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Evaluation of epidemiological features and immunohistochemical profile of non-Hodgkin's lymphoma in a tertiary referral hospital

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Abstract

Background: Non-Hodgkin lymphoma (NHL) represents a diverse group of malignancies of lymphoid tissue due to clonal proliferation of lymphoid cells. India has a notable distribution of NHL, but its characterization and description are still insufficient. The objective of this study was to evaluate the epidemiological features and immunohistochemical profile of NHL in patients attending a tertiary referral hospital.

Material and methods: This study is a descriptive analysis of cases patients diagnosed with NHL referred to the Department of Oncology at a tertiary referral hospital in South India. The case records were retrospectively reviewed to explore both the epidemiological and immunohistochemical aspects of NHL cases. The collected data was organized and presented in frequency distribution tables. The **c**ategorical and counting variables were expressed using frequencies and percentages.

Results: The study analysed a total of 71 cases of lymphoma diagnosed and treated during the specified period. Among the 71 cases of lymphoma 59 (83%) were non-Hodgkin's lymphoma and 12 (17%) were Hodgkin's lymphoma. The most common age group was 41 to 60 years. There was a notable male predominance in the distribution of NHL with male-to-female ratio 1.7:1. There was higher prevalence of lymphoma cases among individuals from rural areas 41 (69.5%) as compared to those from urban centres 18(30.5%). Most frequently involved site was lymph nodes 48 (81.4%) and diffuse large B-cell lymphoma was the most prevalent subtype of NHL.

Conclusion: Non-Hodgkin lymphomas demonstrate a higher prevalence among rural populations. In resource-limited settings Immunohistochemistry markers stand out as valuable tools for guiding further ancillary techniques.

Keywords: non-Hodgkin lymphoma; epidemiology; immunohistochemistry

Introduction

Lymphoid neoplasms are a diverse group of disorders that are primarily categorized into two distinct clinicopathologic groups: Hodgkin's lymphoma and non-Hodgkin's lymphomas. Hodgkin's lymphoma is characterized by the presence of Reed-Sternberg cells, which are a hallmark of this disease.

On the other hand, non-Hodgkin's lymphomas (NHL) represent a heterogeneous group of clonal tumors that can originate from mature and immature B cells, T cells, or natural killer (NK) cells at various stages of differentiation[1, 2]. In India, the age-adjusted incidence rates for NHL are 2.9 per 100,000 in men and 1.5 per 100,000 in women [3].

NHL can be classified reliably through a combination of morphological analysis and immunophenotyping. These methods are crucial for identifying and categorizing

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the specific type of lymphoma. However, molecular techniques are often required to confirm subgroups of lymphoma that share similar characteristics, thereby ensuring accurate diagnosis.

The fifth edition of the World Health Organization classification (WHO-HAEM5) provides a framework that allows for the use of class-level definitions in cases where diagnostic criteria are only partially met or when a complete investigational workup is not feasible [4]. This classification system is essential in guiding the diagnosis and treatment of lymphomas, especially in resource-limited settings.

The present study aimed to evaluate the epidemiological and immunohistochemical features of NHL cases at a tertiary referral hospital in South India.

Material and methods

This descriptive study was conducted at Mysore Medical College and Research Institute in South India. The study period extended from January 2021 to October 2024. This study focused on newly diagnosed cases of NHL which were retrospectively reviewed. The study received approval from the Institutional Ethical Committee.

Data collection: Clinico-pathological data was collected from medical records of patients diagnosed with lymphoma. These patients had their treatment plans approved by the tumor board of the institution and were managed in the Department of Oncology at the tertiary referral hospital.

Inclusion and exclusion criteria: All newly diagnosed cases of NHL were included in the study. However, cases of relapse and those with incomplete data were excluded from the analysis.

Data representation and analysis

(1) The collected data was organized and presented using frequency distribution tables. (2) Categorical and counting variables were analyzed and presented using frequencies and percentages. The data analysis was carried out using the Statistical Package for Social Sciences (SPSS) for Windows, Version 20.0.

Results

During the study period, a total of 75 lymphoma cases presented for treatment in the Department of Oncology. Out of these, 71 cases were included in the study, while 4 cases were excluded due to relapse. Among the included lymphoma cases NHL was the predominant type, with 59 cases, constituting approximately 83% of the total cases and Classic Hodgkin's Lymphoma (CHL) cases were 12 making up about 17% of the cases.

In the present study, we examined a cohort of 59 NHL patients. The distribution of 59 NHL cases was analysed according to age, sex and community household.

Age distribution (Table 1): All the cases of NHL belonged to adults. The mean age at presentation was 55 years and the majority of patients fell within the 41 to 60 age range (Table 1) representing 59.3% of the total cases with M: F ratio of 1.7:1.

Gender distribution (Table 2): In this study, the data indicates that there is a higher prevalence of NHL in males compared to females with males accounting for 37(62.7%) of the total cases.

Community household distribution (Table 3): The findings reveal a higher prevalence of NHL among patients from rural areas 41 patients (69.5%).

Site of involvement (Table 4): Nodal NHL accounted for 48 cases, equivalent to 81.4% of cases and ExtraNodal NHL represented 11 cases, making up 18.6% of cases. Diffuse Large B-Cell Lymphoma (DLBCL) was the subtype which accounted 64% of the total cases presented in extra-nodal sites which included stomach, ileum, caecum, thyroid, testis and nasopharynx.

IHC profile of non-Hodgkin's lymphoma (Table 5)

The main characteristics of NHL subtypes are analysed, with each lymphoma subtype displaying a variety of distinct markers, including both positive and negative ones.

Diffuse large B-cell lymphoma: A total of 29 cases (49%) were analyzed. The incidence was fairly balanced between genders, with 15 males (51.7%) and 14 females (48.3%). The most common age group for DLBCL, NOS was between 41 to 60 years.

The histopathological examination of these cases was consistent with the morphology typical of DLBCL. All 29 cases belonged to the DLBCL, NOS category.

The Hans algorithm [6] was applied to cases that fulfilled the necessary criteria and the following subtypes were identified. Germinal Centre B-cell-like (GCB) DLBCL: Thirteen cases showed positivity for CD10.Non-GCB DLBCL: Five cases were identified, with three cases showing negativity for CD10 and BCL6 and other two cases were positive for BCL6 and MUM1. The Ki-67 proliferative index in DLBCL, NOS ranged significantly from 50% to 90%. Following additional findings were observed CD30, positivity was observed in two cases and CD5, positivity was seen in one case.

Table 1: Distribution of non-Hodgkin's lymphoma by demographic features (Age).

		B-cell lymphoma									*T-cell lymphoma*			
Age group (yrs)		DLBCL,NOS 29,49%	HGBL 8,14%	FL 9,15%	NMZL 3,5%	ENMZL 1,2%	MCL 3,5%	THRLBCL 1,2%	LPL 1,2%	SLL 1,2%	AITL 1,2%	T-LBL 1,2%	CTCL 1,2%	Total
21-40	Number	4	0	0	0	0	0	1	0	0	0	0	0	5
	Percentage (%)	13.8	0	0	0	0	0	100	0	0	0	0	0	8.5
41-60	Number	16	5	5	3	1	2	0	0	0	1	1	1	35
	Percentage (%)	55.2	62.5	55.6	100	100	66.7	0	0	0	100	100	100	59.3
61-80	Number	9	3	4	0	0	1	0	1	1	0	0	0	19
	Percentage (%)	31.0	37.5	44.4	0	0	33.3	0	100	100	0	0	0	32.2
Total	Number	29	8	9	3	1	3	1	1	1	1	1	1	59
	Percentage (%)	100	100	100	100	100	100	100	100	100	100	100	100	100

Pearson Chi-Square Value =7.661 df=11 Asymp. Sig. (2 sided) =0 .743 (p>.05)

Table 2: Distribution of non-Hodgkin's lymphoma by demographic features (Gender).

		B-cell lymphoma									*T-cell lymphoma*			
Gender		DLBCL,NOS 29,49%	HGBL 8,14%	FL 9,15%	NMZL 3,5%	ENMZL 1,2%	MCL 3,5%	THRLBCL 1,2%	LPL 1,2%	SLL 1,2%	AITL 1,2%	T-LBL 1,2%	CTCL 1,2%	Total
Male	Number	15	5	7	2	1	2	1	1	0	1	1	1	37
	Percentage (%)	51.7	62.5	77.8	66.7	100	66.7	100	100	0	100	100	100	62.7
Female	Number	14	3	2	1	0	1	0	0	1	0	0	0	22
	Percentage (%)	48.3	37.5	22.2	33.3	0	33.3	0	0	100	0	0	0	37.3
Total	Number	29	8	9	3	1	3	1	1	1	1	1	1	59
	Percentage (%)	100	100	100	100	100	100	100	100	100	100	100	100	100

Pearson Chi-Square Value =7.661 df=11 Asymp. Sig. (2 sided) =0.743 (p>.05)

Table 3: Distribution of non-Hodgkin's lymphoma by demographic features (Community household).

		B-cell lymphoma									*T-cell lymphoma*			
Community Household		DLBCL,NOS 29,49%	HGBL 8,14%	FL 9,15%	NMZL 3,5%	ENMZL 1,2%	MCL 3,5%	THRLBCL 1,2%	LPL 1,2%	SLL 1,2%	AITL 1,2%	T-LBL 1,2%	CTCL 1,2%	Total
Rural	Number	21	6	4	3	1	2	1	1	1	0	0	1	41
	Percentage (%)	72.4	75.0	44.4	100	100	66.7	100	100	100	0	0	100	69.5
Urban	Number	8	2	5	0	0	1	0	0	0	1	1	0	18
	Percentage (%)	27.6	25.0	55.6	0	0	33.3	0	0	0	100	100	0	30.5
Total	Number	29	8	9	3	1	3	1	1	1	1	1	1	59
	Percentage (%)	100	100	100	100	100	100	100	100	100	100	100	100	100

Pearson Chi-Square Value =10.974 df=11 Asymp. Sig. (2 sided) =0.445 (p>.05)

Table 4: Distribution of non-Hodgkin's lymphoma by site.

		B-cell lymphoma												*T-cell lymphoma*
Site		DLBCL,NOS 29,49%	HGBL 8,14%	FL 9,15%	NMZL 3,5%	ENMZL 1,2%	MCL 3,5%	THRLBCL 1,2%	LPL 1,2%	SLL 1,2%	AITL 1,2%	T-LBL 1,2%	CTCL 1,2%	Total
Nodal	Number	22	6	9	3	0	3	1	1	1	1	1	0	48
	Percentage	75.9	75.0	100	100	0	100	100	100	100	100	100	0	81.4
Extra-nodal	Number	7	2	0	0	1	0	0	0	0	0	0	1	11
	Percentage	24.1	25.0	0	0	100	0	0	0	0	0	0	100	18.6
Total	Number	29	8	9	3	1	3	1	1	1	1	1	1	59
	Percentage	100	100	100	100	100	100	100	100	100	100	100	100	100

Pearson Chi-Square Value =14.101 df=11 Asymp. Sig. (2 sided) =0.227(p>.05)

High-grade B-cell lymphoma (HGBL): The present study included a total of 8 cases of HGBL. The demographic distribution of HGBL cases revealed male predominance 5 cases (62.5%) and the most frequently affected age group was between 41 and 60 years. 7 out of 8 cases (88%) showed double expressor status with positivity for both MYC and BCL2 proteins.

Follicular lymphoma (FL): The study encompassed a total of 9 cases of Follicular lymphoma. Of these cases, 77.8% (7 cases) were male, while 22.2% (2 cases) was female. The age distribution was balanced between two groups: 41-60 years and 61 -80 years.

The histopathological examination of the cases was consistent with the diagnosis of FL. All 9 cases demonstrated positivity for CD20, 4 cases showed positivity for PAX5.7 cases were BCL6: positive and 4 cases exhibited CD10 positivity, 2 cases showed positivity for MUM1 and CD3.

Nodal marginal zone lymphoma (NMZL): The present study included three cases of NMZL, All three cases (100%) were positive for CD20 and PAX5. Two out of the three cases (67%) showed positivity for BCL2 and one case (33%) tested positive for CD4.

Mantle cell lymphoma (MCL): The present study focused on a total of 3 cases of MCL. All three cases also tested positive for SOX11, Two of the three cases showed positivity for cyclin D1, One case was positive for CD5.

In our observation, we have encountered the following distinct cases of lymphomas, each presenting unique characteristics and challenges in diagnosis and treatment. The epidemiological and immunohistochemical findings of each of the following lymphomas are presented in Table 1-4 and Table 5 respectively.

Table 5: Immunohistochemical profile of non-Hodgkin's lymphoma.

Subtype of NHL	*Positive markers*	*Negative markers*
DLBCL	CD 19, CD20 CD 79a CD10 BCL2, BCL6, MUM1	CD 3, CD5, Cyclin D1, TdT
HGBL	CD 20, C MYC, BCL 6, BCL 2 CD 10, MUM 1	CD 3, CD5, Cyclin D1, TdT, CD 138, IgA
FL	CD20, PAX 5, CD10, BCL2 BCL6, MUM1	CD3, CD 5, Cyclin D1,CD 23, CD 21
NMZL	CD20, PAX 5, BCL2, CD 43	CD 3, CD5, CD23, Cyclin D1, CD 10, CD 30
ENMZL	CD20, CD 79a, BCL2, BCL6	CD5, CD23, Cyclin D1, CD 10, CD 3 CD 30 MUM 1
MCL	CD20, CYCLIN D1, SOX 11, CD5, MUM 1, BCL 2	CD10, BCL 6, CD 30, TdT, CD 34 ANNEXIN
THRLBCL	CD 20, PAX 5, BOB 1 OCT 2 CD 45, BCL 6	CD15, CD 30, EMA, EBV-LMP1
LPL	MUM1,CD 138, CD 79A, CD 20	CD 10, CD 56, CD 3, CD 5
SLL	CD20, CD5 CD 23, BCL2	CD3, BCL6, CD 10, CYCLIN D1, SOX-11, C MYC
AITL	CD3, CD4, CD7, CD30 CD 10, BCL6, ICOS, PD1	EBER, CD15 CD 20
T-LBL	CD 3, CD 5, TDT, CD 2, CD 99	CD 20, BCL 2, BCL 6, C-MYC, CD 10, CYCLIN D1, CD 30, CD 4, CD 7, CD 8, TIA 1, PERFORIN, GRANZYME
CTCL	CD3, CD4	CD 8, CD30, CD 56, ALK

Nasopharyngeal ExtraNodal marginal zone lymphoma (ENMZL). Small lymphocytic lymphoma (SLL), T cell/ Histiocyte rich B-cell non-Hodgkin lymphoma (THRLBCL), Lymphoplasmacytic lymphoma (LPL,T Lymphoblastic lymphoma (T-LBL, cutaneous T cell lymphoma not otherwise specified (CTCL NOS).

Discussion

Lymphoid neoplasms encompass a variety of tumors that originate from B-cells, T-cells, and natural killer (NK) cells. Immunohistochemistry (IHC) is the preferred initial ancillary technique employed in the diagnosis and classification of lymphoid neoplasms. This study analysed the epidemiological and immunohistochemical data of 59 NHL patients treated at an Oncology Centre in a tertiary referral hospital in South India.

The majority of cases were identified as Diffuse large B-cell lymphoma (DLBCL), aligning with global trends. There was a significant presence of follicular lymphomas, which are often characterized by specific immunohistochemical expressions.

The study noted variations in the prevalence of certain subtypes compared to other regional studies, which could be attributed to genetic, environmental, or lifestyle factors. The current study's findings were juxtaposed with other national research as well as a comprehensive review of the literature.

In the present study, the overall gender distribution of NHL showed a predominance of males. This finding is consistent with several other studies, including those conducted by Shanmugasundaram et al [7] Sharma JD et al [8], Shukla et al [9], Pal et al [10], and Sharma et al [11] (Table 6). This trend suggests that males are more frequently diagnosed with NHL compared to females, which may point to underlying biological, environmental, or lifestyle factors that warrant further investigation.

The common age group incidences for NHL in this study are between 41 to 60 years, accounting for 59% of the cases, with a median age of 55 years. This suggests that NHL is more likely to onset in the later stages of life. This age distribution aligns with the findings of studies conducted by Shanmugasundaram et al [7] Shukla et al [9] and Hazarika et al [12].

These studies indicate that NHL is predominantly a disease affecting middle-aged to older adults, who may have implications for screening and early detection strategies. These findings suggest areas for further research to explore the underlying causes of these demographic trends.

In the study, the findings revealed a significant predominance of B cell lymphomas compared to T cell lymphomas. B cell lymphomas comprised 95% of the cases studied and T cell lymphomas made up 5% of the cases. The study's results highlight the predominance of B cell lymphomas over T cell lymphomas, a pattern that is supported by the findings of Shukla et al [9] and Lisa et al [13].

The incidence of B-cell non-Hodgkin lymphoma (B-NHL) varies geographically which underscores the importance of understanding regional patterns to enhance diagnosis and treatment strategies. The findings in this study reveal a higher prevalence of NHL among patients from rural areas 41 patients (69.5%), which contrasts with general incidence reports from India. Individuals in rural locations may be exposed to diverse environmental elements, such as pesticides or agricultural chemicals, leading to varying NHL rates. This study's findings highlight the need to explore specific local factors that might influence NHL occurrences differently than national trends suggest.

This study found that lymph nodes were the most frequent site of NHL (78%) and specifically the cervical lymph nodes were the most commonly affected (80%) and Inguinal lymph nodes followed with 20% involvement. Extranodal sites accounted for 22% of the NHL cases in the study with gastrointestinal tract (GIT) as the most common extra nodal site.

The observations from this study show some variation when compared to other research. Shanmugasundaram et al [7] reported a higher rate of nodal involvement at 88%. In contrast, studies conducted by Shukla et al [9] and Devi et al [17], highlighted a more frequent involvement of extra nodal sites.

In this study, the predominant histological subtype identified was Diffuse large B-cell lymphoma not otherwise specified (DLBCL NOS), accounting for 29 cases, or 49% of the total. This finding is consistent with other studies, which also highlight the prominence of this subtype in various populations.

The Hans algorithm provides a useful framework for further categorizing DLBCL NOS cases. In this study, 13 cases were classified as Germinal Center B-cell-like (GCB) subtype and 5 cases were identified as Non-Germinal center B-cell-like (Non-GCB) subtype. This distinction is crucial as it serves as a predictive marker, influencing treatment decisions and patient prognosis.

Despite the utility of the Hans algorithm, 11 cases of DLBCL could not be categorized due to insufficient

Table 6: Comparison of distribution of non-Hodgkin's lymphoma among other studies.

	Shanmuga-sundaram et al [7]	*Pal et al[10]*	*Lisa et al [13]*	*Patel et al [16]*	*Shukla et al [9]*	*Present study*
Number of NHL cases	41	62	416	178	89	59
B-NHL	32(78.5%)	56(90%)	79.10%	134(75.3%)	74(83.1%)	56(95%)
T-cell NHL	9(21.5%)	6(10%)	16.20%	44(24.7%)	13(14.6%)	3(5%)
M:F Ratio	1.5:1	1.8:1	3.08:1	1.97:1	1.87:1	1.7:1
Mean Age	50 yrs	53 yrs	-	46.4 yrs	52.5 yrs	55 yrs
Site	-	-	-	-	-	-
Nodal	44(88)	61%	244(58.2%)	62,40%	48.30%	48,81%
Extra Nodal	6(12)	39%	-	37,60%	52.80%	11,19%
Distribution of Subtypes (n,%)						
DLBCL	9(21.9)	41%		65(36.5%)	47(52.8%)	29(49%)
HGBL	-		9(2.1%)	4(2.2%)	-	8(14%)
FL	9(21.9)	18%		12 (6.7%)	3(3.37%)	9(15%)
NMZL	-	11%	2(0.47%)	2(1.1%)	-	3(5%)
ENMZL	-	7%	4(0.95%)	-	4(4.49%)	1(2%)
MCL	-	-	19(4.5%)	15(8.4%)	1(1.12%)	3(5%)
THRLBCL	-	-	04(0.95%)	-	1(1.12%)	1(2%)
LPL	-	-	-	-	-	1(2%)
SLL	11(26.8)	14%	29(6.9%)	4(2.2%)	1(1.2%)	1(2%)
AITL	2(4.8)	33%	3(0.71%)	2(1.1%)	2(2.24%)	1(2%)
T-LBL	-	-	20(4.7%)	7(3.9%)	2(2.24%)	1(2%)
CTCL	-	-	-	-	-	1(2%)

information on immunohistochemistry (IHC) markers required by the Hans criteria [6]. Addressing this gap is essential for accurate classification and treatment planning. Research indicates that CD30 positivity in DLBCL is associated with a better prognosis due to the lack of MYC rearrangement, while CD5 positivity correlates with more aggressive disease features and worse survival outcomes. Understanding these markers can help guide treatment decisions and improve patient management in DLBCL cases [14].

HGBL cases are not frequently reported in India, making each report valuable for expanding the medical literature. According to Patel et al [16], the incidence of HGBL in their study was 4 cases, accounting for 2.2% of the total cases examined. In the current study, all 8 cases of HGBL expressed germinal center B-cell (GCB) markers. Among these, 7 cases were identified as double expressors.

Chen JB et al [18], have recommended a diagnostic approach that begins with MYC fluorescence in situ hybridization (FISH) in cases exhibiting aggressive clinical presentation, blastoid morphology, or B-cell lymphoma, unclassifiable (BCLU) morphology. This strategy is especially important for tumors with a GCB phenotype and those that exhibit double expression of MYC and BCL2. Testing for MYC rearrangement should be followed by BCL2 and BCL6. These results aid in classifying the malignancies as either HGBL not otherwise specified (NOS) or HGBL with MYC and BCL2 and/or BCL6 rearrangements.

An interesting case from the study involved a DLBCL NOS initially identified in the testis, which has now been reclassified as large B-cell lymphoma (LBCL) of an immune-privileged site [5].

Traditionally, follicular lymphoma (FL) has been graded based on the proportion of large cells, known as

centroblasts, within the tumor. In this study, Grade 2 FL has been observed to be more common than Grade 1 FL. With the advent of World Health Organization's latest classification[5] ,WHO HAEM5, the mandatory nature of grading Classic FL (cFL) has been relaxed but requires the presence of the t(14;18)(q32;q21) translocation, it underscores the role of genetic markers in diagnosis and treatment, moving beyond traditional histological grading.

In this study, follicular lymphoma (FL), all cases were found to be positive for germinal center (GC) associated markers CD10 and BCL6. Notably, one case also tested positive for LMO2. The findings from this study provide valuable insights into the incidence and characteristics of FL. Incidence rates of FL reported in this study were consistent with the findings of Shanmugasundaram et al, Sharma JD et al [8] and Shukla et al [9]. However, Sharma et al [11] described a lower incidence of FL and, Borgahin et al [19] noted an increased frequency of follicular lymphoma in their research. This variation in findings underscores the need for continued research to understand the factors influencing these differences.

In all cases of Mantle cell lymphoma (MCL) in the present study, the tumor cells were positive for Cyclin D1 and Sox 11. These markers are pivotal in confirming the diagnosis of MCL. The study revealed that the incidence of MCL in the current dataset is comparatively lower than reported in other studies by researchers such as Lisa et al [13] and Patel et al [16].

Negative markers are invaluable tools in distinguishing various types of lymphomas, particularly when diagnosing specific subtypes such as Nodal Marginal Zone Lymphoma (MZL) and Extranodal Marginal Zone Lymphoma (ENMZL). These lymphomas often involve excluding other entities such as Follicular Lymphoma (FL), Small Lymphocytic Lymphoma (SLL), and Mantle Cell Lymphoma (MCL).

The study conducted by Pal et al [10] reported an 11% incidence of MZL among NHL, which is notably higher than the incidence observed in the current study, where it was found to be 5% (3 cases).

In our study, we documented a few instances of specific lymphomas. Such instances are significant as they contribute to the broader understanding of lymphoma diversity. In the diagnosis of small cell lymphoma, tumor cells were positive for B-cell markers and CD23. Tumor cells in small cell lymphoma were negative for Cyclin D1 and Sox11. These markers, helping to distinguish it from other lymphomas like mantle cell lymphoma, which typically shows Cyclin D1 positivity. The World Health Organization (WHO) [5] has set forth recommendations to enhance the prognosis and prediction of small cell lymphoma which include mutational analysis. Research by Lisa et al [13], has reported an increase in the incidence of small cell lymphoma.

In THRLBCL, the tumor cells typically express markers that are characteristic of B-cells. Apart from the standard markers, tumor cells in THRLBCL have also been found to express OCT-2 and BOB.1 which highlights the importance of utilizing a comprehensive panel of immunohistochemical markers.

Lymphoplasmacytic lymphoma (LPL) is a rare type of NHL. This study examined an incidence of LPL in an elderly male with immunophenotypic profile consistent with LPL. Bone marrow examination revealed 20% of the cells exhibited plasmacytoid differentiation which is a significant finding in LPL confirming the diagnosis.

Understanding different types of lymphomas can be challenging due to their varied presentations and markers. This study focuses on two specific cases of lymphoma: Angioimmunoblastic T-cell lymphoma and T-lymphoblastic lymphoma.

The first case involves an elderly male diagnosed with angioimmunoblastic T-cell lymphoma, which is also known as Nodal T follicular helper (TFH) cell lymphoma, angioblastic type. The tumor cells were positive for PD1 and ICOS, which are indicative of TFH cell origin.

The second case is of an adult female diagnosed with T-lymphoblastic lymphoma. The cells were positive for CD99 along with the lineage markers. According to a literature search, CD99 can be a useful marker for assessing minimal residual disease (MRD) in patients. A study conducted by Devi et al [17] reports an incidence rate of 6% for similar cases. In the present study, Cutaneous T-cell lymphoma (CTCL) affected patient aged between 48 years. A Research has identified mycosis fungoides as the most prevalent form of primary cutaneous lymphoma, accounting for 71% of cases [21].

Limitation: There may be referral bias on the incidences of various lymphoma subtypes, as our tertiary care centre is a referral centre for oncology patients.

Conclusion

Lymphomas appear to be more prevalent in rural populations. This increased prevalence may be attributed to environmental exposures and limited access to healthcare. The use of optimal IHC markers

offers a promising path forward even in settings with limited resources.

Conflicts of interest

Authors declare no conflicts of interest.

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