

## Research Article

# The Diagnostic Challenges of Sinonasal Lesions: A Prospective Histological Review

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Article History

**Received:** 06.05.2026

**Revised:** 21.05.2026

**Accepted:** 15.06.2026

**Published:** 30.06.2026

**Citations:**

Buranakunta, J., Tahseen, S. I., Deshala, H., Rafath, S. A., & Earla, L. B. (Year). The diagnostic challenges of sinonasal lesions: A prospective histological review. *J Surg Radiol*, V5(6) 434-439

**Abstract:** *Introduction:* Lesions of the nasal cavity and paranasal sinuses encompass a broad spectrum of pathological entities ranging from non-neoplastic inflammatory conditions to benign and malignant neoplasms. These lesions vary widely depending on age, occupation and addiction habits and other environmental factors. A careful clinical workup including symptomatology, radiological investigations & endoscopy helps to determine a differential diagnosis but histopathology provides the final diagnosis. *Objective:* To evaluate the histopathological features of sinonasal lesions in a tertiary care setting and document their frequency and distribution. *Methods:* A prospective cross-sectional study of 80 cases conducted over 2 years (January 2024–January 2026) in department of Pathology, Government General Hospital, Mahabubnagar. Histopathological examination was performed using hematoxylin and eosin staining, with relevant Immunohistochemistry and classified based on WHO guidelines. *Results:* Non-neoplastic lesions predominated (75%), with Rhinosinusitis being most common (40%). Benign neoplasms (18.75%) outnumbered malignant ones (6.25%). Hamartoma (REAH) and Hemangioma were the most frequent benign tumors, while Sinonasal squamous cell carcinoma, Sinonasal undifferentiated carcinoma and Olfactory neuroblastoma represented malignant cases. *Conclusion:* Histopathology remains the cornerstone for definitive diagnosis of sinonasal lesions. Awareness of rare entities such as REAH and inverted papilloma is essential to avoid misdiagnosis.

**Keywords:** Sinonasal lesions, Histopathology, Rhinosinusitis, Inverted papilloma, REAH, Olfactory neuroblastoma.

## INTRODUCTION

The sinonasal tract is a collective term that refers to the nasal cavity and paranasal sinuses [1]. Despite their anatomical proximity, the diversity in tissue types and exposures contributes to the wide histological variation.[2] Lesions of the sinonasal tract encompass a wide spectrum of non neoplastic and neoplastic conditions that often pose diagnostic challenges due to overlapping clinical and radiological features; while malignant tumours are relatively uncommon, they typically present late and carry significant morbidity [3,4]The nasal cavity, nasopharynx and paranasal sinuses form functional unit of nose [5]. Sinonasal area is exposed to various infective agents, chemicals, antigens, mechanical and many other influences. These deleterious exposures lead to formation of tumour like and neoplastic conditions [6].

## MATERIALS AND METHODS

This prospective cross-sectional study was conducted over 18 months (January 2024–June 2025) in department of pathology, Government General Hospital, Mahabubnagar. All cases were retrieved and processed via gross examination, routine tissue processing, paraffin embedding, 4–5 µm sectioning, Hematoxylin and Eosin staining following standard protocol. Lesions were classified into Non-Neoplastic and Neoplastic categories with further benign and malignant groups. Tumors were classified according to the World Health Organisation (WHO) histological classification of tumors of the nasal cavity and paranasal sinuses.

## RESULTS

In the present study, 80 cases of non-neoplastic and neoplastic lesions of nasal cavity and PNS were studied over a period of 24 months from tertiary care academic institute prospectively. Out of which 60 cases were non-neoplastic and 20 cases were neoplastic. Out of 20 neoplastic cases, 15 cases were benign and 5 cases were malignant.

Table 1 shows the number of patients included in this study along with their histological diagnosis. Among 60 cases of Non-Neoplastic sinonasal lesions.

Rhinosinusitis is most frequently encountered accounting for 32(40%) cases followed by Total Sinonasal polyps accounting for 26(32%) cases. In the polyps, Allergic polyp being the commonest with 10(12.5%) cases followed by equal incidence of Antrochoanal polyp and Inflammatory polyp being 8(10%) cases each respectively. Least being Mucormycosis with 2(2.5%) cases.

**Table 1: Percentage Distribution of Histopathological Findings in Various Sinonasal Lesions**

Type of lesion	Histopathological findings	No. of cases	Percentage
Non-neoplastic	Rhinosinusitis	32	40%
	Allergic polyp	10	12.5%
	Inflammatory nasal polyp	8	10%
	Antrochoanal polyp	8	10%
	Mucormycosis	2	2.5%
Neoplastic-Benign	Hamartoma(REAH)	5	6.25%
	Nasal hemangioma	5	6.25%
	Inverted papilloma	4	5%
	Angiofibroma	1	1.25%
Neoplastic-Malignant	Squamous cell carcinoma	2	2.5%
	Sinonasal undifferentiated carcinoma	2	2.5%
	Olfactory neuroblastoma	1	1.25%
<b>TOTAL</b>		<b>80</b>	<b>100%</b>

Figure 1 shows incidence of lesions. Among 20 cases of Neoplastic sinonasal lesions, Benign-neoplastic were accounting for 15(18.75%) cases, in those 5(6.25%) cases were Nasal hemangiomas and with 5(6.25%) cases of Respiratory epithelial adenomatoid hamartoma (REAH), 4(5%) cases of Inverted Papilloma and 1(1.25%) case of Angiofibroma.

Malignant-neoplastic were 5(6.25%) cases with Sinonasal keratinizing squamous cell carcinoma (SCC) 2(2.5%) cases and Sinonasal undifferentiated carcinoma (SNUC) accounting for 2(2.5%) cases and 1(1.25%) case was Olfactory neuroblastoma (ONB).

**Fig.1 incidence of sinonasal lesion according to the present study**

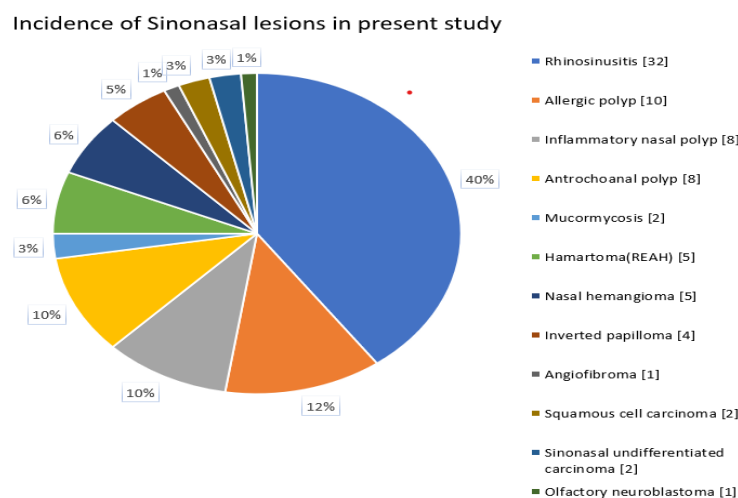
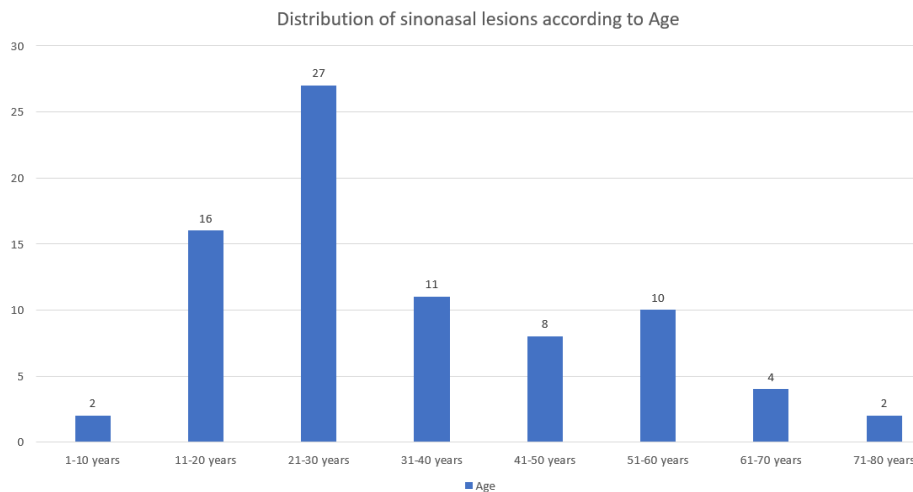


Figure 2 shows distribution of sinonasal lesion shows according to the age. Maximum cases were seen in the 3<sup>rd</sup> decade.

**Figure 2: Distribution of sinonasal lesions according to the age**



Among the 80 cases of sinonasal lesions analyzed, there was a male predominance, with 43 males (53.75%) and 37 females (46.25%), yielding a M:F ratio of approximately 1.16:1 (figure 3).

**Figure 3: Distribution of sinonasal lesions according to Gender**



## DISCUSSION

The sinonasal tract, comprising the nasal cavity and paranasal sinuses, is a complex anatomical region exposed to a wide range of environmental influences including allergens, pathogens, chemical irritants, and pollutants. This constant exposure predisposes the tract to a spectrum of inflammatory, infectious, and neoplastic conditions. Clinical presentation often overlaps, with symptoms such as unilateral or bilateral nasal obstruction, epistaxis, facial swelling, anosmia, and blood-tinged nasal discharge. While radiological imaging and endoscopy aid in localization and assessment of extent, **Histopathological examination remains the gold standard** for definitive diagnosis and classification of these lesions.

Non-neoplastic lesions form the majority of sinonasal pathology. Nasal polyps are the most frequent benign lesions, arising from chronic mucosal inflammation and associated with allergy, infection, asthma, and aspirin

sensitivity. Histologically, polyps are subdivided into allergic types, characterized by abundant eosinophils, and inflammatory types, which show a paucity of eosinophils. Ethmoidal polyps are generally allergic, whereas antrochoanal polyps are typically inflammatory.

Peak incidence is noted in the second and third decades of life. Despite their benign nature, polyps are clinically significant due to recurrence potential and impact on quality of life. Angiofibroma shows a fibrous stroma with scattered spindle cells and numerous thin-walled, irregular blood vessels lacking muscular support, which explains its tendency for profuse bleeding. Mucormycosis, a broad non-septate hypha causing thrombosis and tissue necrosis with angioinvasion.

Among benign neoplastic lesions, **Hemangiomas** are prominent vascular tumors of the sinonasal tract. Capillary hemangiomas are frequently encountered.

Inverted papilloma with endophytic growth of squamous/transitional epithelium into underlying stroma is also notable; which are multicentric in up to 30% of cases and carry a risk of malignant transformation (figure 4). Respiratory Epithelial Adenomatoid Hamartoma (REAH) is an overgrowth of surface epithelium derived medium-sized, ciliated glands surrounded by thickened basement membrane (figure 5).

Malignant lesions of the sinonasal tract, though less frequent, present significant diagnostic and therapeutic challenges. **Keratinizing squamous cell carcinoma (SCC)** is the most common subtype, morphologically identical to squamous carcinomas elsewhere, and characterized by eosinophilic cytoplasm, intercellular bridges, keratin pearls, and irregular nests in desmoplastic stroma. Grading depends on keratinization and atypia, ranging from well-differentiated tumors with abundant keratinization, prominent bridges, minimal pleomorphism, and low mitotic activity, to poorly differentiated carcinomas with marked atypia, pleomorphism, high mitotic activity, and minimal keratinization. SCCs are frequently associated with local invasion and recurrence, and HPV-related variants may carry distinct molecular and prognostic implications (Figure 6).

**Sinonasal undifferentiated carcinoma (SNUC)**, defined as an undifferentiated carcinoma lacking glandular or squamous features and considered a diagnosis of exclusion, typically presents as a high-grade

blue cell tumor with necrosis, brisk mitotic and apoptotic activity, and immunoreactivity restricted to pancytokeratin (AE1/AE3) and simple keratins such as CK7, CK8, and CK18 (Figure 7).

**Olfactory neuroblastoma (ONB)**, a rare neuroendocrine tumor arising from the olfactory epithelium, demonstrates a broad histological spectrum that often overlaps with other small round cell tumors. Morphologically, ONB is composed of sharply demarcated nests, lobules, or sheets of small cells with scant cytoplasm in a fibrillary background, often forming pseudo-rosettes within a richly vascular stroma. Immunohistochemically, ONB is positive for neuroendocrine markers such as synaptophysin and chromogranin, while sustentacular cells highlight with S100 protein (Figure 8).

Management strategies differ according to lesion type. Non-neoplastic and benign neoplastic lesions generally require surgical excision, while malignant tumors demand multimodal therapy including surgery, radiotherapy, and chemotherapy. Even benign tumors may recur locally, underscoring the importance of complete excision and vigilant follow-up. Malignant lesions, particularly squamous cell carcinoma, are associated with poor outcomes due to late diagnosis and limited effectiveness of adjuvant modalities. Histopathology, therefore, plays an indispensable role not only in diagnosis but also in guiding prognosis and therapeutic decisions.

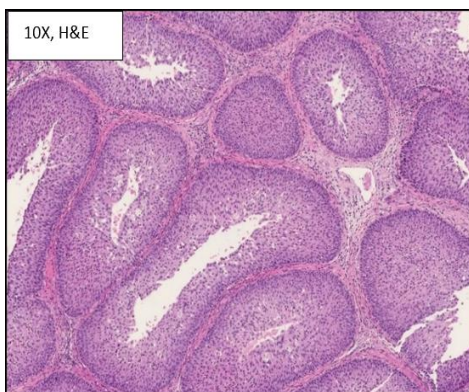


Fig 4: Inverted papilloma with Endophytic growth of squamous/transitional epithelium

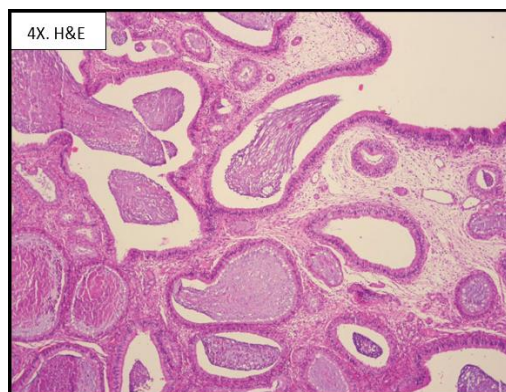
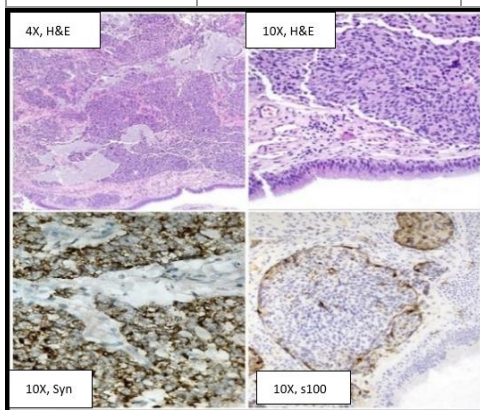


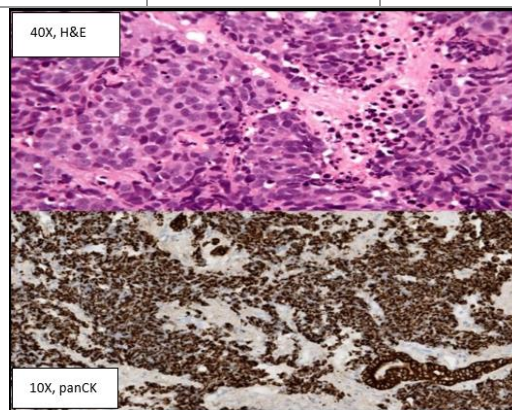
Figure 5: REAH with an overgrowth of surface epithelium derived medium-sized, ciliated glands surrounded by thickened basement membrane

Comparative Overview of Present study with Aman Jain & Prachi Mehta et al. (2025), Rajitha & Srikanth et al. (2021), Kulkarni et al. (2012).

Parameter	Present Study (80 cases, 2024–26)	Aman Jain & Prachi Mehta et al. (2025)	Rajitha & Srikanth et al. (2021)	Kulkarni et al. (2012)
<b>Lesion Types</b>	Non-neoplastic (75%), Neoplastic (25%)	Non-neoplastic predominated; nasal polyps most common	Non-neoplastic predominated; rhinosinusitis & polyps frequent	Non-neoplastic predominated; polyps & rhinosinusitis common
<b>Common Non-neoplastic Lesions</b>	Rhinosinusitis (40%), Polyps (32%), Mucormycosis (2.5%)	Nasal polyps most frequent	Polyps & rhinosinusitis	Polyps & rhinosinusitis
<b>Benign Neoplasms</b>	Hemangioma (6.25%), REAH (6.25%), Inverted papilloma (5%), Angiofibroma (1.25%)	Inverted papilloma, hemangioma reported	Inverted papilloma, hemangioma	Inverted papilloma, hemangioma
<b>Malignant Neoplasms</b>	SCC (2.5%), SNUC (2.5%), Olfactory neuroblastoma (1.25%)	SCC most common	SCC most common	SCC most common
<b>Gender Distribution</b>	M:F ≈ 1.16:1 (53.75% male)	Male predominance	Male predominance	Male predominance
<b>Age Distribution</b>	Peak in 3rd decade	Peak in 3rd–4th decade	Peak in 3rd decade	Peak in 3rd–4th decade



**Fig 5.** Olfactory neuroblastoma is characterized by sheets of solid growth & moderate pleomorphism, tumor is positive with Synaptophysin and S100 positive in sustentacular cells.



**Fig 6:** SNUC characterized by sheets and nests, comprised of cells that have a high nuclear to cytoplasmic ratio, vesicular to open nuclear chromatin and often prominent nucleoli showing strongly positive with pancytokeratin.

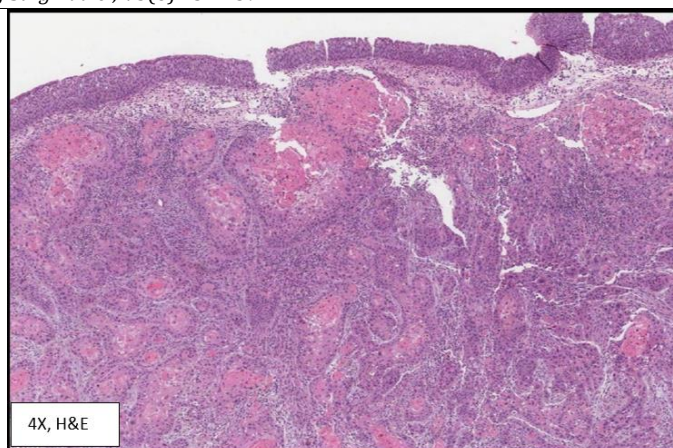


Figure 6: Keratinizing squamous cell carcinoma of the sinonasal tract shows invasive nests of atypical squamous cells with intercellular bridges and keratin pearl formation.

## CONCLUSION

The present study provides a comprehensive overview of the histopathological spectrum of lesions in the nasal cavity and paranasal sinuses. Non neoplastic lesions, particularly chronic rhinosinusitis and inflammatory nasal polyps, were the most prevalent. Among neoplasms, benign tumors outnumbered malignant ones, with inverted papilloma and hemangioma being the most frequent. Because clinical presentations often overlap, histopathological examination remains the cornerstone for definitive diagnosis. Awareness of key histological patterns, including rare entities such as REAH and inverted papilloma, is crucial to avoid misdiagnosis and ensure appropriate management.

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