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RESEARCH ARTICLE
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DIAGNOSTIC UTILITY OF FINE NEEDLE ASPIRATION CYTOLOGY IN HEAD AND NECK SWELLINGS: A 1,745-CASE EXPERIENCE FROM A TERTIARY CARE CENTRE

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ABSTRACT

Background: Head and neck swellings encompass a diverse spectrum of inflammatory, benign, and malignant lesions. Fine needle aspiration cytology (FNAC) is a rapid, minimally invasive diagnostic tool for the evaluation. **Methods:** A total of 1,745 patients with head and neck swellings underwent FNAC over two years. Smears were stained with May-Grünwald-Giemsa and Papanicolaou stains; Ziehl-Neelsen and Periodic Acid-Schiff stains were used where indicated. **Results:** Lymph node swellings were the most common (46.82%), followed by thyroid (22.64%), miscellaneous (21.37%), and salivary gland (9.17%) lesions. Non-neoplastic cases constituted 76.51%, while benign and malignant neoplasms accounted for 12.09% and 11.40%, respectively. The 21–30 years age group showed the highest prevalence (19.7%), with a male predominance (M: F 1.12:1). Reactive lymphadenitis (42.36%) was the commonest lymph node diagnosis; colloid goiter (39.49%) and lymphocytic thyroiditis (25.06%) led among thyroid lesions. Acute sialadenitis (33.75%) and pleomorphic adenoma (33.12%) were the predominant salivary gland findings. **Conclusion:** FNAC is an effective first-line modality for head and neck swellings, accurately distinguishing non-neoplastic from neoplastic lesions and guiding clinical management across all age groups.

Keywords: Fine needle aspiration cytology, head and neck swellings, lymphadenopathy, thyroid lesions, salivary gland lesions

INTRODUCTION

Head and neck swellings constitute a heterogeneous group of lesions encountered frequently in clinical practice, ranging from reactive inflammatory processes to benign and malignant neoplasms. The anatomical complexity of this region, encompassing lymph nodes, thyroid
gland, salivary glands, and various soft tissue structures, often poses a diagnostic challenge for clinicians. Fine needle aspiration cytology (FNAC) has emerged as a rapid, minimally invasive, and cost-effective first-line diagnostic tool for evaluating such swellings [1, 2]. Since its introduction by Martin and Ellis in 1930, FNAC has gained widespread acceptance due to its high diagnostic accuracy, simplicity, and ability to provide same-day results [3]. The procedure obviates the need for

open biopsy in many cases, reduces patient anxiety, and guides appropriate surgical or medical management [4]. In the head and neck region, where diverse pathologies frequently overlap in clinical presentation, FNAC serves as an invaluable triage tool. Several studies have documented the utility of FNAC in distinguishing neoplastic from non-neoplastic lesions, identifying metastatic deposits, and diagnosing specific inflammatory conditions such as tubercular lymphadenitis [5, 6]. Despite its advantages, diagnostic pitfalls exist, particularly in cases with inadequate sampling or when dealing with certain low-grade malignancies [7]. The present study was undertaken to comprehensively analyse the cytomorphological spectrum of head and neck swellings using FNAC in a large cohort of 1,745 patients, and to evaluate its diagnostic utility across different age groups, sexes, and anatomical subsites.

MATERIALS AND METHODS

Study design and setting: This was a combined prospective and retrospective study conducted in the Cytology section of the Department of Pathology at Government Medical College Jammu over a total duration of two years. The retrospective phase covered the period from 1st August 2022 to 31st July 2023, while the prospective phase spanned from 1st August 2023 to 31st July 2024.

Inclusion and exclusion criteria: All patients presenting with palpable head and neck swellings of both sexes and all age groups referred to the cytology section were included. Unsatisfactory smears and non-cooperative patients were excluded.

FNAC procedure: The procedure was explained to each patient, and written informed consent was obtained. Aspiration was performed under aseptic conditions using a 20 mL disposable syringe with a 21–23-gauge needle attached to a Franzen handle. The swelling was fixed manually, and the needle was introduced into the lesion. Negative pressure was applied, and the needle was moved back and forth within the mass to obtain cellular material. After releasing the vacuum, the needle was withdrawn, and the aspirated material was expelled onto clean glass slides. Smears were prepared, with two slides immediately fixed in 95% isopropyl alcohol (or equal parts ethyl alcohol and ether) for Papanicolaou (PAP) staining, and two slides air-dried for May-Grünwald-Giemsa (MGG) staining. Ziehl-Neelsen (ZN) staining was performed where acid-fast bacilli were suspected. Periodic Acid-Schiff (PAS) staining was done when indicated.

Staining protocols: PAP staining was performed following standardised steps, including haematoxylin staining, differentiation, bluing, and counterstaining with OG6 and EA50. MGG staining involved fixation in methanol, staining with diluted MGG and Giemsa solutions, and differentiation in buffer. ZN staining used carbolfuchsin with heat, acid-alcohol differentiation, and methylene blue counterstain. All stained smears were examined by a cytopathologist. Clinical details, local examination findings, and cytological diagnoses were recorded on a predesigned proforma.

RESULTS

A total of 1,745 patients with head and neck swellings were included. Base line characters and variables are shown in tables below.

Table 1: Distribution of swellings according to organ of origin

Organ of Origin	No. of cases (n)	Percentage (%)
Lymph Node	817	46.82
Thyroid Gland	395	22.64
Miscellaneous*	373	21.37
Salivary Glands	160	9.17
Total	**1745**	**100.00**

*The miscellaneous group includes swellings from skin, soft tissue, blood vessels, neural tissue, and congenital lesions.

Table 2: Various disease groups diagnosed in the study

Disease Group	No. of cases (n)	Percentage (%)
Non-neoplastic	1335	76.51
Neoplastic – Benign	211	12.09
Neoplastic – Malignant	199	11.40
Total	**1745**	**100.00**

Table 3: Age distribution of head and neck lesions

Age group (years)	No. of cases (n)	Percentage (%)
<10	317	18.1
11–20	289	16.5
21–30	345	19.7
31–40	234	13.3
41–50	221	12.6
51–60	187	10.6
61–70	102	5.8
71–80	50	2.8
>80	10	0.57
Total	**1745**	**100.0**

Table 4: Sex distribution in the study

Sex	No. of cases (n)	Percentage (%)
Male	902	51.69
Female	843	48.31
Total	**1745**	**100.00**

Table 5: Sex distribution as per organ involvement

Organ of Origin	Male n (%)	Female n (%)	Total (n)
Lymph Node	541 (66.22)	276 (33.78)	817
Salivary Glands	92 (57.50)	68 (42.50)	160
Thyroid Glands	66 (16.71)	329 (83.29)	395
Miscellaneous	203 (54.42)	170 (45.58)	373
Total	**902**	**843**	**1745**

CYTOMORPHOLOGICAL FEATURES

Figure 1: NHL, FNA smear showing monomorphic population of lymphoid cells

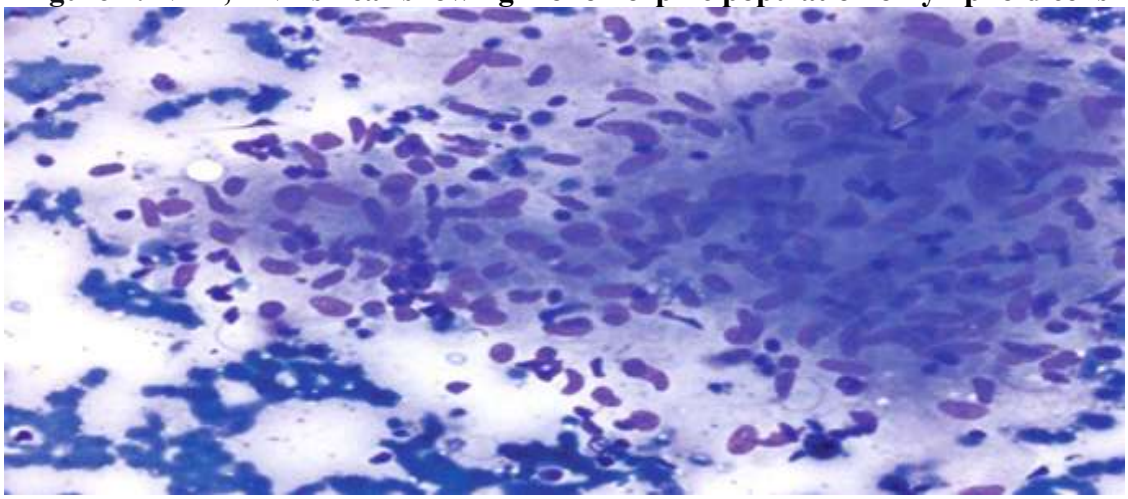


Figure 2: ZN smear showed acid fast bacilli (ZN X 1000)

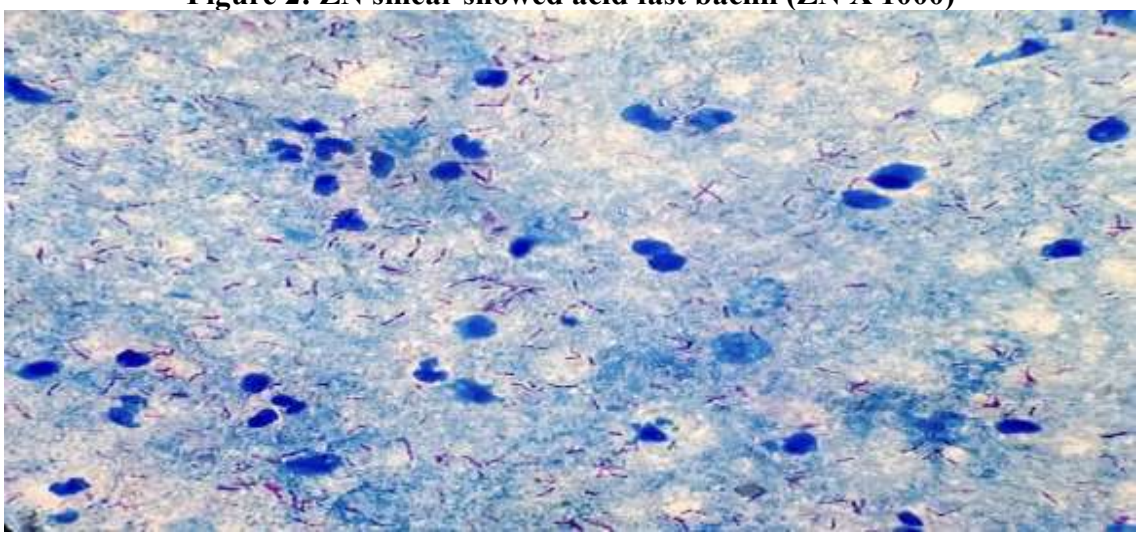
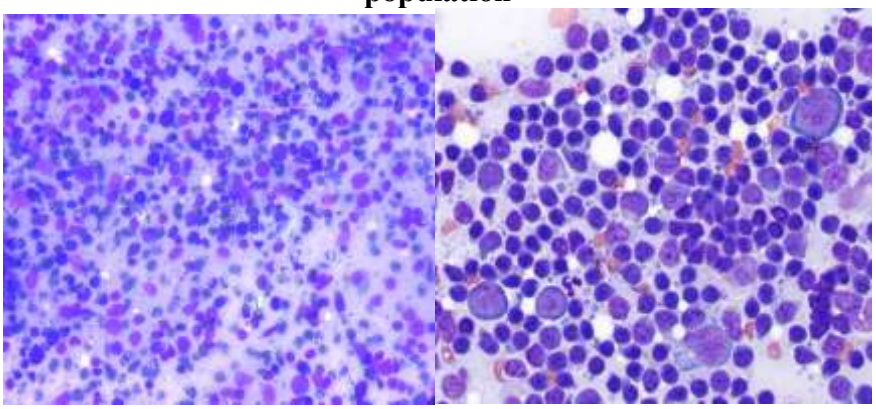


Fig 3: Non-specific reactive Lymphadenitis- FNA Smear depicting polymorphic lymphoid cell population



The cytomorphological findings of the most prevalent lesions are illustrated in Figures 1–3. Among the 817 lymph node aspirates, non-specific reactive lymphadenitis constituted the largest subgroup with 346 cases (42.36%). Smears from these cases typically revealed a polymorphous population of lymphoid cells including small mature lymphocytes, centrocytes, centroblasts, plasma cells, and scattered tingible body macrophages, as depicted in Figure 3. In tubercular lymphadenitis, which accounted for 192 cases (23.50% of lymph node lesions), the diagnosis was confirmed by the presence of epithelioid cell granulomas and, when required, by Ziehl-Neelsen staining demonstrating acid-fast bacilli (Figure 2). Among the 67 cases (8.20%) of non-Hodgkin lymphoma, smears showed a monomorphic population of atypical lymphoid cells with scant cytoplasm, irregular nuclear contours, and absence of tingible body macrophages, features that help distinguish lymphoma from reactive hyperplasia (Figure 1). These cytomorphological patterns enabled accurate categorization of the majority of head and neck swellings**.**

DISCUSSION

Fine needle aspiration cytology has revolutionised the initial diagnostic approach to head and neck swellings, offering a quick and reliable alternative to surgical biopsy [1, 3]. The present study analysed 1,745 cases, one of the larger series from this region, to delineate the cytomorphological spectrum and diagnostic utility of FNAC.

Our findings demonstrate that lymph node swellings constituted the largest group (46.82%, Table 1), which aligns with observations by Gupta et al. (2017) who reported lymph node involvement in 44.5% of head and neck FNACs [8]. Similarly, Kishor et al. (2015) documented lymph node predominance

in 48.2% of their cohort [9]. Thyroid swellings comprised 22.64% of our cases, comparable to the 20–25% range reported by Baloch et al. (2002) [10] and Ali et al. (2009) [5]. The preponderance of non-neoplastic lesions (76.51%, Table 2) mirrors the findings of Jasani et al. (2013), who noted 74.8% benign/inflammatory conditions [11]. Reactive lymphadenitis (42.36% of lymph node lesions) was the commonest diagnosis, similar to the 40.2% reported by Ahmad et al. (2008) [2]. Among thyroid lesions, colloid goiter (39.49%) and lymphocytic thyroiditis (25.06%) dominated, consistent with the distribution described by Gharib and Goellner (1993) [12] and Wang and Grubbs (2007) [13]. In salivary glands, acute sialadenitis (33.75%) and pleomorphic adenoma (33.12%) were the leading diagnoses, corroborating the findings of Boufonsou et al. (2017) [14] and Orell and Sterrett (2012) [15]. The age distribution peak in the 21–30 years group (19.7%, Table 3) and a secondary peak in children <10 years (18.1%) reflect the biphasic pattern noted by Ali et al. (2022) [17]. The male predominance overall (M: F 1.12:1, Table 4) but striking female predominance in thyroid lesions (83.29%, Table 5) is well documented by Baloch and Livolsi (2003) [18] and attributed to hormonal factors and autoimmune susceptibility. The male excess in lymph node swellings (66.22%) mirrors the observations of Nayar and Frost (2002) [19] and Silverman and Schiller (2015) [20], likely reflecting higher exposure to infectious and environmental risk factors in males.

The possible mechanisms underlying these patterns include: (i) higher prevalence of reactive lymphoid hyperplasia due to recurrent upper respiratory infections in younger age groups; (ii) hormonal influences (oestrogen) promoting thyroid follicular cell proliferation and autoimmune thyroiditis in women; (iii) greater occupational and tobacco-related exposure in males predisposing to reactive lymphadenopathy and metastatic squamous cell carcinoma; (iv) the predilection of colloid goiter for iodine-deficient regions, still prevalent in sub-Himalayan belts.

Clinically, our findings underscore that FNAC effectively triages head and neck swellings, avoiding unnecessary surgeries for the vast majority of benign/inflammatory lesions. The procedure enabled specific diagnosis of tubercular lymphadenitis (192 cases), prompting anti-tubercular therapy without biopsy. Identification of metastatic squamous cell carcinoma (131 cases) guided primary tumour search and staging. Detection of rare entities (cryptococcosis, myocysticercosis, Rosai-Dorfman disease) highlights FNAC's ability to diagnose unexpected pathologies. The technique is well-tolerated even in paediatric patients (317 cases <10 years) and elderly (50 cases >70 years) [4, 7].

Nevertheless, FNAC has limitations. Inadequate sampling remains a challenge, particularly in cystic lesions or fibrotic tumours. Distinction between follicular adenoma and carcinoma on cytology alone is impossible, requiring histopathological correlation [16]. Low-grade lymphomas may be misinterpreted as reactive hyperplasia [1]. Operator experience and on-site evaluation significantly influence diagnostic yield, which was not uniformly available in our setting. Despite these caveats, FNAC remains an indispensable first-line investigation for head and neck swellings.

CONCLUSION

FNAC is a highly effective, safe, and economical diagnostic modality for head and neck lesions, accurately distinguishing neoplastic from non-neoplastic pathology and guiding patient management. The procedure demonstrates excellent utility across all age groups and anatomical subsites, with characteristic age, sex and organ-specific patterns that align with global literature.

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