A clinicopathological study of masses arising from sinonasal tract and nasopharynx in north Bengal population with special reference to neoplasms

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Introduction
Various masses arise from sinonasal tract and nasopharynx, which are embryologically distinct.
Aims and objectives
A cross-sectional study for 1 year in a tertiary care hospital was carried out.
Materials and methods
Either incisional biopsy or surgical excision sample with proper history and imaging was collaborated.
Results
The total percentage of these tumors during the 1-year period was 3.52%. A total of four nonspecific lesions, 49 non-neoplastic masses, 17 benign neoplastic masses, and 24 malignant neoplastic masses were found.
Conclusion
Non-neoplastic masses were the majority in number (52.12%). Among the neoplastic masses (43.61%), malignant neoplasms constituted 25.53%, a vast majority being nasopharyngeal carcinomas. Immunohistochemistry further helped to differentiate undifferentiated carcinomas into epithelial and lymphoid malignancies.

Keywords:
Clinicopathological study, Mass, Sinonasal tract, Nasopharynx

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Introduction

The nasal cavity and paranasal sinuses are collectively referred to as the sinonasal tract, which is anatomically and embryologically distinct from the nasopharynx [1]. The nasal cavity, paranasal sinuses, and nasopharynx form a functional unit, which is lined by stratified squamous, respiratory-type pseudostratified columnar, and transitional (intermediate) epithelium [2,3]. The mucosa of nasal cavity and paranasal sinuses is referred to as the Schneiderian membrane [4]. Sinonasal tract and nasopharyngeal lesions can be non-neoplastic (polyps, bacterial and fungal infections) and neoplastic (benign and malignant). Rhinosporidiosis is endemic in India, but it has also been reported in other parts of the world [5]. Foreign body-type granulomas can develop in nasal mucous membranes [6]. Mucocele can be cystic and clinically mimic malignant process [7]. Respiratory epithelial adenomatoid hamartomas are grossly similar to polyps but are distinctly classified [8]. Although the sinonasal epithelium is an uncommon site for neoplastic processes, it can present an entire range of both epithelial and nonepithelial tumors, epithelial tumors being three times more frequent than the nonepithelial tumors [9]. Inverted papillomas and squamous cell carcinomas are the most frequent neoplasms [10]. Lymphoid tumors involving this area are mainly non-Hodgkin's lymphomas (NHLs) reported to be higher in Asian countries [11]. NHLs of the sinonasal tract are heterogeneous diseases that can be clinically aggressive [12]. Nasopharyngeal cancer with a strong correlation with Epstein–Barr virus infection, reported to be quite high in Nagaland, is a leading cause of death in south-east Asia [13]. Schmincke type of nasopharyngeal carcinoma (NPC) poses a diagnostic problem [2]. However, as a whole sinonasal tumors and malignancies constitute only a very small fraction of solid tumors [10]; with increasing industrialization and with increase in the burning of additional fossil fuels and rising air pollution rates, we are likely to see an increasing incidence of sinonasal tumors [14]. There are hardly any reports in the Indian literature on this issue [10], specially from the population of North Bengal. Therefore, this present study was conducted to look for the occurrence of various masses arising from the sinonasal tract and nasopharynx, to categorize them, and to correlate between their clinical mode of presentation and histological types.

Aims and objectives

The aim of the study was to find the occurrence of various masses arising from the sinonasal tract and

nasopharynx, to categorize them into nonspecific, non-neoplastic, and neoplastic (benign and malignant), and also to find the correlation between various clinical modes of presentation and histological types of these masses and etiological factors in case of non-neoplastic lesions (fungal infections). In case of neoplastic masses, the role of immunohistochemistry (IHC) in differentiating epithelial malignancies from lymphomas was seen.

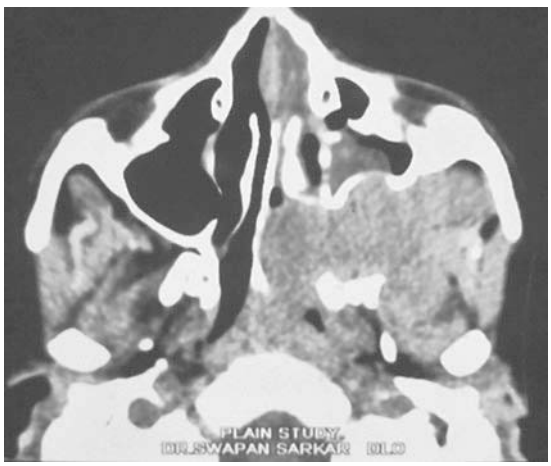
Materials and methods

A cross-sectional study was performed in a tertiary care set up, in the Department of Pathology with the study population of patients attending Department of Otorhinolaryngology with masses arising from sinonasal tract and nasopharynx and undergoing either incisional biopsy or surgical excision during the study period of 1 year from 1 February 2010 to 31 January 2011. Ethics Committee approval and written informed consent from patients were taken before the study was conducted. Sample size was 94. Sample design included surgically excised specimens of the masses (may or may not be FNAC proved/suggested) arising from sinonasal tract and nasopharynx presenting for the first time and incisional biopsy specimens of these masses along with proper history and imaging study of the patient. Any mass invading the region from adjoining areas, masses that have recurred, nonavailability of proper history and imaging study, and patients who have received chemotherapy and/or radiotherapy in the past due to lesion in this zone were excluded from the sample. After receiving the specimens, the patient particulars were noted and grossing was performed followed by proper fixation and processing. Sections were stained by Hematoxylin and eosin (H&E) for histopathological study and accordingly classified into different categories provisionally. Various histological findings were correlated with the clinical and imaging parameters. Some sections of non-neoplastic masses were further stained by special stain (PAS) for the demonstration of fungal organisms. Sections of neoplastic masses were further stained by immunohistochemical procedures using antibodies against cytokeratin (CK) and leukocyte common antigen (LCA) as and when needed to arrive to a final diagnosis.

Results and analysis

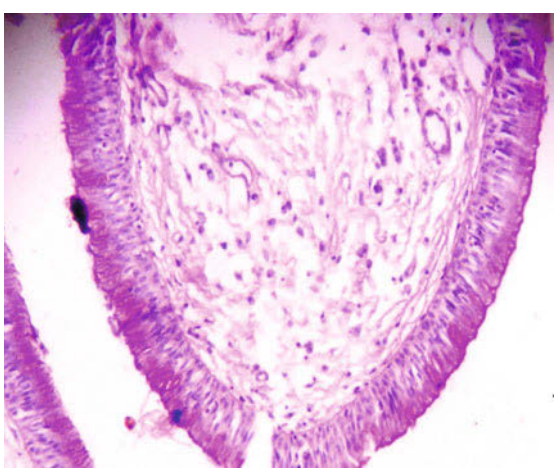
A total of 94 cases of sinonasal and nasopharyngeal masses were received among total number of 2670 histopathological specimens (Figs. 1–11).

Figure 1



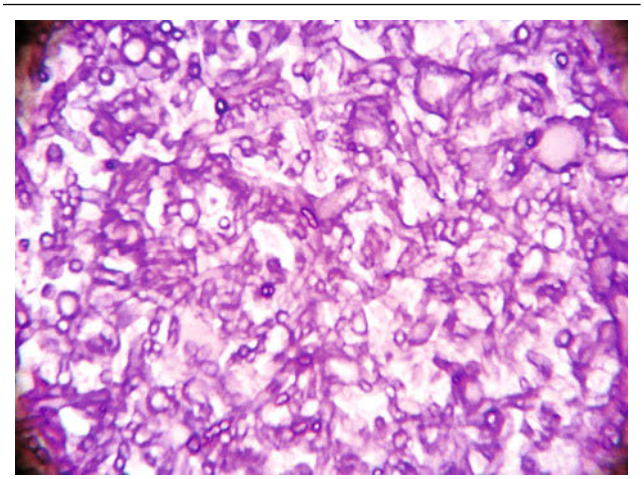
CT scan of nasopharyngeal angiofibroma. CT, computed tomography.

Figure 2



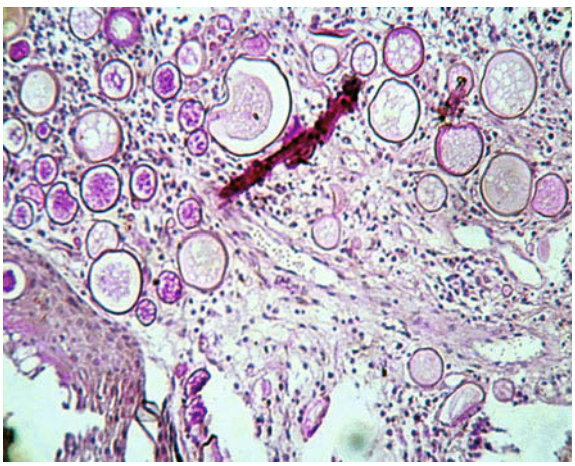
Allergic polyp.

Figure 3



Aspergillus spp. (PAS, ×400).

Figure 4

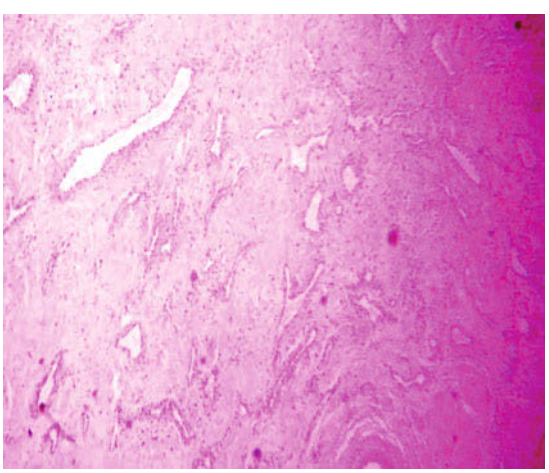


Rhinosporidiosis (PAS, ×40).

Figure 5

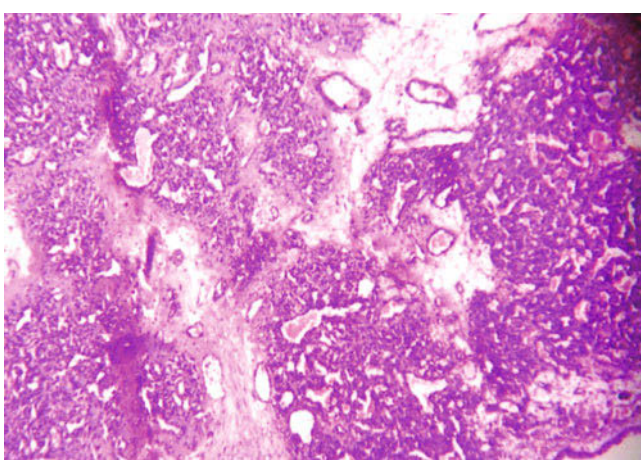
Specimen of nasopharyngeal angiofibroma.

Figure 6



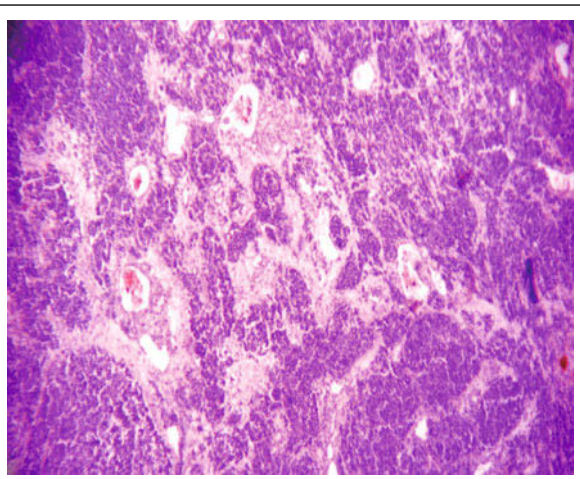
Nasopharyngeal angiofibroma (H and E, ×100).

Figure 7



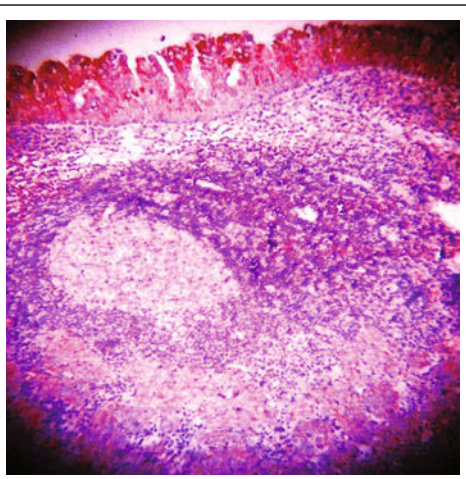
Lobular capillary hemangioma (H and E, ×40).

Figure 8



Olfactory neuroblastoma (H and E, ×40).

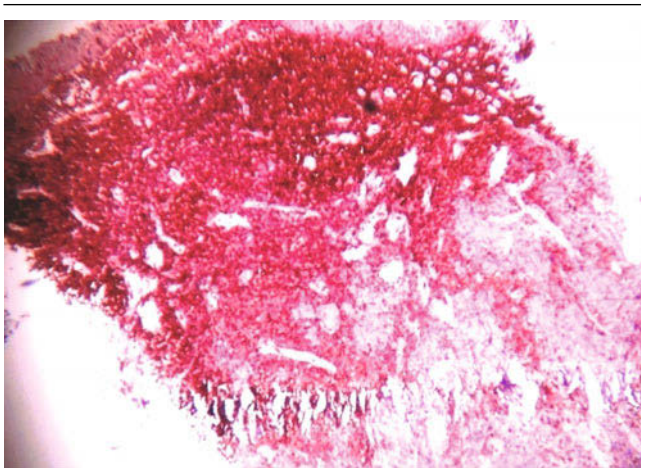
Figure 9



Pan-CK-positive nasal mass and epithelium. CK, cytokeratin.

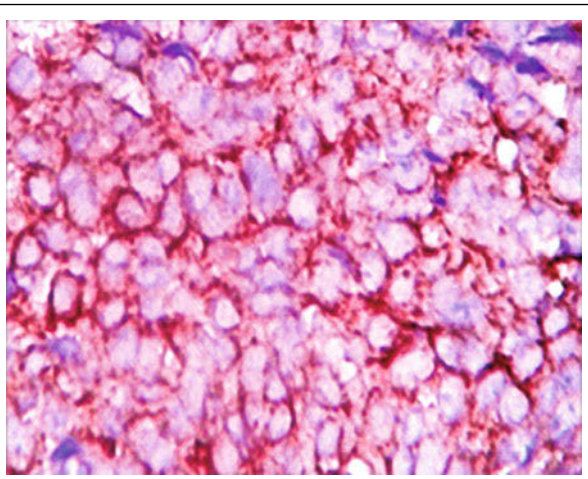
Therefore, the total percentage of these masses during the 1-year period was 3.52%. A total of four nonspecific lesions, 49 non-neoplastic masses, 17 benign neoplasms, and 24 malignant neoplasms were found (Table 1). Majority of non-neoplastic masses occurred in the age group of 11–30 years. The highest number of cases of benign neoplastic and malignant neoplastic masses occurred in the age group of 11–20 years and 51–60 years, respectively. A male predominance was seen in both benign and malignant neoplastic categories. Most of the patients presented with nasal obstruction followed by nasal mass, rhinorrhea, and epistaxis. Of the total 49 cases of non-neoplastic masses, 36 cases were of different kinds of nasal polyps, three cases were of rhinosporidiosis, one case each of mucormycosis, candidasis, aspergillosis, histoplasmosis, and fibrous dysplasia, two cases of fibromatosis, and three cases of cysts (Table 2). Among 17 cases of benign neoplasms, five cases each of inverted papilloma and lobular capillary hemangioma, four cases of angiofibroma, two cases of pleomorphic adenoma, and one case of neurofibroma were found (Table 3). Of the total 24 cases of malignant neoplasms, one case each were of nasal squamous cell carcinoma, olfactory neuroblastoma, and rhabdomyosarcoma, two cases each of nasal adenoid cystic carcinoma and nasopharyngeal non-Hodgkins lymphoma (NP-NHL), three cases of sinonasal undifferentiated carcinoma (SN-UDC), four cases of nonkeratinizing NPC, and 10 cases of nasopharyngeal undifferentiated carcinoma (NP-UDC) (Table 4). Ten cases of NP-UDC, three cases of SN-UDC, and two cases of NP-NHL were further subjected to IHC using Pan-CK and LCA markers (Table 5). As we can see from Table 5, five cases of NPC, two cases of NP-UDC, and five cases of NP-NHL were diagnosed of a total of 12 cases of nasopharyngeal malignant neoplasms, which were subjected to IHC. Of the three cases of SN-UDC, one was found to be SN-SCC, one was found to be SN-NHL, and one case was diagnosed as SN-UDC as such, after immunohistochemical procedures. In our study, we found one case of SN-NHL, which was previously diagnosed as SN-UDC. We also found five cases of NP-NHL, among which three cases were previously diagnosed as NP-UDC. A similarity (concordance) of 73% and a difference (discordance) of 27% were found between histopathological diagnosis and final diagnosis after immunohistochemical confirmation (Table 6). Among seven cases of fungal sinonasal masses, three cases of rhinosporidiosis were not associated with any immunodeficient states. One case each of aspergillosis, mucormycosis, candidiasis, and histoplasmosis were associated with immunodeficient states such as steroid therapy, diabetes, and HIV positivity, respectively. An association of immunodeficient states with fungal sinonasal masses was found with a P value of 0.02 (Table 7).

Figure 10



LCA-negative nasal mass and epithelium with LCA-positive lymphoid aggregates (the same specimen as on left panel). LCA, leukocyte common antigen.

Figure 11



Inset (Pan-CK-positive cells). CK, cytokeratin.

Table 1 Total no of neoplasms at a glance

Total number of various histopathological specimens received	Total number of sinonasal and nasopharyngeal masses received [*n* (%)]	Total nonspecific lesions [*n* (%)]	Total non-neoplastic masses [*n* (%)]	Total neoplastic masses [*n* (%)]	
				Benign	Malignant
2670	94 (3.52)	4 (4.25)	49 (52.12)	17 (18.08)	24 (25.53)

Table 2 Distribution of non-neoplastic masses

Type	Number of cases (*N* = 49) [*n* (%)]
Antrochoanal polyp	14 (28.57)
Ethmoid polyp	10 (20.40)
Sinonasal polyp	11 (22.44)
Nasopharyngeal polyp	1 (2.04)
Rhinosporidiosis	3 (6.12)
Mucormycosis	1 (2.04)
Aspergillosis	1 (2.04)
Candidiasis	1 (2.04)
Histoplasmosis	1 (2.04)
Fibrous dysplasia	1 (2.04)
Fibromatosis	2 (4.08)
Cysts	3 (6.12)

Table 3 Distribution of benign sinonasal and nasopharyngeal neoplasms

Type	Number of cases (*N* = 17) [*n* (%)]
Pleomorphic adenoma	2 (11.76)
Inverted papilloma	5 (29.41)
Lobular capillary hemangioma	5 (29.41)
Angiofibroma	4 (23.52)
Neurofibroma	1 (05.88)

Table 4 Distribution of malignant sinonasal and nasopharyngeal neoplasms

Primary H/P type	IHC (Pan-CK and LCA)	Number of cases (*N* = 24) [*n* (%)]
Nasal-squamous cell carcinoma	Not done	1 (4.16)
Nasal-adenoid cystic carcinoma	Not done	2 (8.33)
Nasal-olfactory neuroblastoma	Not done	1 (4.16)
Nasal-rhabdomyosarcoma	Not done	1 (4.16)
Sinonasal undifferentiated carcinoma	Done	3 (12.50)
Nonkeratinizing nasopharyngeal carcinoma	Not done	4 (16.66)
Nasopharyngeal undifferentiated carcinoma	Done	10 (41.66)
Nasopharyngeal non-Hodgkin lymphoma	Done	2 (8.33)

CK, cytokeratin; H/P, histopathological; IHC, immunohistochemistry; LCA, leukocyte common antigen.

Table 5 Differentiation and categorization of sinonasal and nasopharyngeal undifferentiated carcinomas and non-Hodgkins lymphoma by IHC

Primary H/P diagnosis	IHC		Final diagnosis
	Pan-CK	LCA	
SN-UDC	+	–	SN-SCC
SN-UDC	–	+	SN-NHL
SN-UDC	–	–	SN-UDC
NP-UDC	–	+	NP-NHL
NP-UDC	–	+	NP-NHL
NP-UDC	–	+	NP-NHL
NP-UDC	+	–	NPC
NP-UDC	+	–	NPC
NP-UDC	+	–	NPC
NP-UDC	+	–	NPC
NP-UDC	+	–	NPC
NP-UDC	–	–	NP-UDC
NP-UDC	–	–	NP-UDC
NP-NHL	–	+	NP-NHL
NP-NHL	–	+	NP-NHL

CK, cytokeratin; H/P, histopathological; IHC, immunohistochemistry; LCA, leukocyte common antigen; NHL, non-Hodgkins lymphoma; NP, nasopharyngeal; NPC, nasopharyngeal carcinoma; SN, sinonasal; UDC, undifferentiated carcinoma.

Table 6 Difference between H/P diagnosis and final diagnosis after IHC confirmation

Total (*N* = 15)	
Concordance (%)	Discordance (%)
11	04
73.33	26.66

H/P, histopathological; IHC, immunohistochemistry.

Table 7 Association of immunodeficient states with fungal sinonasal masses among all non-neoplastic masses

Total non-neoplastic masses (*N* = 49)	Immunodeficient states (present)	Immunodeficient states (absent)
Fungal sinonasal masses (*N* = 7)	4	3
Others (*N* = 42)	6	36

Risk ratio = 0.5, odds ratio = 0.125. *P* value (by the Fisher exact probability test) = 0.02 (significant).

Discussion

The sinonasal tract is anatomically distinct from nasopharynx but forms a common functional unit and is lined by Schneiderian membrane [1–4]. A variety of non-neoplastic and neoplastic conditions involve the nasal cavity, paranasal sinuses, and nasopharynx, and these are very common lesions encountered in clinical practice. A large number of diseases affecting these structures are due, in major part, to many of the specialized tissues, each with its own aberrations that exist in the region [15]. The presenting features and symptomatology and advanced imaging technique help to reach a presumptive diagnosis, but histopathological examination remains the mainstay of final definitive diagnosis. Thus, careful histological workup is essential for a correct diagnosis and timely intervention. Four cases of granulation tissue were found in the nasal cavity, and thus were kept in the category of nonspecific lesions. It is important to recognize the range of non-neoplastic lesions in this region and to differentiate them from neoplastic lesions because of different treatment modality and emotional burden on the patient. Zafar *et al.* [16] found that, of the polypoidal lesions, nasal polyp was the commonest, which is very much consistent with our study (36 cases of nasal/NP polyps of a total of 49 non-neoplastic cases). Zafar *et al.* [16], Dasgupta *et al.* [17], and Tondon *et al.* [18] found an incidence of 20.7, 17.4, and 10 cases of non-neoplastic masses per year, respectively, over a long and variable study period. The researchers found a total of 49 non-neoplastic masses over a study period of 1 year.

The peak age of presentation, sex ratio, and clinical presentation were similar to that observed by these authors.

Rhinosporidiosis is a chronic granulomatous disease caused by *Rhinosporidium seeberi*. Although a variety of sites may be affected, the principal site of infection is the nasal mucosa; the disease is endemic in India and Sri Lanka. Samaddar and Sen [19] studied 116 cases of rhinosporidiosis in the Medical College at Bankura from January 1983 to December 1987 and showed more prevalence in male patients and in the second decade of life. In our study, we found three cases of rhinosporidiosis, of which two were male patients and one was female patient. Two patients were in their third decade of life and one in the first decade. Chopra *et al.* [20] reported five cases of invasive fungal sinusitis in sphenoid sinus, of which three patients had aspergillosis and two patients had mucormycosis. In our study, we found one case each of aspergillosis, mucormycosis, candidiasis, and histoplasmosis, the first two being in the maxilla and the last two being in the nasal cavity. Challa *et al.* [21] identified predisposing conditions in 19 patients of 63 cases of fungal rhinosinusitis with diabetes mellitus as the commonest and *Aspergillus* spp. as the commonest etiologic agent. In our study, we found diabetes to be associated with mucormycosis, corticosteroid intake being associated with aspergillosis, and HIV infection being associated with candidiasis and histoplasmosis. Our study also found an association of immunodeficient states with fungal sinonasal masses ($P = 0.02$).

According to Tsai *et al.* [22], fibrous dysplasia in sinonasal tract is rare. However, we found one case involving maxilla, which is nearly similar to the study by Zafar *et al.* [16] who found two cases during the study period of 7 years. In our study, we found three cysts similar to the study by Zafar *et al.* [16] who found two of them.

Although the sinonasal epithelium is an uncommon site for neoplastic processes, it can present an entire range of both epithelial and nonepithelial tumors, epithelial tumors being three times more frequent than nonepithelial tumors [9]. Panchan *et al.* [10] studied 120 specimens of sinonasal tumors in 10 years in which 69 cases were epithelial tumors (59.2%). Inverted papillomas and squamous cell carcinomas were the most frequent neoplasms. This is in support of our study that has found 23 cases of epithelial neoplasms (56.09%) and 18 cases of nonepithelial neoplasms of a total of 41 neoplasms. A total of two cases of sinonasal squamous cell carcinomas (33.33%) and one case of SN-UDC were found in a total of six sinonasal carcinomas. SN-UDC is a distinctive clinicopathologic entity that must be distinguished from other, less aggressive sinonasal neoplasms such as olfactory neuroblastoma [23]. Buchwald *et al.* [24] studied 82 patients with sinonasal papillomas diagnosed from 1975 to 1993 histologically and showed 58 cases of inverted papillomas including five cases of associated carcinoma. In our study, we found five cases of inverted papillomas of 17 cases of benign neoplasms (29.41%), and no other histopathological types of papillomas were reported. Manning and Batsakis [25] studied that salivary-type neoplasms of the nasal cavity and paranasal sinuses are numerically dominated by adenoid cystic carcinomas and pleomorphic adenomas. All others, benign or malignant, are rarely encountered and are usually biologically and histologically low grade. Our study found two cases of pleomorphic adenomas in a total of 17 benign neoplasms (11.76%) and two cases of adenoid cystic carcinoma in a total of six cases of sinonasal carcinomas (33.33%).

Nasopharyngeal angiofibroma, restricted to young-aged male patients, arising from posterolateral wall of roof of nose, can also grow into nasal cavity and has got definite endocrinal influence [2]. We found four cases of angiofibroma; all of them were male patients.

Studies based on NPC cases registered in most of the cancer diagnosis and treatment centers in North-Eastern region of India during 1988–1989 and computed with the population structure of the region indicated that the incidence of NPC is quite high in Nagaland (about 4.3 per 100 000 people/year). Taking into consideration the 1981 census figure for the population structure of Nagaland, the incidence of NPC was nearly 6.2 and 2.1/100 000 male and female population, respectively [26,27]. Furthermore, hospital-based studies on the pattern of cancer incidence in Nagaland revealed that, of 149 biopsies of suspected cancer cases, 37 were histopathologicaly positive for malignancies and about two-third of them were with cancer of nasopharynx [28]. In our study, we found a total of 10 cases of NP-UDC (41.66%), four cases of nonkeratinizing-NPC (16.66%), and two cases of NP-NHL (08.33%) of 24 cases of malignant neoplasms. A total of 12 cases of NP malignant neoplasms were further subjected to IHC and final diagnosis was reached. Five cases of NPC, two cases of NP-UDC, and five cases of NP-NHL were diagnosed. It is very difficult to locate, and random biopsies are needed from fossa of Rossenmullar to obtain specimen. Schmincke type of NPC poses a diagnostic problem due to its microscopic similarity with large cell malignant lymphoma, where nuclear morphology and IHC play important role [2].

Ye *et al*. [29] studied 41 cases of nasopharyngeal and 13 cases of nasal malignant lymphoma, histopathologically and immunohistochemically. All cases were NHL, and they concluded that, as the large cell type of lymphoma was predominant, the differential diagnosis from undifferentiated carcinoma is important and is facilitated by the use of immunostaining methods. In our study, we found one case of sinonasal NHL, which was previously diagnosed as SN-UDC. We also found five cases of NP-NHL, of which three cases were previously diagnosed as NP-UDC. A concordance of 73.33% and discordance of 26.66% were found between histopathological diagnosis and final diagnosis after immunohistochemical confirmation.

Conclusion

Sinonasal and nasopharyngeal masses, both non-neoplastic and neoplastic, constituted 3.52% of the total surgical pathology specimens during the study period of 1 year. Nasal obstruction was the presenting symptom in majority of the patients. Non-neoplastic masses were the majority in number (52.12%), and polyps contributed to the bulk. Fungal lesions although small in number had a significant association with immunodeficient states (P = 0.02). Of the neoplastic masses (43.61%), malignant neoplasms constituted 25.53%, a vast majority being NPC. IHC further helped to differentiate undifferentiated carcinomas into epithelial and lymphoid malignancies. A discordance of 26.66% and a concordance of 73.33% were found between histopathological and immunohistochemical diagnosis. Proper histopathological diagnosis is the mainstay, whereas immunohistochemical methods play a major role in differentiating undifferentiated carcinomas. Correct diagnosis will direct the clinician toward the proper management. This study served all the purposes mentioned above.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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