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ORIGINAL ARTICLE

Complete remission rate in advanced-stage diffuse large B-Cell lymphoma following treatment with R-CHOP.

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ABSTRACT… Objective: To evaluate the complete remission (CR) rate in patients with advanced-stage DLBCL following treatment with R-CHOP. **Study Design:** Descriptive Cases-series study. **Setting:** The Institute of Nuclear Medicine and Oncology (INMOL) in Lahore. **Period:** 16th May 2025 to 16th October 2025. **Methods:** Conducted on 60 patients diagnosed with stage III or IV DLBCL and treated with six cycles of R-CHOP chemotherapy at a tertiary care oncology unit were included in this observational study. Demographic baseline data, clinical record, and laboratory data were taken, such as age, gender, performance status, and stage of disease. The clinical evaluation and imaging assessment were used to evaluate response to treatment based on standard response criteria after therapy. **Results:** The average age of the patients was 44.17±12.85 years, and the patients were mostly men (61.7%). Over fifty percent of the patients (55) had stage III disease and forty five percent had stage IV disease. After six cycles of R-CHOP, the complete remission rate was 68.3 and partial remission of 21.7 and disease progression of 10 percent were seen. The CR rate in this study is also in line with other reports found in the literature that range between 65 and 75% of advanced-stage DLBCL. **Conclusion:** R-CHOP chemotherapy is a viable first-line therapy in achieving a high percentage of complete remissions in the advanced stage of DLBCL. However, a subset of patients unable to gain complete remission, which underlines the necessity to detect high-risk cases early and possibly to include new targeted or improved treatment methods.

Key words: Advanced-stage Lymphoma, Complete Remission, Chemotherapy Outcomes, Diffuse Large B-cell Lymphoma, R-CHOP.

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INTRODUCTION

Diffuse large B-cell lymphoma (DLBCL) is a malignancy of B lymphocytes, which are responsible for antibody production. It represents a subtype of B-cell lymphoma which is aggressive and non-Hodgkin in nature and accounts for nearly 30%[1] among these cases. Clinically, DLBCL typically manifests as a rapidly enlarging mass or localized tissue infiltration and is frequently accompanied by symptoms, including fever, unexplained weight loss, and night sweats.[2]

DLBCL can be classified according to the resemblance of its malignant cells to normal stages of B-cell differentiation. Cases that genetically resemble normal germinal center B cells are categorized as germinal center B-cell–like DLBCL (GCB-DLBCL), while those resembling activated B cells are classified as activated B-cell–like DLBCL (ABC-DLBCL).[3] The Hans algorithm, based on immunohistochemical staining for CD10, MUM1, and BCL6, is commonly used to distinguish between GCB and non-GCB subtypes.[4]

Fluorescence in situ hybridization (FISH) analysis revealing translocations involving both BCL6 with MYC or BCL6 with MYC2 genes identifies "double-hit lymphomas," while the presence of translocations in all three genes defines "triple-hit lymphomas.[5]" These subtypes are classified as high-grade B-cell lymphomas. The standard diagnostic evaluation for DLBCL typically includes a complete blood count (CBC), lactate dehydrogenase (LDH), uric acid, PET/CT or contrast-enhanced CT scan of the pelvis, abdomen and chest, hepatitis B screening, echocardiography, serum electrolytes, liver and renal function tests, and serum calcium measurement.[6]

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Most DLBCL cases arise due to genetic changes, including mutations, altered gene expression, amplifications, and chromosomal translocations, which lead to dysregulation of signaling pathways controlling cell maturation, proliferation, survival, immune evasion, and other malignant behaviors.[7] Commonly affected genes include PAX5, CD79B, CD79A, CREBBO, MYD88, EZH2, MYC, BCL6 and BCL2. As a result, neoplastic cells exhibit overactive NF-κB, Toll-like receptor, B-cell receptor, MAPK/ERK, JAK-STAT, PI3K/AKT/mTOR and NF-κB signaling pathways, promoting uncontrolled malignant behavior.[8,9]

A meta-analysis conducted on combined efficacy of rituximab with chemotherapy showed higher CR rates in the R-CHOP group than in the CHOP group (63.2% versus 50.7%).[10] Other studies comparing R-CHOP with or without additional agents demonstrated CR in 88% of patients and partial remission in 12%, with no significant difference between the arms.[11] Additionally, a study comparing obinutuzumab versus rituximab plus CHOP reported similar CR rates in both treatment arms, whether assessed by Alone CT or combined CT and PET/CT showing values 35.4% vs. 33.9% and 56.5% vs. 59.1% respectively.[12]

METHODS

The study was conducted to determine the efficacy of R-CHOP in B-Cell lymphoma patients. This study was conducted as a descriptive case-series study from 16th May 2025 to 16th October 2025, at the Institute of Nuclear Medicine and Oncology (INMOL) in Lahore over a duration of six months. A total of 60 patients were selected. After ethical approval (IRB#INMOL-53-(200) 18-02-25 was obtained and informed consent was secured, these previously untreated, CD20-positive advanced-stage DLBCL patients aged 20-60 with an Eastern Cooperative Oncology Group performance status of 0 to 2 and no central nervous system involvement were enrolled.

The exclusion criteria ruled out individuals with any other malignancy, prior chemotherapy or radiotherapy, HIV infection, active hepatitis B or C, pregnancy, or other severe diseases. Complete remission was defined as the absence of all detectable disease six weeks after treatment, confirmed by a PET-CT scan showing a Deauville score of 1-3, the complete disappearance of all measurable lesions, and the resolution of all disease-related symptoms. Diffuse Large B-Cell Lymphoma was defined as an aggressive CD20-positive B-cell lymphoma, confirmed by histopathological analysis of a biopsy, with patients having advanced-stage disease at enrollment.

Patients enrolled in this study received complete set of R-CHOP regimen including vincristine, doxorubicine, cyclophosphamide, prednisone and Rituximab administered in six cycles every 21 days. Tumor response was assessed via a PET-CT scan six weeks after treatment completion. For statistical analysis using SPSS version 26.0, qualitative data such as gender and cancer stage were presented as frequency and percentage, while quantitative data like age were presented with mean, median, and standard deviation. The potential effects of modifiers like age and disease stage were controlled through stratification, and a post-stratification Chi-square test was applied to see their impact on outcomes, with significant probability values (0.05).

RESULTS

The study included 60 patients with a mean age of 44.17 ± 12.85 years. Most of the patients were older than 40 years (61.7%), and males comprised 61.7% of the study sample. Regarding cancer stage, 55% of patients were in stage III and 45% in stage IV. According to ECOG performance status, 21.7% of patients were classified as ECOG 0, 41.7% as ECOG 1, and 36.7% as ECOG 2, indicating a predominance of patients with mild to moderate functional limitations [Table-I].

After six months of treatment, 68.3% of patients achieved complete remission, while 31.7% did not. [Figure-1]. The analysis revealed no statistically significant association between remission status and age ($p = 0.646$), gender ($p = 0.682$), cancer stage ($p = 0.759$), or ECOG score ($p = 0.103$). Although patients with lower ECOG scores tended to have higher remission rates, the difference did not reach statistical significance. [Table-II].

TABLE-I

Demographic and baseline characteristics of patients (n=60)

Variable	Categories	Frequency (n)	Percentage (%)
Age (years)	Mean±SD=44.17±12.85		
	≤40 years	23	38.3
	>40 years	37	61.7
Gender	Male	37	61.7
	Female	23	38.3
Cancer stage	III	33	55.0
	IV	27	45.0
ECOG	0	13	21.7
	1	25	41.7
	2	22	36.7

FIGURE-1

Complete remission after 6 months among the patients (n=60)

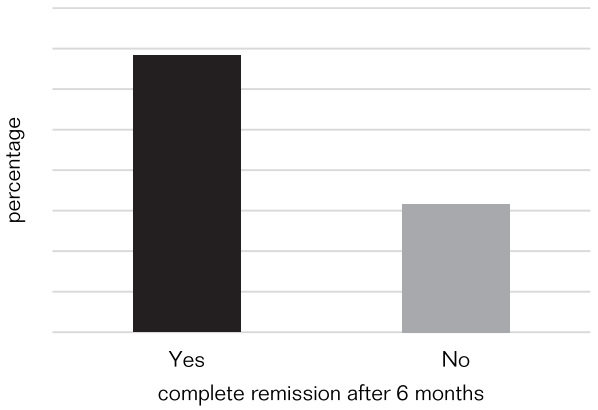

TABLE-II

Association of remission after 6 months with demographic and baseline profile of the patients (n = 60)

Variable	Category	Complete remission after 6 Months: Yes 41 (68.3%)	Complete remission after 6 Months: No 19 (31.7%)	Test of sig.
Age (years)	≤40 years	17 (41.5)	6 (31.6)	χ^2=0.537, d.f=1,p=0.646
	>40 years	24 (58.5)	13 (68.4)	
Gender	Male	26 (63.4)	11 (57.9)	χ^2=0.167, d.f=1,p=0.682
	Female	15 (36.6)	8 (42.1)	
Cancer stage	III	22 (53.7)	11 (57.9)	χ^2=0.094, d.f=1,p=0.759
	IV	19 (46.3)	8 (42.1)	
ECOG	0	12 (29.3)	1 (5.2)	χ^2=4.54, d.f=2,p=0.103
	1	16 (39.0)	9 (47.4)	
	2	13 (31.7)	9 (47.4)	

N (%), chi-square test was applied. Column wise percentage was calculated.

DISCUSSION

Mechanistically, R-CHOP combines cytotoxic agents that target rapidly dividing lymphoma cells with rituximab, an anti-CD20 monoclonal antibody that improves tumor cell clearance through antibody-dependent cytotoxicity and complement activation. The addition of rituximab to CHOP produced one of the most important survival gains in lymphoma therapy history, and the CR rate after R-CHOP reflects both chemosensitivity of the tumor and the immunologic potentiation provided by anti-CD20 therapy.[13,14]

In this cohort of 60 patients with advanced-stage diffuse large B-cell lymphoma (DLBCL) treated with R-CHOP, the observed complete remission (CR) rate of 68.3% is consistent with findings from major clinical trials and population-based studies. Jakobsenet al[15] reported a CR rate of approximately 70% among Danish patients treated with R-CHOP–like regimens, indicating comparable treatment effectiveness in real-world settings. Similarly, Habermannet al[16] demonstrated that adding rituximab to CHOP significantly improved CR rates to around 76%, compared to 63% with CHOP alone, in elderly patients. The MInT trial by Pfreundschuhet al[17] also showed CR rates exceeding 80% in younger, good-prognosis patients treated with R-CHOP. Thus, the CR rate in the present study falls within the expected range for advanced-stage disease, though slightly lower than that of favorable-risk populations.

The mean age in our study (44.17 ± 12.85 years) was lower than that reported in Western cohorts, where the median age is typically around 60–65 years.[18] A younger population may experience fewer comorbidities and better treatment tolerance, potentially explaining the relatively high CR rate despite inclusion of only stage III and IV cases. In contrast, older age has been repeatedly identified as a negative prognostic factor in DLBCL due to

reduced chemotherapy tolerance and biological disease aggressiveness.[18]

Regarding disease stage, all patients in our cohort had advanced disease, with 55% in stage III and 45% in stage IV. This distribution aligns with findings by Musimaret al[19], who also reported a predominance of advanced-stage disease in their real-world series. Despite advanced stage being associated with poorer survival outcomes, our CR rate remained favorable, suggesting effective disease control with standard R-CHOP even in higher stages.

The favorable CR rate observed in our all–advanced-stage cohort is consistent with earlier evidence demonstrating durable remission with R-CHOP, though relapse remains a concern. Frontiers in Oncology reviewed that even after achieving CR, relapse rates in stage III–IV DLBCL remain 25–30%, prompting exploration of consolidative strategies such as radiotherapy or maintenance therapy.[20] Therefore, while short-term remission outcomes in our study are encouraging, long-term follow-up is essential to assess sustained response and survival.

A recent Pakistani cohort conducted by Hassan et al[21] reported an 84.2% CR rate following first-line R-CHOP in newly diagnosed adult DLBCL patients. Major randomized trial data confirm that the addition of rituximab improved CR rates: the long-term update of the GELA study in elderly DLBCL found CR/CRu of 75% in the R-CHOP arm vs 63% in the CHOP arm; and 5-year PFS and OS of 54% and 58% in the R-CHOP arm.[22]

Finally, a large single-centre real-world study (n=1183) of patients who did not complete six cycles of R-CHOP (22% of cohort) observed substantially worse outcomes: 5-year OS significantly higher in those achieving CR/PR and receiving ≥3 cycles (58.5% vs 24.2%).[23]

CONCLUSION

R-CHOP chemotherapy is a viable first-line therapy in achieving a high percentage of complete remissions in the advanced stage of DLBCL. However, a subset of patients unable to gain complete remission, which underlines the necessity to detect high-risk cases early and possibly to include new targeted or improved treatment methods.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Faryal Azhar:** Article writing, Literature search.
2	**Fatima Mehak Zia:** Statistical analysis.
3	**Amber Amin:** Drafting.
4	**Zeeshan Badar:** Data collection.
5	**Faraz Saif:** Revision.
6	**Muneeb Nasir:** Data collection.