

A NOVEL APPROACH TO CLASSIFICATION AND REPORTING OF LYMPH NODE FINE-NEEDLE CYTOLOGY: APPLICATION OF THE PROPOSED SYDNEY SYSTEM

Pathology

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ABSTRACT

Background: Fine needle aspiration cytology (FNAC) is a minimally invasive, cost-effective tool for evaluating lymphadenopathy. However, lack of standardized reporting has limited its reproducibility. The Sydney System was introduced to provide a uniform, five-tier classification with defined cytomorphological criteria, improving consistency and aiding clinical correlation. **Methods:** This retrospective and prospective study was conducted in the cytopathology section of the Department of Pathology at the Government Medical College attached to a tertiary care centre in South Gujarat over a period of 24 months from January 2023 to December 2024. A total of 535 patients with suspected lymphadenitis were included in this study. **Results:** A total of 535 lymphadenopathy cases were studied at a tertiary care center showing a female predominance (56.07%) with a peak in young adults (21–30 years) and cervical lymph nodes being most commonly involved (75.88%). The majority of cases were benign L2 (86.54%), predominantly granulomatous, reactive, and tuberculous lymphadenitis. Neoplastic categories included L3 (0.18%), L4 (2.05%), and L5 (9.34%), with metastatic squamous cell carcinoma being the most common malignancy, followed by metastatic carcinoma and non-Hodgkin lymphoma. Histopathological follow-up was available in 69% of cases. The risk of malignancy was 14.3% in L1, 0% in L2, 100% in L3 and L5, and 80% in L4. Sensitivity of 97.14%, specificity of 99.40%, PPV of 94.44%, NPV of 99.69%, and accuracy of 99.18%. **Conclusions:** The Sydney System effectively classifies lymph node cytology with high accuracy, improving diagnostic consistency, reproducibility, and clinician–pathologist communication.

KEYWORDS

Sydney System; Diagnostic Categorization; Malignancy Risk Assessment.

INTRODUCTION:

Persistent generalized lymphadenopathy is a common clinical presentation indicating underlying systemic disease ⁽¹⁾. The cervical region contains nearly two-thirds of the body's lymph nodes, making cervical lymphadenopathy a frequent finding, often presenting as enlargement with altered consistency. ⁽¹⁾The most common etiologies include inflammatory and immune-mediated conditions, while chronic infections such as tuberculosis and HIV remain significant causes. ⁽¹⁾Tuberculous lymphadenitis is particularly prevalent in adults in developing countries, though less common in children. ⁽²⁾Malignancies account for a smaller proportion of cases, cervical lymph nodes are involved in nearly 90% of lymphadenopathy cases associated with head and neck cancers. ⁽³⁾ Among lymphoid malignancies, Hodgkin lymphoma commonly affects cervical nodes and is a leading cancer in adolescents, whereas diffuse large B-cell lymphoma is the most common non-Hodgkin lymphoma in older adults.

In May 2019, at the 20th International Congress of Cytology, the Sydney System for reporting lymph node cytopathology was introduced. It classifies FNAC samples into five standardized categories-L1 (Inadequate), L2 (Benign), L3 (Atypical/ALUS), L4 (Suspicious), and L5 (Malignant). Each category is linked to an estimated risk of malignancy (ROM) and recommended clinical management, ensuring uniform, reproducible, and clinically meaningful reporting. ⁽³⁾

METHOD:

This is cross-sectional retrospective and prospective study was conducted over 24 months at Cytopathology section of government medical collage Surat in South Gujarat. A total of 535 patients with suspected lymphadenitis undergoing FNAC were included. Clinical, radiological, and laboratory data were collected using a standardized proforma after ethical approval and informed consent for accurate cytological evaluation.

A detailed history including age, sex, and symptoms such as low-grade fever, cough, and lymph node swelling was recorded. History of tuberculosis, contact, family history, and prior treatment (ATT) were noted. General and local examination were performed to assess lymphadenopathy and systemic involvement. Follow-up was done clinically or histopathologically to determine risk of malignancy and compare with other studies.

The aspiration site was sterilized and FNAC was performed using a 22–23 gauge needle with a 10 ml syringe. The aspirated material was noted and smears were prepared (wet-fixed, dry-fixed, and additional

slides). Remaining material was sent for CBNAAT. Slides were stained with H&E, PAP, and Giemsa. IHC was performed in suspected lymphoma cases for confirmation.

RESULTS:

Out of the total 535 cases of lymphadenopathy studied between January 2023 and December 2024, patients ranged in age from 1 to 90 years, with a mean age of 28.5 years. The highest number of cases was observed in the 21–30 year age group (159 cases; 29.71%). The lowest number of cases (5 cases; 0.93%) was noted in the 71–80 and 81–90 year age groups.

Gender distribution, 300 cases (56.07%) were females and 235 cases (43.92%) were males, demonstrating a female predominance with a male-to-female ratio of approximately 1:1.28.

Based on cytological findings, The majority were non-neoplastic (463 cases; 86.54%), followed by neoplastic cases (62 cases; 11.58%), while non-diagnostic cases constituted the smallest group (10 cases; 1.86%).

Table 1: Distribution of non-neoplastic cases according to predominant cytological pattern:

Cytological finding	Frequency	Percentage	Category
Granulomatous lymphadenitis	172	37.14%	L2
Suppurative Granulomatous lymphadenitis	12	2.5%	L2
Tuberculous lymphadenitis	120	25.91%	L2
Suppurative Tuberculous lymphadenitis	06	1.29%	L2
Necrotising lymphadenitis	12	2.59%	L2
Suppurative lymphadenitis	03	0.64%	L2
Chronic reactive lymphoid hyperplasia	138	29.80%	L2
Total	463	100%	-

In this study, 463 non-neoplastic lymph node cases were analyzed.

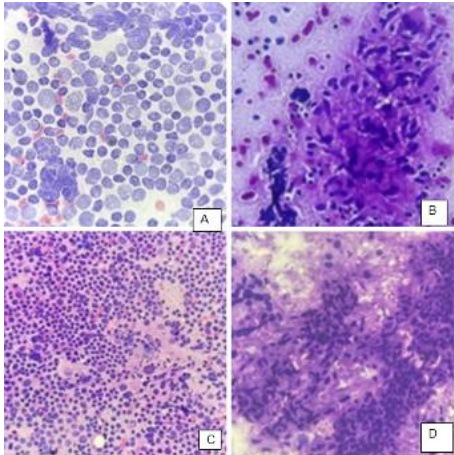
In this study, 62 cases were categorized as neoplastic based on cytological patterns. Metastatic squamous cell carcinoma was most common 26 cases (41.93%), followed by metastatic carcinoma 15 cases (24.19%). Suspicious lymphoproliferative disorders 11 cases, and confirmed lymphoproliferative disorders 07 cases. Rare cases included metastatic adenocarcinoma with squamous differentiation, atypical lymphoproliferative disorder and recurrent angioimmunoblastic T-cell lymphoma. Overall, metastatic malignancies predominated among neoplastic lesions.

Table 2: Stratification of ROM in the Sydney system diagnostic categories:

Sydney System Diagnostic Category	Histological or Clinical Follow-Up	Confirmed Malignant Lesions	Risk of Malignancy (ROM)
L1	07	01	14.28%
L2	326	00	00
L3	01	01	100
L4	10	08	80%
L5	25	25	100%
Total	369	35	-

Overall, 369 cases had histopathologic and clinical follow-up, whereas 166 cases were lost to follow-up.

CASE IMAGES



A) Lymphoproliferative disorder consistent with non-Hodgkin lymphoma (NHL) (MGG, ×40), B) Well-formed epithelioid granuloma (Giemsa, ×10), C) Chronic reactive lymphoid hyperplasia (H&E, ×40), D) Metastatic squamous cell carcinoma (Giemsa, ×10).

DISCUSSION:

Fine-needle aspiration cytology (FNAC) is a safe, simple, and cost-effective outpatient procedure for evaluating superficial palpable lesions and providing rapid diagnosis.

Table 3 : Comparison of age group and M:F ratio of present study with similar studies:

Author	Number of cases	Common age group (year)	M:F Ratio
Baruah A.K at al ⁴ [2022]	600	<20	1:1.18
Das at al ⁵ [2024]	456	21-30	1:1.81
Joshee et al. ⁶ [2022]	1409	21-30	1.09:1
Present study	535	21-30	1:1.28

In the present study, patients ranged from 1 to 90 years, with a mean age of 28.5 years. The most common age group was 21–30 years. This finding is consistent with studies by Das et al. and Joshee et al. which also reported the 21–30-year group as most affected.

Table 4 : Comparison of site of lymph nodes involved with other studies:

Study	Cervical	supraclavicular	Submandibular	Axillary	Inguinal	others
Das at al ⁵ [2024]	60%	9.0%	11.1%	12.2%	4.4%	3%
Juanita Juanita at al ⁷ [2023]	82.4%	4.4%	5.0%	5.7%	2.5%	-
Present study	75.88%	7.66%	5.60%	5.04%	4.11%	1.68 %

A comparative analysis of Das et al., Juanita et al., and the present study shows that cervical lymphadenopathy was most common in all, with the present study (75.88%) higher than Das et al. (60%) but lower than Juanita et al. (82.4%).

Table 5: Comparison of distribution of cases according to various

categories in the present study with others studies:

Sydney categories	Baruah A.K at al ⁴ [2022]	Das at al ⁵ [2024]	Sreelekshmi et al ⁸ [2023]	Present study
L1	3.18% (7)	7% (30)	5.60% (14)	1.86% (10)
L2	64.09% (141)	60% (274)	63.60% (159)	86.54% (463)
L3	20% (44)	3% (15)	1.60% (4)	0.18% (1)
L4	3.63% (8)	7% (32)	2% (5)	2.05% (11)
L5	9.09% (20)	23% (105)	27.20% (68)	9.34% (50)

Table 6 : Comparison of Risk of malignancy with other studies:

Sydney categories	Sreelekshmi et al ⁸ [2023]	Robert As at al ⁹ [2023]	Gupta P at al ¹⁰ [2021]	Vigliar E. et al ¹¹ [2021]	Present study
L1	0%	20%	27.5%	50%	14.28%
L2	3%	10%	11.5%	1.92%	0%
L3	66.6%	50%	66.7%	58.3%	100%
L4	100%	100%	88%	100%	80%
L5	100%	100%	99.6%	100%	100%

In the present study, the sensitivity was 97.14%, this is comparable to findings by Sreelekshmi et al. (95.65%), Robert et al. (97.94%), Pandya et al. (95.23%), and Vigliar et al. (98.4%). In contrast, Gupta et al. reported a lower sensitivity of 79.9%.

The specificity was 99.40%, this was higher than Sreelekshmi et al. (96.29%), Robert et al. (96.92%), Vigliar et al. (95.3%), and Pandya et al. (94.11%), while being comparable to Gupta et al. (98.1%).

The Positive Predictive Value (PPV) of 94.44% was slightly lower than other studies. The Negative Predictive Value (NPV) was highest at 99.69%. The overall diagnostic accuracy of 99.18% surpassed most other studies.

CONCLUSION:

The present study demonstrates the effectiveness of the Sydney System for Reporting Lymph Node Cytopathology in providing a standardized and reproducible approach to lymph node FNAC reporting. The system showed high diagnostic accuracy and improved consistency in categorizing cytological findings. Its defined diagnostic categories, along with corresponding risks of malignancy (ROM), facilitate accurate risk assessment and clinical decision-making. The Sydney System enhances communication between cytopathologists and clinicians, contributing to better patient management and follow-up. Overall, it serves as a reliable framework for uniform reporting, improved diagnostic confidence, and better clinical outcomes.

Conflict of Interest: No conflict of interest

Source of Funding: None

Ethical Approval: Ethical clearance for the study was obtained from the Human Research Ethics Committee of the Medical College & Hospital of the present study setup.

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