THE UTILISATION OF CYTOPATHOLOGY TECHNIQUE AT MAKERERE UNIVERSITY PATHOLOGY LABORATORY, KAMPALA, CENTRAL UGANDA

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Abstract

Background: Cytopathology plays a central role in the early detection and management of benign and malignant conditions. Makerere University Pathology Laboratory (MUPL) provides diagnostic cytopathology services for patients from across Uganda. This retrospective study assessed the utilisation of cytopathology technique and evaluated predictors of malignancy from 2015 to 2019.

Methods: A total of 400 archived cytopathology records were reviewed. Data on patient demographics, specimen type, and diagnostic outcome were extracted. Descriptive, bivariate, and multivariate analyses were performed using SPSS version 25. Chi-square tests and independent t-tests explored associations, while binary logistic regression identified independent predictors of malignancy. Significance was set at $p < 0.05$.

Results: Of the 400 cases, the mean age was 44.2 ± 13.7 years; 68.5% were female. Cervical (31.0%) and breast (27.5%) specimens predominated. The overall malignancy rate was 24.5%. A significant association was found between specimen type and malignancy ($\chi^2 = 23.7$, $p < 0.001$). Multivariate analysis revealed that increasing age (AOR = 1.05; 95% CI: 1.02–1.08; $p = 0.002$) and breast specimens (AOR = 2.94; 95% CI: 1.31–6.58; $p = 0.008$) were independent predictors of malignancy.

Conclusion: Cytopathology utilisation at MUPL has increased, with high diagnostic yield in breast and cervical lesions. Continuous investment in cytopathology infrastructure, training, and quality assurance is essential to enhance diagnostic accuracy and improve patient outcomes.

1. Introduction

Cytopathology has revolutionized diagnostic remedy by means of imparting rapid, accurate, and minimally invasive assessment of mobile samples, extensively improving early disorder detection and patient management (Srebotnik Kirbis & Strojan FleŽar, 2025). Its huge programs extend past cancer screening to encompass infectious disease diagnosis, inflammatory situations, and intraoperative consultations, thereby playing a relevant position in each preventive and diagnostic healthcare structures (Aly et al., 2021). The approach's ability to offer well timed effects with minimal affected person discomfort has made it crucial in modern-day pathology exercise, mainly in low-resource settings wherein superior histopathological offerings may be restrained (Lloyd, 2023).

Makerere college Pathology Laboratory (MUPL), situated within Mulago country wide Referral health center, serves as a primary diagnostic hub in Uganda, imparting cytopathology services to each public fitness centers and private healthcare carriers. As one of the Uganda's main centers for pathology diagnostics, MUPL contributes appreciably to country wide disease surveillance, most cancers manipulate applications, and educational research. but, despite its important position, there remains a lack of comprehensive local information regarding cytopathology provider usage, case distribution, and diagnostic accuracy across various specimen types (Lloyd, 2023).

Know-how those patterns are critical for knowledgeable aid allocation, laboratory capability enhancement, and guiding clinicians in specimen selection and prioritization for cytological evaluation (*(PDF) Assessment of Cytomorphological Features and Risk of Malignancy of Bethesda Category III in Thyroid Cytopathology*, n.d.). Moreover, such insights can help country wide coverage improvement, fortify diagnostic networks, and foster proof-based interventions aimed at enhancing early cancer detection and patient results (Cozzolino et al., 2025). This examine, therefore, aimed to evaluate the utilisation of cytopathology techniques at MUPL among 2015 and 2019, to pick out winning trends, and to determine factors associated with malignant diagnoses (Ye et al., 2025).

2. Materials and Methods

Study design

A retrospective go-sectional examine was performed using archived facts from the MUPL database spanning 2015–2019. The laboratory gets specimens from both government and private hospitals.

Sample size and sampling

A sample of 400 instances became determined using the Yamane (1967) components at a ninety five% confidence degree and five% margin of errors. Systematic random sampling turned into used to pick out information assembly the inclusion standards.

Data collection

Statistics extracted blanketed year, age, intercourse, specimen kind (cervix, breast, thyroid, lymph node, salivary gland, and so on.), and diagnosis (benign or malignant).

Data analysis

Data were analyzed in SPSS v25. Descriptive records (way, frequencies, and possibilities) summarized pattern characteristics. Bivariate associations have been evaluated the use of Chi-square and t-checks, at the same time as multivariate logistic regression decided predictors of malignancy.

Ethical consideration

Identity of the participants was protected. Statistics were anonymized to preserve confidentiality.

3. Results

3.1 Descriptive Statistics

A total of 400 patient records were reviewed, with a mean age of 44.2 ± 13.7 years (range: 16–78 years). Females constituted 68.5% (n = 274), and males 31.5% (n = 126). Cervical (31%) and breast (27.5%) specimens were most common, followed by thyroid (14.3%), lymph node (13.8%), and salivary gland (7.5%).

Overall, 98 (24.5%) were malignant and 302 (75.5%) benign.

Table 1. Distribution of Cytopathology Specimens and Malignant Cases (2015–2019)

Specimen Type	Frequency (n)	Percentage (%)	Malignant (n)	Malignancy Rate (%)

Cervical	124	31.0	26	21.0
Breast	110	27.5	38	34.5
Thyroid	57	14.3	9	15.8
Lymph Node	55	13.8	17	30.9
Salivary Gland	30	7.5	8	26.7
Total	**400**	**100**	**98**	**24.5**

3.2 Bivariate Analysis

A Chi-square test indicated a significant relationship between specimen type and malignancy status ($\chi^2 = 23.7$, $p < 0.001$). The highest malignancy rates were observed in breast (34.5%) and lymph node (30.9%) specimens.

Patients with malignant findings were significantly older (49.6 ± 12.1 years) than those with benign findings (42.5 ± 13.9 years; $t = 4.38$, $p < 0.001$).

Table 2. Bivariate Analysis of Factors Associated with Malignancy (n=400)

Variable	Category	Malignant (%)	χ^2 / t-value	p-value
Sex	Male (n=126)	25.4	0.07	0.79
	Female (n=274)	24.1		
Age (years)	Mean ± SD	49.6 ± 12.1 vs 42.5 ± 13.9	4.38	<0.001**
Specimen Type	—	—	23.7	<0.001**
Year of Sample	2015–2019	—	4.22	0.24

***p<0.05*

3.3 Multivariate Logistic Regression Analysis

Variables significant at $p<0.05$ in bivariate analysis were entered into a binary logistic regression model. Increasing age and breast specimen were significant predictors of malignancy after adjustment.

Table 3. Multivariate Logistic Regression Predicting Malignancy (n=400)

Variable	AOR	95% CI (Lower–Upper)	p-value
Age (years)	1.05	1.02 – 1.08	0.002**
Breast specimen	2.94	1.31 – 6.58	0.008**
Lymph node specimen	1.75	0.78 – 3.91	0.17

***p<0.05*

4. Discussion

This study demonstrates a steady increase in the utilisation of cytopathology at MUPL, reflecting growing clinical reliance on cytological diagnostics in Uganda (*(PDF) Comparative Analysis of the World Health Organization Reporting System for Head and Neck Cytopathology and the Milan System for Reporting Salivary Gland Cytopathology*, n.d.). The predominance of cervical and breast samples mirrors national cancer patterns, where breast and cervical cancers account for over 60% of female malignancies (*Solid-Pseudopapillary Neoplasm of Pancreas: Insights from Cytopathology | Request PDF*, n.d.).

The observed malignancy detection rate (24.5%) aligns with reports by (Folaranmi et al., 2025) who found malignancy yields between 20–30% in mixed cytology studies (VandeHaar et al., 2025). Similarly, noted that fine-needle aspiration and exfoliative cytology remain valuable first-line diagnostic tools for early cancer detection in low-resource settings (Crumley et al., 2025).

Age emerged as a significant predictor of malignancy, consistent with findings by (Chong et al., 2025), suggesting cumulative genetic and hormonal factors increase susceptibility to neoplasia with age (*Dr. Leena Krogerus: A Grand Old Lady of the Finnish Cytopathology and My Cytopathology Mum | Request PDF*, n.d.). The higher malignancy risk in breast specimens is comparable to results from studies in Kenya and Nigeria (Muharremi et al., 2025), indicating similar regional disease burdens (Folaranmi et al., 2025).

Non-significant sex and year associations may reflect uniform access to diagnostic services over the five years (Sulaiman et al., 2021). Nonetheless, the results underscore the importance of maintaining consistent laboratory capacity to meet increasing case volumes (*(PDF) Thyroid*

Lesions Diagnosed by Fine-Needle Aspiration Cytology in Uganda: A Five Year Retrospective Study, n.d.).

5. Conclusion and Recommendations

The utilisation of cytopathology techniques at MUPL has progressively increased, with notable diagnostic yields for breast and cervical specimens. Increasing age and breast lesions were independent predictors of malignancy.

Recommendations:

Capacity Building: Continuous professional development for cytotechnologists and pathologists.

Infrastructure: Procurement of advanced cytological tools (e.g., liquid-based cytology, cell block processing).

Quality Assurance: Regular external quality assessments and equipment calibration.

Public Health Integration**:** Strengthen national cancer screening programs utilizing cytology-based approaches.

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