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Original Research Article

Histopathological Spectrum of Salivary Gland Neoplasms in a Tertiary Care Center

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Abstract:

Background: Salivary gland neoplasms are uncommon tumors with diverse histopathological patterns and variable biological behavior.

Objectives: To study the histopathological spectrum of salivary gland neoplasms in patients presenting to a tertiary care center.

Methods: A descriptive observational study was conducted on 70 histopathologically confirmed cases of salivary gland neoplasms, which were classified according to established diagnostic criteria and analyzed for demographic and anatomical distribution.

Results: Benign tumors constituted 57.14% of cases, with pleomorphic adenoma being the most common lesion, while mucoepidermoid carcinoma was the most frequent malignant tumor. The parotid gland was the most commonly involved site.

Conclusion: Salivary gland neoplasms exhibit wide histopathological diversity, and detailed histopathological evaluation remains essential for accurate diagnosis and effective clinical management.

Keywords: Salivary gland neoplasms, Histopathology, Pleomorphic adenoma, Mucoepidermoid carcinoma.

Introduction

Salivary gland neoplasms represent a rare and histologically diverse group of tumors arising from the major and minor salivary glands. Although they constitute less than 2% of all human tumors, these neoplasms pose significant diagnostic and therapeutic challenges due to their wide morphological spectrum and variable biological behavior [1]. The majority of salivary gland tumors occur in the major glands, particularly the parotid, followed by the submandibular and minor glands, with distinct patterns of benign and malignant neoplasms observed across different anatomical sites [2].

Accurate histopathological classification is crucial for determining appropriate clinical management, as benign tumors such as pleomorphic adenoma exhibit a different prognosis and treatment strategy compared with malignant counterparts such as mucoepidermoid carcinoma and adenoid cystic carcinoma [3].

The World Health Organization (WHO) classification of head and neck tumors, updated to its fifth edition in 2022, provides a comprehensive framework that incorporates both morphological and emerging molecular criteria for salivary gland neoplasms [4]. Recent updates include the recognition of novel entities and refined diagnostic categories, which have improved the precision of pathological interpretation and have implications for prognostic assessment and therapeutic decision-making [5]. Advances in immunohistochemical and molecular techniques have further enhanced diagnostic accuracy, allowing pathologists to distinguish between closely related tumor subtypes and to identify specific genetic abnormalities associated with certain lesions [6].

Epidemiological studies from tertiary care centers globally demonstrate that benign tumors, especially pleomorphic adenomas and Warthin tumors, remain the most common salivary gland neoplasms, while malignant tumors such as mucoepidermoid carcinoma, adenoid cystic carcinoma, and acinic cell carcinoma account for a smaller but clinically significant proportion of cases [7].

The age distribution of these tumors typically peaks in the fourth to sixth decades of life, with slight gender variations noted in some series [8].

Additionally, regional variations in tumor frequency and histological patterns have been reported, emphasizing the importance of localized studies to inform clinical practice and resource allocation in specific populations [9].

Despite advances in classification and diagnostic modalities, the histopathological spectrum of salivary gland neoplasms continues to evolve, with emerging entities and controversial categories requiring ongoing investigation. Understanding the relative distribution of these neoplasms within a tertiary care setting provides valuable insights for clinicians and pathologists alike, facilitating early diagnosis, appropriate surgical planning, and tailored postoperative management [10]. Therefore, the present study was undertaken to evaluate the histopathological spectrum of salivary gland neoplasms in patients presenting to a tertiary care center.

Material and Methods

This hospital-based descriptive observational study was conducted in the Department of Pathology of a tertiary care center to evaluate the histopathological spectrum of salivary gland neoplasms. The study was carried out over a defined study period after obtaining approval from the Institutional Ethics Committee. All procedures were performed in accordance with ethical standards, and informed consent was obtained from patients wherever required. A total of 70 cases of salivary gland neoplasms were included in the study. All surgically excised specimens from major and minor salivary glands received in the pathology department during the study period and diagnosed as neoplastic lesions on histopathological examination were considered for inclusion. Non-neoplastic salivary gland lesions, inflammatory conditions, cystic lesions, recurrent tumors, and inadequately preserved or insufficient biopsy specimens were excluded from the study. Relevant clinical and demographic details such as age, sex, site of lesion, and clinical presentation were obtained from requisition forms and hospital records. The specimens were fixed in 10% neutral buffered formalin, processed routinely, and embedded in paraffin wax. Sections of 3–5 micrometers thickness were cut and stained with hematoxylin and eosin for histopathological evaluation. All cases were examined microscopically and classified according to the latest World Health Organization classification of salivary gland tumors. Tumors were categorized as benign or malignant, and further subclassified based on their histological features. Special stains and immunohistochemical studies were performed wherever required to confirm the diagnosis and to differentiate morphologically overlapping entities.

The collected data were compiled and analyzed using appropriate statistical methods. Descriptive statistics were used to summarize the frequency and distribution of various salivary gland neoplasms with respect to age, gender, anatomical site, and histopathological type. Results were expressed as numbers and percentages, and the findings were presented in tables and figures for clarity and interpretation.

Results:

Table 1 shows the distribution of benign salivary gland tumors among the study population. Out of 70 cases, 40 tumors (57.14%) were benign. Pleomorphic adenoma was the most common benign tumor, accounting for 31 cases (44.29%), followed by Warthin tumor, which constituted 9 cases (12.86%). (Figure 1) These findings indicate that pleomorphic adenoma remains the predominant benign salivary gland neoplasm in the studied population.

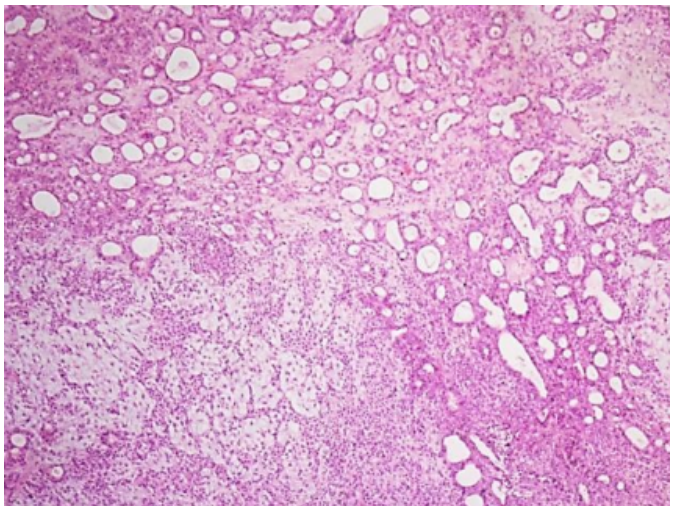


Figure 1: Microscopic appearance of Pleomorphic adenoma showing both epithelial and mesenchymal components. H&E stain

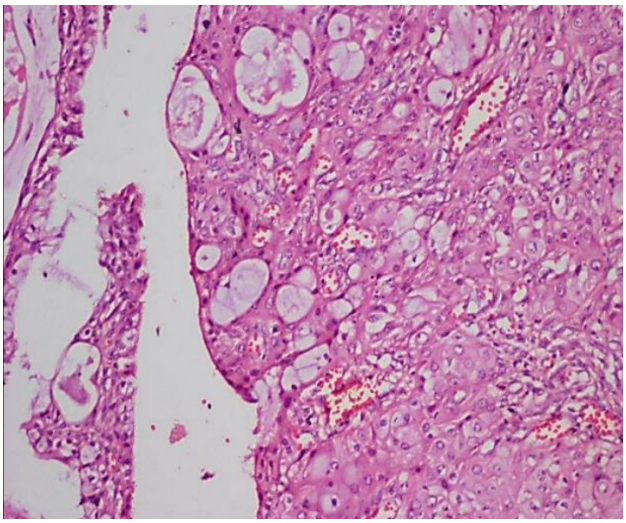


Figure 2: Microscopic appearance of Mucoepidermoid Carcinoma showing epidermoid cells and mucous cells. H&E stain

Table 2 depicts the distribution of malignant salivary gland tumors. A total of 30 cases (42.86%) were malignant. Mucoepidermoid carcinoma was the most frequently observed malignant tumor, seen in 18 cases (25.71%), followed by adenoid cystic carcinoma in 8 cases (11.43%) and acinic cell carcinoma in 4 cases (5.71%). (Figure 2) This highlights the predominance of mucoepidermoid carcinoma among malignant salivary gland neoplasms.

Table 3 presents the age distribution of patients included in the study. The majority of cases were seen in the 41–50 years age group, comprising 18 patients (25.71%), followed by the 31–40 years group with 15 patients (21.43%). Patients aged 51–60 years accounted for 12 cases (17.14%). Younger age groups below 30 years constituted 13 cases (18.57%), while patients above 60 years formed a smaller proportion, indicating a peak incidence in the middle decades of life. Table 4 illustrates the age-wise distribution of different histopathological tumor types. Pleomorphic adenoma showed maximum occurrence in the 31–50 years age group, while Warthin tumor was predominantly observed in patients above 50 years. Mucoepidermoid carcinoma showed a wider age distribution, with most cases occurring between 31–50 years. Adenoid cystic carcinoma was more frequently seen in the 41–60 years age group, whereas acinic cell carcinoma was observed predominantly in patients aged 41–50 years. Table 5 demonstrates the gender distribution according to tumor type. Overall, males constituted a higher proportion of cases. Pleomorphic adenoma showed a slight female predominance, whereas Warthin tumor was predominantly observed in males. Malignant tumors such as mucoepidermoid carcinoma and adenoid cystic carcinoma showed a higher incidence among females, while all cases of acinic cell carcinoma were observed in female patients.

Table 6 shows the anatomical distribution of salivary gland tumors. The parotid gland was the most commonly involved site, accounting for 51 cases (72.86%). Minor salivary glands were involved in 16 cases (22.86%), while submandibular gland involvement was seen in only 3 cases (4.28%). Parotid gland predominance was observed across both benign and malignant tumors, except for adenoid cystic carcinoma, which showed a higher predilection for minor salivary glands.

Table 1: Distribution of benign salivary gland tumors (n = 70)

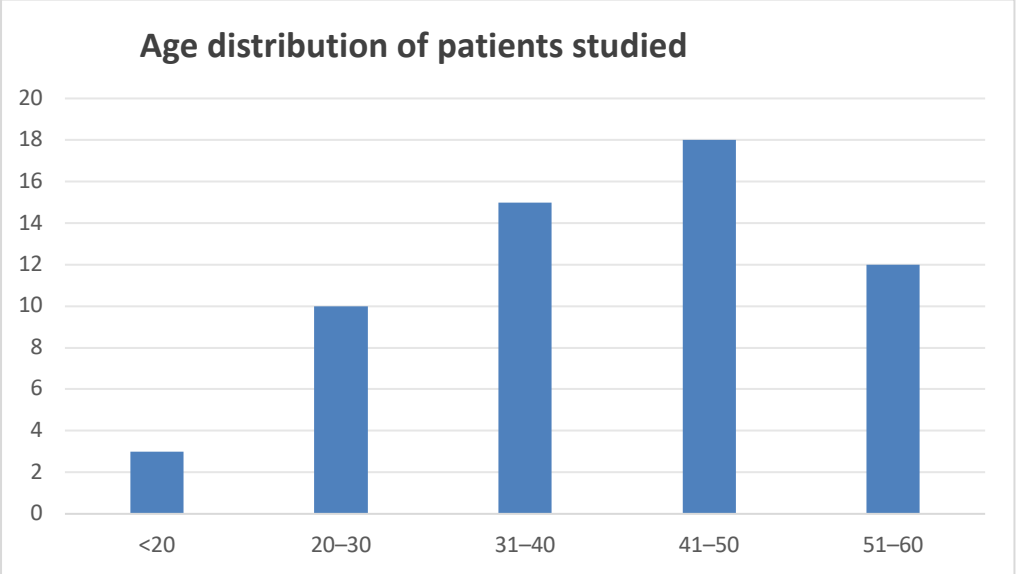
Tumor	Number of patients	Percentage (%)
Pleomorphic adenoma	31	44.29
Warthin tumor	9	12.86
Total benign tumors	**40**	**57.14**

Table 2: Distribution of malignant salivary gland tumors (n = 70)

Tumor	Number of patients	Percentage (%)
Mucoepidermoid carcinoma	18	25.71
Adenoid cystic carcinoma	8	11.43
Acinic cell carcinoma	4	5.71
Total malignant tumors	**30**	**42.86**

Table 3: Age distribution of patients studied (n = 70)

Age group (years)	Number of patients	Percentage (%)
<20	3	4.29
20–30	10	14.29
31–40	15	21.43
41–50	18	25.71
51–60	12	17.14
61–70	9	12.86
>70	3	4.29
Total	**70**	**100.00**



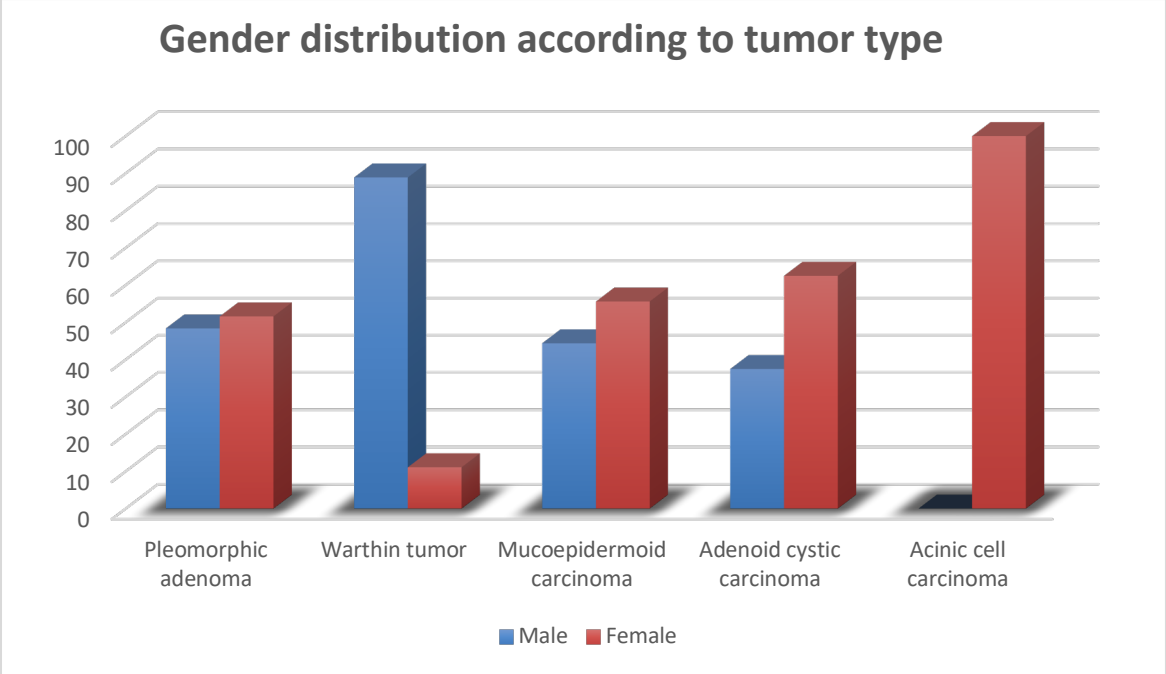
Graph 1: Age distribution of patients studied

Table 4: Age distribution according to histopathological tumor type (%)

Age group (years)	Pleomorphic adenoma	Warthin tumor	Mucoepidermoid carcinoma	Adenoid cystic carcinoma	Acinic cell carcinoma
<20	6.5	0	5.6	0	0
20–30	12.9	0	16.7	12.5	0
31–40	29.0	0	22.2	25.0	0
41–50	32.3	11.1	33.3	12.5	50.0
51–60	16.1	44.4	11.1	37.5	25.0
61–70	3.2	33.4	11.1	12.5	25.0
>70	0	11.1	0	0	0

Table 5: Gender distribution according to tumor type (%)

Gender	Pleomorphic adenoma	Warthin tumor	Mucoepidermoid carcinoma	Adenoid cystic carcinoma	Acinic cell carcinoma
Male	48.4	88.9	44.4	37.5	0
Female	51.6	11.1	55.6	62.5	100



Graph 2: Gender distribution according to tumor type

Table 6: Anatomical location of tumors according to histopathology (%)

Location	Pleomorphic adenoma	Warthin tumor	Mucoepidermoid carcinoma	Adenoid cystic carcinoma	Acinic cell carcinoma	Total (%)
Parotid gland	71.0	100	77.8	25.0	100	72.86
Submandibular gland	6.5	0	0	0	0	4.28
Minor salivary gland	22.5	0	22.2	75.0	0	22.86

Discussion

The present study provides a comprehensive overview of the histopathological spectrum of salivary gland neoplasms encountered in a tertiary care center and highlights the marked heterogeneity of these tumors. In the current series, benign tumors constituted 57.14% of cases, with pleomorphic adenoma being the most frequent lesion, accounting for 44.29% of all tumors. This predominance of pleomorphic adenoma is consistent with large institutional and population-based studies, which have consistently reported it as the most common salivary gland neoplasm due to its pluripotent cellular origin and broad morphological diversity [11]. The substantial proportion of benign tumors underscores the importance of accurate histopathological diagnosis to prevent overtreatment while ensuring appropriate surgical management.

Malignant tumors accounted for 42.86% of cases in the present study, with mucoepidermoid carcinoma emerging as the most common malignant neoplasm, followed by adenoid cystic carcinoma and acinic cell carcinoma. This distribution aligns with contemporary literature, which identifies mucoepidermoid carcinoma as the most prevalent malignant salivary gland tumor across major and minor glands [12]. Richardson et al. [13] and Ali et al. [14] also observed mucoepidermoid carcinoma to be the most common salivary gland tumor in their studies.

The relative frequency of adenoid cystic carcinoma observed in this study is clinically significant due to its known propensity for perineural invasion, local recurrence, and delayed distant metastasis, emphasizing the need for long-term follow-up in affected patients. This observation is similar to studies by Vergas et al. [15] The common location of Adenoid cystic carcinoma was in minor salivary glands this is similar to the observations done by Bhavani et al. [16] and Rewusuwan et al. [17]

Age-wise analysis revealed that the majority of salivary gland neoplasms occurred in the fourth to sixth decades of life, with a peak incidence between 41 and 50 years which was similar to study done by Hussain et al. [18] Benign tumors, particularly pleomorphic adenoma, were more common in younger and middle-aged adults, whereas malignant tumors demonstrated a tendency to occur in relatively older age groups. Similar age-related patterns have been documented in prior studies, suggesting cumulative genetic alterations

and prolonged exposure to etiological factors may contribute to malignant transformation with advancing age [19]. Gender distribution analysis showed an overall male predominance, with notable variations across tumor subtypes. Warthin tumor exhibited a strong male predilection, a finding that has been repeatedly attributed to higher tobacco exposure among males, which is a well-established risk factor for this tumor [20]. In contrast, malignant tumors such as mucoepidermoid carcinoma and adenoid cystic carcinoma demonstrated a higher incidence among females in the present study, a pattern that has been variably reported in the literature and may reflect additional hormonal or genetic influences.

The anatomical distribution of tumors in the present study showed a clear predominance of the parotid gland, which accounted for nearly three-fourths of all cases. This observation is in accordance with established data indicating that the parotid gland is the most common site for salivary gland neoplasms due to its larger volume of glandular tissue. Minor salivary gland tumors, although fewer in number, showed a higher proportion of malignancy, particularly adenoid cystic carcinoma, reinforcing the widely accepted concept that tumors arising in minor salivary glands carry a higher risk of malignant behavior [21].

Overall, the findings of the present study reaffirm the diverse histopathological nature of salivary gland neoplasms and emphasize the critical role of histopathological examination in guiding diagnosis, prognostication, and management.

The observed patterns of age, gender, and site distribution are broadly consistent with global trends while also reflecting regional variations inherent to tertiary care referral centers.

Conclusion

Salivary gland neoplasms exhibit a wide histopathological spectrum with a predominance of benign tumors, particularly pleomorphic adenoma, while malignant tumors constitute a significant proportion. Mucoepidermoid carcinoma was the most common malignant neoplasm encountered.

The majority of tumors occurred in the middle decades of life, with distinct age, gender, and site-specific patterns observed across different histological subtypes. Accurate histopathological evaluation remains essential for optimal patient management, prognostic assessment, and therapeutic planning in salivary gland neoplasms.

References

1. Rajpoot PS, Sharma S, Gupta P, Singh M, Kumar R. The intricate histopathological spectrum of salivary gland tumors: A comprehensive review. Asian J Med Sci. 2024;15(5):201–208.
2. de Lima WP, de Souza LL, Costa RA, Fernandes T, de Oliveira MLAC, Pereira AA. Salivary gland tumors: A 13-year clinicopathologic retrospective study. J Clin Pathol. 2023;76(8):556–562.
3. Bobati SS, Patil BV, Dombale VD. Histopathological study of salivary gland tumors: A clinicopathological evaluation. J Oral Maxillofac Pathol. 2017;21(1):46–50.
4. Skálová A, Hyrcza MD, Leivo I, Simpson RHW, Lewis JS, Rinaldo A. Update from the 5th edition of the WHO classification of head and neck tumors: Salivary glands. Head Neck Pathol. 2022;16(1):40–53.
5. Swid MA, Reddy VB, Riaz N, Xu B, Katabi N, Wenig BM. Updated salivary gland immunohistochemistry: Diagnostic implications in modern practice. Hum Pathol. 2023;129:43–55.
6. Niu S, Smith L, Jones R, Patel A, Brown J, Carter J. Salivary gland cytology: Refining diagnostic patterns with molecular features. Diagn Cytopathol. 2024;52(4):273–285.
7. Barca I, Ramirez C, Alvarez R, Morales J, Gomez D, Sanchez M. Minor salivary gland tumors: A retrospective review and histopathological challenges. Oral Oncol. 2025;110:105362.
8. Lima WP, da Silva LN, Santos L, Pereira A, Costa R, Fernandes T. Clinicopathologic profile of salivary gland tumors in a high-volume tertiary center. Int J Oral Maxillofac Surg. 2023;52(11):1532–1539.
9. Sarwar U, Khan R, Ahmed S, Malik A, Hussain N, Ali S. Histopathological analysis of salivary gland lesions in a tertiary care hospital: Correlation with demographic parameters. Pak J Med Dent. 2025;14(1):77–84.
10. Meyer MT, Lacombe D, Nardi V, Garcia JJ, Faquin WC, Sadow PM. Diagnostic markers and translocations in salivary gland neoplasms: A clinicopathologic update. Head Neck. 2021;43(12):3399–3412.
11. Speight PM, Barrett AW. Salivary gland tumours. Oral Dis. 2002;8(5):229–240.
12. El-Naggar AK, Chan JKC, Grandis JR, Takata T, Slootweg PJ. WHO Classification of Head and Neck Tumours. 4th ed. Lyon: IARC Press; 2017.
13. Naeem Sultan Ali, Ahmad Nawaz, Shaheryar Rajput, MubasherIkram. Parotidectomy: A Review of 112 Patients Treated at a Teaching Hospital in Pakistan; Asian Pacific Journal of Cancer Prevention 2010, 11.
14. Richardson GS, Dickason WL, Gaisford JC et al. Tumors of salivary glands; An analysis of 752 cases. Plastic Reconstr Surg 1975; 55:131.

15. Vargas PA, Rene Gerhard, Vergilius JF, Ines Vieiro. Salivary gland tumours in Brazilian population. A retrospective study of 124 cases. Rev Hos Clinfac Med S Paulo 2002; 57(6):271-276.
16. Bhavani K, Urs Ran et al. Histopathological study of salivary gland tumors. J evol Med Dent Sci 2016; 5(72):5240-5244.
17. ewusuwan S, Settakorn J, Mahanupab P, Salivary gland tumors in MaharajNakorn Chiang Mai hospital: A retrospective study of 198 cases. Chiang Mai Med Bull. 2006; 45(2):45-43.
18. 18. HussainSI, Akhter G, Sideeq F, Iqbal B, Reshi R, Farzana Manzoor F, et al. Histopathological spectrum of salivary gland tumours: a hospital based study. Int J Adv Res. 2017;5(2):1912-22.AB
19. Barnes L, Eveson JW, Reichart P, Sidransky D. Pathology and Genetics of Head and Neck Tumours. Lyon: IARC Press; 2005.
20. Barnes L. Surgical Pathology of the Head and Neck. 3rd ed. New York: Informa Healthcare; 2009.
21. Spiro RH. Salivary neoplasms: Overview of a 35-year experience with 2,807 patients. Head Neck Surg. 1986;8(3):177–184.