



Original Article

Clinicopathological study of sinonasal tract lesions

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ABSTRACT

Background: Sinonasal tract is a histologically complex structure, resulting in a wide spectrum of non-neoplastic and neoplastic lesions encountered in clinical practice. Though presenting clinical features and imaging techniques help to reach a presumptive diagnosis, histopathological examination remains mainstay for definitive diagnosis and appropriate management. This study aimed to examine the histopathological spectrum of sinonasal tract lesions, classify neoplasms as per World Health Organization 2022 classification of tumours of nasal cavity and paranasal sinuses and correlate histopathological findings with clinical presentation.

Material and Methods: This was a five-year study (3 year retrospective and 2 year prospective study) conducted from January 2020 to December 2024 at Department of Pathology, Gulbarga Institute of Medical Sciences, Kalaburagi, Karnataka, India. Relevant clinical features, histopathological diagnoses along with classification were recorded.

Results: A total of 151 cases of sinonasal tract lesions were included with ages ranging from 9 to 77 years and male to female ratio of 1.15:1. Non neoplastic lesions constituted 125 (83%) cases and neoplastic lesions accounted for 26 (17%). Nasal obstruction was the most common presenting symptom. Inflammatory polyp was the most common non-neoplastic lesion followed by fungal sinusitis. Benign tumours (15%) constituted sinonasal papilloma, capillary hemangioma, schwannoma, cemento-ossifying fibroma and pleomorphic adenoma. Malignant neoplasms (2%) included Olfactory Neuroblastoma, Squamous cell carcinoma and Adenoid cystic carcinoma. Clinicopathological correlation was achieved in 77.4% cases.

Conclusion: An integrated clinicopathological approach and awareness of diverse variety of histopathological lesions is vital for categorizing sinonasal tract lesions. Histopathological analysis is crucial for appropriate patient management.

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INTRODUCTION

The nasal cavity along with frontal, ethmoid, maxillary and sphenoid sinuses, is collectively referred to as the sinonasal region.¹ The lesions of the nasal cavity and paranasal sinuses were first described by Hippocrates, and Galen.² Hippocrates the “Father of Rhinology”, gave a graphic description of nasal polypoidal masses as early as 460-370 B.C.³

Incidence of sinonasal tract lesions ranges from 1% to 4% across various regional populations with higher incidence seen in Asia and Africa.^{1,4,5} Clinically, patients with sinonasal tract lesions present with a nasal mass

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causing nasal obstruction in 70% to 97% cases, followed by nasal discharge, epistaxis and smell disturbances.^{2,3,6} Nonneoplastic and neoplastic conditions can present with similar clinical features. The presenting clinical features and imaging techniques aid in forming a preliminary diagnosis. A definitive diagnosis requires histopathological examination.

Sinonasal tract is a histologically complex structure, comprising epithelium, lymphoid tissue, mesenchymal tissue, minor salivary glands, olfactory tissue, cartilage and bone.⁷ Due to this histological diversity, a variety of non-neoplastic and neoplastic conditions are commonly encountered in clinical practice.² The majority of the lesions are non-neoplastic and should be differentiated clinically from neoplastic lesions. Awareness of the diversity of lesions and their correct recognition avoids unnecessary radical surgeries.⁸

This study aimed to examine the histopathological spectrum of sinonasal tract lesions at a tertiary care hospital, to categorize these into non-neoplastic and neoplastic lesions, to classify the neoplastic lesions as per the WHO 2022 classification of Tumours of Nasal Cavity and Paranasal Sinuses and to correlate them with clinical presentation.⁹

MATERIAL AND METHODS

This was a descriptive cross-sectional study conducted in the Department of Pathology at a Tertiary care center for a duration of 5 years. This study included a three years retrospective period from January 2020 to December 2022 and a two year prospective period from January 2023 to December 2024. Ethical approval was obtained from the Institutional Ethical Committee.

Samples of sinonasal tract lesion from patients of all age groups and gender received in histopathology laboratory during the study period were included. Poorly preserved samples, traumatic nasal lesions, lesions of nasal skin and lesions from patients on chemotherapy/radiotherapy were excluded from the study.

For the retrospective study, paraffin blocks and slides of sinonasal tract lesions were retrieved from the Department of Pathology records and related clinical details were retrieved from the Medical Records Department. For the prospective study, sinonasal tract lesion specimens received in the histopathology laboratory were processed and sections were stained with haematoxylin and eosin as per standard operating procedures. Special stains like Grocott's Methenamine silver (GMS), Periodic Acid-Schiff (PAS) were done wherever required.¹⁰

After the study of microscopic features and correlation with clinical and radiological findings, the final histopathology diagnosis was given. Lesions were categorized as non-neoplastic and neoplastic. Neoplasms were further categorized as per the WHO Classification of Tumours of Nasal Cavity and Paranasal Sinuses (2022).⁹

The data obtained were compiled and entered in Microsoft Excel spreadsheet and analyzed using SPSS Software version 16 in the form of range and percentages.

RESULTS

A study of 151 cases of sinonasal tract lesions was done. These constituted 24% of Ear, Nose and Throat (ENT) specimens received. Total ENT specimens constituted 5.5% of all specimens received in the department during the study period.

In the present study cases were noted in the age range of 9 to 77 years. The majority of the non-neoplastic lesions were seen in the third decade of life, whereas neoplastic lesions were seen predominantly in the second and fourth decades of life.

Of the 151 cases, 81 (53.64%) were male and 70 (46.35%) were female with male to female ratio of 1.15:1. This male predominance was seen in both non-neoplastic and neoplastic lesions.

Non-neoplastic lesions of sinonasal tract (n = 125, 82.7%) were more common compared to neoplastic lesions (n = 26, 17.3%). Benign neoplasms (n = 23, 15.23%) were more common than malignant neoplasms (n=3, 1.9%). Nasal obstruction was the most common presenting symptom seen in 147 (97%) cases followed by rhinorrhea in 40 (26.5%) cases. Other presenting clinical features were epistaxis seen in 17 cases and headache in 15 cases. Neoplastic and non-neoplastic lesions presented with identical clinical features.

The majority of the lesions were unilateral lesions (137, 90.72%) as compared to bilateral lesion (14, 9.27%). Right sided lesions (78, 51.65%) were more common than left sided lesions.

Non-Neoplastic Lesions

A total of 125 cases of non-neoplastic lesions were observed. Inflammatory nasal polyps (81, 64.8%) were the most common non-neoplastic lesion followed by fungal sinusitis (39, 31.2%), chronic rhinosinusitis (4, 3.2%) and one case of rhinoscleroma (0.8%).

Histological findings of inflammatory nasal polyps showed that majority of polyps (82.7%) were lined by pseudostratified columnar epithelium with edematous stroma. Mixed inflammatory cell infiltrate constituting lymphocytes, plasma cells, eosinophils and macrophages was seen in all the polyps. Predominant eosinophilic infiltration was seen in only four cases, however these cases had no clinical features suggestive of allergy.

Fungal sinusitis included 38 cases of Mucormycosis and one case of Aspergillosis. Mucormycosis cases were more common during the study period from May 2021 to July

2022 in COVID positive immunocompromised patients. Histopathological examination of these cases showed broad, aseptate hyphae of mucormycosis with irregular branching at right angle, chronic inflammatory cell infiltrates. Areas of necrosis and angioinvasion by the fungus was seen (Figure 1). Diagnosis of fungal sinusitis was confirmed with help of special stain PAS and GMS.

In the case of Rhinoscleroma, histopathological examination revealed a dense chronic inflammatory cell infiltrates composed of lymphocytes, plasma cells and foamy histiocytes (Mikulicz cells). PAS positive rod-shaped bacilli, consistent with *Klebsiella rhinoscleromatis* were noted with special stain PAS, thus confirming the diagnosis.

Neoplastic Tumors

In the present study, neoplastic lesions accounted for 26 (17.2%) of total cases. Among neoplastic lesions, benign neoplasms, 23 (15.23%) were more common compared to malignant neoplasms 3 (1.9%). Table 1 shows the distribution of sinonasal neoplasms as per the WHO 2022 Classification of Tumours of Nasal Cavity and Paranasal Sinuses.

Table 1: Distribution of sinonasal neoplasms as per WHO 2022 classification (n = 26)

Tumor	No. of Cases [n (%)]
Sinonasal Papilloma	9 (34.6)
Capillary Hemangioma	9 (34.6)
Cemento Ossifying Fibroma	2 (7.69)
Schwannoma	2 (7.69)
Pleomorphic Adenoma	1 (3.84)
Olfactory Neuroblastoma	1 (3.84)
Non-Keratinising Squamous cell carcinoma	1 (3.84)
Adenoid cystic carcinoma	1 (3.84)

Benign Neoplasms

The most common benign neoplasms were Sinonasal papilloma and Capillary hemangioma. The majority of Sinonasal Papilloma were of the inverted papilloma type (seven cases), with one each of exophytic Sinonasal Papilloma (Fig 2) and Oncocytic Sinonasal Papilloma.

Oncocytic Papilloma had mucosa lined by eosinophilic cells with interspersed mucous cells containing inspissated mucin. Mucosal cells showed mild nuclear pleomorphism with occasional mitotic figures and neutrophilic infiltration in mucosa (Fig 3).

Two cases (8.7%) each of Cemento-ossifying fibroma arising from periodontium and Schwannoma arising from peripheral nerve sheath were seen. Cemento-ossifying fibroma noted in maxillary sinuses showed fibrous stroma containing osteoid and cementum like calcification (Fig 4).

Also a single case of Pleomorphic adenoma arising from minor salivary gland was noted in right side of nasal septum.

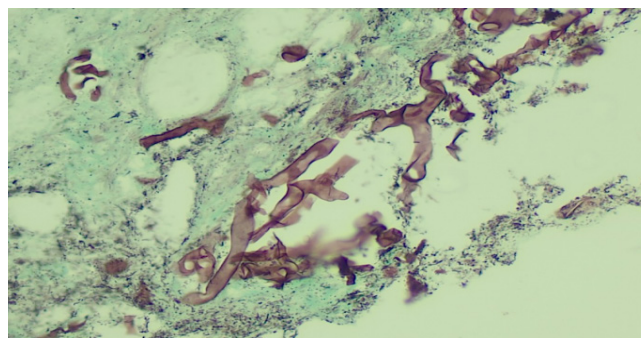


Fig 1: Mucormycosis Sinusitis- showing broad aseptate fungal hyphae with irregular branching at right angles (GMS, 40X)

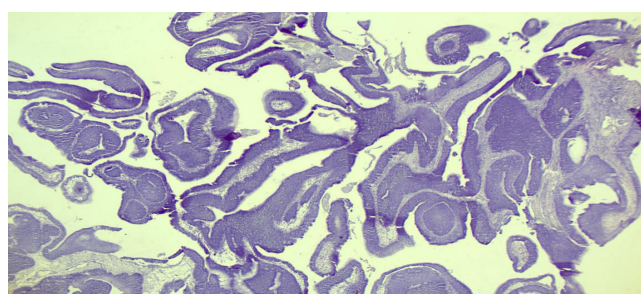


Fig 2: Exophytic Sinonasal Papilloma - showing exophytic papillary projections lined by squamous epithelium (H&E, 20X)

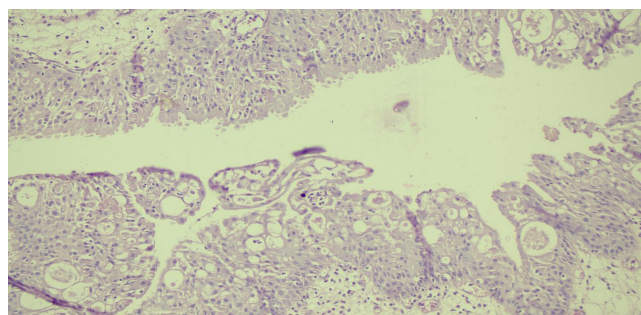


Fig 3: Oncocytic Sinonasal Papilloma- lined by eosinophilic cells with interspersed mucous cells containing inspissated mucin and acute inflammatory cell infiltrate (H&E, 20X)

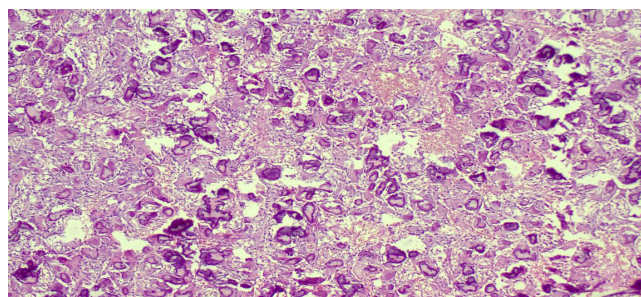


Fig 4: Cemento-ossifying Fibroma- showing variably sized cementum like ossicles embedded in fibrous stroma (H&E, 20X)

Malignant Neoplasms:

Three cases of malignant neoplasms were noted. One case of Olfactory Neuroblastoma arising from the specialized

olfactory neuroepithelium present in superior region of nasal cavity was noted in a 9-year-old male child. Microscopy revealed a round cell tumour with prominent mitosis and minimum fibrillary matrix and was graded as Grade 3 (Hyams grading).

A case of Adenoid Cystic Carcinoma arising from the minor salivary gland was noted infiltrating maxillary sinus in a 45-year-old female. Histopathological examination revealed tumor cells cribriform pattern with microcystic like spaces.

A case of Non-keratinizing Squamous Cell Carcinoma infiltrating nasal cavity and maxillary sinus was seen in a 64-year-old male.

Clinicopathological correlation of sinonasal tract lesions

In the present study, clinicopathological correlation was noted in 77.4% of cases of sinonasal tract lesions. Clinical diagnosis and histopathological diagnosis were identical in 82.4% of non-neoplastic lesions and 53.84% of neoplastic lesions. The clinicopathological discordance was more in neoplastic lesions (46.15%) as compared to non-neoplastic lesions (17.6%).

DISCUSSION

In the present study, sinonasal tract lesions were noted in patients aged nine years to 77 years with the third to fifth decade being the most commonly affected. These findings were similar to studies done by Lathi et al.³ (second to fourth decade), Jagannadham et al.¹¹ (third to fifth decade) and Zinzala et al.¹² (fifth to sixth decade).

A marginally higher prevalence in male seen in the present study (M:F=1.15:1) was similar to studies done by Birare et al.¹ (1.12 :1) and Lathi et al.³ (1.54 :1).

Non neoplastic and neoplastic lesions presented with similar nonspecific clinical features, causing difficulty in differentiation based solely on clinical presentation.

Clinically, most sinonasal tract lesions form polypoidal masses leading to common complaint of nasal obstruction. Nasal obstruction was noted in 97.3% cases by Lathi et al.³ and 93% by Birare et al.¹, similar to present study (97%). Rhinorrhea was reported as the second most common complaint in 49%, 70% and 26% cases by Lathi et al.³, Birare et al.¹ and present study respectively.

In the present study conducted in northern Karnataka region, non-neoplastic lesions constituted the majority of cases 125 (82.7%), followed by benign neoplasms 26 (15.23%) and malignant neoplasms 3(1.9%). Lathi et al.³ observed 80 (71.42%) non-neoplastic lesions, 19 (16.96%) benign neoplasms, and 13 (11.6%) malignant neoplasms in western Maharashtra region, while Parajuli et al.² reported 119 (80%) non-neoplastic, 19 (12.83%) benign, and 10 (6.75%) malignant cases in Nepal. Similarly, Birare et al.¹ noted 82 (78.8%) non-neoplastic, 16 (15.4%) benign, and 6 (5.76%) malignant lesions in central Maharashtra region.

Table 2 shows that inflammatory polyps were the most common non-neoplastic lesion in the present study. Similar percentage was noted in studies done by Birare et al.¹ and Jagannadham et al.¹¹ respectively.

Table 2: Comparison of incidence of non-neoplastic lesions with other studies

Study Group	Sample Size	Inflammatory Nasal Polyps [n (%)]	Fungal Sinusitis [n (%)]	Rhinoscleroma [n (%)]
Birare et al ¹ (2019)	104	74 (71.2%)	3 (2.9%)	1 (0.9%)
Jagannadham et al ¹¹ (2019)	88	27 (69.2%)	4 (10.3%)	2 (5.1%)
Zinzala DK et al ¹² (2021)	106	4 (3.8%)	57 (53.8%)	1 (0.9%)
Present Study (2024)	151	81 (64.8%)	39 (25.8%)	1 (0.6%)

Zindala DK et al.¹² had lower frequency of inflammatory polyp and a higher frequency of Mucormycosis cases as their one-year study period (from Jan 2021 to Dec 2021) was predominantly conducted during COVID-19 pandemic.

Lesions noted in other studies like rhinosporidiosis, granulomatous inflammatory lesion were not seen in present study. This might be due to geographic and ethnic differences as rhinosporidiosis is a chronic granulomatous infection caused by an aquatic parasite *Rhinosporidium seeberi*, transmitted through contact with contaminated water in ponds. In India, it is endemic in Tamil Nadu, Kerala, Pondicherry, Andhra Pradesh, West Bengal and Chhattisgarh.¹³

In the present study, there were 23 benign neoplastic lesions. Sinonasal Papilloma and Capillary Hemangioma were most frequent, each accounting for nine (5.96%) cases. This finding is comparable to the study by Khan et al.¹⁴ which reported 15(6.25%) cases of Sinonasal Papilloma and 11(4.58%) cases of Capillary Hemangioma, and to Lathi et al.³, who found 7(6.25%) cases of Sinonasal Papilloma and 9(8%) cases of Capillary Hemangioma. Similarly, Birare et al.¹ reported 8(7.69%) cases of Capillary Hemangioma and 3(2.88%) cases of Sinonasal Papilloma. Schwannoma was observed in two (1.32%) cases in the present study, which is in concordance with the findings of Birare et al.¹ (1, 0.96%) and Dewan et al.¹⁵ (3, 3.65%), whereas Khan et al.¹⁴ did not report any cases. Cemento-ossifying fibroma was seen in two (1.32%) cases which aligns with the findings of Dewan

et al.¹⁵ (2, 2.43%). One case of Pleomorphic Adenoma was noted in the present study (0.66%), comparable to the 0.96% reported by Birare et al.¹ and the 1.66% reported by Khan et al.¹⁴, while Dewan et al.¹⁵ did not report any cases.

Malignant tumours in sinonasal tract account for less than 1% of all malignancies in body as per global cancer statistics and is about 3% of all head and neck malignancies.¹⁶⁻¹⁹

Incidence of malignant sinonasal neoplasms was low in studies done by Birare et al.¹ (6, 5.76%) and Lathi et al.³ (13, 11.6%) similar to the present study. In the present study, three cases of malignancy consisting of Olfactory Neuroblastoma, Squamous Cell Carcinoma and Adenoid Cystic Carcinoma were noted. Similar findings were reported in the study by Birare et al.¹ who reported three cases of squamous cell carcinoma, one case each of Olfactory Neuroblastoma, Acinic Cell Carcinoma and Primitive Neuroectodermal Tumour. However, in the study by Lathi et al.³, out of 13 cases (11.6%) of malignancy, 12 were Squamous Cell Carcinoma.

Difference in risk factors across geographical locations influenced by varying socioeconomic conditions, exposure to carcinogens, and the wide variety of tumour types seen in the sinonasal tract might explain the difference in incidence and types of malignancies observed in the above studies.

Sharma R et al.²⁰ and Birare et al.¹ found clinicopathological correlation in 84% and 88% cases each. This finding is similar to the result of the present study. Discordance is largely due to the significant overlap of clinical features between benign and early stage malignant neoplasms, making purely clinical differentiation challenging.

Limitation of the study

The low incidence of malignant neoplasms makes it difficult for a single institution to accumulate a sufficient number of cases and draw meaningful conclusions with the true incidence.

CONCLUSION

The present study elaborates on the wide variety of sinonasal tract lesion. These lesions are predominantly noted in third to fifth decades of life. Non-neoplastic lesions are more common than neoplastic lesions and malignant lesions are rare.

Non-neoplastic and neoplastic lesions commonly present as nasal obstruction causing difficulty in clinical categorization. Non-neoplastic lesions like invasive fungal sinusitis can clinically and radiologically mimic malignancy. Hence, histopathological examination is essential.

Awareness of diverse histopathological spectrum of sinonasal tract lesions is important for accurate diagnosis and typing, which is crucial for optimum patient treatment

and care.

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Conflict of Interest: None

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