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Pathology

Assess the Utility of FNAC in Preoperative Diagnosis of Salivary Gland Lesions with Histological Correlation

Lt Col Mostare Khondoker[1*], Lt Col Wasim Selimul Haque[2], Prof Col (Rtd) SK Jaynul Islam[3]

[1]Classified Specialist in Pathology, Combined Military Hospital, Sylhet, Bangladesh
[2]Classified Specialist in Pathology, CO 81 Field Ambulance, Bangladesh
[3]Classified Specialist in Pathology, BIRDEM General Hospital, Dhaka, Bangladesh

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***Corresponding author:** Lt Col Mostare Khondoker
Classified Specialist in Pathology, Combined Military Hospital, Sylhet, Bangladesh

Abstract **Original Research Article**

Background: Salivary gland lesions encompass a wide spectrum of non-neoplastic and neoplastic conditions arising from major and minor salivary glands. Due to overlapping clinical features, preoperative diagnosis is challenging yet crucial. Fine Needle Aspiration Cytology (FNAC) is widely used as a preliminary diagnostic tool, but its accuracy must be validated against histopathology, the gold standard. ***Objective:*** To evaluate the diagnostic accuracy of FNAC in salivary gland lesions by comparing cytological findings with final histopathological diagnoses. ***Methods:*** This retrospective cross-sectional study was conducted at the Armed Forces Institute of Pathology (AFIP), Dhaka Cantonment, from January 2014 to September 2015. A total of 55 cases were selected based on available FNAC and histopathology results. Data were analyzed using SPSS version 11, and diagnostic correlation metrics such as true positive (TP), true negative (TN), false positive (FP), and false negative (FN) were calculated. ***Results:*** The majority of patients were aged 20–29 years, and the male-to-female ratio was 1.62:1. Of 55 cases, 42 were diagnosed as benign by FNAC, with 41 confirmed histologically (TN) and one case found malignant (FN). Among 13 FNAC-diagnosed malignant cases, 12 were histologically confirmed (TP) and one was benign (FP). Mucoepidermoid carcinoma was the most common malignancy. Concordance was observed in all cases of pleomorphic adenoma, Warthin tumor, benign cystic lesions, tuberculosis, and abscesses. Discordance was noted in 3 cases, highlighting FNAC limitations, particularly in differentiating between mucoepidermoid carcinoma and pleomorphic adenoma. ***Conclusion:*** FNAC proved to be a highly effective, minimally invasive, and cost-efficient diagnostic tool for evaluating salivary gland lesions. It demonstrated high concordance with histopathology, particularly in benign lesions. However, diagnostic discrepancies in specific tumor types reinforce the need for histopathological confirmation for definitive diagnosis and treatment planning.

Keywords: Salivary gland lesions, Fine Needle Aspiration Cytology (FNAC), mucoepidermoid carcinoma, cytology-histology correlation.

INTRODUCTION

Salivary gland lesions present a diverse range of pathological entities, encompassing both non-neoplastic and neoplastic conditions. These lesions can arise from major salivary glands—such as the parotid, submandibular, and sublingual glands—as well as numerous minor salivary glands scattered throughout the oral cavity and upper aerodigestive tract [1-3]. Due to their varied etiology and overlapping clinical presentations, an accurate and timely preoperative diagnosis is crucial for determining the most appropriate therapeutic intervention.

Fine Needle Aspiration Cytology (FNAC) is a minimally invasive, cost-effective, and rapid diagnostic tool that has gained widespread acceptance for evaluating salivary gland swellings. It allows for preliminary differentiation between benign and malignant lesions and can guide clinicians in formulating surgical plans. FNAC is especially valuable in avoiding unnecessary surgeries for non-neoplastic or benign conditions and in planning the extent of surgical resection for malignant cases [4-6].

Despite its advantages, FNAC is not without limitations. Factors such as sample inadequacy, poor cellular preservation, and interpretive challenges due to overlapping cytological features can lead to diagnostic

inaccuracies. [7] Thus, the diagnostic performance of FNAC must be continuously evaluated against the gold standard—histopathological examination of excised tissue.

Histological correlation plays a critical role in validating FNAC findings, providing insights into its sensitivity, specificity, and overall diagnostic accuracy. Numerous studies have attempted to establish the concordance between cytological and histological diagnoses, and while FNAC often demonstrates high diagnostic yield, variability in its effectiveness has been noted across different institutions and patient populations.

OBJECTIVE

This study aims to evaluate the accuracy and reliability of FNAC by correlating its findings with post-surgical histopathological results, thereby identifying both its diagnostic strengths and areas for improvement.

METHODOLOGY

Study Design This study was designed as a retrospective cross-sectional analysis.

Study Setting The study was conducted in the Department of Histopathology and Cytopathology at the Armed Forces Institute of Pathology (AFIP), Dhaka Cantonment.

Study Period Data collection spanned from January 2014 to September 2015.

Study Population

The study population included all patients who underwent Fine Needle Aspiration Cytology (FNAC) for salivary gland swellings at AFIP during the study period. FNAC was performed by a cytopathologist, and surgical decisions, including the need for biopsy, were made by a surgical specialist based on clinical and cytological evaluations. A total of 55 patients who underwent both preoperative FNAC and subsequent histopathological examination were included for final analysis.

Sampling Method Purposive sampling was employed for this study.

Sample Size

Out of 125 FNAC procedures performed during the study period, 55 cases involving swellings of major and minor salivary glands with available postoperative histopathological reports were selected for inclusion.

Inclusion Criteria

- Patients of any age and sex who underwent FNAC for salivary gland swellings at AFIP and subsequently received operative treatment were included in the study.

Exclusion Criteria: The following cases were excluded:

1. Lymph node swellings
2. Inadequate cytological samples
3. Patients who did not consent to participate in the study

Ethical Considerations:

All data were collected with prior permission from the participants. Participation was entirely voluntary, and patients retained the right to withdraw at any point without consequence. Written informed consent was obtained from all participants after explaining the objectives and nature of the study. Patient confidentiality was strictly maintained, and data anonymity was ensured throughout the research.

Statistical Analysis:

Data analysis was conducted using the SPSS (Statistical Package for Social Sciences) software, version 11 for Windows. Results were presented using appropriate tables and graphical representations where applicable.

RESULTS

Most of the cases were in the age group of 20-29 years, followed by 40-49 years. There were 08 cases over 60 years.

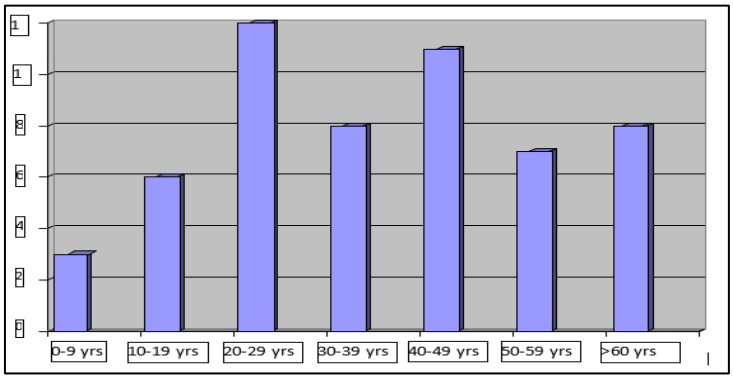

Figure-1: Age distribution of the study group (n=55)

Out of 55 patients included in the study, 34 cases (61.82%) were male and 21cases (38.12%) were female, with a male to female ratio 1.62:1. The results are depicted below in a pie diagram

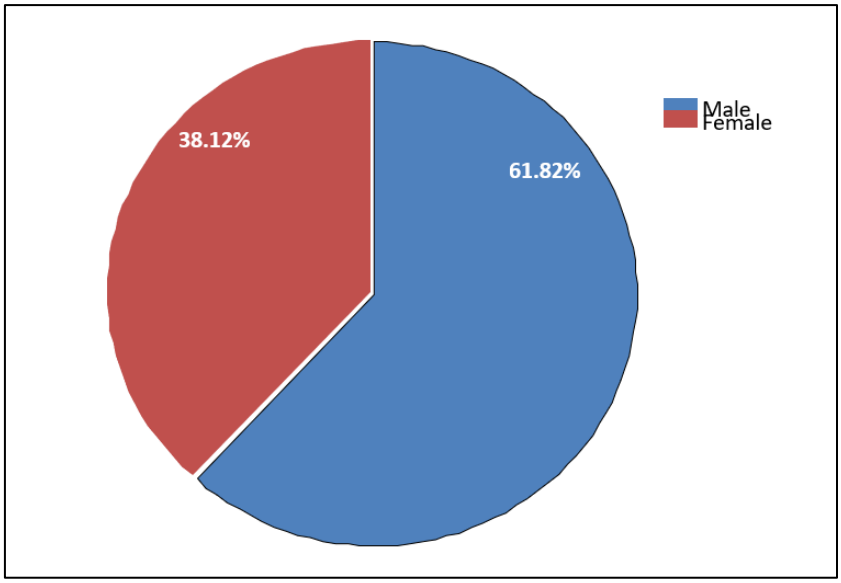

Figure-2: Pie diagram showing sex distribution of the study group (N=55)

Among the 55 cases evaluated by FNAC, the most common cytopathological diagnosis was sialadenitis, accounting for 25.45% (14 cases) of the total. Pleomorphic adenoma was the second most frequent diagnosis, comprising 14.54% (8 cases). Cases suspicious for malignancy and those diagnosed with tuberculosis or abscess each represented 10.90% (6 cases) of the sample. Warthin tumor accounted for 9.09% (5 cases), while mucoepidermoid carcinoma and benign cystic lesions each comprised 5.45% (3 cases). Less frequent diagnoses included acinic cell carcinoma and spindle cell lesions, both at 3.63% (2 cases each), followed by adenoid cystic carcinoma and suspicious benign/negative for malignancy, each at 1.82% (1 case). Schwannoma/myoepithelioma and other lesions were also noted, each representing 3.63% (2 cases).

Table 1: Distribution of cytopathological diagnosis of 55 cases

FNA diagnosis	No of cases	Percent
Sialadenitis	14	25.45%
Pleomorphic adenoma	08	14.54%
Suspicious for malignancy	06	10.90%
Tuberculosis &abscess	06	10.90%
Warthin tumor	05	9.09%
Mucoepidermoid carcinoma	03	5.45%
Benign cystic lesion	03	5.45%
Acinic cell carcinoma	02	3.63%
Adenoid cystic carcinoma	01	1.82%
Spindle cell lesion	02	3.63%
Schwannoma/myoepithelioma	02	3.63%
Suspicious benign/-ve for malignancy	01	1.82%
Others	02	3.63%
Total	55	100%

Table presents the histopathological outcomes of cytologically suspicious lesions identified through Fine Needle Aspiration (FNA). Among the six cases labeled as "suspicious for malignancy" on FNA, five were confirmed as mucoepidermoid carcinoma and one as acinic cell carcinoma, validating the initial suspicion. Additionally, one lesion reported as suspicious but negative for malignancy on FNA was later diagnosed as heterotopic gastric mucosa on histopathology.

Table-2: Cytologically suspicious lesions confirmed by histology

FNA examination	Histopathological exam
06xsuspicious for malignancy	05xMucoepidermoid carcinoma 01xAcinic cell carcinoma
01xsuspicious lesion, (-)ve for malignancy	01xheterotrophic gastric mucosa

Table highlights the discordant cases between Fine Needle Aspiration (FNA) and final histopathological diagnoses. Two cases initially diagnosed as sialadenitis on FNA were later confirmed as a giant cell tumor and a Warthin tumor, accounting for 14.28% of discordant findings. One case diagnosed as mucoepidermoid carcinoma on FNA was revealed to be pleomorphic adenoma on histopathology (33.33%), while another case labeled as acinic cell carcinoma was later confirmed as mucoepidermoid carcinoma (50%). These discrepancies reflect the diagnostic limitations of FNA in certain salivary gland lesions and underscore the importance of histopathological confirmation.

Table-3: Discordant lesions between FNA and histopathology

FNA diagnosis	Histopathological diagnosis	Percentage
02xsialadenitis	01xGiant cell tumor	14.28%
	01xWarthin tumor	
01xMucoepidermoid carcinoma	01x Pleomorphic adenoma	33.33%
01xAcinic cell carcinoma	01xMucoepidermoid carcinoma	50%

Table illustrates the correlation between Fine Needle Aspiration Cytology (FNAC) and final histopathological diagnosis. Out of 55 total cases, FNAC identified 42 as benign, of which 41 were confirmed as benign on histopathology (true negatives), and 1 was found to be malignant (false negative). Among the 13 cases diagnosed as malignant by FNAC, 12 were confirmed malignant (true positives), while 1 case was histologically benign (false positive). These results demonstrate a high degree of diagnostic accuracy for FNAC, with strong concordance between cytological and histopathological findings.

Table-4: Correlation of FNA diagnosis with final histopathology

FNAC diagnosis	Histopatholpgical diagnosis	
Benign (42)	Benign	Malignant
Malignant (13)	41(TN) 1(FP)	1(FN) 12(TP)

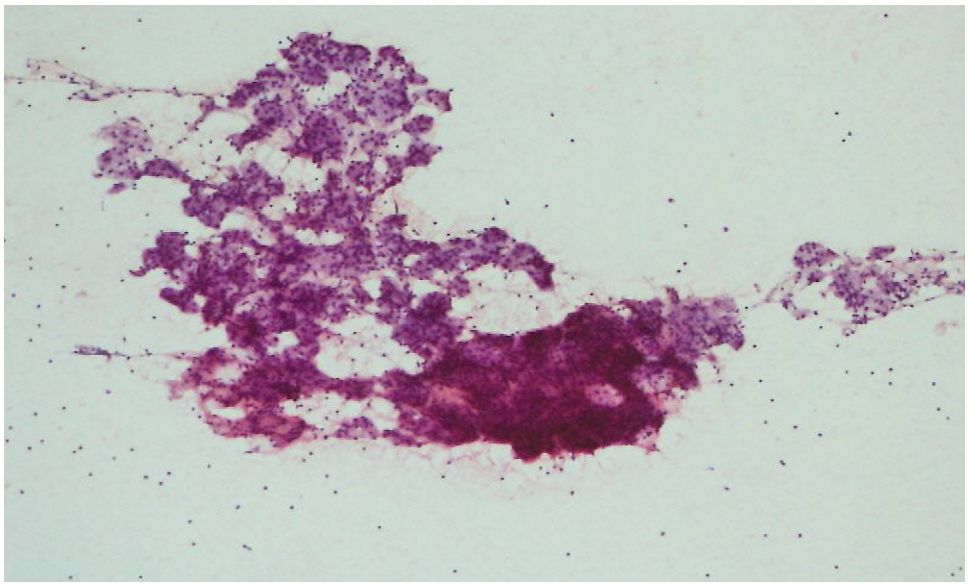

Figure 3: Cytology of Chronic sialadenitis (H&E Stain, 40X)

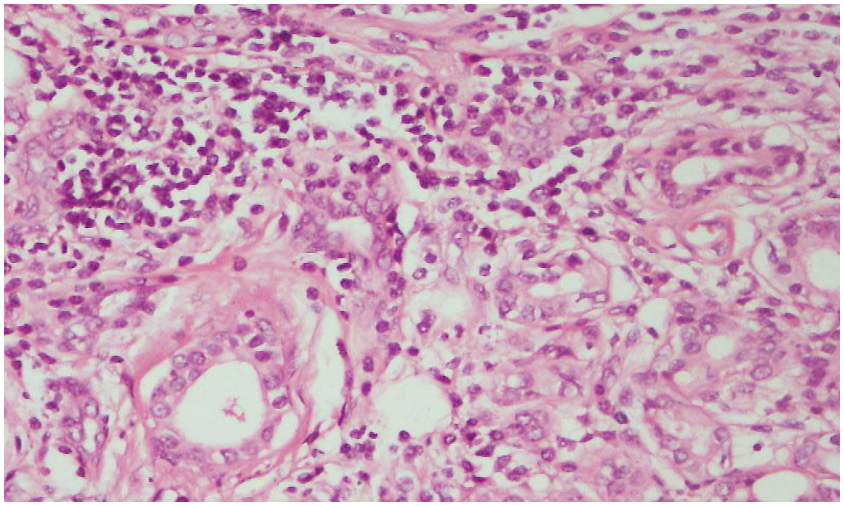

Figure 4: Histology of Chronic sialadenitis (H&E Stain, 40X)

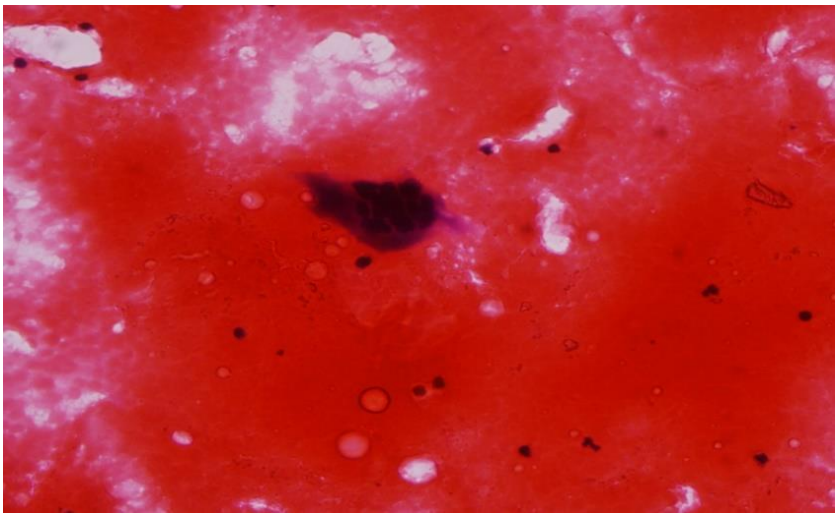

Figure 5: cytology of Giant cell tumor resembling sialadenitis

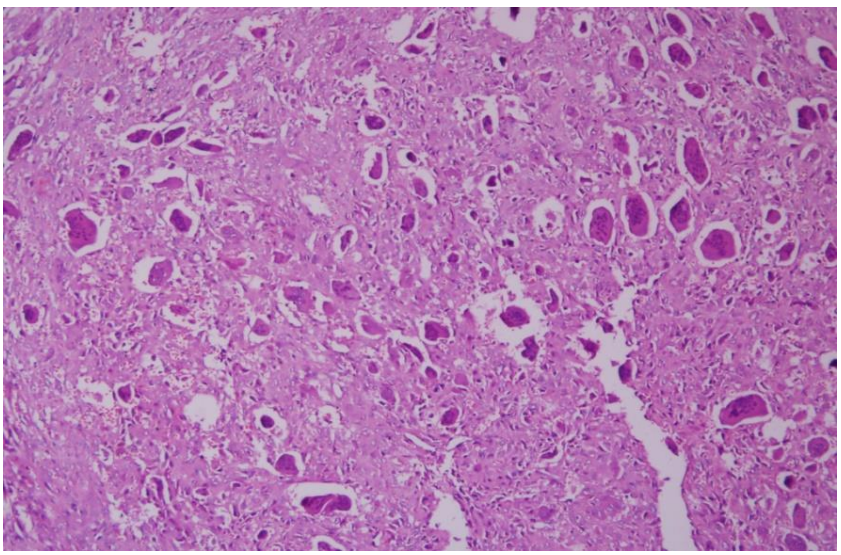

Figure 6: Histology of Giant cell tumor (H&E Stain, 40X)

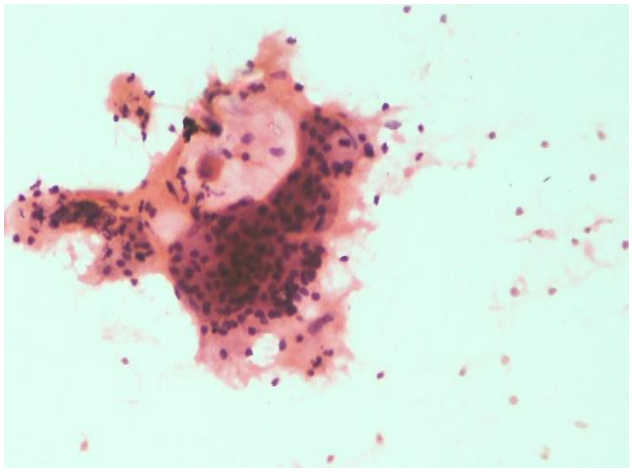

Figure 7: Cytology of Warthin tumor

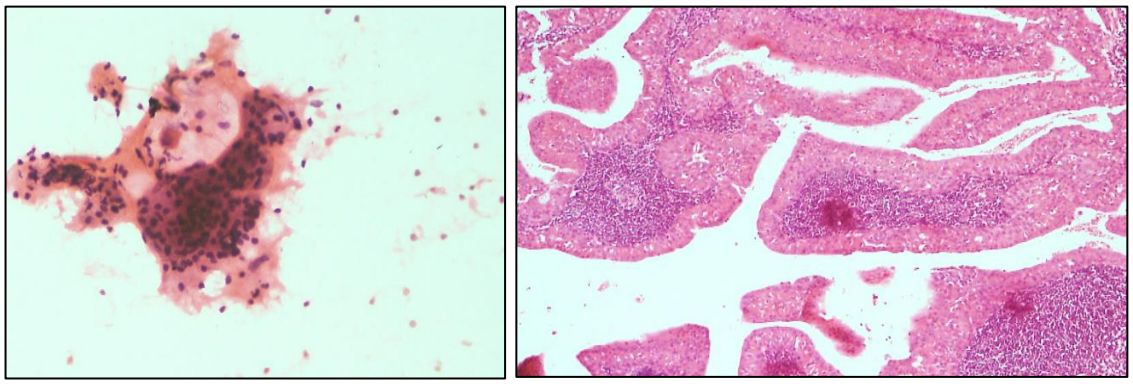

Figure 8: Histology of Warthin tumor (H&E Stain, 4X)

DISCUSSION

In our study out of 55 cases, 19 (34.55%) cases was diagnosed as benign neoplastic lesion on FNA exam .The incidence of benign neoplasm has been reported as 41%, 40%, 61% and 69% by different authors(36,37) .13 cases (23.65%) of our study were malignant lesions, as against 10%, 6% , 37% and 13% reported by other authors.[8] In our study 40% of cases have been reported as non neoplastic lesions mainly inflammatory lesions and tuberculosis. In other studies 20%, 40% of cases have been reported as non-neoplastic. [9]

Out of 14 cases diagnosed as sialadenitis on FNAC examination, 12 were correctly diagnosed by histopathological examination. In the remaining two cases, 1 was diagnosed as an intermediate borderline tumor, Giant cell tumor, and 1 as Warthin tumor. For a diagnosis of Warthin's tumour on FNAC, three components namely oncocytes, lymphocytes, and granular debris are required. If the sample is not representative, there may be difficulties in diagnosis. In Christallinis *et al* study, a diagnosis of non neoplastic lesion was given in two cases, which turned out to be Warthins tumour on histology. Klijanieko *et al* observed Cyto-histological correlation of 81.8% for Chronic sialadenitis' [10].

In this study 08 cases were diagnosed as pleomorphic adenoma on FNA examination, and all cases were confirmed with histopathological examination. In FNAC smears, features of pleomorphic adenoma are a mixture of epithelial and spindle-shaped cells along with chondromyxoid ground substance [11]. Pleomorphic adenoma was the most frequent benign neoplasm (21.42%). This is in agreement with other studies in which 50% and 21.6% cases were of pleomorphic adenoma [8-9].

In our series, we diagnosed 05 cases of Warthin tumor on FNAC and all cases were confirmed by histopathology. In case of Warthins Tumour, Klijanieko *et al* showed 90.1% correlation with histopathological examination (39). In our study there was 100% correlation. We also observed 100% correlation between FNA & histopathological examination in case of benign cystic lesion (03), tuberculosis (03) and abscess (03).

Mucoepidermoid carcinoma was the most common malignant neoplasm (08 cases). Out of 06 cases diagnosed as suspicious lesions for malignancy on FNAC ,05 cases proved to be mucoepidermoid carcinoma on histopathological examination. We could offer a specific diagnosis of Mucoepidermoid carcinoma in 03 cases on FNA examination. 02 cases of which showed histopathological correlation. The remaining one

was Pleomorphic adenoma on histopathological examination. This was the false positive case in our study. Rest one was diagnosed as acinic cell carcinoma on FNA examination initially, which was later proved as Mucoepidermoid carcinoma on histopathological examination. The mucoepidermoid carcinoma is probably the most difficult to diagnosis accurately by FNAC. Mucoepidermoid carcinoma and pleomorphic adenoma need to be differentiated as it is a recognized pitfall. Sometimes the intermediate cell population of mucoepidermoid carcinoma closely resembled the basal or myoepithelial cells of pleomorphic adenoma. Other study was observed the same in his case series in which 3/4 lesions were misdiagnosed as pleomorphic adenoma. [11]

CONCLUSION

In conclusion, this study highlights the diagnostic utility of Fine Needle Aspiration Cytology (FNAC) in evaluating salivary gland lesions, demonstrating high accuracy when compared with final histopathological findings. The majority of cases occurred in the 20–29-year age group, with a male predominance (male-to-female ratio of 1.62:1). Among the cytologically suspicious cases, most were confirmed malignant on histology, reinforcing FNAC's role in early malignancy detection. While a few discordant cases were noted—underscoring FNAC's limitations in distinguishing certain lesions—overall, the technique proved to be a reliable, minimally invasive tool for initial diagnosis and management planning.

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