

Research Article

HEAD AND NECK LESION: A CYTOMORPHOLOGICAL STUDY WITH HISTOPATHOLOGICAL CORRELATION IN NEOPLASTIC CASES

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ABSTRACT

Introduction: Head and neck swellings constitute a wide spectrum of lesions ranging from inflammatory to malignant conditions. Fine Needle Aspiration Cytology (FNAC) is a simple, cost-effective, and reliable diagnostic tool for their initial evaluation. This study assessed the cytomorphological spectrum of head and neck lesions and correlated the findings with histopathology wherever available.

Aim: To study the cytomorphological spectrum of head and neck lesions, their distribution with respect to age, sex, and site, and to correlate cytomorphological findings in neoplastic lesions with histopathological findings wherever possible.

Materials and Methods: This prospective hospital-based study was conducted in the

Department of Pathology, SMCH, over a period of one year. FNAC was performed on 321 patients presenting with head and neck swellings. Histopathological correlation was carried out in neoplastic cases. Cytological categorization was done using Sydney, Bethesda, and Milan classification systems for lymph node, thyroid and salivary gland respectively.

Results: Lymph node lesions were the most common (51.09%), followed by skin and soft tissue lesions (25.55%), thyroid lesions (13.08%), salivary gland lesions (5.61%), and oral cavity lesions (4.67%). Reactive lymphadenitis (36.59%), keratinous cyst (43.90%), and colloid goitre (64.29%) were the most frequent benign lesions. Among malignant lesions, squamous cell carcinoma was the most common, accounting for 40% of malignant cases.

FNAC showed high diagnostic concordance with histopathology and demonstrated a sensitivity of 80% for malignant lesions.

Conclusion: FNAC is a minimally invasive, accurate, and cost-effective first-line diagnostic modality for head and neck swellings. It shows high sensitivity and strong histopathological correlation, highlighting its importance in early diagnosis and appropriate patient management.

Keywords: FNAC, Head and Neck Lesions, Cytomorphology, Histopathology, Squamous Cell Carcinoma

INTRODUCTION

Lesions of the head and neck region encompass a wide spectrum of pathological conditions ranging from inflammatory and benign disorders to malignant neoplasms. Fine Needle Aspiration Cytology (FNAC) is widely accepted as the first-line investigative modality for the evaluation of head and neck swellings, as it is a simple, safe, rapid, and cost-effective diagnostic procedure. Early and accurate diagnosis plays a crucial role in guiding appropriate clinical management and improving patient outcomes.

The cytomorphological assessment obtained through FNAC provides valuable information regarding the nature of the lesion, enabling differentiation between non-neoplastic, benign, and malignant conditions. FNAC is particularly useful in the evaluation of lesions involving the thyroid gland, salivary glands, lymph nodes, and soft tissues, where clinical examination and radiological investigations alone may not be sufficient to establish a definitive diagnosis.

Head and neck swellings, including malignant lesions, are a significant health concern in Assam, with a higher incidence

reported among males and individuals from rural areas, particularly in the 50–70 year age group. This increased burden has been attributed largely to the high prevalence of tobacco consumption in the region. Squamous cell carcinoma constitutes the majority of head and neck malignancies, with the hypopharynx being one of the most commonly involved sites.

The present study aims to analyse the cytomorphological patterns of head and neck lesions, to study their distribution with respect to age, sex, and anatomical site, and to correlate the cytomorphological findings in neoplastic lesions with histopathological findings wherever possible.

MATERIALS AND METHODS

The present hospital-based prospective study was conducted in the Department of Pathology, Silchar Medical College and Hospital, Silchar, Assam, India, from July 2024 to January 2025. The study was approved by the Institutional Ethics Committee of Silchar Medical College and Hospital. Informed written consent was obtained from all patients prior to the procedure. A total of 321 cases of head and neck lesions were included in the study. Data were collected from the Cytology and Histopathology sections of the Department of Pathology.

Inclusion Criteria

Patients of all age groups and both sexes presenting with palpable and/or radiologically detected head and neck swellings, and patients who underwent FNAC followed by biopsy of the lesion wherever feasible, were included in the study.

Exclusion Criteria

Patients with lesions located outside the head and neck region were excluded from the study.

Methodology

Patients presenting with head and neck swellings were clinically evaluated. Relevant clinical details including age, sex, anatomical site of the lesion, duration of symptoms, and radiological findings (where available) were recorded.

FNAC was performed under strict aseptic precautions using a 22–24 gauge needle attached to a 10 mL disposable syringe. The needle was inserted into the lesion and negative pressure was applied to obtain adequate cellular material. Multiple passes were made to ensure sufficient sampling. The aspirated material was expelled onto clean glass slides.

Thin smears were prepared by gently spreading the material using another slide. Air-dried smears were stained with May–Grünwald Giemsa (MGG) stain and PAP stain and examined under light microscopy.

Cytological Evaluation

All smears were evaluated for cellularity, cellular morphology, background elements, and other associated specific diagnostic features. Based on cytomorphological findings, lesions were categorised as non-neoplastic, benign, suspicious/atypical, or malignant according to different classification systems.

Histopathological Correlation

In neoplastic cases where biopsy or excision specimens were available, the tissue samples were processed routinely, stained with haematoxylin and eosin (H&E), and examined histopathologically. Cytological diagnoses were then correlated with the corresponding histopathological findings.

Statistical Analysis

The data were entered into Microsoft Excel and analysed using Statistical Package for the Social Sciences (SPSS) software (version 23). Descriptive statistical analysis was performed. Categorical variables were expressed as frequencies and percentages. Sensitivity of FNAC for malignant lesions was calculated using histopathological diagnosis as the gold standard wherever available.

RESULTS AND OBSERVATIONS

321 cases of fine needle aspiration cytology were performed from head and neck region. The various lesions involving lymph nodes, skin and soft tissue, thyroid, salivary glands, and oral cavity were analysed. The site, gender and age wise distribution of cases is summarised in Table 1 and 2. Lymph node lesions constituted a major proportion of cases and were categorised according to the Sydney Reporting System for Lymph Node Cytopathology in Table 3. Neoplastic lymph node lesions with surgical biopsy included metastatic squamous cell carcinoma and Non-Hodgkin lymphoma (Table 4).

Skin and soft tissue lesions were predominantly non-neoplastic (Table 6). Thyroid lesions were classified using the Bethesda System for Reporting Thyroid Cytopathology (Table 7), with neoplastic lesions detailed separately (Table 8). Salivary gland lesions were categorised according to the Milan System (Table 9, Table 10). Oral cavity lesions included both non-neoplastic and neoplastic conditions, with squamous cell carcinoma being the predominant malignancy (Table 11,12).

Table 1: Distribution of head and neck lesions according to site and gender

Tissue involved	Male	Female	Total	Percentage (%)
Lymph Node	83	81	164	51.09
Skin and soft tissue	45	37	82	25.55
Thyroid	08	34	42	13.08
Salivary gland	05	13	18	5.61
Oral cavity	10	05	15	4.67
Total	150	171	321	100

Note: Data are expressed as absolute numbers and percentages. Percentages are calculated with respect to total cases (n=321). Male and female values indicate number of cases.

Table 2: Age-wise distribution of various head and neck lesions

AGE(years)	No. of cases	Percentage of cases(%)
0-10	40	12.46
11-20	54	16.82
21-30	71	22.12
31-40	45	14.02
41-50	50	15.57
51-60	37	11.53
>60	24	7.48
TOTAL	321	100

Table 3: Sydney Reporting System for lymph node cytopathology:

Category	Lesions	Male	Female	Total	Percentage (%)
L1-insufficient/inadequate	Insufficient/inadequate/non-diagnostic	3	2	05	3.05
L2-Benign	Reactive lymphadenitis	25	30	55	33.54
	Granulomatous lymphadenitis	16	20	36	21.95
	Tubercular lymphadenitis	10	13	23	14.02
	Acute suppurative lymphadenitis	07	04	11	6.71
L3	Atypical/AUS	00	00	00	0.00
L4	Suspicious for malignancy	01	01	02	1.22
L5- Malignant	Non Hodgkins lymphoma	02	02	04	2.44
	Metastatic SCC	20	08	28	17.07
	Total	83	81	164	100

Table:4 Lymph node Neoplastic Lesions with surgical biopsy:

FNAC diagnosis	No. of cases	Cases with surgical biopsy	Consistent	Inconsistent	Histopathological finding
Metastatic SCC	28	5	5	0	Metastatic SCC-5
Non-Hodgkins lymphoma	4	1	1	0	Non- Hodgkins lymphoma-1
Reactive lymphadenitis	55	1	0	1	Non- Hodgkins lymphoma-1

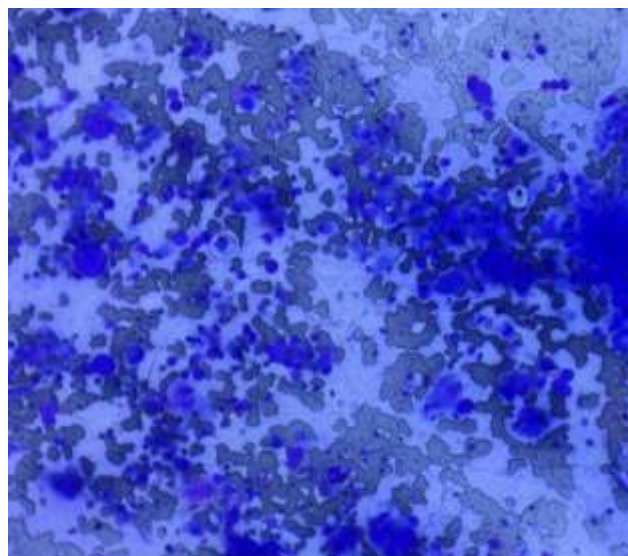


Figure 1: MGG stained image of Metastatic SCC

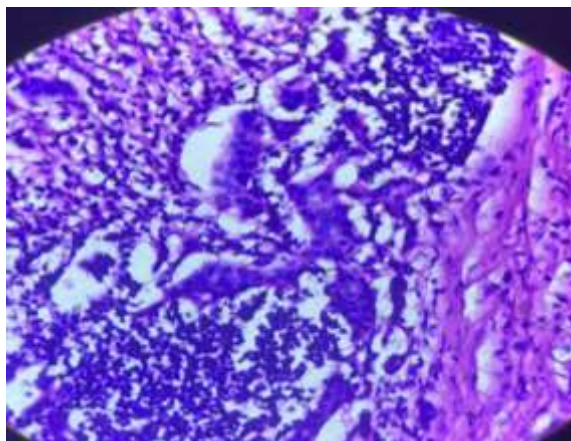


Figure 2: H & E image of Metastatic SCC

Table 5: Distribution of Skin and soft tissue lesions:

Category	Lesions	Male	Female	Total	Percentage (%)
Insufficient/inadequate		00	01	01	1.22
Benign	Keratinous cyst	20	16	36	43.90
	Lipoma	06	09	15	18.30
	Benign skin adnexal tumor	05	02	07	8.54
	Benign cystic lesion	03	01	04	4.88
	Acute suppurative lesion	08	05	13	15.85
	Trichilemmal cyst	01	01	02	2.44
	Thyroglossal cyst	01	02	03	3.66
Malignant		01	00	01	1.22

	Total	45	37	82	100
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Table 7: Thyroid lesions were categorised according to Bethesda system for reporting thyroid pathology:

Category	Lesions	Male	Female	Total	Percentage (%)
I- Nondiagnostic / Unsatisfactory		00	01	01	2.38
II- Benign	Colloid goitre	4	22	26	61.90
	Adenomatoid goitre	01	03	04	9.52
	Lymphocytic thyroiditis	01	04	05	11.90
III- Atypia of Undetermined Significance (AUS)		00	00	00	0.00
IV- Follicular neoplasm		01	01	02	4.76
V- Suspicious for malignancy		00	00	00	0.00
VI- Malignant	Papillary thyroid carcinoma	01	03	04	9.52
	Total	08	34	42	100

Table:8 Thyroid Neoplastic Lesions:

FNAC diagnosis	No. of cases	Cases with surgical biopsy	Consistent	Inconsistent	Histopathological finding
Papillary thyroid carcinoma	4	2	2	0	Papillary thyroid carcinoma-2
Follicular neoplasm	2	1	0	1	Papillary thyroid carcinoma-1

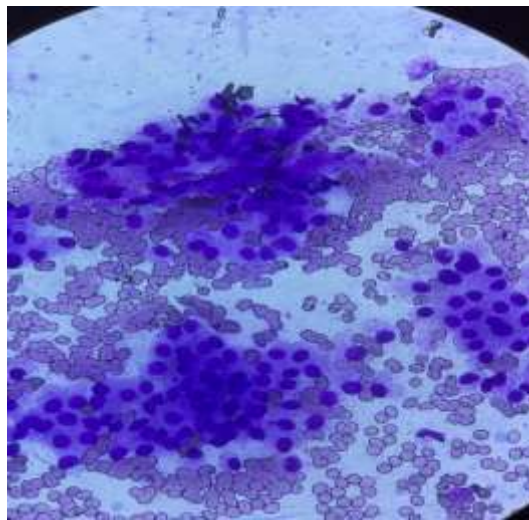


Figure 3: MGG stained smear of papillary thyroid carcinoma

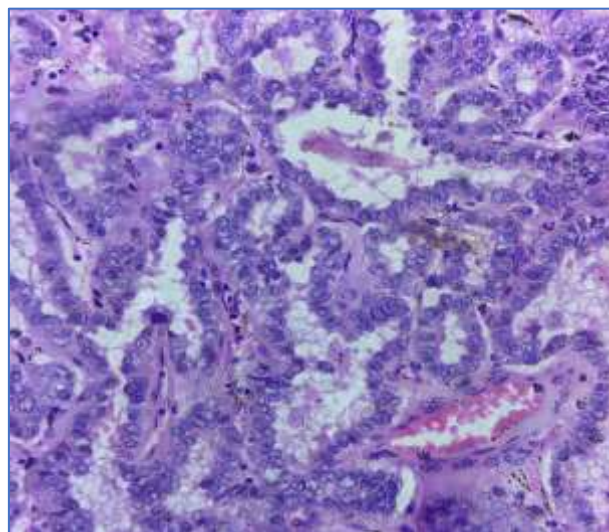


Figure 4: H & E section of papillary thyroid carcinoma

Table 9: Salivary gland lesions were categorized according to Milan system for reporting salivary gland pathology:

Category	Lesions	Male	Female	Total	Percentage (%)
Non-diagnostic		00	00	00	0.00
Non-neoplastic	Parotitis	01	01	02	11.11
	Sialadenitis	02	04	06	33.33
Atypia of Undetermined Significance (AUS)		00	00	00	0.00
Benign Neoplasm	Pleomorphic adenoma	02	06	08	44.44
Salivary Gland Neoplasm of Uncertain Malignant Potential (SUMP)		00	00	00	0.00
Malignant	Adenoid cystic carcinoma	00	01	01	5.55
	Acinic cell carcinoma	00	01	01	5.55
	Total	05	13	18	100

Table:10 Salivary gland Neoplastic Lesions:

FNAC diagnosis	No. of cases	Cases with surgical biopsy	Consistent	Inconsistent	Histopathological finding
Adenoid cystic carcinoma	01	01	00	01	Low grade polymorphous adenocarcinoma-1
Pleomorphic adenoma	08	02	01	01	Adenoid cystic carcinoma-1 Pleomorphic adenoma-1

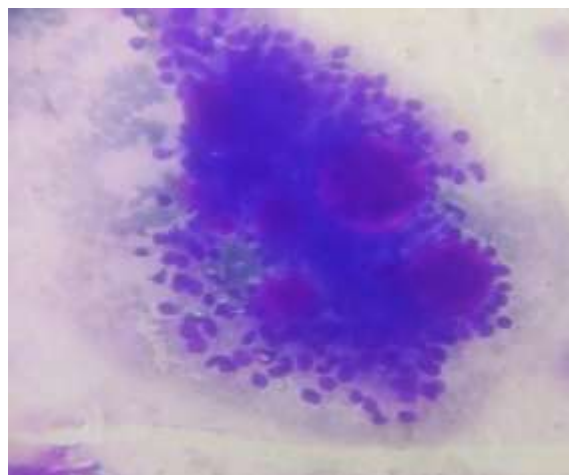


Figure 5: MGG stained smear of Adenoid Cystic Carcinoma

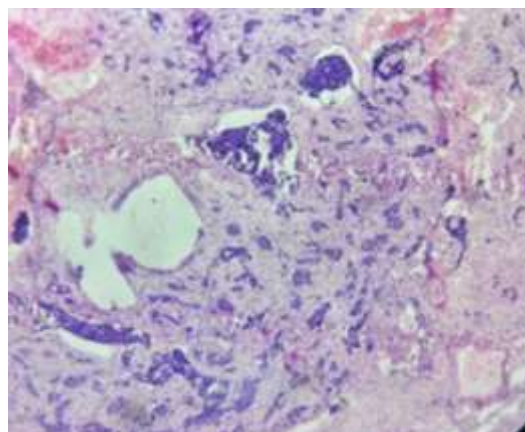


Figure 6: H & E section of Adenoid Cystic Carcinoma

Table 11: Distribution of Oral lesions:

Category	Lesions	Male	Female	Total	Percentage (%)
Inadequate/ Unsatisfactory		2	0	02	13.33
Non-neoplastic	Inflammatory/Reactive lesions	01	00	01	6.66
Benign	Benign cystic lesions	02	03	05	33.33
Suspicious or Atypical		00	01	01	6.67
Malignant	Squamous cell carcinoma	04	02	06	40.00
	Total	10	05	15	100

Table:12 Oral cavity Neoplastic Lesions:

FNAC diagnosis	No. of cases	Cases with surgical biopsy	Consistent	Inconsistent	Histopathological finding
Moderately differentiated SCC	3	2	1	1	Moderately differentiated SCC-1 Keratinizing SCC-1
Well differentiated SCC	3	2	2	0	Well differentiated SCC-2

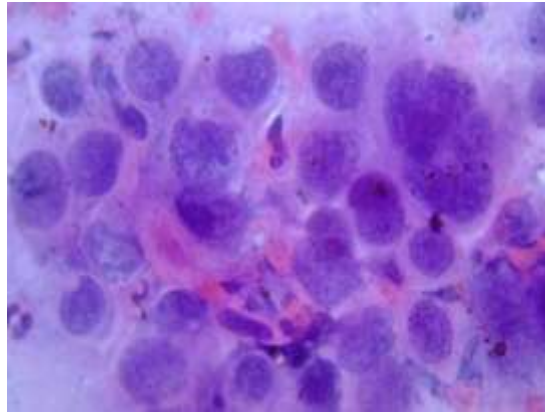


Figure 7: MGG stained smear of Squamous cell Carcinoma

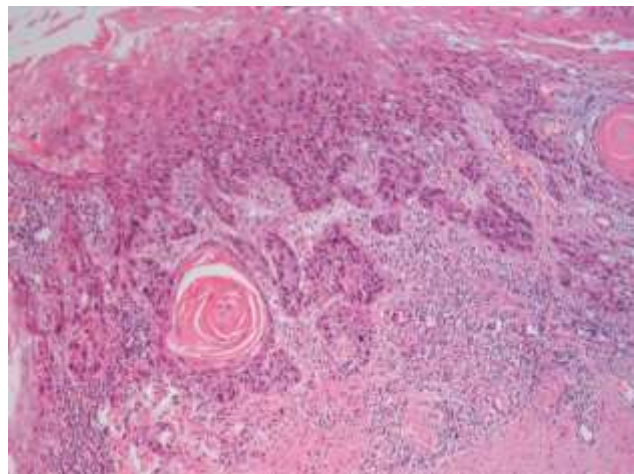


Figure 8: H & E of Squamous cell carcinoma

DISCUSSION

The present hospital-based prospective study analysed the cytomorphological spectrum, demographic profile, and cyto-histopathological correlation of 321 head and neck lesions over a six-month period, with Fine Needle Aspiration Cytology (FNAC) serving as the primary diagnostic modality. The findings reaffirm FNAC as a rapid, safe, and cost-effective first-line investigation, as reported in multiple published series.

A slight female predominance was observed in the present study, comparable

to the observations of Gautam et al. and Sharma et al., where thyroid lesions contributed significantly to female preponderance. In contrast, studies by Khetrpal et al. and Khant et al. reported male predominance, reflecting regional and referral-based variations. The peak incidence in the 21–30-year age group is similar to findings reported by Jain et al. and Hota et al., whereas studies from Western populations often demonstrate a higher incidence in older age groups, largely due to a greater proportion of malignant lesions.

Lymph nodes were the most commonly involved site, accounting for just over half of all cases, a finding consistent with reports by Lathkar et al., and Mundasad et al. Among lymph node lesions, reactive lymphadenitis (36.59%) and granulomatous lymphadenitis (23.17%) were the most common benign conditions, while metastatic squamous cell carcinoma represented the majority of malignant lymph node cases (17.07%), which is in agreement with studies by Mohamed et al., where tobacco-related head and neck malignancies were the leading cause of cervical nodal metastasis. Metastatic squamous cell carcinoma (SCC) and non-Hodgkin lymphoma were diagnosed with 100% sensitivity, 100% PPV, and 100% accuracy. These values are consistent with prior studies Khetrapal et al., 2019; Nadesan et al., 2021 reporting high FNAC reliability for lymph node metastases. One case initially diagnosed as reactive lymphadenitis on FNAC was subsequently confirmed as non-Hodgkin lymphoma on biopsy; similar diagnostic challenges have been reported by A K Gupta et.al who in their large study of 1,261 lymphadenopathy cases, highlighted the difficulty in differentiating reactive hyperplasia from non-Hodgkin lymphoma on FNAC and emphasized the need for excisional biopsy in cases with clinicocytological discrepancy.

The thyroid lesion profile was dominated by colloid goitre (64.29%), consistent with trends reported by Gupta et al. (2010) and Babu et al. (2016), where benign lesions outnumber malignancies by a wide margin. The low malignancy rate observed in thyroid FNACs mirrors findings in other large Indian series, supporting the role of FNAC in avoiding unnecessary surgical interventions. Papillary thyroid carcinoma achieved 100% sensitivity and PPV, whereas follicular neoplasm showed 0%

sensitivity and PPV, reflecting complete discordance in the small number of cases, likely due to cytological overlap and sampling limitations.

Salivary gland lesions showed a predominance of benign neoplasms, particularly pleomorphic adenoma (44.44%), in keeping with the well-established epidemiology of salivary gland neoplasms comparable to reports by Vora et al. and Jasani et al. Adenoid cystic carcinoma demonstrated 0% sensitivity and PPV, where the FNAC diagnosis did not match the histopathological outcome (low-grade polymorphous adenocarcinoma) illustrating the cytological overlap between benign and malignant salivary gland lesions, particularly those with a myxoid matrix or basaloid component. The use of the Milan System (as used in this study) is designed to minimize these errors, but the discrepancies underscore the necessity of histological confirmation for all salivary gland neoplasms as stated by study done by Saoud C et.al.

In oral cavity lesions, squamous cell carcinoma accounted for half of all cases, reflecting the high carcinogenic burden of tobacco-related habits in this population. Overall, squamous cell carcinoma emerged as the single most frequent malignant diagnosis in the present study (50% of malignant lesions), corroborating national cancer registry data. Well-differentiated SCC achieved 100% sensitivity, PPV, and accuracy, while moderately differentiated SCC showed 50% sensitivity and PPV, with one false positive and one false negative, likely due to sampling errors in ulcerated lesions.

Skin and soft tissue swellings showed a predominance of keratinous cysts (43.90%) and lipomas (18.30%), with malignancies comprising only a small fraction (2.44%). Cyto-histopathological correlation demonstrated a high concordance rate,

comparable to previously published studies. Discordant cases were largely confined to follicular-patterned thyroid lesions, lymphomas, and select salivary gland neoplasms, reflecting well-recognized limitations of FNAC. Similar diagnostic challenges have been highlighted by Baloch et al. and Kocjan et al., underscoring the need for histopathological confirmation and ancillary techniques in selected cases.

In our study, the overall sensitivity of FNAC for detecting malignant lesions was 80% which is within the range reported in similar Indian studies (78-97%), underscoring FNAC's strong role in the preliminary diagnosis of malignant head and neck lesions. Specificity could not be calculated precisely because true negative cases (benign lesions confirmed histologically) were not included in the performance dataset. The exceptionally high PPV in most categories indicates that a positive FNAC diagnosis of malignancy is highly reliable. The neoplastic cases taken from cytology for the histopathological correlation the risk of malignancy calculated is 100% in our study. Inferential statistical testing was not performed as the study aimed to evaluate diagnostic accuracy rather than compare independent groups.

CONCLUSION

Our study successfully characterized the cytomorphological spectrum of head and neck lesions, reflecting a typical pattern of a high burden of inflammatory/infectious (Tuberculosis) and benign (Colloid goitre, Reactive lymphadenitis) disease prevalent in our region. The high diagnostic accuracy of FNAC, confirmed by robust cyto-histopathological correlation, supports its continued use as the primary screening tool.

Limitations: Not all neoplastic cases could be followed up with biopsy, due to patient

unwillingness or clinical inaccessibility, limiting complete diagnostic validation. The data were derived from a single tertiary care center, which may not reflect the broader demographic or regional variability. In differentiating follicular neoplasms and subtle lymphomas necessitate judicious use of the Bethesda and Milan reporting systems and a low threshold for recommending excisional biopsy or ancillary studies to ensure optimal patient care, as widely advocated by Cibas et al. (2020) and other international bodies.

Declaration of Conflict of Interest

The authors declare that there is no conflict of interest, financial or otherwise, associated with this study. The manuscript has not been published previously in any language and is not under consideration for publication elsewhere, either in whole or in part. This work does not form part of any previously published study. The authors also declare that this research is not derived from a thesis or PhD work.

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