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Original Research Article

Demographic and Histopathological Profile of Sinonasal and Nasopharyngeal Lesions Along with Relevant Immunohistochemical Markers in a Tertiary Care Hospital: A Retrospective and Prospective Analysis

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Abstract

Introduction: Sinonasal and nasopharyngeal lesionscomprise a heterogeneous group of conditions ranging from inflammatory polyps to aggressive malignant neoplasms. Their overlapping clinical presentations often necessitate histopathological evaluation for definitive diagnosis.

Aim: To evaluate the clinicopathological spectrum of sinonasal and nasopharyngeal lesions in a tertiary care hospital, with emphasis on demographic distribution, clinical presentation, and histopathological categorization.

Materials and Methods: This retrospective plus prospective observational study included 317 patients presenting with sinonasal masses. Biopsy and excision specimens were processed using routine histopathological techniques, with special stains and immunohistochemistry applied where necessary. Lesions were classified into non-neoplastic and neoplastic categories. Demographic and clinical data were analyzed, and statistical associations were assessed using the Chi-square test.

Results: Of 317 cases, 224 (71%) were non-neoplastic and 93 (29%) were neoplastic. Inflammatory polyps were the most common non-neoplastic lesion (79.02%), while sinonasal papilloma (51.57%) and hemangioma (26.56%) predominated among benign neoplasms. Squamous cell carcinoma was the leading malignant tumor (27.58%). The majority of cases occurred in the 31–40 year age group (22.71%), with a male predominance (59.94%). Age showed a statistically significant association with lesion type ($p = 0.0004$), whereas gender did not ($p = 0.628$).

Conclusion: Sinonasal and nasopharyngeal lesions are predominantly non-neoplastic, with inflammatory polyps being the most frequent. Benign neoplasms outnumber malignant ones, though squamous cell carcinoma remains the most common malignancy. Histopathological evaluation is indispensable for accurate diagnosis, and regional variations such as higher frequencies of fungal and granulomatous lesions highlight the importance of local epidemiological data in guiding clinical management.

Keywords: Sinonasal lesions, Inflammatory polyp.

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Introduction

The sinonasal tract is a complex anatomical region that plays a vital role in respiration, olfaction, and filtration of inhaled air. Owing to its constant exposure to environmental agents, allergens, infectious organisms, and carcinogens, it is prone to a wide spectrum of pathological conditions ranging from simple inflammatory polyps to aggressive malignant neoplasms[1]. Clinically, these lesions often present with overlapping symptoms such as nasal obstruction, rhinorrhea,

epistaxis, and facial swelling, which makes clinical and radiological differentiation challenging[2]. Consequently, histopathological examination remains the gold standard for accurate diagnosis and classification[3].Non-neoplastic lesions constitute the majority of sinonasal pathologies, with inflammatory polyps being the most common worldwide[4]. Infectious conditions such as fungal rhinosinusitis, rhinosporidiosis, and granulomatous diseases like rhinoscleroma and leprosy are also encountered, particularly in tropical and developing regions[5]. These lesions, though benign, can cause significant morbidity due to recurrent obstruction, secondary infections, and cosmetic deformity. Neoplastic lesions of the sinonasal tract, though less frequent, are clinically significant because of their potential for local invasion, recurrence, and impact on survival. Benign tumors such as papillomas, hemangiomas, and angiofibromas are relatively common, whereas malignant tumors—including squamous cell carcinoma, adenoid cystic carcinoma, and sinonasal undifferentiated carcinoma—are rare but aggressive[6]. Malignant sinonasal tumors account for less than 1% of all cancers and about 3% of head and neck malignancies, yet they pose considerable diagnostic and therapeutic challenges due to their late presentation and proximity to vital structures[7].Demographic factors such as age and gender have been shown to influence the occurrence of sinonasal lesions. Several studies report a male predominance and peak incidence in the third to fifth decades of life[8]. However, regional variations exist, with infectious and granulomatous lesions being more prevalent in endemic areas[9].

Given the clinical overlap and diverse pathology, systematic evaluation of sinonasal lesions in terms of demographic distribution, clinical presentation, and histopathological spectrum is essential for guiding appropriate management strategies[10]. The present study was undertaken to analyze the clinicopathological profile of sinonasal & nasopharyngeal lesions in a tertiary care hospital setting, with emphasis on the relative frequency of non-neoplastic and neoplastic conditions, their demographic correlations, and statistical significance. Such data are expected to contribute to regional epidemiological understanding and aid clinicians in early diagnosis and treatment planning.

Aims and Objectives

Aim

To evaluate the clinicopathological spectrum of sinonasal & nasopharyngeal lesions in patients presenting to a tertiary care hospital, with emphasis on demographic distribution, clinical presentation, and histopathological categorization.

Objectives

1. To analyze the relative frequency of non-neoplastic and neoplastic sinonasal & nasopharyngeallesions.
2. To study the age, gender distribution & clinical presentations of patients with sinonasal & nasopharyngeal lesions.
3. To classify neoplastic lesions into benign and malignant categories and identify their histological subtypes.
4. To assess statistical associations between demographic parameters and lesion type.

Material and Methods

Study Design and Setting: This was a retrospective as well as prospective observational study conducted in the Department of Pathology, Smt. Kashibai Navale Medical College & General Hospital, Pune, Maharashtra over a period of 2019 to 2022. All patients presenting with sinonasal &nasopharyngeallesions and undergoing biopsy or surgical excision were included.

Inclusion Criteria

1. Specimens of Patients with sinonasal masses received in the department of pathology over the period of 9 years (January 2012 to December 2020)
2. Cases where adequate tissue samples were available for histopathological examination.

Exclusion Criteria

1. Patients with inadequate or autolyzed tissue samples.
2. Cases with incomplete clinical data.
3. Patients unwilling to participate in the study.

Sample Collection and Processing

Biopsy specimens and surgically excised sinonasal masses were collected in 10% buffered formalin. Gross examination was performed to assess size, shape, consistency, and surface characteristics. Representative sections were processed, embedded in paraffin, and stained with hematoxylin and eosin (H&E). Special stains were employed wherever necessary (e.g., PAS for fungal elements, Ziehl–Neelsen for acid-fast bacilli).

Histopathological Evaluation

All specimens obtained from sinonasal and nasopharyngeal lesions were subjected to meticulous histopathological examination. Following fixation in 10% buffered formalin, tissues were processed using standard paraffin embedding techniques. Sections of 4–5 µm thickness were cut and stained routinely with hematoxylin and eosin (H&E). Gross examination was performed prior to sectioning, noting the size, shape, consistency, and surface characteristics of each lesion.

For cases where routine staining was insufficient to establish a definitive diagnosis, special histochemical stains were employed. Periodic acid–Schiff (PAS) and Gomori methenamine silver (GMS) stains were used to highlight fungal organisms in suspected cases of fungal rhinosinusitis. Ziehl–Neelsen (ZN) stain was applied to detect acid-fast bacilli in lesions with granulomatous morphology suggestive of leprosy or tuberculosis.

Mucicarmine stain was utilized in selected cases to demonstrate mucin-secreting cells, aiding in the diagnosis of mucoepidermoid carcinoma. Each lesion was classified into non-neoplastic and neoplastic categories. Non-neoplastic lesions were further sub-grouped into inflammatory, infectious, and other miscellaneous conditions. Neoplastic lesions were categorized as benign or malignant, based on established histological criteria. Benign tumors such as papillomas, hemangiomas, and angiofibromas were identified by their characteristic architecture, cellular morphology, and absence of invasive features. Malignant tumors—including squamous cell carcinoma, adenoid cystic carcinoma, and sinonasal undifferentiated carcinoma—were diagnosed based on features such as cellular atypia, increased mitotic activity, necrosis, and evidence of invasion into adjacent structures. In addition to routine morphological assessment, attention was given to the pattern of growth, stromal reaction, vascularity, and presence of inflammatory infiltrates, which provided supportive diagnostic clues. Immunohistochemistry (IHC) was selectively employed in diagnostically challenging cases, particularly for differentiating poorly differentiated carcinomas, lymphomas, and small round cell tumors. Markers such as cytokeratin, CD3, CD20, and CD99 were used to confirm lineage and establish definitive diagnosis where required. All histopathological findings were correlated with clinical and radiological data to ensure diagnostic accuracy. Final diagnoses were documented systematically, and each case was included in the statistical analysis for comparative evaluation of demographic and clinical parameters.

Clinical Data Collection: Demographic details including age, gender, and clinical presentation were recorded. Relevant clinical history and radiological findings were correlated with histopathological diagnosis.

Statistical Analysis: Data were compiled and analyzed using descriptive statistics. Frequencies and percentages were calculated for categorical variables. Chi-square test was applied to assess associations between demographic parameters (age, gender) and lesion type. A p-value of <0.05 was considered statistically significant.

Observation and Result

Table 1: Demographic and Clinical Profile of Patients

Sr No	Parameter	Non-neoplastic 224 (71 %)	Neoplastic 93 (29 %)	Total 317 (100 %)
1	Age Group			
	a) 0 to 10 years	7 (2.21%)	3 (0.95%)	10 (3.15%)
	b) 11 to 20 years	43 (13.57%)	11 (3.47%)	54 (17.04%)
	c) 21 to 30 years	41 (12.93%)	7 (2.21%)	48 (15.14%)
	d) 31 to 40 years	51 (16.09%)	21 (6.62%)	72 (22.71%)
	e) 41 to 50 years	39 (12.30%)	16 (5.05%)	55 (17.36%)
	f) 51 to 60 years	26 (8.20%)	18 (5.68%)	44 (13.88%)
	g) 61 to 70 years	13 (4.10%)	17 (5.36%)	30 (9.46%)
	h) >70 years	4 (1.26%)	0 (0%)	4 (1.26%)
2	Gender			
	a) Male	137 (43.23%)	53 (16.73%)	190 (59.94%)
	b) Female	87 (27.45%)	40 (12.62%)	127 (40.06%)
3	Symptoms			
	a) Nasal block	160 (50.47%)	55 (17.36%)	215 (67.83%)
	b) Nasal mass	45 (14.20%)	44 (13.88%)	89 (28.08%)
	c) Bleeding (Epitaxies)	1 (0.32%)	1 (0.32%)	2 (0.63%)
	d) Watery nasal discharge	9 (2.84%)	2 (0.63%)	11 (3.47%)
4	Type	-		
	a) Benign		64 (20 %)	-
	b) Malignant		29 (9 %)	

The study included a total of 317 cases, of which 224 (71%) were non-neoplastic lesions and 93 (29%) were neoplastic lesions. Age distribution revealed that the majority of cases occurred in the 31–40 year age group (22.71%), followed by 21–30 years (15.14%) and 41–50 years (17.36%), indicating that sinonasal lesions are most prevalent in young to middle-aged adults. Pediatric cases (0–

10 years) were relatively uncommon (3.15%). Gender analysis showed a male predominance (59.94%) compared to females (40.06%).

Symptomatology demonstrated that nasal obstruction was the most frequent presenting complaint (67.83%), followed by nasal mass (28.08%), while epistaxis and watery nasal discharge were rare (0.63% and 3.47% respectively).

Among neoplastic lesions, benign tumors accounted for 64 cases (20%) and malignant tumors for 29 cases (9%), highlighting that benign neoplasms were more common than malignant ones.

Table 2: Distribution of Non-Neoplastic Sinonasal Lesions

S. N.	Non-neoplastic lesions	No of cases (N)	Percentage (%)	% of total cases(n=317)
1	Inflammatory sino-nasal Polyps	177	79.02%	55.83%
2	Fungal rhinosinusitis	16	7.14%	5.05%
3	Rhinosporidiosis	07	3.13%	2.21%
4	Rhinoscleroma	06	2.68%	1.89%
5	Epidermal inclusion cyst	05	2.23%	1.58%
6	Chronic non-specific inflammation	05	2.23%	1.58%
7	Antrochoanal polyp	05	2.23%	1.58%
8	Lepromatous leprosy	03	1.34%	0.94%
Total N (%)		224	100%	70.66%

Within the non-neoplastic group, inflammatory sinonasal polyps were the predominant lesion (79.02% of non-neoplastic; 55.83% of total cases), followed by fungal rhinosinusitis (7.14%) and rhinosporidiosis (3.13%). Rare conditions such as rhinoscleroma, epidermal inclusion cyst, chronic non-specific inflammation, antrochoanal polyp, and lepromatous leprosy were also observed in small proportions.

Table 3: Distribution of Neoplastic Sinonasal Lesions

Sr No	Neoplastic lesions	No of cases (n)	Percentage (%)	% of total cases(n=317)
1	Benign Lesions	64	20.19%	20.19%
	a) Sinonasal papilloma	33	51.57%	10.41%
	b) Hemangioma	17	26.56%	5.36%
	c) Nasopharyngeal angiofibroma	05	7.81%	1.58%
	d) Pleomorphic adenoma	04	6.25%	1.26%
	e) Schwannoma	04	6.25%	1.26%
	f) Neurofibroma	01	1.56%	0.32%
2	Malignant lesions	29	9.15%	9.15%
	a) Squamous cell carcinoma	08	27.58%	2.53%
	b) Adenoid cystic carcinoma	05	17.24%	1.58%
	c) Sinonasal undifferentiated carcinoma	04	13.79%	1.28%
	d) Basal cell carcinoma	04	13.79%	1.28%
	e) Hodgkin lymphoma (nodular sclerosis)	01	3.45%	0.31%
		01	3.45%	0.31%
	f) Mucoepidermoid carcinoma	01	3.45%	0.31%
	g) Nasopharyngeal carcinoma	01	3.45%	0.31%
	h) T cell lymphoma	01	3.45%	0.31%
	i) PNET / Ewing's sarcoma	01	3.45%	0.31%
	j) Sinonasal glomangiopericytoma	01	3.45%	0.31%
	k) Anaplastic large cell T-cell lymphoma	01	3.45%	0.31%
	l) Angiosarcoma			
Total N (%)		93	29.34%	29.34%

In the neoplastic category, benign lesions formed the majority (68.8%), with sinonasal papilloma (51.57%) and hemangioma (26.56%) being the most frequent. Other benign tumors included nasopharyngeal angiofibroma, pleomorphic adenoma, schwannoma, and neurofibroma. Malignant lesions comprised 31.2% of neoplastic cases, with squamous cell carcinoma being the most common (27.58%), followed by adenoid cystic carcinoma (17.24%) and sinonasal undifferentiated carcinoma (13.79%). Less frequent malignancies included basal cell carcinoma, Hodgkin lymphoma, mucoepidermoid carcinoma, nasopharyngeal carcinoma, T-cell lymphoma,

PNET/Ewing's sarcoma, glomangiopericytoma, anaplastic large cell lymphoma, and angiosarcoma.

Table 4: Comparative Analysis of Demographic Parameters in Non-Neoplastic and Neoplastic Lesions

Sr No	Parameter	Non-neoplastic 224 (71 %)	Neoplastic 93 (29 %)		Chi square	P value
			Benign Lesions	Malignant lesions		
1	Age Group				24.16	0.0004 (S)
	a) 0 to 10 years	7 (2.21%)	3 (0.95%)	0 (0%)		
	b) 11 to 20 years	43 (13.57%)	9 (2.84%)	2 (0.63%)		
	c) 21 to 30 years	41 (12.93%)	6 (1.89%)	1 (0.32%)		
	d) 31 to 40 years	51 (16.09%)	15 (4.73%)	6 (1.89%)		
	e) 41 to 50 years	39 (12.30%)	11 (3.47%)	5 (1.58%)		
	f) 51 to 60 years	26 (8.20%)	13 (4.10%)	5 (1.58%)		
	g) 61 to 70 years	13 (4.10%)	7 (2.21%)	10 (3.15%)		
	h) >70 years	4 (1.26%)	0 (0%)	0 (0%)		
2	Gender				0.92	0.628 (NS)
	a) Male	137 (43.23%)	35 (11.04%)	18 (5.68%)		
	b) Female	87 (27.45%)	29 (9.15%)	11 (3.47%)		

Statistical analysis (Table 4) revealed a significant association between age distribution and type of lesion (Chi-square = 24.16, p = 0.0004), suggesting that age plays an important role in differentiating non-neoplastic from neoplastic lesions. However, gender distribution was not statistically significant (p = 0.628), indicating that both benign and malignant lesions occur across genders without marked disparity.

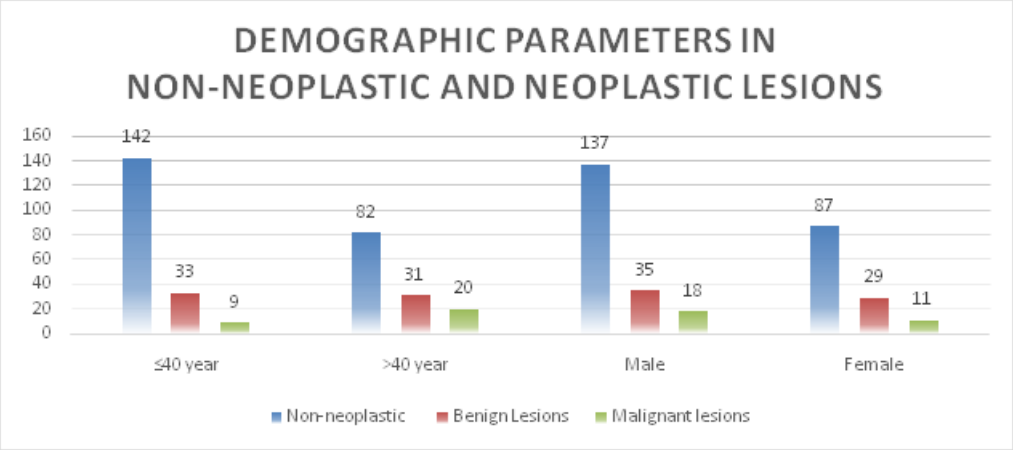

Figure 1: Comparative Analysis of Demographic Parameters in Non-Neoplastic and Neoplastic Lesions

Discussion

The present study highlights the predominance of non-neoplastic lesions (71%) over neoplastic lesions (29%) in the sinonasal tract. This finding is consistent with the observations of Karthikeyan et al., who reported that inflammatory polyps constituted the majority of sinonasal masses in their cohort, underscoring the high burden of benign inflammatory pathology in routine practice[11]. Similarly, studies from other Indian centers have documented inflammatory polyps as the most frequent lesion, followed by fungal infections and granulomatous conditions [12].

The predominance of non-neoplastic lesions in our study reinforces the importance of histopathological evaluation, as clinical features alone are insufficient to differentiate between inflammatory and neoplastic conditions. In terms of age distribution, our study found the highest incidence in the 31–40 year age group (22.71%), followed by 21–30 years and 41–50 years. This pattern is comparable to the findings of Bist et al., who reported peak incidence in the third and fourth decades of life [13]. The significant association between age and lesion type (p = 0.0004) in our study suggests that neoplastic lesions tend to occur more frequently in older age groups, whereas non-neoplastic lesions are more common in younger adults. This age-related trend may reflect cumulative exposure to environmental carcinogens and delayed clinical presentation in malignant cases. Gender analysis in our study revealed a male predominance (59.94%), which aligns with the findings of Vaidya et al., who also reported a higher incidence of sinonasal lesions in males [14]. However, statistical analysis showed no significant association between gender and lesion type (p =

0.628), indicating that while males are more frequently affected overall, both benign and malignant lesions occur across genders without marked disparity.This suggests that gender may influence susceptibility to sinonasal pathology in general but does not necessarily determine the nature of the lesion. Among neoplastic lesions, benign tumors (68.8%) outnumbered malignant ones (31.2%), with sinonasal papilloma being the most common benign neoplasm (51.57%). This finding is in agreement with the study by Saha et al., who documented papillomas and hemangiomas as the leading benign tumors of the sinonasal tract [15]. Malignant tumors in our study were dominated by squamous cell carcinoma (27.58%), followed by adenoid cystic carcinoma and sinonasal undifferentiated carcinoma.

Similar patterns have been reported in global literature, where squamous cell carcinoma consistently emerges as the most frequent sinonasal malignancy [16]. The relatively high proportion of squamous cell carcinoma in our cohort underscores its clinical importance, given its aggressive nature and poor prognosis. An interesting insight from our study is the relatively higher proportion of fungal rhinosinusitis (7.14%) compared to some Western studies, where fungal infections are less commonly reported. This may reflect regional climatic and environmental factors, particularly in tropical and humid regions, which favor fungal colonization and infection [17]. Likewise, rare granulomatous conditions such as rhinosporidiosis and lepromatous leprosy were observed, highlighting the influence of endemic diseases in shaping the spectrum of sinonasal pathology in our population.

Overall, the findings of our study corroborate the existing literature while also emphasizing regional variations. The predominance of non-neoplastic lesions, the male preponderance, and the dominance of squamous cell carcinoma among malignant tumors are consistent with prior studies. However, the relatively higher frequency of fungal and granulomatous lesions in our cohort provides valuable epidemiological insight, reinforcing the need for region-specific data to guide clinical suspicion and diagnostic strategies.

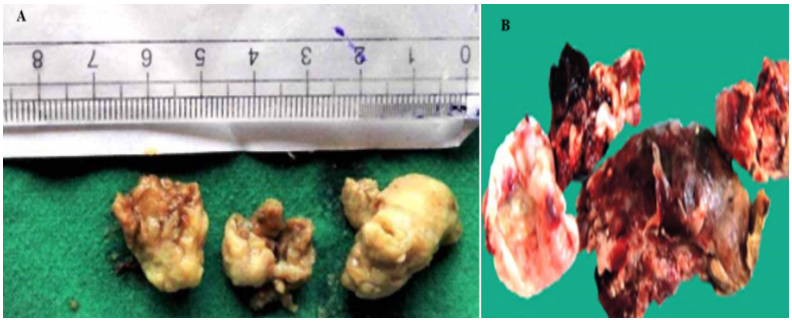

Figure 1: Gross photograph A) sinonasal polyp B) angiosarcoma

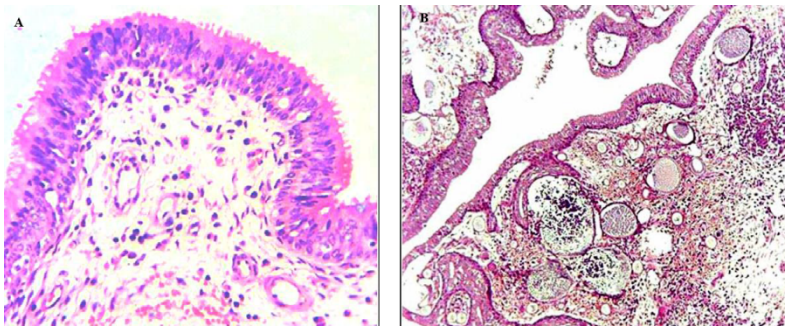

Figure 2: Photomicrograph H&E, A) sinonasal polyp B) rhinosporidiosis

Conclusion

Sinonasal and nasopharyngeal lesions in this study were predominantly non-neoplastic, with inflammatory polyps being the most common. Neoplastic lesions formed a smaller proportion, with benign tumors outnumbering malignant ones; papillomas were the leading benign lesion, while squamous cell carcinoma was the most frequent malignancy. Age showed a significant association with lesion type, whereas gender did not. These findings reaffirm the importance of histopathological evaluation for accurate diagnosis and highlight regional variations, particularly the higher frequency of fungal and granulomatous lesions. Systematic clinicopathological assessment remains essential for guiding timely management and improving patient outcomes.

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