

Clinico-Pathological Evaluation of Neck Swellings at a Tertiary Care Hospital

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Received: 01-06-2026 / Revised: 15-07-2026 / Accepted: 21-08-2026

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Conflict of interest: Nil

Abstract

Background: Neck swellings are common surgical presentations with a broad spectrum of developmental, inflammatory, infective and neoplastic conditions. A structured clinicopathological approach is required because similar clinical presentations may represent very different underlying pathologies.

Objectives: To describe the demographic and clinical spectrum of neck swellings, classify the lesions according to clinical and pathological findings, and assess the diagnostic performance of fine-needle aspiration cytology (FNAC) against histopathology for distinguishing malignant from non-malignant lesions.

Methods: A prospective cross-sectional observational study was undertaken in the Department of General Surgery, Government Teaching General Hospital, Vizianagaram. The study protocol planned a minimum sample of 200 patients. A total of 200 patients were included in the analysis. Demographic and clinical variables, FNAC findings, and histopathological findings were summarized using frequencies, percentages, mean and standard deviation. For the definitive diagnostic comparison, only records with binary malignant/non-malignant classifications on both FNAC and histopathology were included.

Results: Among 200 patients, 142 (71.0%) were female and 58 (29.0%) were male. Mean age was 40.96 ± 17.63 years (range 2–80 years). Cervical lymphadenitis was the most frequent clinical diagnosis (54; 27.0%), followed by solitary thyroid nodule (46; 23.0%) and multinodular goitre (31; 15.5%). FNAC classified 180 (90.0%) as non-malignant and 18 (9.0%) as malignant, with one suspicious and one indeterminate result. Histopathology classified 172 (86.0%) as non-malignant, 23 (11.5%) as malignant, two as indeterminate and three as not done. In 193 definitive binary FNAC–HPE comparisons, TP=16, TN=172, FP=0, and FN=5; sensitivity was 76.2%, specificity 100.0%, PPV 100.0%, NPV 97.2%, and overall accuracy 97.4%.

Conclusion: The study demonstrates a wide clinicopathological spectrum of neck swellings with predominance of non-malignant lesions. FNAC showed high specificity and overall accuracy in the definitive comparison subset, while false-negative malignant cases reinforce the importance of clinicopathological correlation and histopathological confirmation in selected lesions.

Keywords: Neck Swelling; Cervical Lymphadenopathy; FNAC; Histopathology; Thyroid Swelling; Salivary Gland Swelling; Malignancy; Clinicopathological Correlation.

DOI: 10.25258/ijcpr.18.9.185

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Introduction

Neck swellings constitute a heterogeneous group of clinical conditions encountered in surgical practice. They may arise from lymph nodes, thyroid and

salivary glands, congenital remnants, soft tissues or metastatic disease.

The differential diagnosis therefore requires systematic clinical assessment followed by appropriate cytological, radiological and histopathological investigations. The cervical lymphadenopathy study by Naidu et al. at the same institution demonstrated the usefulness of FNAC in defining inflammatory, tuberculous and malignant lymph-node pathology, with age and sex distributions presented alongside the FNAC spectrum [6].

The thyroid swelling study by Babu et al. similarly used a structured hospital-based observational methodology, detailed clinical examination, ultrasonography and FNAC, and presented results using demographic tables, clinical classifications, diagnostic correlation and graphical figures [7].

The study protocol for the present work was designed to evaluate the distribution of neck swellings by age and etiology, classify them as developmental, inflammatory or neoplastic, and assess clinicopathological correlation and FNAC diagnostic accuracy against histopathology.

Aims and Objectives

Aim

- To analyze the distribution of neck swellings according to age and etiology.
- To evaluate clinicopathological correlation and distinguish benign/non-malignant from malignant lesions.

Objectives

- To identify the common causes and clinical presentations of neck swellings in patients attending the surgical OPD.
- To categorize neck swellings into developmental, inflammatory/infective and neoplastic groups based on clinical and pathological findings.
- To correlate FNAC findings with histopathological findings where both were available.
- To calculate sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of FNAC for malignant versus non-malignant disease.

Materials and Methods

Study Design and Setting: This was a prospective cross-sectional observational study conducted in the Department of General Surgery, Government Teaching General Hospital, Vizianagaram, Andhra Pradesh, India.

The supplied protocol specifies the study design and tertiary-care surgical setting. The study period

was defined prospectively as the period required to recruit participants until the planned sample size of 200 patients was reached and was carried between march 2025 to march 2026.

Study Population: Patients presenting with neck swellings to the surgical outpatient department were considered. The protocol included all age groups and both sexes, provided patients underwent FNAC and/or surgical biopsy and gave consent.

Patients with incomplete clinical/pathological information, trauma-related swellings and previously diagnosed and treated recurrent swellings were excluded.

Sample Size: The study protocol planned a minimum sample of 200 patients using Cochran's formula and rounded the calculated sample upward to account for potential data loss or incomplete records.

Data Collection: Data were collected using a structured proforma that included demographic characteristics, clinical features, investigation findings, and pathological classifications.

Diagnostic Assessment: FNAC findings in the study data were categorized as non-malignant, malignant, suspicious or indeterminate. Histopathological findings were categorized as non-malignant, malignant, indeterminate or not done. For diagnostic accuracy calculations, only cases with definitive binary malignant/non-malignant classification on both FNAC and histopathology were included.

Statistical Analysis: Data were summarized using frequencies, percentages, mean and standard deviation. Diagnostic performance was calculated from a 2×2 table using histopathology as the reference standard. Sensitivity, specificity, PPV, NPV and accuracy were calculated as follows: sensitivity = $TP/(TP+FN)$; specificity = $TN/(TN+FP)$; PPV = $TP/(TP+FP)$; NPV = $TN/(TN+FN)$; accuracy = $(TP+TN)/\text{total definitive comparisons}$. For diagnostic accuracy analysis, the 2×2 table was derived directly from the FNAC and histopathology classification variables.

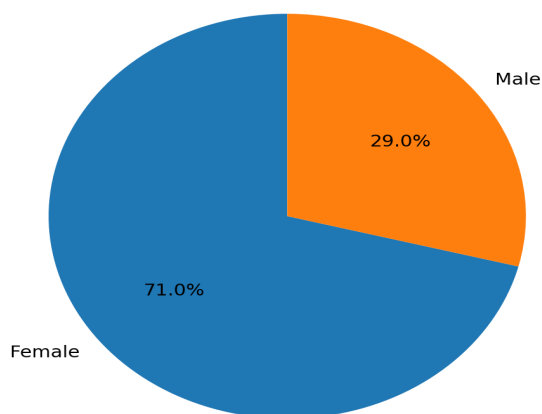
Results

Demographic Profile: A total of 200 patients were available for analysis. The mean age was 40.96 ± 17.63 years, with a range of 2–80 years. There was a female predominance (142; 71.0%) compared with males (58; 29.0%).

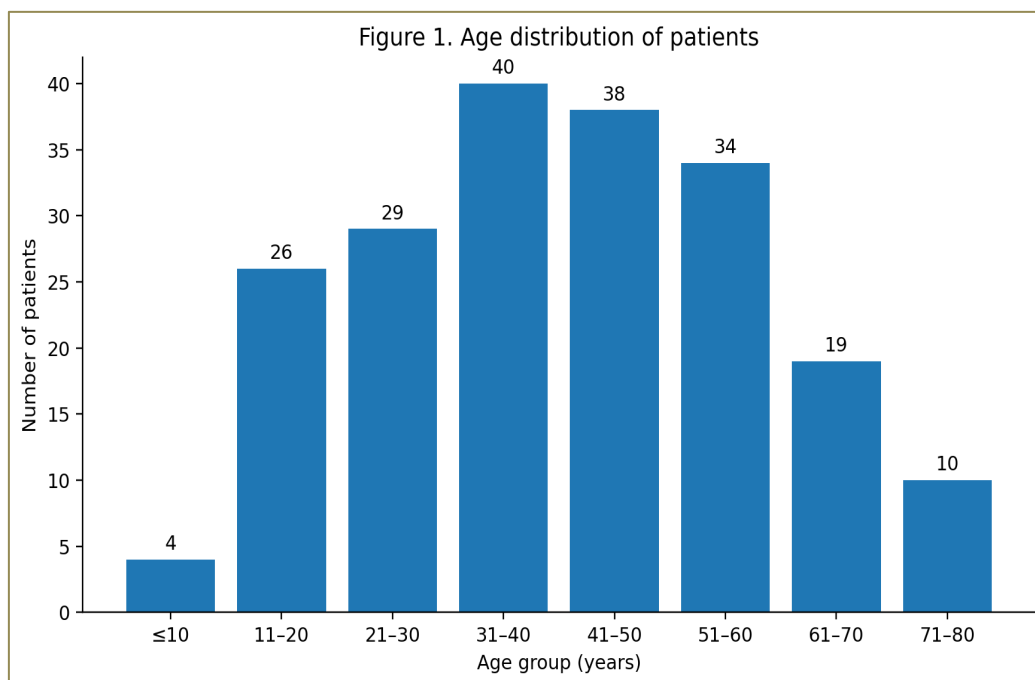
Table 1: Sex distribution

Sex	Number	Percentage
Female	142	71.0%
Male	58	29.0%

Figure 2. Sex distribution

**Figure 1: Sex distribution of the study participants.****Table 2: Age-group distribution**

Age group (years)	Number	Percentage
≤10	4	2.0%
11–20	26	13.0%
21–30	29	14.5%
31–40	40	20.0%
41–50	38	19.0%
51–60	34	17.0%
61–70	19	9.5%
71–80	10	5.0%

**Figure 2: Age distribution of patients with neck swellings.**

Clinical spectrum: Cervical lymphadenitis was the most frequent clinical diagnosis, followed by solitary thyroid nodule and multinodular goitre. Salivary gland swellings, cystic lesions and malignant/secondary neck lesions formed additional important groups.

Table 3: Ten most frequent clinical diagnoses among the study participants

Clinical diagnosis	Number	Percentage
Cervical Lymphadenitis	54	27.0%
Solitary Thyroid Nodule (STN)	46	23.0%
Multinodular Goitre (MNG)	31	15.5%
Submandibular Swelling	15	7.5%
Parotid Swelling	13	6.5%
Neck Secondaries	7	3.5%
Lipoma	5	2.5%
Thyroglossal Cyst	5	2.5%
Dermoid Cyst	5	2.5%
Abscess	3	1.5%

Figure 3. Common clinical diagnoses

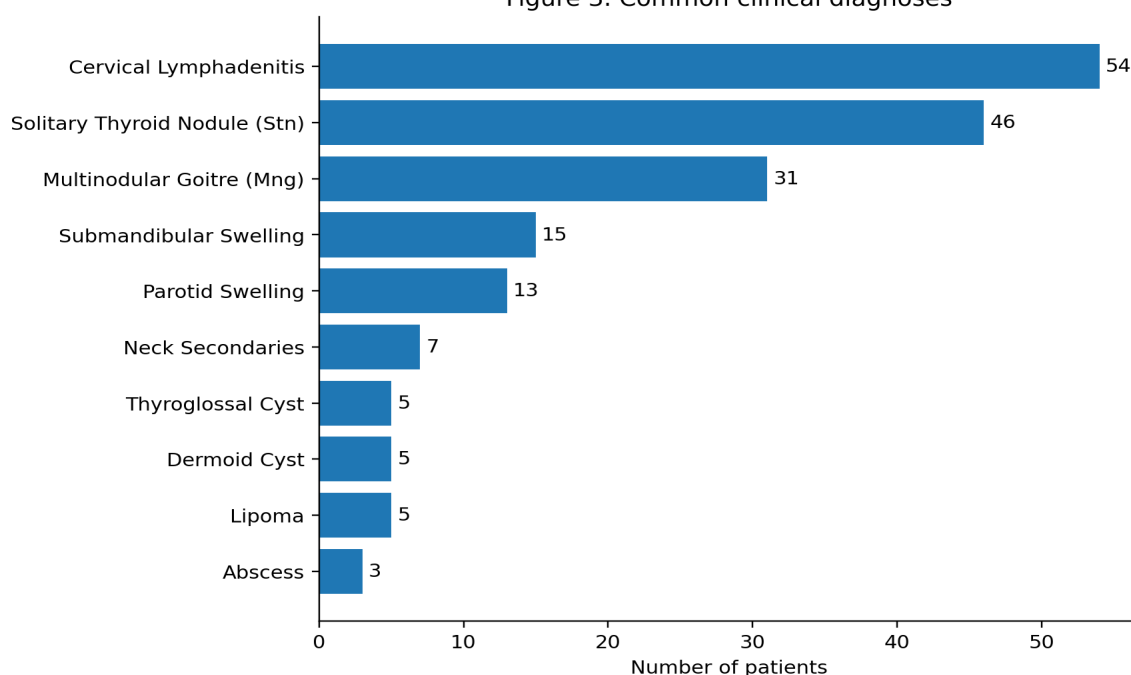


Figure 3: Ten most frequent clinical diagnoses among the study participants.

Broad etiological classification

Table 4: Broad etiological classification

Etiological group	Number	Percentage
Neoplastic / glandular	107	53.5%
Inflammatory / infective	62	31.0%
Developmental / congenital	14	7.0%
Other	10	5.0%
Benign soft-tissue lesion	5	2.5%
Malignant / metastatic	2	1.0%

FNAC and histopathological findings

Table 5: FNAC classification

FNAC classification	Number	Percentage
Non-malignant	180	90.0%
Malignant	18	9.0%
Suspicious	1	0.5%
Indeterminate	1	0.5%

Figure 4. FNAC classification

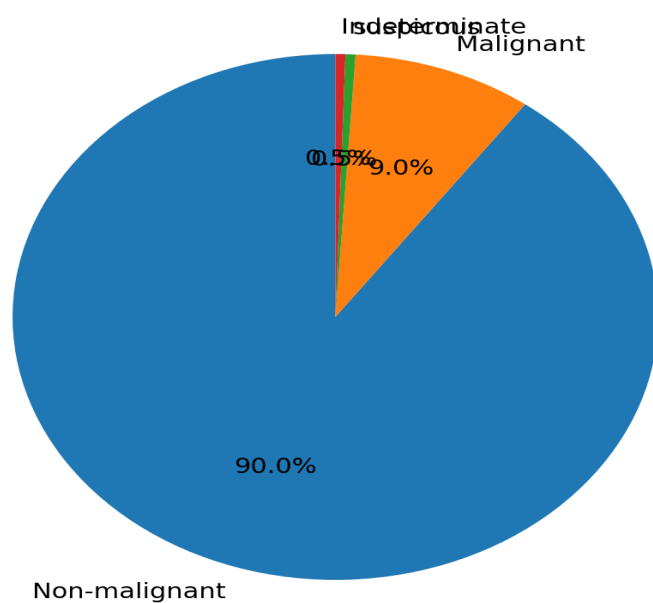


Figure 4: FNAC classification of neck swellings.

Table 6: Histopathological classification

Histopathological classification	Number	Percentage
Non-malignant	172	86.0%
Malignant	23	11.5%
Not done	3	1.5%
Indeterminate	2	1.0%

Figure 5. Histopathological classification

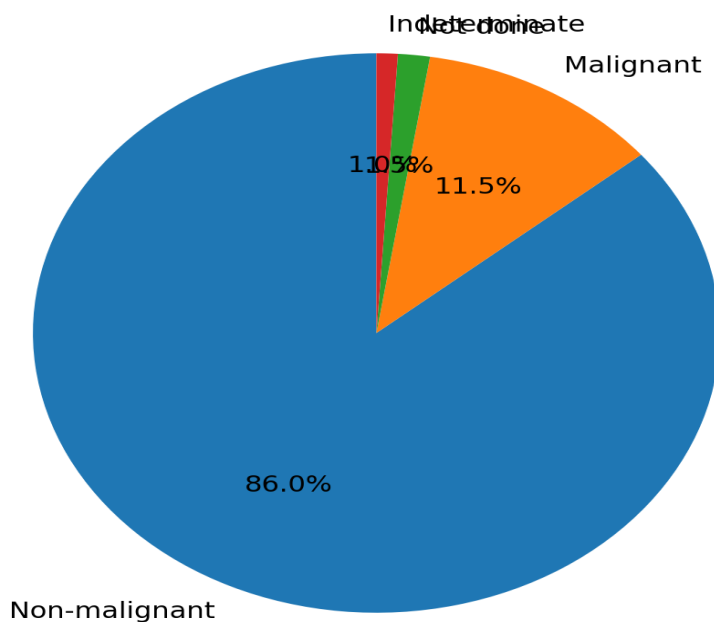


Figure 5: Histopathological classification.

Common histopathological diagnoses**Table 7: Common histopathological diagnoses**

Histopathological diagnosis	Number	Percentage
Nonspecific reactive lymphadenitis	24	12.0%
Nodular goitre with cystic changes	22	11.0%
Nodular goitre	16	8.0%
Metastatic squamous cell carcinoma	14	7.0%
Pleomorphic adenoma	10	5.0%
Lymphocytic thyroiditis	10	5.0%
Caseating tuberculosis lymphadenitis	9	4.5%
Granulomatous lymphadenitis	9	4.5%
Cold abscess	9	4.5%
Colloid cyst	7	3.5%

Diagnostic accuracy of FNAC: Among 193 patients with definitive binary FNAC and histopathological classifications, FNAC identified 16 true-positive malignant cases and 172 true-negative non-malignant cases. There were 0 false-positive and 5 false-negative classifications.

Table 8: Diagnostic performance of FNAC compared with histopathology

Diagnostic measure	Result
True positive	16
True negative	172
False positive	0
False negative	5
Sensitivity	76.2%
Specificity	100.0%
PPV	100.0%
NPV	97.2%
Accuracy	97.4%

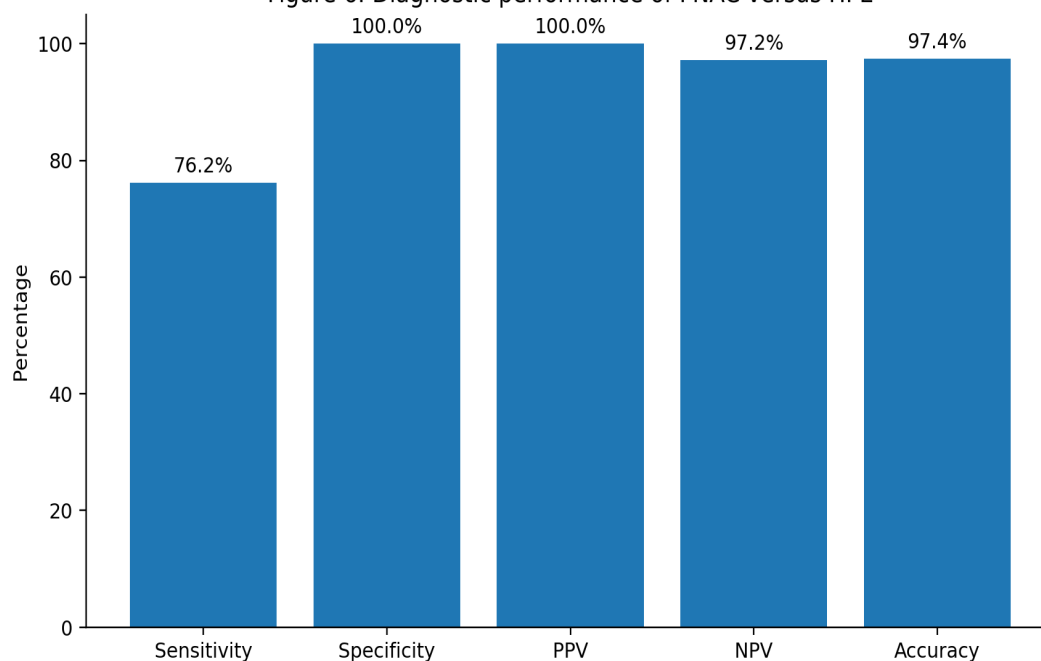
Figure 6. Diagnostic performance of FNAC versus HPE**Figure 6: Diagnostic performance of FNAC compared with histopathology.**

Figure 7. Study and diagnostic-analysis flow

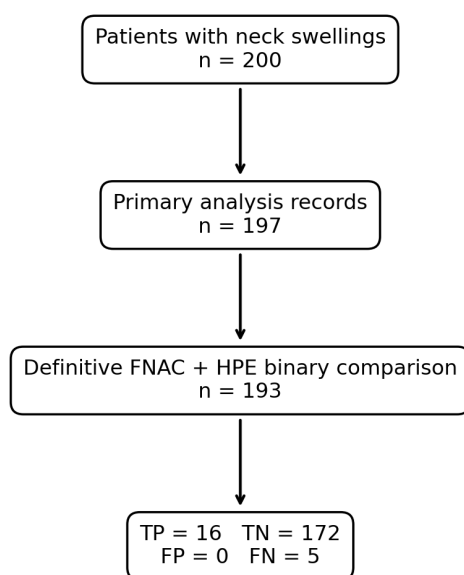


Figure 7: Study and diagnostic-analysis flow diagram.

Discussion

The present study describes a broad clinicopathological spectrum of neck swellings in a tertiary-care general surgery setting. The demographic presentation, clinical categorization, and use of FNAC and histopathology are consistent with the approach used in comparable hospital-based studies.

The female predominance in the present dataset (71.0%) should be described as a characteristic of this study population rather than generalized to all neck swellings. The wide age range and mixture of pathological categories reflect the heterogeneous nature of the study population.

FNAC demonstrated 100% specificity and PPV and 97.4% overall accuracy in the definitive binary comparison, but sensitivity was 76.2% because five malignant cases were classified as non-malignant by FNAC. This finding reinforces the limitation of cytology in lesions where architectural information is important. The thyroid swelling study similarly emphasized FNAC as a key diagnostic modality while acknowledging the complementary role of imaging and the need for correlation.

Histopathology remains important for definitive diagnosis in selected lesions. This is particularly relevant where cytology may not establish tissue architecture or where a clinically suspicious lesion has a non-malignant cytological result. The present study therefore supports a clinicopathological

pathway rather than reliance on any single investigation.

Clinical Implications

- A structured assessment of neck swellings should integrate history and physical examination with appropriate imaging, FNAC and histopathology.
- FNAC is useful as a minimally invasive first-line cytological investigation for many superficial neck lesions.
- Histopathology remains important when tissue architecture is required or when clinical and cytological findings are discordant.
- Presentation of demographic, clinical and pathological data in separate tables and figures improves clarity and facilitates comparison with institution-based studies.

Limitations

- The study period continued until the planned sample size of 200 participants was reached.
- The study data include indeterminate and not-done pathology categories, reducing the number available for definitive FNAC–HPE binary comparison.
- The study is single-centre and the findings may not be directly generalizable to other populations.
- No multivariable modelling was undertaken to evaluate independent associations of age, sex or lesion category with malignancy.

Conclusion

This clinicopathological study of 200 patients demonstrates the heterogeneous nature of neck swellings encountered in a tertiary-care general surgery department.

Cervical lymphadenitis, thyroid swellings and other glandular/soft-tissue lesions constituted major clinical categories, while histopathology demonstrated both benign and malignant disease. FNAC showed high specificity and overall diagnostic accuracy for malignant versus non-malignant classification in the definitive comparison subset, although false-negative malignant cases were present. A structured combination of clinical examination, appropriate imaging, FNAC and histopathological confirmation remains important for accurate diagnosis and management.

Ethical Considerations: The study received approval from the Institutional Ethics Committee of Government Medical College, Vizianagaram, following scientific and ethical review. The approval was issued under Serial No. 53/IEC GMC/FEB 2025.

The ethics committee registration details on the approval letter are EC/NEW/INST/2023/3519 and ECR/1829/INST/AP/2023. The Principal Investigator was Dr J Rameshwari Prabhu, Assistant Professor of General Surgery, with Dr B Chaitanya Babu, Dr P. A. Ramani, Dr G. Venkata Naidu and Dr R. Sasidhar as co-investigators. Written informed consent was obtained from participants, with confidentiality and anonymization maintained. The study period was defined as the period required to recruit the planned sample size of 200 participants.

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