

## HISTOMORPHOLOGIC EVALUATION OF EPSTEIN–BARR VIRUS-ASSOCIATED CYTOPATHIC EFFECTS IN LYMPHOMAS: IMPLICATIONS FOR SCREENING AND DIAGNOSTIC UTILITY

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### Abstract

**Background:** Lymphomas comprise a heterogeneous group of lymphoid malignancies with diverse etiological factors, including infection with Epstein–Barr virus (EBV). EBV-associated lymphomas include Hodgkin lymphoma, Burkitt's lymphoma, and other non-Hodgkin lymphomas. Despite substantial global evidence linking EBV infection to lymphomagenesis, there is a limited available data describing EBV-associated morphologic patterns in lymphomas, particularly in North-east Nigeria. The absence of well-defined histomorphologic indicators of EBV restricts its utility as a screening or diagnostic tool. **Objective:** To evaluate the histomorphologic features suggestive of EBV-associated cytopathic effects in archived lymphoma specimens in North-east Nigeria. **Materials and Methods:** A retrospective study was conducted involving thirty-one archived lymphoma cases retrieved from the Department of Histopathology, Modibbo Adama University Teaching Hospital, Yola. Formalin-fixed paraffin-embedded tissue sections were stained with haematoxylin and eosin using standard protocols. Relevant sociodemographic and clinical data were extracted from patients' medical records. **Results:** Among the 31 cases analysed, 45.2% (n=14) were females and 54.8% (n=17) were males. Hodgkin lymphoma accounted for 9.7% (n=3), Burkitt's lymphoma constituted 32.2% (n=10), while other non-Hodgkin lymphomas represented 58.1% (n=28). EBV-associated cytopathic effects such as multinucleated large atypical cells, Reed-Sternberg-like cells, starry-sky appearance, and diffuse populations of large cells with abundant cytoplasm were observed. **Conclusion:** These findings suggest that H&E histomorphologic evaluation may serve as a useful preliminary screening approach for identifying EBV-association lymphomas, particularly in resource-limited settings. However, further studies incorporating immunohistochemistry and molecular techniques are recommended to validate these findings and develop standardised morphologic scoring systems for predicting EBV status through multicentre retrospective and prospective investigations.

**Keywords:** Epstein–Barr virus; Lymphoma; Histomorphology; Haematoxylin and Eosin

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## Introduction

Epstein-Barr virus (EBV) is a gamma herpesvirus that asymptotically infects and establishes life-long latency in B lymphocytes in more than 90% of the world population. In Africa, primary EBV infection commonly occurs in the first five years of life. Since its initial identification in 1964 in Burkitt's lymphoma, EBV has been implicated in the pathogenesis of several lymphoid malignancies, including Hodgkin lymphoma, Diffuse large B-cell lymphoma, extranodal natural killer (NK)/T-cell lymphoma, and post-transplant lymphoproliferative disorders (1–3).

Lymphomas represent a diverse group of haematological malignancies that are frequently diagnosed at advanced stages particularly in low-income countries. Therefore, contributing to poor clinical outcomes, terminal crisis, and increased disease-related mortality. Detection of EBV within lymphoma tissues could have important diagnostic, prognostic, and therapeutic implications. However, this detection may require advanced molecular and immunohistochemical techniques, which are not routinely available in many resource-limited environments. Consequently, histomorphologic evaluation using haematoxylin and eosin (H&E) staining makes a feasible preliminary screening and diagnostic modality. Histomorphologic features could provide valuable preliminary indicators with positive predictive value (PPV) to suggest EBV infection.

EBV-associated lymphomas typically demonstrate type I or type II EBV latency. These types of latencies are characterised by the expression of a limited viral markers including, Epstein-Barr encoded RNAs (EBERs), Epstein-Barr nuclear antigen-1 (EBNA-1), and latent membrane protein-1 (LMP-1) (4). These genes possess oncogenic properties and thus contribute to

lymphomagenesis through multiple mechanisms. For example, EBERs have been shown to be sufficient to induce and maintain cell proliferation and inhibit apoptosis compared to control cells (5–7). While LMP-1 is shown to be involved in activating cellular signalling pathways that lead to cell growth, survival, differentiation, and transformation (8).

Certain histomorphologic features observable on routine H&E staining have been associated with EBV-associated lymphomas. These features include architectural effacement of lymphoid tissues, diffuse, nodular, or angiocentric infiltration, geographic necrosis, presence of large immunoblast-like cells, starry-sky appearance, and polymorphous inflammatory backgrounds (3,9). Additionally, Reed-Sternberg-like cells and nuclear features of vesicular chromatin and prominent nucleoli are cytopathic effects linked to EBV-associated lymphomas (10). These histomorphologic characteristics are shown to have strong correlation with EBV-associated lymphomas, particularly endemic Burkitt's lymphoma and extranodal NK/T-cell lymphoma (11).

Lymphomas constitute a significant public health burden in Nigeria, where non-Hodgkin lymphoma ranks among the leading cancers, with an estimated 1,989 new cases and 920 deaths reported in 2022 (12). Both EBV prevalence and lymphoma subtype distribution exhibit marked geographic variation, influencing disease patterns and diagnostic predictive values (2,4). Burkitt's lymphoma, for instance, shows a strong epidemiological association with sub-Saharan Africa, including Nigeria (4). Despite this burden, there is an observed paucity of comprehensive data on haematological malignancies and EBV-associated lymphomas in Nigeria, particularly the North-eastern part of the country. Therefore, this study aimed to

evaluate histomorphologic features suggestive of EBV association in archived lymphoma histological specimens in Northeast Nigeria, with the objective of assessing the potential screening and diagnostic utility of the cytopathic observations.

### Materials and Methods

A retrospective study was conducted at Modibbo Adama University Teaching Hospital (MAUTH), Yola. The study involved the review of archived tissue specimens and corresponding clinical records of patients previously diagnosed with lymphoma. Archived formalin-fixed paraffin-embedded (FFPE) tissue blocks of confirmed lymphoma patients were retrieved from the histopathology archives of MAUTH, and stained with H&E. Cases with insufficient tissue, poorly preserved specimens, or inadequate staining were excluded from the study. Relevant sociodemographic data such as, age, gender, place of residence, etc. were extracted from the patients' medical record. Clinical and behavioural variables potentially associated with lymphoma risk including smoking, alcohol consumption, presence of chronic diseases, and previous haematological disorders, co-infections were also obtained where available from the documented records.

The tissue blocks retrieved were previously fixed in 10% neutral buffered formalin for 24 h at room temperature and dehydrated through graded ethanol (50%, 70%, 95%, and 100%; 2 min each), cleared in two changes of xylene; 5 min each, and embedded in paraffin wax. Paraffin blocks were sectioned at 3  $\mu$ m thickness using a microtome. Sections were mounted on poly-L-lysine-coated glass slides and dried at 60 °C for 1 h. Sections were deparaffinised in two changes of xylene for 5 min each, and rehydrated through a descending alcohol series (100%, 95%, and 70%; 2 min each), followed by rinsing in

distilled water. The slides were stained with haematoxylin for 5 min and rinsed in running tap water for 5 min. Differentiation was performed using 1% acid alcohol (1% HCl in 70% ethanol) for 1 min, followed by immediate washing in distilled water. Bluing was achieved using tap water substitute for 1 min, followed by rinsing in running tap water for 5 min. The sections were counterstained with 1% eosin Y solution for 1 min, followed by brief rinsing in distilled water to remove excess stain. Stained sections were mounted using DPX mounting medium (Molechem) with glass coverslips. Stained sections were examined under a light microscope (Leica HistoCore BIOCUT). Representative images were captured using a digital imaging system attached to the microscope.

Descriptive statistics were performed using Microsoft Excel (Microsoft, Redmond, WA, USA). Graphs were generated using the same Microsoft Excel (Microsoft, Redmond, WA, USA), package. Ethical approval for the study was obtained from the Health Research Ethics Committee of Modibbo Adama University Teaching Hospital, Yola (Approval No MAUTHY/HREC/24/354 dated 17<sup>th</sup> October, 2024). Patient confidentiality was maintained throughout the study by anonymising all retrieved data.

### Results

A total of fifty (50) Formalin-fixed Paraffin-Embedded (FFPE) lymphoma blocks were retrieved. Nine (9) cases were excluded due to unavailability of corresponding medical records at the time of data compilation. Additionally, ten (10) tissue blocks were deemed unsuitable for analysis owing to tissue deterioration during storage and hence, could not withstand sectioning or staining procedures. Consequently, thirty-one (31) FFPE lymphoma cases met the inclusion criteria and were included in the final analyses. The blocks/samples that met the

inclusion criteria during the study period comprised of 45.2% (n=14) females and 54.8% (n=17) males (Figure 1). Among these, 64.3% (n=9) of females and 47.1% (n=8) of the males were married (Figure 1). The age of study participants ranged from 8 to 73 years, with a mean age of 35.2 years (Figure 2). Patients were seen from all senatorial zones of Adamawa State, including Mubi North, Mubi South, Maiha, Hong, Gombi, Song, Girei, Yola North, Yola South, and Mayo Belwa Local Government Areas, as well as neighbouring Jalingo in Taraba State, indicating a wide regional referral coverage.

The distribution of lymphomas in this study was found to vary based on sociodemographic parameters, such as age, gender. For instance, Burkitt’s lymphoma constituted 32.2% (n=10) of the lymphoma cases reported in this study. Majority of these patients were males of ages between 8 – 19 years (Figure 2). Other NHL were found to be distributed across all age groups (10 – 73 years), while HL totals 9.7% (n=3) found in mid-age patients with 30 – 50 years old.

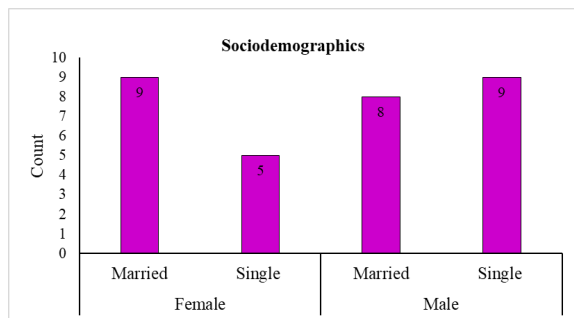


Figure 1: Gender and marital status of the study population

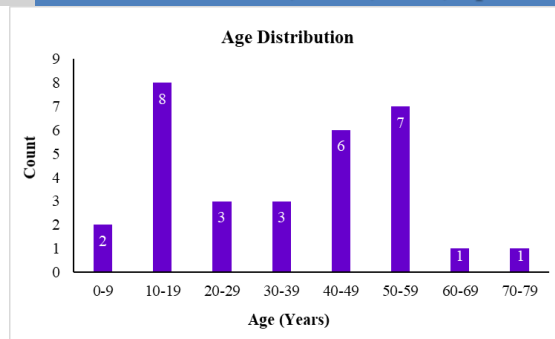


Figure 2: Age distribution of the study population

Based on the predefined morphological criteria observed in this study, 54.8% (n=17) of the cases were suggestive of EBV-associated lymphoma. These features include prominent large, multinucleated cells, some with large cytoplasm. Other features are Reed-Sternberg-like cells and angiocentric growth pattern, and starry-sky appearance. Co-infection with *M. tuberculosis* was detected in one of the cases. Most of the clinical diagnosis were linked to non-Hodgkin lymphomas (NHL), with 90.3% (n=28) cases. Of these, Burkitt’s lymphoma made up a total of 32.2% (n=10), anaplastic large cell lymphoma 3.2% (n=1), follicular lymphoma 6.4% (n=2), and unclassified NHL constitute 48.4% (n=15) (Figure 3). Hodgkin lymphomas account for 9.7% (n=3) (Figure 3).

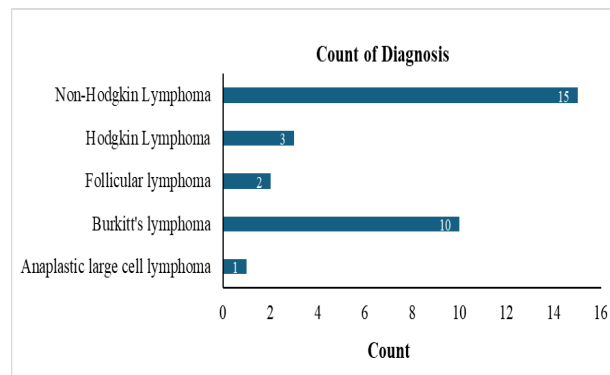


Figure 3: Clinical diagnosis of the study subjects

Burkitt's lymphoma cases were found predominantly in individuals aged  $\leq 19$  years.

While some of the tissue sections of Burkitt's lymphoma showed classical histomorphologic patterns consistent with EBV-associated cytopathic effects, others demonstrated typical morphology without obvious changes suggestive of EBV (Figure 4). The EBV-suggestive features observed in Burkitt's lymphoma included multinucleated large cells, Reed-Sternberg-like cells, and prominent starry-sky appearance (Figure 4). Furthermore, these children were shown to have normal range of monocytes including, neutrophils, lymphocytes, and eosinophils. Similarly, other non-Hodgkin lymphoma

cases exhibited multinucleated atypical cells and Reed-Sternberg-like morphology (Figure 5), whereas a small proportion ( $n = 3$ ) showed no obvious EBV-associated morphologic features. Hodgkin lymphoma (HL) accounted for 6.4% ( $n=3$ ). All Hodgkin lymphoma cases demonstrated characteristic morphologic findings, including Reed-Sternberg-like cells, multinucleated large cells, and diffuse distribution of large atypical cells with abundant cytoplasm (Figure 6), consistent with features commonly reported in EBV-associated Hodgkin lymphoma (13).

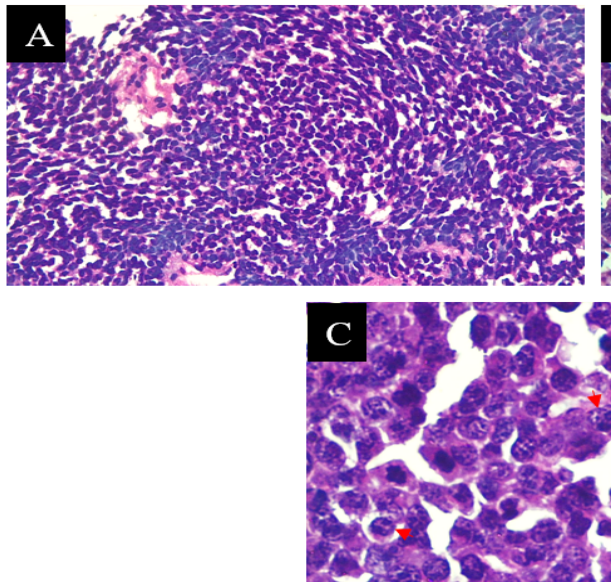


Figure 4: EBV morphologic features in Burkitt's lymphoma  
 A = showing no obvious EBV cytopathic effect (x100).  
 B = showing starry-sky appearance (x100).  
 C = showing multinucleated cells, and Reed-Sternberg-like cells (x400).

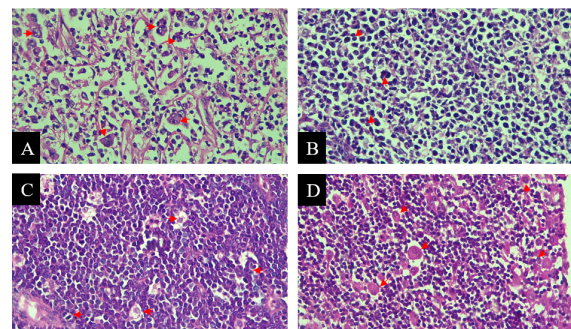


Figure 5: EBV morphologic features in non-Hodgkin lymphoma  
 A = showing Anaplastic large cell lymphoma (x100).  
 B = showing multinucleated large cells, and Reed-Sternberg-like cells (x100).  
 C = showing starry-sky appearance, and Reed-Sternberg-like cells (x100).  
 D = showing Anaplastic large cell lymphoma, cells with larger cytoplasm, and Reed-Sternberg-like cells (x100).

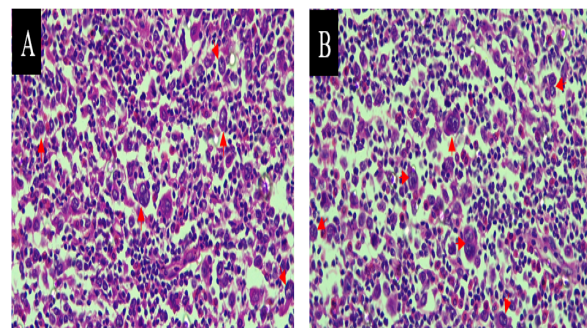


Figure 6: EBV morphologic features in Hodgkin lymphoma

A = showing wide-distribution of multinucleated large cells, and cells with large cytoplasm (x100).

B = showing wide-distribution of multinucleated large cells, and cells with large cytoplasm, and Reed-Sternberg-like cells (x100).

## Discussion

Lymphomas constitute a significant source of malignancy-related morbidity and mortality globally and in Nigeria (14,15). Lymphomas, like most other malignancies, largely have uncertain aetiologies. However, strong empirical evidence has linked causality of some lymphoma to infection with Epstein-Barr virus. This variation in causality could be linked to the differences in environmental location among other sociodemographic parameters. EBV, a ubiquitous and oncogenic virus, is asymptotically carried by more than 90% of the human population (1,16). The virus preferentially and efficiently infects and establishes lifelong latency in lymphocytes (6,17). EBV-associated malignancies are characterised with high fatality risk. Estimates indicate that globally, approximately 239,700 - 357,900 people develop EBV-associated malignancies annually, with around 137,900 - 208,700 deaths (4). This represents ~ 60% fatality. EBV was first identified in the Africa region in 1964 in a case of Burkitt's lymphoma (1). The global picture reveals that haematological malignancies are ranked in the top 10% of all malignancies worldwide (12), and they are diagnosed in both males and females in developed and developing countries of the world (4,18). Nonetheless, the findings in this study and many previous literature imply an increased incidence risk of lymphomas in males than females (19,20). This gender inclination could be attributed to the direct anti-proliferative effects of estrogen on lymphocytes that express the estrogen receptor (19,20). Increasing

lymphoma incidence observed worldwide could partly be attributed to improved diagnostic capabilities, heightened disease awareness, and advances in tumour classification systems.

The distribution of lymphomas in this study varies considerably across sociodemographic factors, such as age, gender, marital status, geographical location, clinical presentations, treatment options and prognosis (2). For instance, Burkitt's lymphoma constituted one-third of the lymphoma cases reported in this study, comprises majority of male patients with ages between 8 – 19 years. Of this, paediatrics of  $\leq 14$  years constituted the majority. This findings conforms with many previous studies as compiled in a review article by Khan and colleagues (4). Similarly, in the present study, non-Hodgkin lymphoma (NHL) constituted the predominant lymphoma subtype in MAUTH compared with Hodgkin lymphoma (HL). This is consistent with epidemiological patterns reported globally and within Nigeria (15,21). It is also reported that married lymphoma patients are shown to have superior 5-year survival outcomes compared to their unmarried counterparts (22). This impact is observed in many haematologic malignancies and also multiple solid tumours (22,23). Although this observation is not yet biologically described, it could be attributed to social factors such as emotional and financial support, improved adherence of the long-term treatment regimens, and greater access to healthcare services (22,23). The increased number of married patients observed this study could be ascribed to the mentioned social factors that may lead the married patients have access to early and proper diagnosis.

We further evaluated the usefulness of H&E morphology as a screening tool for EBV in lymphoma cases. Our findings demonstrate that H&E-based assessment indicated

moderate-to-high sensitivity and specificity, with positive predictive value in specific Burkitt's lymphoma and other non-Hodgkin lymphoma. The morphologic features often predictive of EBV positivity were large, multinucleated cells with large cytoplasm, Reed-Sternberg-like cells, and angiocentric growth, and "starry-sky" patterns, etc. The "starry-sky" pattern and high mitotic activity observed in Burkitt's lymphoma correlated strongly with EBV positivity, especially in paediatric and endemic cases (24).

Although we found that the lymphoma biopsies at MAUTH express morphologic changes typical of EBV, we were not able to histopathologically investigate for EBV markers due to paucity of tools. Furthermore, efforts to screen for the EBV markers using PCR amplification proves abortive probably due to the nature of the biopsies as recovering DNA from the FFPE samples is very challenging. Therefore, it is recommended that future studies to perform histopathological screening for EBV markers in lymphoma biopsies in Northeast Nigeria, particularly at MAUTH.

While H&E morphology demonstrated potential positive predictive value, histologic assessment alone does not seem sufficient to establish EBV diagnosis. This is because EBV-positive lymphomas may exhibit overlapping morphologic features with EBV-negative counterparts, and thus, cases may lack distinctive morphologic clues. Though Epstein-Barr encoded RNA (EBER) *in situ* hybridisation remains the gold standard for detecting latent EBV infection in tissue sections due to its high sensitivity and specificity (7,25), its application for routine screening in resource-limited settings may not be feasible due to its high financial and infrastructural cost. We therefore support a realistic diagnostic approach in which morphologic prediction on routine H&E examination guides selective application of confirmatory EBV testing. Such targeted testing strategies may improve diagnostic

efficiency and resource utilisation in many Nigerian hospitals.

### Conclusion

This study demonstrates that routine haematoxylin and eosin histomorphologic evaluation may serve as a useful preliminary screening tool for identifying lymphomas with potential Epstein-Barr virus association, particularly in resource-constrained environments where advanced diagnostics are limited. However, the absence of standardised morphologic indicators may contribute to false-negative or indeterminate interpretations when morphology alone is relied upon. Consequently, confirmation of EBV involvement should incorporate ancillary diagnostic techniques such as EBER *in situ* hybridisation or immunohistochemistry. Establishing reproducible morphologic criteria capable of predicting EBV status on routine histology would facilitate prioritisation of cases for confirmatory testing and improve diagnostic accuracy. Therefore, future studies, are recommended to utilise both retrospective and prospective methods to standardised morphologic scoring systems for predicting EBV in lymphomas.

### Limitation of the study

The limitations of this study include its retrospective design, relatively small sample size, and single-centre setting, which may limit generalisability of the findings. Therefore, multicentre studies involving larger cohorts and incorporating confirmatory EBV validation are recommended to develop and standardised histomorphologic scoring systems for predicting EBV status in lymphoma cases.

### References

1. Epstein MA, Achong BG, Barr YM. Virus Particles in Cultured Lymphoblasts from Burkitt's Lymphoma. *Lancet*. 1964 Mar 28;283(7335):702-3.
2. Young LS, Rickinson AB. Epstein-Barr Virus: 40 Years On. *Nat Rev*. 2004;4:757-68.
3. Cohen, JI, Kimura H, Nakamura S,

Ko YH, Jaffe ES. Epstein–Barr virus-associated lymphoproliferative disease in non-immunocompromised hosts: a status report and summary of an international meeting, 8–9 September 2008. *Ann Oncol* [Internet]. 2009 [cited 2022 Jul 20];20(9):1472. Available from: [/pmc/articles/PMC2731018/](https://pubmed.ncbi.nlm.nih.gov/19111118/)

4. Khan G, Fitzmaurice C, Naghavi M, Ahmed LA. Global and regional incidence, mortality and disability-adjusted life-years for Epstein-Barr virus-attributable malignancies, 1990–2017. *BMJ Open* [Internet]. 2020 Aug 30 [cited 2020 Oct 25];10(8):e037505. Available from: [/pmc/articles/PMC7462312/?report=abstract](https://pubmed.ncbi.nlm.nih.gov/3462312/)

5. Yajima M, Kanda T, Takada K. Critical Role of Epstein-Barr Virus (EBV)-Encoded RNA in Efficient EBV-Induced B-Lymphocyte Growth Transformation. *J Virol*. 2005;79(7):4298–307.

6. Ahmed W, Hassan Z, Abdelmowla YAA, Philip PS, Shmygol A, Khan G. Epstein-Barr virus noncoding small RNA (EBER1) induces cell proliferation by up-regulating cellular mitochondrial activity and calcium influx. *Virus Res* [Internet]. 2021;305:198550. Available from: <https://doi.org/10.1016/j.virusres.2021.198550>

7. Hassan Z, Philip PS, Khan G. The Impact of Deleting Stem-Loop 1 of Epstein – Barr Virus-Encoded RNA 1 on Cell Proliferation. *Viruses* [Internet]. 2022;14(2538). Available from: <https://doi.org/10.3390/v14112538>

8. Herbert KM, Pimienta G. Consideration of Epstein-Barr Virus-Encoded Noncoding RNAs EBER1 and EBER2 as a Functional Backup of Viral Oncoprotein Latent Membrane Protein 1. *MBio*. 2016;7(1):e01926-15.

9. Fujita S, Buziba N, Kumatori A, Senba M, Yamaguchi A, Toriyama K. Early Stage of Epstein-Barr Virus Lytic Infection Leading to the “ Starry Sky ” Pattern Formation in Endemic. *Arch Pathol Lab Med*. 2004;128(5):549–52.

10. Liu CY, Hsieh YC, Chang ST, Wu HC, Chen SW. Effusion cytology of EBV - associated lymphoma: a concise review. 2025;

11. Miller G, Shope T, Lisco H, Stitt D, Lipman M. Epstein-Barr virus: transformation, cytopathic changes, and viral antigens in squirrel monkey and marmoset leukocytes. *Proc Natl Acad Sci U S A* [Internet]. 1972 [cited 2022 Jul 4];69(2):383–7. Available from: <https://www.pnas.org>

12. GLOBOCAN. Global Cancer Observation [Internet]. 2022. Available from: International Agency for Research on Cancer

13. Massini G, Siemer D, Hohaus S. EBV in Hodgkin Lymphoma. *Mediterr J Hematol Infect Dis* [Internet]. 2009;2. Available from: <http://www.mjhid.org/>

14. Wong Y, Meehan MT, Burrows SR, Doolan DL, Miles JJ. Estimating the global burden of Epstein–Barr virus-related cancers. *J Cancer Res Clin Oncol* [Internet]. 2022 Jan 1 [cited 2022 Jul 21];148(1):31–46. Available from: <https://link.springer.com/article/10.1007/s00432-021-03824-y>

15. Ni U, Fe I, Gc U, Eo E, Fo E, Cn U, et al. Prevalence of lymphoma and distribution pattern of lymph node pathologies among adult patients with lymphadenopathy. In: *Proceed the 17th Annual Scientific Conference of The College of Nigerian Pathologists*. 2022. p. 2022.

16. Hassan Z. Structural impact of Epstein-Barr virus (EBV)-encoded small RNA-1 on its transport and function. United Arab Emirates University; 2023.

17. Suzuki T, Takano Y, Yamashita K, Sato K, Kakita A, Okudaira M. A possible role for Epstein-Barr virus in tumorigenesis after immunosuppression in cases of renal transplantation. *J Cancer Res Clin Oncol*. 1993;119:627–9.

18. Swerdlow SH, Campo E, Harris NL, Jaffe ES, Pileri SA, Stein H, et al. *WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues*. 4, editor. 2017.

19. Horesh N, Horowitz NA. Does

Gender Matter in Non-Hodgkin Lymphoma ? Differences in Epidemiology , Clinical Behavior , and Therapy. Rambam Maimonides Med J [Internet]. 2014;5(4):e0038. Available from: www.rmmj.org.il

20. Radkiewicz C, Bruchfeld JB, Weibull CE, Jeppesen ML, Frederiksen H, Lambe M, et al. Sex differences in lymphoma incidence and mortality by subtype: A population-based study | Mats Lambe. Am J Hematol [Internet]. 2023;98(September 2022):23–30. Available from: wileyonlinelibrary.com/journal/ajh

21. Onwubuya IM, Adelusola KA, Durosinmi MA, Sabageh D, Ezike KN. Lymphomas in Ile-Ife , Nigeria : Immunohistochemical Characterization and Detection of Epstein-Barr virus Encoded RNA. J Clin Diagnostic Res. 2015;9(6):14–9.

22. He S, Song H, Zuo W, Liu S, Fang X, Li X. Impact of marital status on survival in patients with follicular lymphoma. Ann Hematol. 2026;105:70.

23. Wang F, Xie X, Yang X, Jiang G, Gu J. The influence of marital status on the survival of patients with Hodgkin lymphoma.

Oncotarget [Internet]. 2017;8(31):51016–23. Available from: www.impactjournals.com/oncotarget/Oncotarget

24. Gandhi MK, Tellam JT, Khanna R. Epstein–Barr virus-associated Hodgkin’s lymphoma. Br J Haematol [Internet]. 2004 May 1 [cited 2022 Nov 25];125(3):267–81. Available from: https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2141.2004.04902.x

25. Khan, G, Coates PJ, Kangro HO, Slavin G. Epstein Barr virus ( EBV ) encoded small RNAs : Targets for detection by in situ hybridisation with oligonucleotide probes. J clin pathol. 1992;45:616–20.

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#### **Conflict of Interest**

The authors declare no competing interests.