



CYTOLOGICAL SPECTRUM OF MAJOR SALIVARY GLAND LESIONS ON THE BASIS OF MILAN'S CRITERIA- AN OBSERVATIONAL STUDY IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Salivary gland lesions exhibit a wide cytological spectrum ranging from non-neoplastic conditions to malignant neoplasms. Fine-needle aspiration cytology (FNAC) is a simple, cost-effective, and minimally invasive diagnostic technique. The Milan System for Reporting Salivary Gland Cytopathology (MSRSGC) provides a standardized framework with risk-based categorization.

Objectives: To determine the cytological spectrum of major salivary gland lesions and to estimate the sensitivity and specificity of FNAC using the Milan System, with histopathology as the gold standard.

Materials and Methods: A cross-sectional observational study was conducted in the Department of Pathology, Agartala Government Medical College and Gobind Ballabh Pant Hospital, Tripura, over five years (June 2019–May 2024). A total of 280 FNAC cases of major salivary gland lesions were analysed. Smears were reviewed independently by three pathologists and classified into six categories according to the MSRSGC. Cytological findings were correlated with available histopathology.

Results: Males were more commonly affected than females (M:F = 1.43:1). The age ranged from 4 to 85 years (mean 46 years). The parotid gland was the most commonly involved site (85%). The majority of cases belonged to category IVA (benign neoplasm) (41.1%), followed by category II (non-neoplastic) (40.4%) and category VI (malignant) (10%). Pleomorphic adenoma was the most common benign tumor (54.8%), while mucoepidermoid carcinoma was the most common malignant tumor

(53.6%). FNAC demonstrated good sensitivity and specificity in differentiating benign from malignant salivary gland neoplasms.

Conclusion: FNAC is a reliable and accurate diagnostic tool for salivary gland lesions. The Milan System enhances uniform reporting and risk stratification, thereby aiding appropriate clinical management. Histopathological correlation remains essential in diagnostically challenging cases.

Keywords: Fine-needle aspiration cytology; Salivary gland lesions; Milan system; MSRSGC; Pleomorphic adenoma; Mucoepidermoid carcinoma.

INTRODUCTION

The salivary gland lesions present with a broad spectrum of pathologies, ranging from inflammatory and reactive conditions to benign tumors and overt malignancies.^{1,2,3,4,5,6} Fine-needle aspiration cytology (FNAC) remains an important initial diagnostic procedure for evaluating salivary gland swellings because it is simple, inexpensive, and generally well accepted by patients. FNA of the salivary gland assists in determining whether a lesion is reactive or neoplastic and in neoplastic cases, it often provides insight into the likely benign or malignant nature and possible grade of the tumor. Hence, it helps to guide clinical management of the patient and the planning of surgery.^{7,8,9} Multiple published reports highlight that FNAC performs well in distinguishing non-neoplastic processes from neoplasms, and further in separating benign from malignant neoplasms; among different studies, the sensitivity of FNAC ranges from 86% to 100%, and specificity ranges between 90% to 100%. Apart from this, FNAC is a significant diagnostic tool to differentiate between primary vs. metastatic lesions specially head and neck malignancies.^{10,11,12,13,14,15,16,17} In 2018, the Milan System for Reporting Salivary Gland Cytopathology (MSRSGC) was introduced with the goal of standardizing the reporting of salivary gland cytology, thus providing a clear framework for guiding clinical management. The new system was intended to be applicable and practical for all institutions with different levels of expertise and experience in salivary gland cytopathology.^{18,19} The Milan System for Reporting Salivary Gland Cytopathology (MSRSGC) adopts a risk-based approach for the interpretation of salivary gland FNAC samples.²⁰ It classifies aspirates into six diagnostic groups: non-diagnostic (category I), non-neoplastic (category II), atypia of undetermined significance (category III), benign neoplasm (category IVA), salivary gland neoplasm of uncertain malignant potential (category IVB), suspicious for malignancy (category V) and malignant (category VI). This structured categorization has been proposed to achieve uniformity in reporting salivary gland cytology.²¹ Besides offering uniform reporting terminology, the MSRSGC assigns an expected risk of malignancy to each category, helping clinicians choose the most appropriate management approach.²²

OBJECTIVES

1. To determine the cytological spectrum of major salivary gland lesions.
2. To estimate the Sensitivity (Sn) and Specificity (Sp) of FNAC for the detection of malignant lesions of major salivary glands based on the Milan System for Reporting Salivary Gland Cytopathology (MSRSGC), taking histopathological examination as the gold standard.

MATERIALS AND METHODS

STUDY DESIGN- Cross-sectional study.

STUDY TYPE- Observational study.

STUDY SETTING-

The study was carried out in the Department of Pathology, Agartala Government Medical College (AGMC & GBPH), Agartala, Tripura.

STUDY PERIOD- 5 years from June 2019 to May 2024

STUDY POPULATION- Patients who visited the cytology section of the Department of Pathology for FNA of major salivary gland lesions as a diagnostic workup during the above period.

EXCLUSION CRITERIA-

The cases with lost or damaged cytological materials were excluded from the study.

SAMPLE SIZE-280 (determined based on records of cytology section, Department of Pathology, AGMC and GBPH).

Year-wise distribution of total cases from June 2019 to May 2024 is shown in Table 1.

Table 1:

Duration	No. of cases
June 2019- May 2020	58
June 2020- May 2021	40
June 2021- May 2022	56
June 2022- May 2023	65
June 2023- May 2024	61
Total	280

SAMPLING TECHNIQUE- Census sampling.

STUDY PROCEDURE- All cytology smears of major salivary gland lesions were retrieved and reviewed by three pathologists, and after reviewing, each case was assigned to one of the six categories after application of strict criteria given by MSRSGC. The review was done blindly, independent of the histopathological diagnosis or previous cytological diagnosis of cases. All cases were evaluated in reference to the location of salivary gland involvement, age and sex of the patient, and type of lesion. The cytological diagnoses were then compared with histopathological follow-up, wherever available.

ETHICAL CONSIDERATION-

The protocol was placed before the Institutional Ethics Committee, Agartala Government Medical College, for approval.

RESULTS

A total of 280 patients visited for FNAC of salivary gland lesion at cytology section of the Department of Pathology of our institute over a period of five years. Males were more affected than females, 165 vs. 115, the ratio being 1.43: 1. The patients' age ranged from 4 to 85 years, with the mean age being 46 years. Parotid gland (85%; N = 238) was involved in the majority of cases, while the Submandibular gland was affected in 15% (N = 42) of cases.

All the cytology cases were reviewed and categorized according to the MSRSGC into six categories. The majority of the cases (41.1%; N = 115) were in the category IVA, i.e. benign neoplasm, followed by 40.4% cases (N=113) in the category II, i.e. non-neoplastic lesions. 10% cases (N=28) were in the category VI. While 3.9% cases (N= 11) were labelled under category I. 2.5% cases (N=7) and 1.8% cases (N=5) were included in categories V and III, respectively. Only one case (0.3%) was there for category IV B.

All the cytology cases are distributed into seven age groups i.e. 0-20, 21-30, 31-40, 41-50, 51-60, 61-70 and >70 years. Majority of the cases (21.4%; N = 60) belongs to age group 51-60 followed by 58 cases (20.7%) in age group 41-50, 45 cases in age group 31-40 (16.1%), 40 cases in age group 61-70 (14.3%), 32 cases in age group 21-30 (11.4%), 30 cases in age group 0-20 (10.7%) and 15 cases in age group >70 (5.4%), Category and age group wise distribution of cases are being summarised [Table 2].

Table 2: Category-wise distribution of all FNAC-diagnosed cases according to age group

Age range	Cat I	Cat II	Cat III	Cat IV A	Cat IV B	Cat V	Cat VI	Total
0-20	1	15	0	14	0	0	0	30
21-30	1	15	1	15	0	0	0	32
31-40	2	20	1	20	0	0	2	45
41-50	1	25	2	26	0	1	3	58
51-60	3	22	1	25	0	2	7	60
61-70	2	10	0	15	1	2	10	40
>70	1	6	0	0	0	2	6	15
Total	11	113	5	115	1	7	28	280

Spectrum of category II, IVA, and IVB are shown in Tables 3, 4, and 5, respectively.

Table 3: Spectrum of category II lesions

	Number	Percentage (%)
Acute/chronic Sialadenitis	75	66.4
Parotid abscess	19	16.8
Sialadenosis	11	9.7
Cystic lesions	05	4.4
Granulomatous lesions	03	2.7
Total	113	100

Bar diagram 1: Spectrum of category II lesions

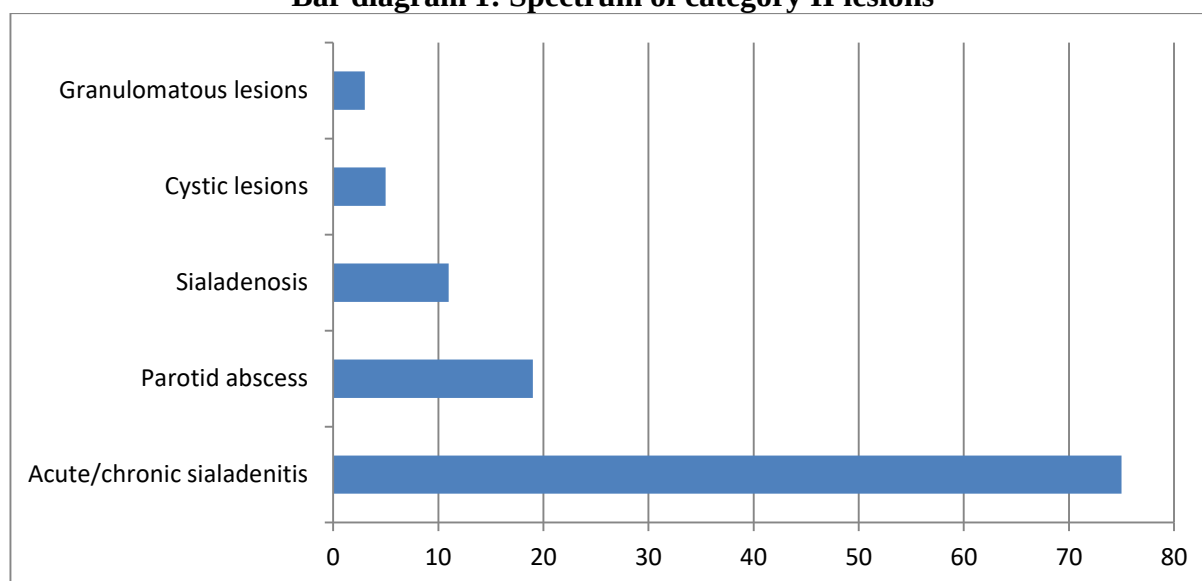


Table 4: Spectrum of category IVA lesions

	Number	Percentage (%)
Pleomorphic Adenoma	63	54.8
Warthin's tumor	46	40
Myoepithelioma	03	2.6
Basal cell Adenoma	03	2.6
Total	115	100

Pie chart 1: Spectrum of category IVA lesions

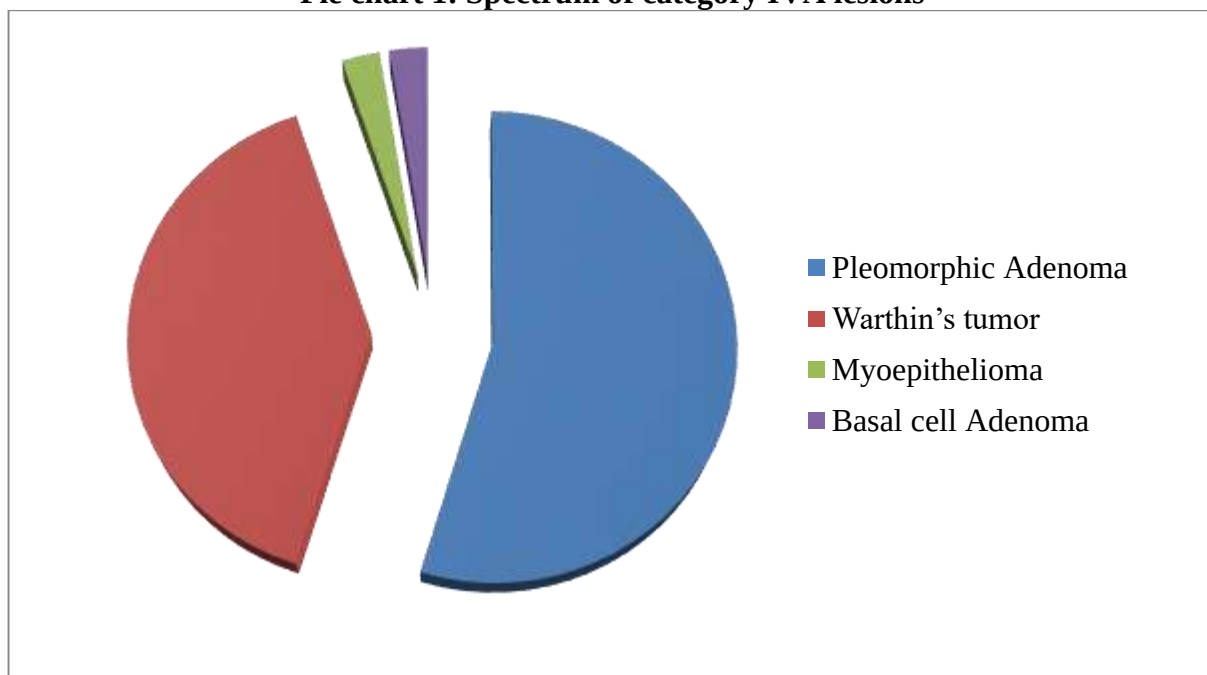
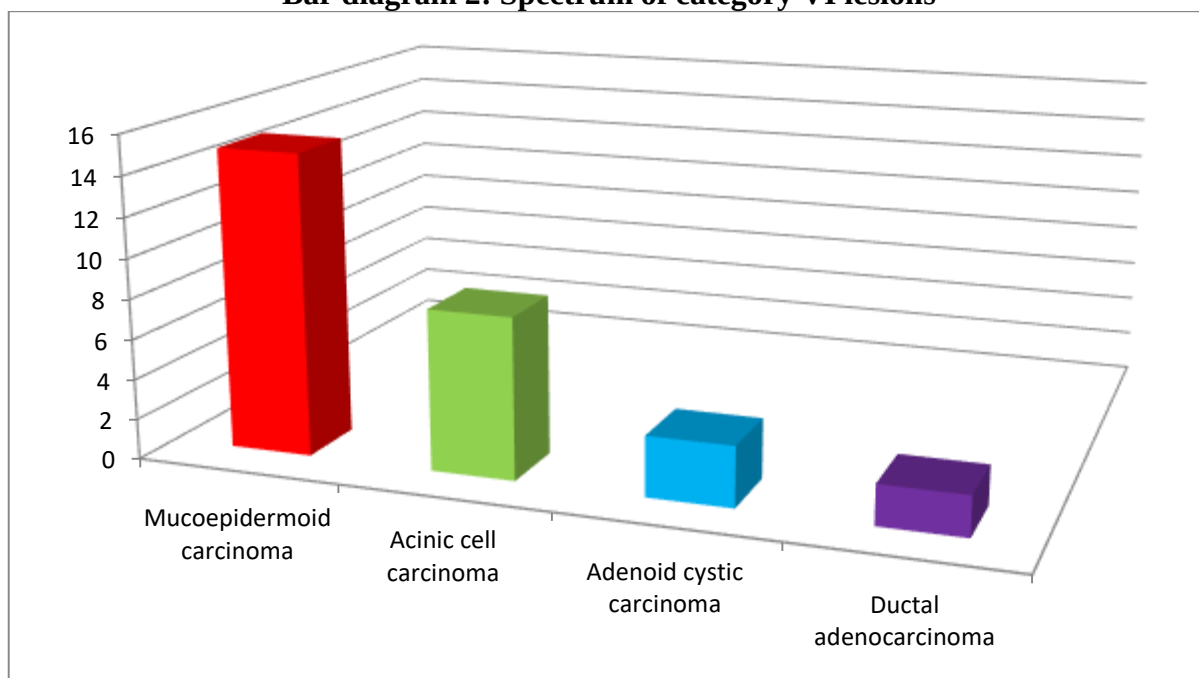


Table 5: Spectrum of category VI lesions

	Number	Percentage (%)
Mucoepidermoid carcinoma	15	53.6
Acinic cell carcinoma	08	28.6
Adenoid cystic carcinoma	03	10.7
Ductal adenocarcinoma	02	7.1
Total	28	100

Bar diagram 2: Spectrum of category VI lesions



Histopathological comparison of diagnosis could be done for 118 cases. 93 cases belonged to category IVA (benign neoplasm) and 25 cases belonged to category VI (malignant neoplasm). Out of these 118 cases, 91 were benign and 27 were malignant on histopathology.

Table 6: 2x2 table for Sn and Sp

FNAC (MSRSGC categories)	Histopathology		Total
	Malignant neoplasm	Benign neoplasm	
Cat VI	24	01	25
Cat. IVA	03	90	93
Total	27	91	118

Hence, Sensitivity (Sn) and Specificity (Sp) of FNAC are calculated and are 88.9% and 98.9%, respectively, in diagnosing major salivary gland malignancies, taking histopathological examination as the gold standard.

Figures:

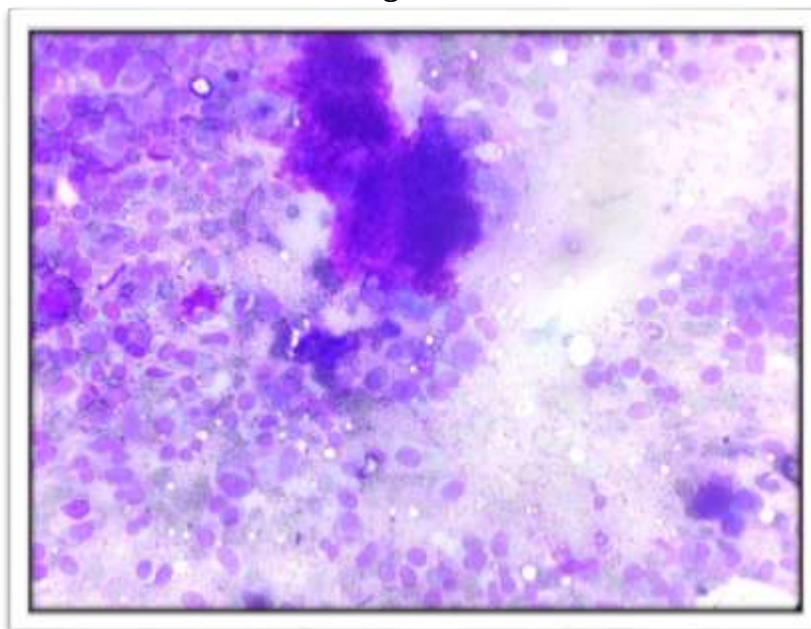


Figure 1. 100x view of Giemsa stained FNAC smear of Pleomorphic Adenoma

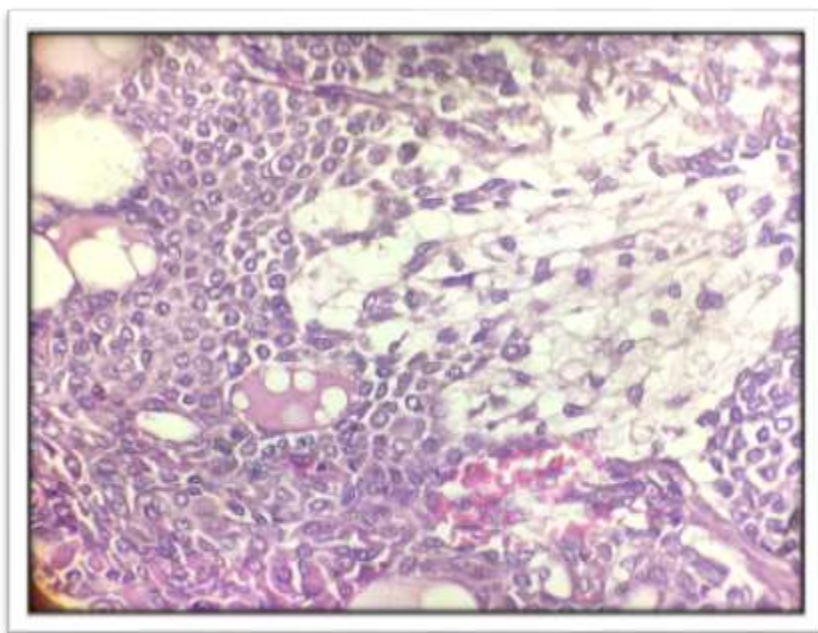


Figure 2. 100x view of H&E stained histopathology slide of Pleomorphic Adenoma

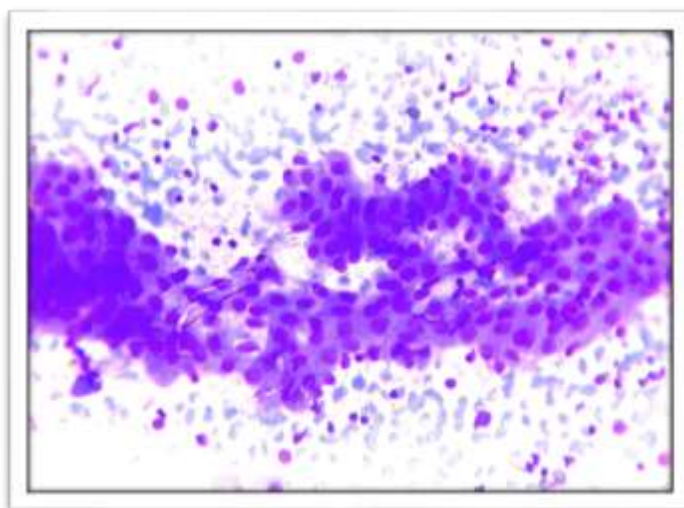


Figure 3. 400x view of Giemsa stained FNAC smear of Warthin's tumor

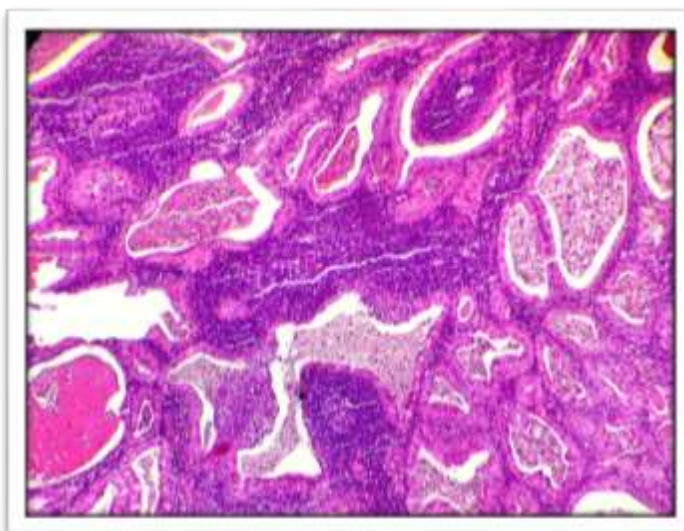


Figure 4. 100x view of H&E stained Histopathology slide of Warthin's tumor

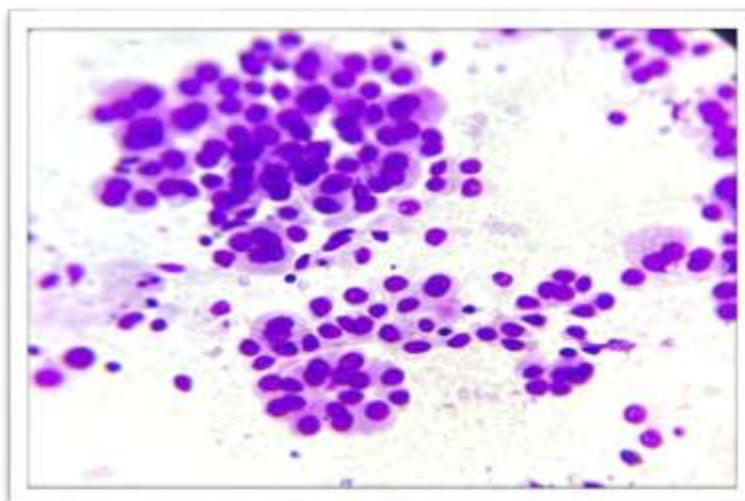


Figure 5. 400x view of Giemsa stained FNAC smear of Mucoepidermoid Carcinoma

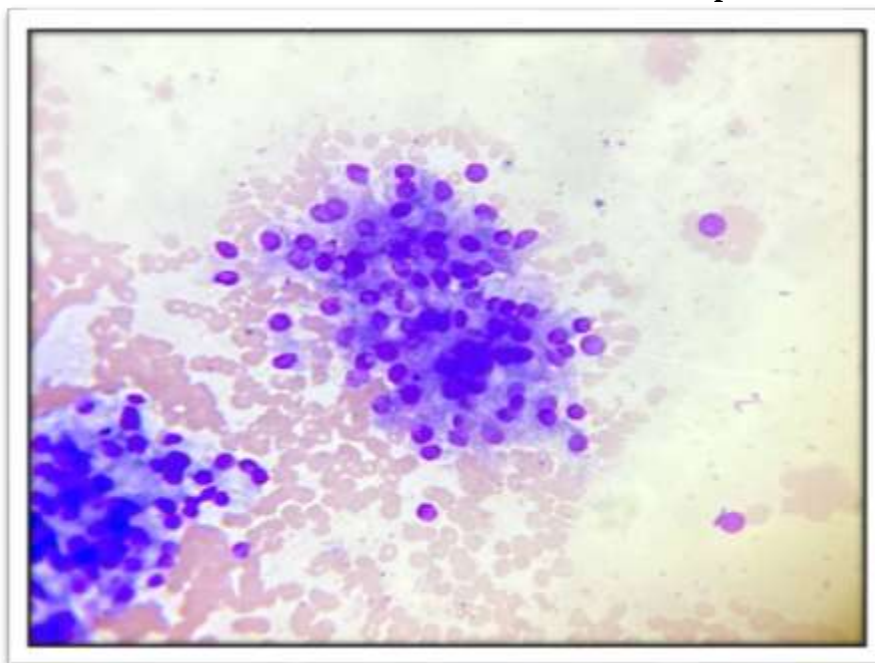


Figure 6. 400x view of Giemsa stained FNAC smear of Acinic Cell Carcinoma

DISCUSSION

The present study shows the most common age group to be involved was 51-60, which is similar to studies done by Chirmade J et al²³, Viswanathan K et al⁶ and Gaikwad V P et al.⁷ A study done by Kala C et al¹⁰ found the most common age group was 21-40. Bharti J N et al¹ and Rolon M R et al¹⁹ found the most common age group to be 41-50. The most common age group to be involved was 31-40, found by Karuna V et al.²⁴

The most common salivary gland involved was found to be the parotid by all the studies.

The present study found category IVA to be mostly involved, which is in concordance with most of the studies. A study by Kala C et al¹⁰ and Rolon M R et al¹⁹ found the most common category of MSRSGC to be involved was category II.

All the studies, including the present study, found the most common category II lesion to be acute/chronic sialadenitis and the most common category IVA lesion to be Pleomorphic Adenoma. The present study found Mucoepidermoid carcinoma to be the most common category VI lesion. A similar finding was seen in all of the studies except the study by Viswanathan K et al⁶, which found most common category VI lesion was Lymphoma.

Sensitivity and Specificity of all the studies are shown in the table below.

Table 7: Comparison of Sensitivity and Specificity

	Sensitivity	Specificity
Gaikwad V P et al ⁷	75%	100%
Kala C et al ¹⁰	83.3%	98.3%
Bharti J N et al ¹	36.3%	94.4%
Chirmade J et al ²³	92.3%	100%
Rolon M R et al ¹⁹	93.3%	94.6%
Viswanathan K et al ⁶	84%	84%
Karuna V et al ²⁴	85%	98.14%
Present study	88.9%	98.9%

CONCLUSION

Differentiating malignant neoplasms (cat VI) from benign (cat IVA) can be achieved with good sensitivity and specificity by cytological diagnosis using the Milan system. Thus Fine-needle aspiration cytology continues to be an accurate diagnostic tool for most salivary gland neoplasms showing classical morphologic features. However, difficult cases with unusual or overlapping features might occur. In these situations, the use of MSRSGC risk-stratification could be helpful to define appropriate management.

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