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Original Article

Role of Fine Needle Aspiration Cytology in the Evaluation and Diagnosis of Salivary Gland Lesions: A Retrospective Study at a Tertiary Care Centre in Rajkot, Gujarat, India

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ABSTRACT

Background: Fine Needle Aspiration Cytology (FNAC) is an easy cyto-diagnostic method based on morphologic features of individual and group of cells aspirated using fine needle. It is very simple, quick, cost effective and minimally invasive technique used to diagnose different type of swellings in lymph nodes, thyroid gland, soft tissues, salivary glands and various other body organs.
Aim and Objective: To evaluate role and utility of FNAC in diagnosis of salivary gland lesions.
Materials & methodology: This study involved 150 cases of parotid and submandibular swellings of patients who underwent FNAC at P.D.U. Medical College & Hospital, Rajkot, Gujarat within the duration of three years from January 2022 to December 2024. FNAC procedure was performed and smears were stained with Hematoxylin & Eosin stain (H & E) and May- Grunwald Giemsa (MGG) stain. The results of FNAC were compared with the histopathological findings wherever possible and accuracy of diagnosis were determined.
Results: Mean age of patients were between 40 to 50 years and male to female ratio was 1.67:1 for salivary gland lesions. Out of the total 150 lesions, 99(66%) lesions were found to be Neoplastic of which 90(60%) were benign and 9(6%) were malignant. Rest 51(34%) were non neoplastic. Acute & Chronic Sialadenitis 38(25.3%) was the most common non-neoplastic lesion. Pleomorphic adenoma 64(42.7%) was the most common benign neoplasm and mucoepidermoid carcinoma 4(2.67%) was most common malignant neoplasm**.** Parotid gland was the most common site involved amongst all the salivary glands.
Conclusion: We found that a good and thorough knowledge of morphology and pathology of salivary gland lesions helps in the diagnosis, typing and staging, formulating treatment plan as well as prediction of prognosis of salivary tumours.

Keywords*: Salivary gland, Fine needle aspiration (FNAC), Parotid gland, Submandibular gland.*

INTRODUCTION

Salivary gland lesions comprise less than 1% of all tumors and 4% of all epithelial neoplasm in head and neck. They are broadly classified as neoplastic and non-neoplastic. Clinically they may present as tumor and may have pathological features similar to some of neoplasm. Fine needle aspiration cytology (FNAC) is a cyto-diagnostic method based on morphologic findings of individual and small group of cells aspirated using a fine needle. The role of FNAC in suspected salivary gland swellings is to confirm its origin and to get a preliminary diagnosis about the nature of the disease process before the definite management plan. FNAC is a reliable method to differentiate between inflammatory and neoplastic lesions. FNAC diagnosis of neoplastic lesions process even when benign usually leads to Surgical excision. The aim of the present study is to evaluate the spectrum of salivary gland lesions in our setting and to assess the diagnostic accuracy of FNAC for salivary gland lesions.

AIMS AND OBJECTIVES

To evaluate role and utility of FNAC in diagnosis of salivary gland lesions. To evaluate benign and malignant salivary gland lesions and study age, sex and site wise distribution of salivary gland lesions.

METHODS & MATERIAL

This is a retrospective observational study performed in Cytopathology laboratory, Department of Pathology, PDU Medical college & Hospital, Rajkot of 3 years during the period of January 2022 to December 2024. The study involved 150 cases who presented with parotid, submandibular & minor salivary gland swellings. FNAC was performed using a 22–23gauge needle attached to a disposable syringe with plunger under aseptic conditions. Smears were prepared and slides were stained with haematoxylin and eosin and Giemsa methods. The results of FNAC and final histopathology were compared wherever was possible and accuracy of FNAC was determined.

Inclusion Criteria: All smears with enough aspirated material.
Exclusion Criteria: Smears having inadequate material and inconclusive diagnosis.

Results: A total of 150 cases were analysed retrospectively within the period of three years from January 2022 to December 2024. Out of these 150 cases, 51(34%) were diagnosed as non-neoplastic lesions and 99(66%) as neoplastic lesions. **(Table 1)**

Table 1: Distribution of non-neoplastic and neoplastic salivary gland lesions.

Lesion	No. of cases	Percentage
Non-Neoplastic	51	34%
Neoplastic	99	66%
Total	150	100%

Chronic & Acute Sialadenitis 38(25.3%) were the most common non neoplastic lesion in our study followed by Mucocele of salivary glands which accounts for 13(8.67%) of all the salivary lesions. Amongst neoplastic lesions 99(66%), Benign lesions 90(60%) outnumbered malignant lesions 9(6%). Pleomorphic adenoma 64 (42.67%) was most common benign lesion, followed by Warthin's tumour 25(16.67%) and basal cell adenoma 01(0.67%) was least common. Mucoepidermoid carcinoma 4(2.67%) was most common malignant lesion of salivary gland. **(Table 2)**

Table 2: Distribution of various salivary gland lesions.

Non-Neoplastic Lesion	No. of cases	Percentage
Sialadenitis	38	25.3%
Mucocele	13	8.67%
Benign Neoplastic Lesions		
Pleomorphic Adenoma	64	42.67%
Warthin's Tumour	25	16.67%
Basal Cell Adenoma	01	00.67%
Malignant Neoplastic Lesions		
Mucoepidermoid Carcinoma	04	2.67%
Carcinoma ex Pleomorphic Adenoma	03	2.00%
Adenoid Cystic Carcinoma	02	1.33%
Total	150	100%

In the study it was observed that the commonest site of salivary gland lesion was parotid gland 94(62.7%), followed by submandibular gland 42(28%) and 14(9.3%) of minor salivary glands. **(Table 3)**

Table 3: Site wise distribution of salivary lesions

Lesion	Non-Neoplastic	Benign	Malignant	Total	Percentage
Parotid	28	62	4	94	62.7%
Submandibular	17	22	3	42	28%
Minor Salivary Glands	06	06	2	14	9.3%
Total	51	90	09	150	100%

Males were more affected more than females (M:F ratio 1.67:1) overall. Female predominance was there in case of pleomorphic adenoma (M:F ratio 0.86:1). In all other cases male predominance was observed. **(Table 4).**

Table 4: M:F ratio of different salivary gland lesions.

Lesion	Male	Female	M:F ratio
Sialadenitis	27	13	2.07:1

Mucocele	12	09	1.33:1
Pleomorphic Adenoma	25	29	0.86:1
Warthin's Tumour	25	00	25:0
Basal Cell Adenoma	01	00	1:0
Mucoepidermoid Carcinoma	02	02	1:1
Carcinoma ex Pleomorphic Adenoma	02	01	2:1
Adenoid Cystic Carcinoma	00	02	0:2
Total	94	56	1.67:1

Overall, most commonly affected age group was 20 to 30 years of age 27(18%). **(Chart 1).**

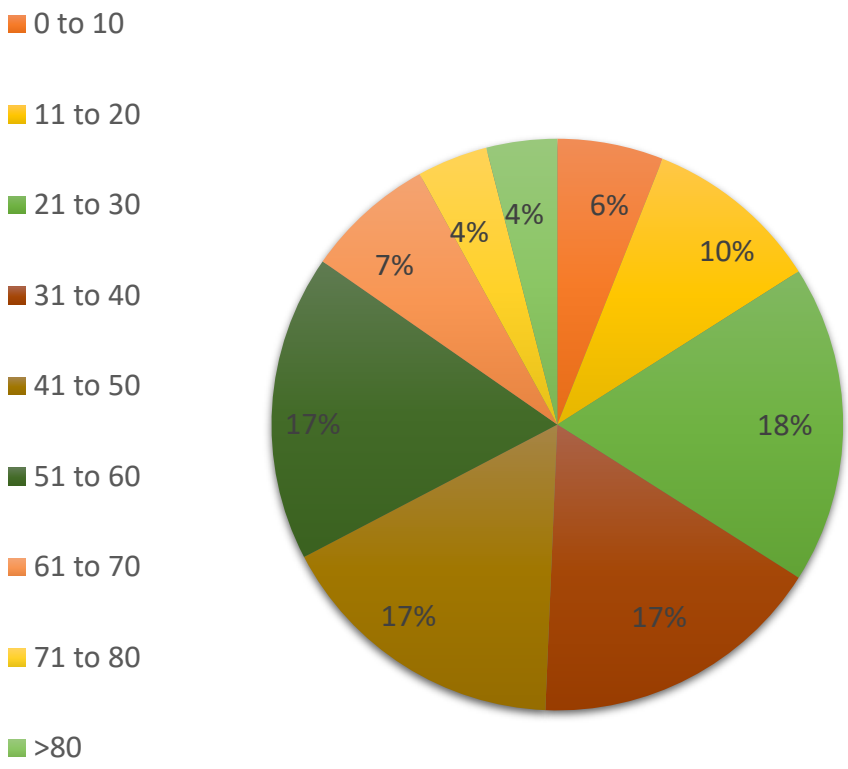

Chart 1: Age distribution of salivary gland lesions

In male most common affected age group was 50 to 60 years of age 19(12.67%). Among female, 2nd & 3rd decade was most commonly affected (11 & 11 respectively (7.33%). **(Chart 2)**

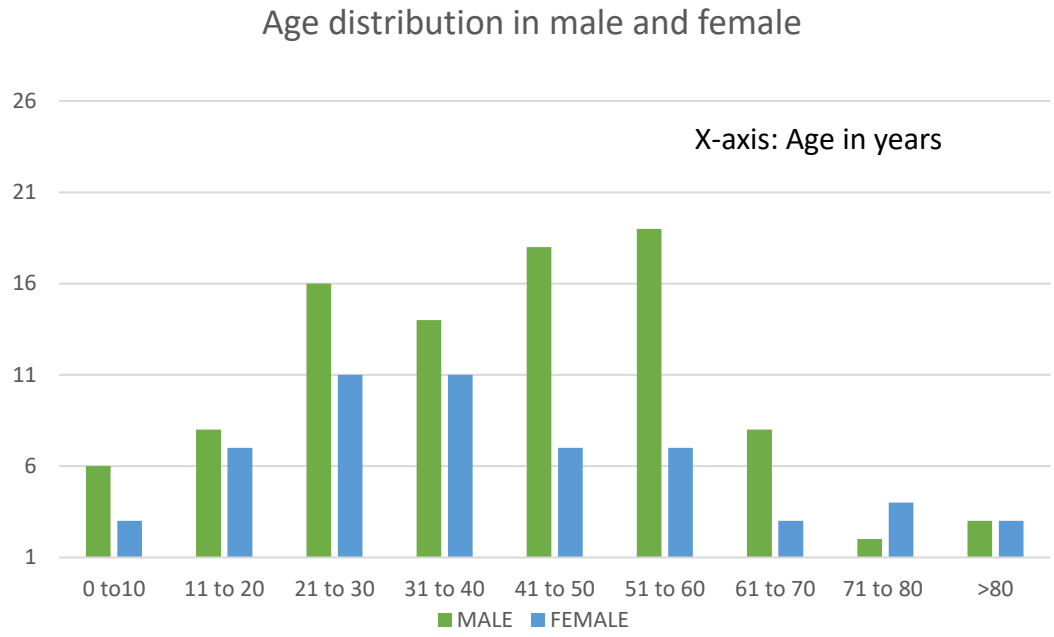

Chart 2: Age distribution of salivary lesions in male & female.

Among non-neoplastic lesions, acute & chronic sialadenitis was more common in 2nd decade of life in male 8(5.33%) & 3rd decade in female 4(2.66%) respectively. Benign neoplastic lesion, Pleomorphic adenoma was more common in 3rd decade in male 8(5.33%) and 2nd decade in female 7(4.67%). Warthin's tumour was found to be common in 5th decade of life in male 10(6.66%), wasn't recorded in females in our study.

Malignant tumour, Mucoepidermoid carcinoma was found in equal proportions in male & female in variable age group. Carcinoma Ex Pleomorphic Adenoma was 2nd most common malignant lesion, was common in 4th and 5th decade in males and was found in female of >80 years of age in our study. **(Table 5 & 6)**

Table 5: Distribution of salivary lesions in different age group in male.

	0-10 years	11-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	71-80 years	>80 years	Total
Sialadenitis	3	1	8	4	6	3	1	0	0	26
Mucocele	2	3	1	0	1	0	0	0	1	8
Pleomorphic Adenoma	1	4	5	8	3	3	2	2	2	30
Warthin's Tumour	0	0	2	2	7	10	4	0	0	25
Basal Cell Adenoma	0	0	0	0	0	1	0	0	0	1
Mucoepidermoid Carcinoma	0	0	0	0	0	1	1	0	0	2
Adenoid Cystic Carcinoma	0	0	0	0	0	0	0	0	0	0
Carcinoma Ex Pleomorphic Adenoma	0	0	0	0	1	1	0	0	0	2
Total	6	8	16	14	18	19	8	2	3	94

Table 6: Distribution of salivary lesions in different age group in female.

	0-10 years	11-20 years	21-30 years	31-40 years	41-50 years	51-60 years	61-70 years	71-80 years	>80 years	Total
Sialadenitis	1	2	2	4	1	1	1	0	0	12
Mucocele	0	1	1	1	0	1	0	1	0	5
Pleomorphic Adenoma	2	3	7	6	5	4	2	3	2	34
Warthin's Tumour	0	0	0	0	0	0	0	0	0	0
Basal Cell Adenoma	0	0	0	0	0	0	0	0	0	0
Mucoepidermoid Carcinoma	0	1	0	0	1	0	0	0	0	2
Adenoid Cystic Carcinoma	0	0	1	0	0	1	0	0	0	2
Carcinoma Ex Pleomorphic Adenoma	0	0	0	0	0	0	0	0	1	1
Total	3	7	11	11	7	7	3	4	3	56

Acute and chronic sialadenitis show predominantly inflammatory cells (polymorphs and lymphocytes respectively) and fragments of ductal epithelial cells with few/ absent acinar cells along with fibrotic stroma. (Figure 1: (a) & (b).

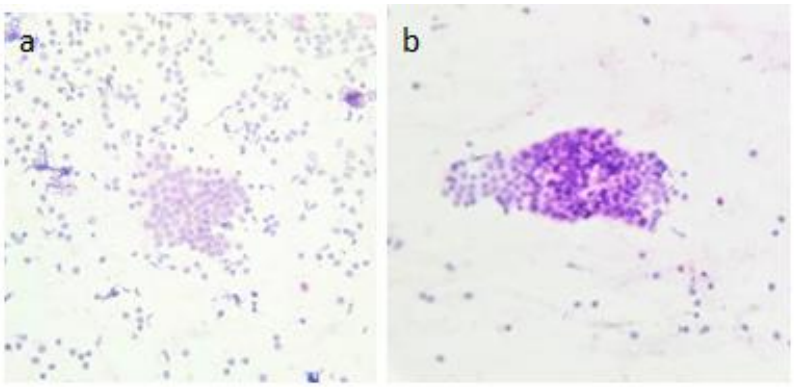

Figure 1: (a)&(b)Cytomorphology of chronic sialadenitis showing fragments of ductal epithelial cells, at places, few acinar cells seen. Background shows chronic inflammatory cells mainly lymphocytes.

Mucinous cyst/Mucocele of salivary gland show presence of thick mucinous material with ductal or acinar cells showing secretory granules or vacuoles.

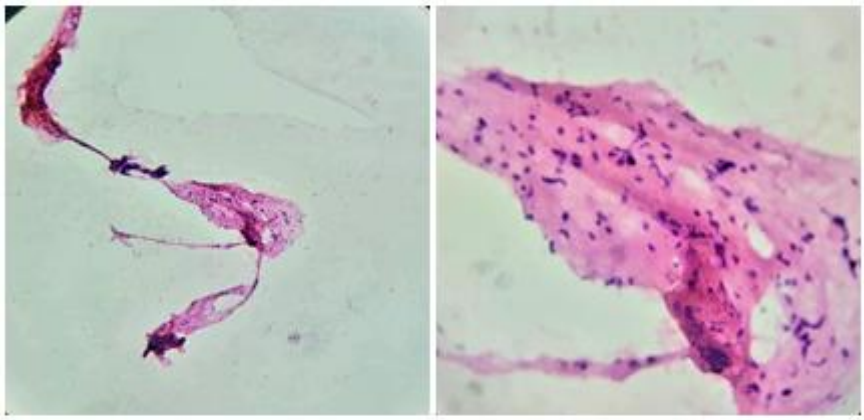

Figure 2: Mucinous cyst/Mucocele of salivary gland show presence of thick mucinous material with ductal or acinar cells showing secretory granules or vacuoles.

Pleomorphic Adenoma is a matrix containing tumour having unique fibrillary stroma, mixture of myoepithelial cells which are round to polygonal plasmacytoid spindle cells, ductal cells with honeycomb or ductal arrangement and extracellular stroma with characteristic feathery/ fibrillary borders and chondromyxoid features.

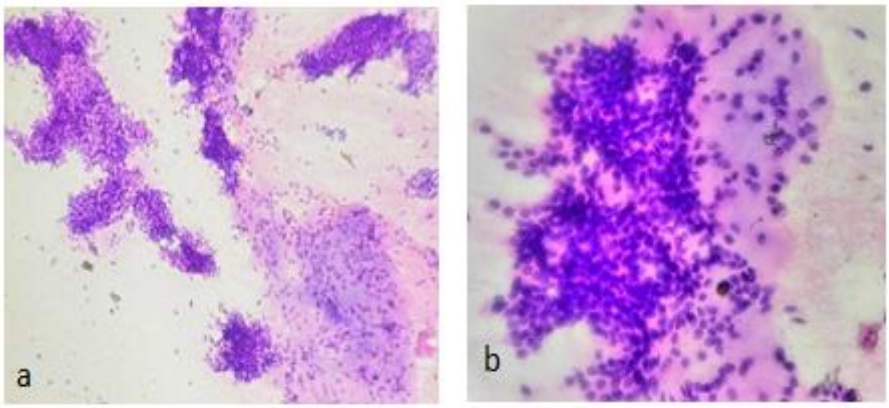

Figure 3: (a)&(b)Cytomorphology of pleomorphic adenoma showing epithelial cells with ovoid myoepithelial cells and chondromyxoid stroma (H & E).

Warthin's Tumour show small cohesive sheets of oncocytes with abundant granular cytoplasm, central round nucleus with prominent nucleolus and many lymphocytes with granular debris in background.

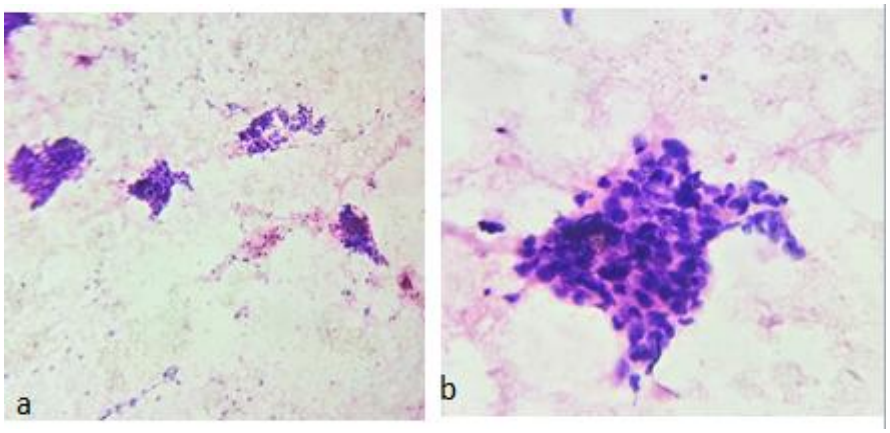

Figure 4: (a)&(b)Cytomorphology of warthins' tumor showing sheets of oncocytic cells, polymorphs, population of lymphocytes in dirty granular background.

Basal cell adenoma shows monomorphic basaloid cells with round nuclei and scanty cytoplasm with irregular nests and trabecula, tubular or peripheral palisading architecture. Few cases may show chondromyxoid stroma and myoepithelial cells or cytological atypia, mitosis and necrosis.

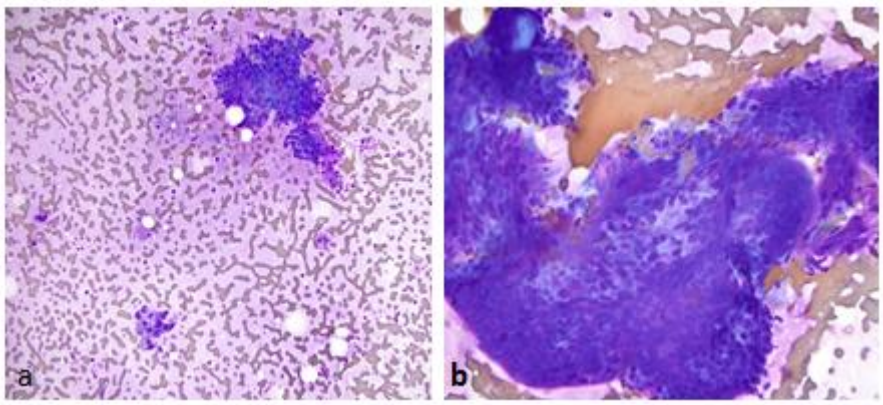

Figure 5: (a)&(b)Cytomorphology of basal cell adenoma show monomorphic basaloid cells with smooth borders, round nuclei, irregular nests, trabecula and scanty cytoplasm.

Carcinoma Ex Pleomorphic adenoma has two components as the name suggests – Pleomorphic Adenoma component showing sheets or cohesive groups of ductal cells, myoepithelial cells dispersed or in loose clusters, dense fibrillary metachromatic matrix and Carcinomatous component- Pleomorphic, hyperchromatic cells, clumped chromatin, high N:C ratio, necrotic background. Mucous or squamous cells may be seen.

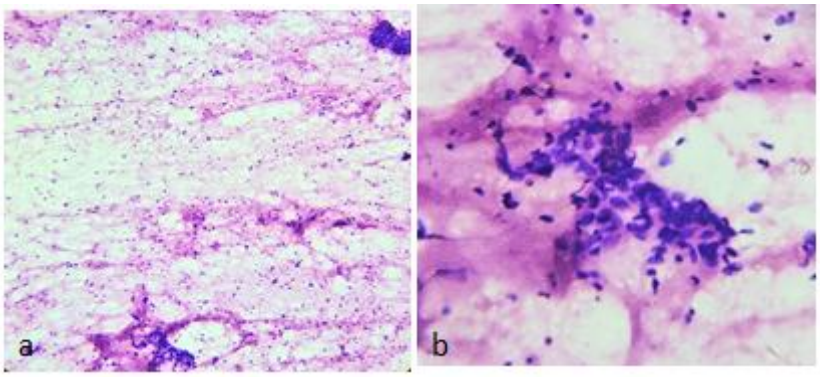

Figure 6: (a)&(b)Cytomorphology of carcinoma ex pleomorphic adenoma shows small clusters, sheets and many dispersed neoplastic cells hyperchromatic angulated nuclei and dense eosinophilic cytoplasm.

Mucoepidermoid carcinoma is composed of a variable mixture of squamous cells, mucus secreting and intermediate cells occasionally focal sebaceous gland, goblet cells also seen. They are the most common form of primary malignant tumour

of the salivary glands. In the present study, among malignant cases diagnosed by FNAC, mucoepidermoid carcinoma was present in 4(2.67%) cases and was the most common primary malignancy. Discordant diagnoses between cytology and histopathology is common, which occurs due to multiple factors. Cytology details should be carefully examined for scanty cytoplasm, high nucleus to cytoplasmic ratio, naked nuclei, nuclear moulding, and hyperchromasia to avoid erroneous diagnosis among the non-neoplastic lesions. On cytological examination, discordant pleomorphic adenoma was common, which on histopathological examination was diagnosed as carcinoma ex pleomorphic adenoma. Pleomorphic adenoma can be misdiagnosed as mucoepidermoid carcinoma on cytological examination because aspiration of mucoid paucicellular fluid may suggest low grade mucoepidermoid carcinoma.

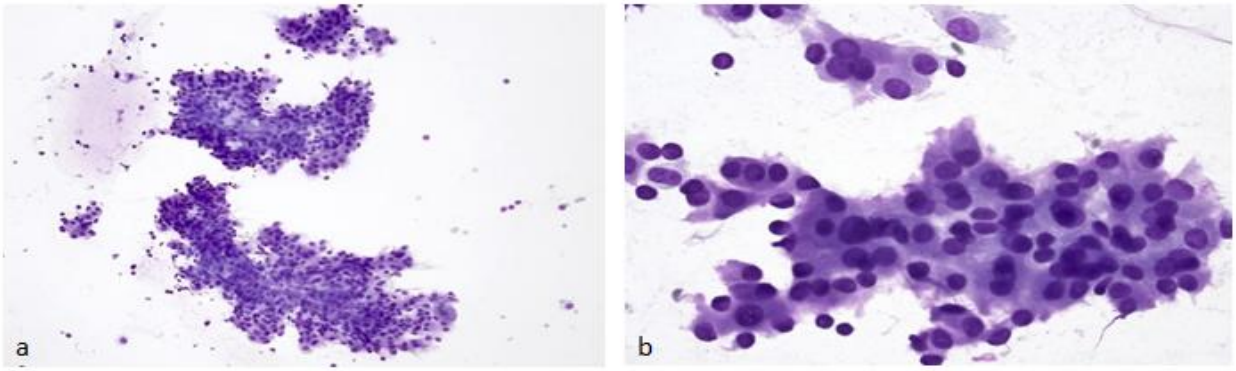

Figure 7: (a)&(b)Cytomorphology of Mucoepidermoid carcinoma showing small clusters, sheets and many dispersed neoplastic cells hyperchromatic angulated and overlapping nuclei and dense eosinophilic cytoplasm.

Adenoid cystic carcinoma a primary salivary gland lesion characterized by its biphasic ductal and myoepithelial differentiation. Cytomorphology shows metachromatic matrix spheres with sharply defined border called Hyaline globules surrounding cohesive clusters of basaloid cells with scant cytoplasm, angulated hyperchromatic nuclei and indistinct nucleoli.

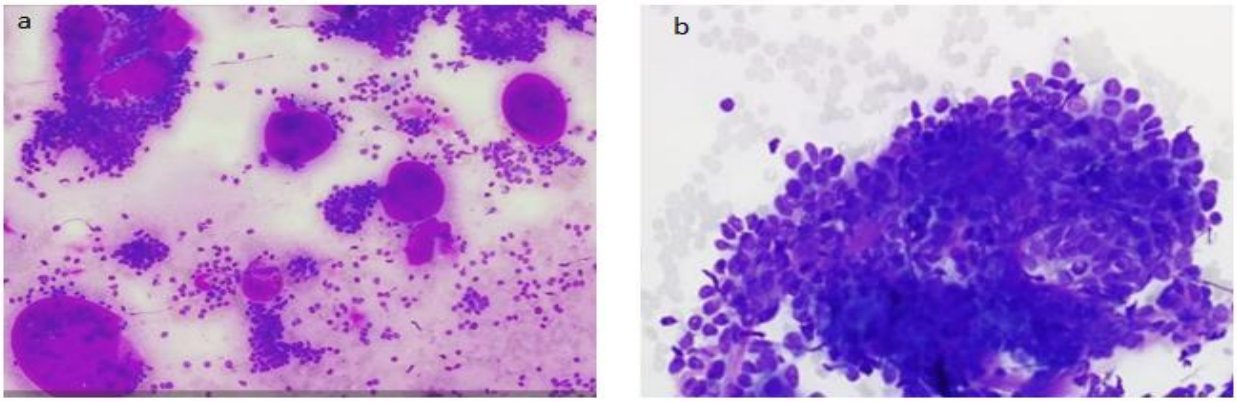

Figure 8: (a)&(b)Cytomorphology of adenoid cystic carcinoma - cellular smears with metachromatic matrix spheres with sharply defined border called Hyaline globules surrounding cohesive clusters of basaloid cells with scant cytoplasm, angulated hyperchromatic nuclei and indistinct nucleoli.

The cytologic diagnosis was later correlated with histopathological diagnosis **[Table 7]**. Out of the total of 150 cases, histological correlation was established for 131(87.3%). Histopathological correlation was not established for 11(7.3%) cases and no correlation data was available for 8(5.3%) cases. In our set up cytopathology was histopathologically confirmed on an average up to 85% in case various salivary lesions.

Table 7: Cytopathological & Histopathological Correlation

Salivary Gland	**Histopathology Correlation (Percentage)**			
Cytopathology Lesion	**Established**	**Not Established**	**Not Available**	**Total(Percentage %)**
Sialadenitis	33(86.8%)	3(7.9%)	2(5.3%)	38%
Mucocele	11(84.6%)	1(7.7%)	1(7.7%)	13%
Pleomorphic Adenoma	58(90.6%)	4(6.25%)	2(3.1%)	64%
Warthin's Tumour	21(84%)	3(12%)	1(4%)	25%
Basal Cell Adenoma	1(100%)	0	0	01%

Mucoepidermoid Carcinoma	3(75%)	0	1(25%)	04%
Adenoid Cystic Carcinoma	2(66.67%)	0	1(33.33%)	03%
Carcinoma Ex Pleomorphic Adenoma	2(100%)	0	0	02%
Total	131(87.3%)	11(7.3%)	8(5.3%)	150(100%)

DISCUSSION

Out of the total of 150 cases studied by us, non-neoplastic lesions were 51(34%) and neoplastic lesions were 99(66%), which is similar to studies done by Shivani Gupta et al . **(Table 8).**

Table 8: Comparision with other studies of incidence of Benign & Malignant lesions.

Study Name	Total	Benign %	Malignant %
Rashmi Jain et al (2021, Bhopal)	71	53(74.6%)	18(25.4%)
Shivani Gupta et al (2019, Etawah)	105	71(67.6%)	34(32.4%)
Ritu Jain et al (2013, Delhi)	72	58(80.6%)	14(19.4%)
A Rameeza et al (2022, Bengaluru)	71	58(81%)	13(19%)
Present study (2025, Rajkot)	104	71 (68.3%)	33 (31.7%)

Benign lesions predominated over malignant lesions among all neoplastic lesions which was similar to the study of Desai P et al and Junudevi et al. **(Table 8)**

The most commonly affected among the salivary glands was parotid gland followed by submandibular gland which was similar to other studies. **(Table 9)**

Table 9: Site distribution of salivary gland lesions in different studies.

Study	Parotid Gland	Sub mandibular Gland	Minor Salivary Gland	Total 100%
Rashmi Jain et al (2021, Bhopal)	79(54.86%)	58(40.27%)	7(4.86%)	144
Balmiki Dutta et al (2023, Guwahati)	40(70.2%)	15(26.3%)	2(3.5%)	57
Shivani Gupta et al (2019, Etawah)	41.08%	51.48%	7.4%	
Ritu Jain et al (2013, Delhi)	54(67.5%)	24(30%)	2(2.5%)	80
A Rameeza et al (2022, Bengaluru)	91(87%)	38(13%)	-	104
Present study (2025, Rajkot)	89(59.3%)	43(28.7%)	18(12%)	150

Age distribution: Non neoplastic lesions were common in 2nd decade of life in our study. Neoplastic benign lesions were common in 3rd and 4th decade which was correlated with the study of Rajdeo RN et al and Desai P et al. Neoplastic malignant lesions were found to be common in between 40 – 60 years of age similar to the study of Rajdeo RN et al.

Gender distribution: Though salivary lesions are found to be more common in females, in our study there was male predominance over female with M:F ratio being 1.67:1 which was similar to the study of Ganguly et al. The probable reason could be lack of awareness and ignorance amongst the women about healthcare and the prevalence of tobacco addiction in males in our region.

Table 10: Male: Female ratio in benign and malignant lesions in various studies.

Study name	Male	Female	M: F Ratio
Kacharu T. Dalve et al (2016, Ambajogai)	52	38	1.36:1
Tushar Kambale et al (2016, Pune)	26	20	1.3:1
Chhavi Gupta et al (2023, Jammu)	31	34	0.9:1
Rajat Gupta et al (2020, Jammu)	40	34	1.17:1
Present study (2025, Rajkot)	94	56	1.67:1

In our study the cytopathological diagnosis was later confirmed by histopathological evaluation making a diagnostic accuracy in 122(81.33%) cases. Different studies show variable degrees of cytopathological correlation with histopathological diagnosis. **(Table 11)**

Study	Histopathological Confirmation.
Junudevi et al (2015, Guwahati)	90.9%
Desai P et al (2019, Surat)	90.9%

Neha Sikdar et al (2018, Puduchery)	87%
Rajdeo RN et al (2015, Nagpur)	94%
Jha S et al (2021, Bhubaneshwar)	87.37%
Present study (2025, Rajkot)	81.33%

CONCLUSION

FNAC is an excellent preliminary diagnostic technique for the diagnosis of salivary gland swelling. However, it may be challenging sometimes especially when cytological features overlap.

Therefore, it is mandatory to use FNAC for primary investigation and it should always be done in conjunction with histopathology along with patient clinical history, physical examination and ultrasonography to reach the correct diagnosis. The present study shows salivary gland lesions are wide range of lesions from non-neoplastic to neoplastic lesion. Benign lesions are more common than malignant lesions with parotid gland being the most common site and pleomorphic adenoma, the most common tumor type. Mucoepidermoid carcinoma is the most malignant primary tumor. Most common age group affected is 51-60 years. Among tumors, female preponderance is seen in pleomorphic adenoma and male predominance in Warthin tumor. So, thorough knowledge of morphology of salivary gland lesion is helpful in final diagnosis in predicting prognosis, typing, staging and grading of salivary neoplasms.

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