioma with actinomycotic colonies, atypical spindle-cell neoplasm and ectopic glial tissue, one case each.

Among the 72 non-neoplastic lesions, inflammatory polyp was the most frequent diagnosis (28/72; 38.9%), followed by mucormycosis (11/72; 15.3%), chronic polypoidal sinusitis (9/72; 12.5%) and allergic polyp (8/72; 11.1%).

Among the 28 malignant lesions, adenoid cystic carcinoma was the single most frequent diagnosis, accounting for 6 (21.43%) malignant cases. Low-grade non-intestinal adenocarcinoma accounted for 3 (10.71%), while a further 3 (10.71%) cases were categorized as sinonasal undifferentiated carcinoma/small-cell/NK-T-cell lymphoma in the source dataset.

Table 4. Clinicopathological associations and endoscopy–histopathology concordance

Parameters	Non-neoplastic	Benign	Malignant	Statistical finding
Nasal obstruction, n (%)§	56 (63.6)	14 (15.9)	18 (20.5)	—
Epistaxis, n (%)§	12 (33.3)	4 (11.1)	20 (55.6)	—
Nasal discharge, n (%)§	24 (75.0)	3 (9.4)	5 (15.6)	—
Olfactory disturbance, n (%)§	8 (61.5)	2 (15.4)	3 (23.1)	—
Ocular symptoms, n (%)§	1 (14.3)	1 (14.3)	5 (71.4)	—
Endoscopy correctly corresponding to histopathological category	68/72 (94.4)	18/20 (90.0)	25/28 (89.3)	High concordance
Anaemia¶	28/92 (30.43%)		16/28 (57.14%)	**p=0.027***

§Percentages are calculated within each symptom category as reported in the source data.

¶CBC analysis compared non-malignant (non-neoplastic + benign) with malignant lesions. *Statistically significant at $p<0.05$.

Clinical presentation varied according to lesion type. Nasal obstruction was predominantly associated with non-neoplastic lesions, whereas epistaxis showed a higher representation of malignant lesions (55.6%). Similarly, 71.4% of patients presenting with ocular manifestations had malignant lesions, indicating that epistaxis

and ocular involvement were relatively prominent clinical features among malignant cases.

Endoscopic assessment showed a high degree of agreement with final histopathology. Endoscopy correctly corresponded with the histopathological category in 94.4% of non-neoplastic, 90.0% of benign and 89.3% of malignant lesions.

A statistically significant association was also observed between CBC findings and malignant status (p=0.027). Anaemia was present in 57.14% of malignant cases compared with 30.43% of non-malignant cases, p=0.027.

Discussion

The present study evaluated the clinicopathological spectrum of 120 mass lesions involving the nasal cavity, paranasal sinuses and nasopharynx. Non-neoplastic lesions constituted the largest group (60.0%), followed by malignant lesions (23.3%) and benign neoplasms (16.7%). The predominance of non-neoplastic lesions emphasizes that inflammatory and infective conditions continue to account for a substantial proportion of sinonasal masses encountered in routine practice.

The age distribution was broad, with the highest proportion of patients in the 51–60-year age group (26.67%), and males predominated (60.83%). Malignant lesions were also most frequent in the 51–60-year group, although neither age nor sex showed a statistically significant association with malignant status. These observations are broadly consistent with the heterogeneous demographic distribution of sinonasal tumours described in contemporary literature. Burggraf et al.[8] and See et al.[9] have emphasized the clinicopathological heterogeneity of aggressive sinonasal malignancies, particularly sinonasal undifferentiated carcinoma.

Nasal obstruction was the most frequent presenting complaint (73.33%), followed by epistaxis (30.0%) and nasal discharge (26.67%). While obstruction was predominantly encountered among non-neoplastic lesions, 55.6% of patients presenting with epistaxis and 71.4% of those with ocular symptoms had malignant lesions. This is clinically relevant because symptoms such as recurrent epistaxis, orbital involvement, visual disturbance and rapidly progressive unilateral disease should increase suspicion of malignancy. The International Consensus Statement on Sinonasal Tumors similarly emphasizes integration of clinical examination, nasal endoscopy, imaging and tissue diagnosis in the evaluation of suspected sinonasal neoplasms.[10] Kuan et al.[11] have further highlighted the importance of multidisciplinary assessment for these uncommon and histologically diverse tumours.

Among the non-neoplastic lesions, inflammatory polyp was the most common (38.9%), followed by mucormycosis (15.28%), chronic polypoidal sinusitis (12.5%) and allergic polyp (11.11%). Sahoo et al.[12], in their clinicopathological study from Central India, likewise demonstrated the importance of histopathological examination in distinguishing common inflammatory lesions from neoplasms. Singh et al.[13] also reported a broad spectrum of inflammatory, benign and malignant sinonasal masses, reinforcing the value of clinicopathological correlation.

Among benign neoplasms, capillary hemangioma was the most frequent (40.0%), followed by angiofibroma (25.0%). Inverted papillomas with varying degrees of dysplasia were also identified. Patel et al.[14] similarly demonstrated considerable histological diversity among sinonasal and nasopharyngeal masses and stressed the importance of histopathological confirmation for appropriate management.

Malignant neoplasms constituted 23.3% of all lesions. Adenoid cystic carcinoma was the most frequent individual malignant diagnosis, accounting for 21.43% of malignant cases. The malignant group also contained non-intestinal-type adenocarcinoma, squamous cell carcinoma, nasopharyngeal carcinoma and undifferentiated malignant tumours. The current WHO framework recognizes the substantial morphological and molecular diversity of sinonasal malignancies, making precise histopathological classification particularly important.[15]

An important observation was the high concordance between endoscopic assessment and histopathological category: 94.4% for non-neoplastic, 90.0% for benign and 89.3% for malignant lesions. Nevertheless, endoscopy cannot replace tissue diagnosis because

morphologically distinct entities may have similar clinical appearances. Histopathological examination therefore remains the definitive method for classification, with immunohistochemistry and molecular investigations being useful in selected diagnostically challenging malignancies.[15]

Overall, the findings demonstrate that sinonasal and nasopharyngeal masses encompass a wide range of inflammatory, infective and neoplastic conditions. Careful correlation of symptoms, endoscopic findings, imaging and histopathology is essential, particularly in patients presenting with epistaxis, ocular manifestations or other features suspicious for malignancy.

Limitations of the Study:

This study was conducted at a single tertiary-care centre with a relatively small sample size of 120 cases, which may limit the generalisability of the findings. The cross-sectional design allowed assessment of associations but did not permit evaluation of treatment outcomes, recurrence or long-term prognosis. Some rare lesions were represented by very few cases, limiting meaningful subgroup analysis. In addition, formal diagnostic accuracy measures for endoscopic assessment were not evaluated.

Future Recommendations:

Future studies should include larger, multicentre cohorts to improve the generalisability of findings and better characterise the regional spectrum of sinonasal and nasopharyngeal lesions. Prospective studies incorporating standardised clinical, endoscopic and radiological assessment, along with appropriate diagnostic accuracy measures, may provide stronger clinicopathological correlations. Long-term follow-up and ancillary investigations such as immunohistochemistry may also be valuable, particularly for rare and diagnostically challenging lesions.

Conclusion

Sinonasal and nasopharyngeal lesions demonstrated a wide clinicopathological spectrum, with non-neoplastic lesions constituting the majority of cases. Inflammatory polyp was the most common non-neoplastic lesion, capillary hemangioma was the most frequent benign neoplasm, and adenoid cystic carcinoma was the most common individual malignant lesion. Nasal obstruction was the predominant presenting symptom, while epistaxis and ocular manifestations were more frequently represented among malignant cases. Anaemia was also significantly more frequent in malignant lesions. Histopathological examination remained essential for definitive diagnosis, highlighting the importance of integrating clinical, endoscopic and pathological findings in the evaluation of sinonasal and nasopharyngeal masses.

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