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Meta-analysis

Prognostic significance of baseline hypoalbuminemia in lymphoma: a systematic review and meta-analysis

I. Dewa Ayu Made Dian Lestari[1]*, I. Putu Bayu Triguna[2]

[1]Departement of Internal Medicine, Wangaya Regional Hospital, Denpasar, Bali
[2]Department of Internal Medicine, Division of Hematology Oncology, Wangaya General Hospital, Denpasar, Bali, Indonesia

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***Correspondence:**
Dr. I. Dewa Ayu Made Dian Lestari
E-mail: dwayudianlestari26@gmail.com

ABSTRACT

Lymphomas remain clinically heterogeneous diseases with variable outcomes despite advances in therapy. Reliable prognostic factors are essential to guide treatment planning. Serum albumin, a marker of both nutritional status and systemic inflammation, has been proposed as a simple biomarker of prognosis, but its role across lymphoma subtypes remains unclear. Objectives were to evaluate the association between baseline hypoalbuminemia and survival outcomes in patients with Hodgkin and non-Hodgkin lymphoma (HL). A systematic review and meta-analysis was conducted following PRISMA guidelines. PubMed, Cochrane Library, and ScienceDirect were searched through June 2025. Cohort studies reporting hazard ratios (HRs) for overall survival (OS) or progression-free survival (PFS) in relation to baseline serum albumin were included. Pooled HRs were calculated using random-effects models. Eight cohort studies with 1,633 patients were included. Hypoalbuminemia was significantly associated with worse OS (HR=2.16; 95% CI: 1.82-2.57; p<0.00001) and poorer PFS (HR=2.49; 95% CI: 1.80-3.45; p<0.00001). These associations remained consistent across lymphoma subtypes, age groups, and treatment contexts, with low to negligible heterogeneity. Notably, patients who achieved albumin recovery during treatment experienced superior outcomes compared with those who remained hypo-albuminemic. The findings underscore albumin's value as a universally available, inexpensive biomarker that adds prognostic information beyond established indices. Its integration into clinical models may improve risk stratification and support more personalized management. Baseline hypoalbuminemia is a significant adverse prognostic factor in lymphoma. Incorporating serum albumin into routine assessment and considering serial monitoring may enhance prognostic accuracy and patient care.

Keywords: Lymphoma, Hypoalbuminemia, Serum albumin, Prognosis, Survival, Meta-analysis

INTRODUCTION

Lymphomas are among the most common hematological malignancies and represent a significant global health challenge due to their incidence, clinical heterogeneity, and impact on survival. NHL accounts for the majority of cases and is consistently ranked as one of the most frequent cancers worldwide, while HL, although less common, remains of particular concern because of its peak incidence in younger adults and its substantial long-term treatment sequelae.[1,2] Together, these diseases contribute to a considerable proportion of cancer-related morbidity and mortality. Improvements in diagnostic tools, staging, as well as therapies have altered the natural history of the lymphomas over the past two decades, yet outcomes remain uneven across sub-types, geographic regions, and patient characteristics.[3] This variation underscores the continued need for robust prognostic factors that can reliably stratify the patients beyond the conventional clinical variables.

The introduction of rituximab-based immunochemotherapy has dramatically improved the survival of patients with diffuse large B-cell lymphoma (DLBCL), the most common form of NHL. Nevertheless, a substantial proportion of patients experience refractory disease or relapse, and the prognosis in such cases remains poor despite novel salvage regimens and stem cell transplantation.[3,4] Prognostic scoring systems such as the International Prognostic Index (IPI) in NHL and the International Prognostic Score (IPS) in HL were developed to address these challenges and remain widely used in clinical practice. These tools integrate clinical features including age, disease stage, performance status, and biochemical markers such as lactate dehydrogenase (LDH), and have been validated repeatedly across populations.[4,5] However, while invaluable for risk stratification, these indices may not fully capture the biological and host-related dimensions that influence disease behavior and treatment response.

A growing body of research highlights the role of nutritional and inflammatory markers in modulating outcomes in cancer patients. In lymphoma, as in many other malignancies, systemic inflammation can accelerate tumor progression, compromise treatment response, and worsen survival.[6] At the same time, disease- or treatment-related malnutrition diminishes performance status and reduces tolerance to chemotherapy, further complicating outcomes. Serum albumin, a protein produced by the liver, has long been recognized as a reliable indicator of both nutritional state and systemic inflammation. Hypoalbuminemia is not merely a bystander abnormality; it reflects a complex interplay of inflammatory cytokine activity, catabolic stress, and nutritional deficits, all of which converge to weaken host defenses and impair recovery.[7]

In oncology, serum albumin has been evaluated as a prognostic biomarker across a range of solid tumors, with consistent findings linking lower levels to inferior survival.[8] Unlike more complex indices, albumin is universally available, inexpensive, and standardized across laboratories, which makes it particularly attractive in clinical settings where resources may be limited. In the context of lymphomas, several cohort studies have recently examined its value. For example, in elderly patients with DLBCL, baseline hypoalbuminemia has been shown to be independently associated with poor OS, even after adjusting for IPI variables.[7] Similarly, studies in transplant candidates have demonstrated that albumin levels prior to autologous stem cell transplantation (ASCT) predict both OS and PFS, highlighting its importance even in highly selected patient populations.[9] These findings suggest that albumin may provide prognostic information that is complementary to, and possibly independent of, conventional risk scores.

Other investigations in HIV-associated lymphomas have reported similar associations, where low serum albumin at diagnosis was linked to shorter survival, further supporting its generalizability across different clinical contexts.[6] Moreover, large cohort analyses in Asia and other regions indicate that albumin cut-offs in the range of 3.4–4.0 g/dL consistently discriminate between high- and low-risk groups.[7] The consistency of these findings is particularly striking given the diversity of study designs, treatment regimens, and populations examined. At the same time, the evidence remains fragmented, and while composite indices that incorporate albumin-such as the Prognostic Nutritional Index (PNI), Controlling Nutritional Status (CONUT) score, or Geriatric Nutritional Risk Index (GNRI)-have been pooled in recent meta-analyses, there has not yet been a focused synthesis on albumin as a single, standalone prognostic factor in lymphoma.[5,8]

This gap in the literature is clinically meaningful. Albumin measurement is part of routine laboratory testing for nearly every patient, making it far more accessible than many specialized biomarkers. If its prognostic role is validated across HL and NHL in a systematic review and meta-analysis, clinicians would have an inexpensive and universally applicable tool for refining risk stratification and potentially guiding supportive interventions such as nutritional optimization or closer monitoring in high-risk groups. Accordingly, the present study aims to systematically review and quantitatively synthesize the available evidence on the association between baseline hypoalbuminemia and survival outcomes in lymphoma patients. Specifically, we evaluate its impact on OS and PFS across both Hodgkin and non-Hodgkin subtypes, providing a comprehensive and up-to-date assessment of its prognostic significance.

METHODS

Literature search strategy

This systematic review and meta-analysis was conducted in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines. A comprehensive search of PubMed, Cochrane Library, and ScienceDirect was performed to identify studies published up to June 2025. The search terms combined subject headings and free-text keywords related to lymphoma, albumin, and prognosis. The primary PubMed search string was: (HL OR NHL OR diffuse large B-cell lymphoma OR lymphoma) AND (albumin OR hypoalbuminemia) AND (survival OR prognosis OR outcome OR mortality).

Equivalent strategies were adapted for the Cochrane Library and ScienceDirect databases. To ensure completeness, the reference lists of all included articles and relevant reviews were also screened manually. Only studies published in English were considered.

Eligibility criteria

Studies were included if they met the following criteria:

Population

Patients with a histologically confirmed diagnosis of HL or NHL.

Exposure

Pretreatment or baseline serum albumin level, analyzed either as a continuous variable or stratified by a cutoff defined within the study.

Comparator

Patients with low albumin (hypoalbuminemia, as per study definition) compared with those with preserved/normal albumin.

Outcomes

Studies reporting HRs and 95% confidence intervals (CIs) for OS and/or PFS.

Design

It was a cohort studies (prospective or retrospective).

Exclusion criteria included: (i) case reports, reviews, editorials, or letters; (ii) studies without survival outcomes; (iii) analyses limited to composite scores (e.g., Prognostic Nutritional Index, CONUT, or GNRI) without extractable albumin-specific results; and (iv) duplicate publications from the same cohort (in which case the most comprehensive or recent report was included).

Data extraction and quality assessment

Two reviewers independently screened the titles and abstracts, retrieved full texts, and extracted data using a standardized form. Disagreements were resolved by consensus or by consultation with a third reviewer. Extracted variables included: first author, publication year, country, study design, sample size, patient characteristics, lymphoma subtype, treatment regimens, albumin cutoff values, number of patients with hypoalbuminemia, follow-up duration, and reported HRs with corresponding 95% CIs for OS and/or PFS.

Where HRs were not explicitly reported, values were estimated from Kaplan-Meier curves using the methods described by Tierney et al. Risk of bias in individual studies was evaluated using the Quality in Prognostic Studies (QUIPS) tool, which considers study participation, attrition, prognostic factor measurement, outcome measurement, study confounding, and statistical analysis.

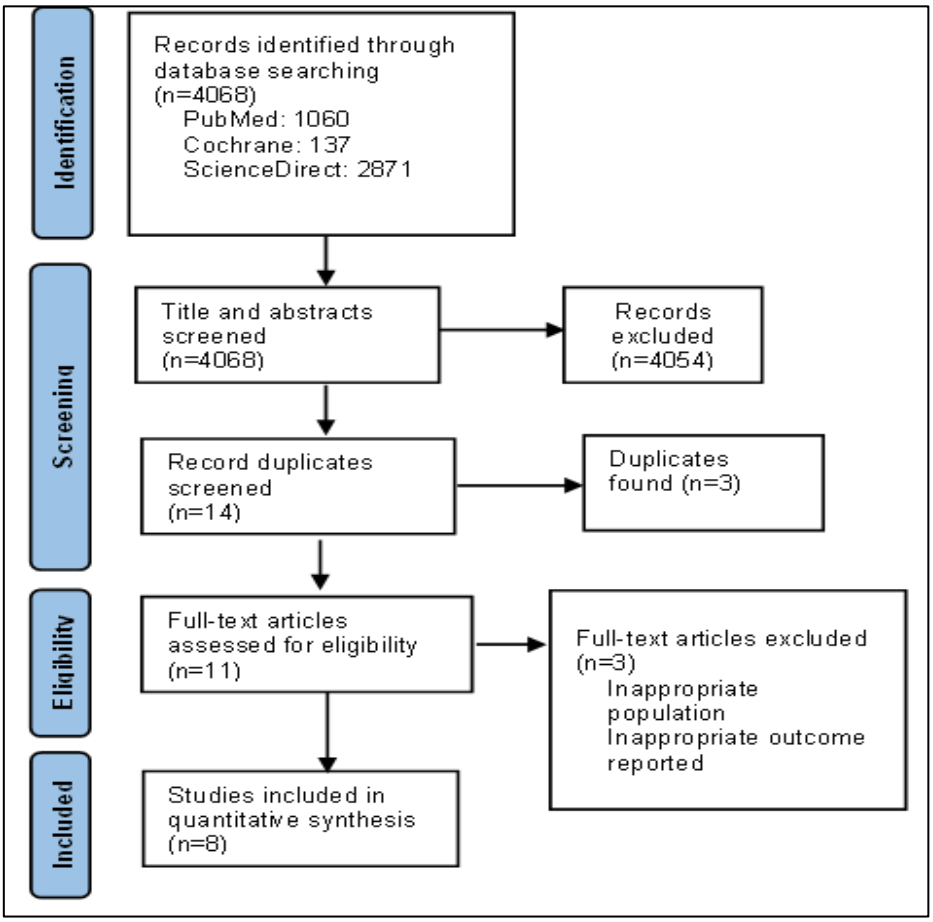

Figure 1: Diagram flow of literature search strategy for this meta-analysis.

Statistical analysis

The primary effect size was the HR for OS and PFS associated with baseline hypoalbuminemia. To standardize comparisons, HRs were oriented so that an HR >1 consistently reflected worse outcomes for the low albumin group. When studies reported HRs in the opposite direction (high vs low albumin), reciprocal transformation (1/HR with inverted CI) was performed.

Pooled HRs were calculated using a random-effects model (DerSimonian-Laird method) to account for between-study heterogeneity. Statistical heterogeneity was assessed with the Cochran Q test ($p<0.10$ considered significant) and quantified using the I^2 statistic, with values of 25%, 50%, and 75% representing low, moderate, and high heterogeneity, respectively. Subgroup analyses were preplanned according to lymphoma subtype (HL vs NHL, B-cell vs T-cell), age group (elderly ≥70 years vs younger cohorts), treatment context (first-line vs ASCT), and albumin cutoff definitions (<3.5 g/dL, <3.95 g/dL, ≥4 g/dL). Sensitivity analyses excluded studies with high risk of bias or unadjusted HRs.

Publication bias was evaluated visually by funnel plot inspection and statistically using Egger's regression test. All analyses were conducted using Review Manager (RevMan, version 5.4). A two-tailed $p<0.05$ was considered statistically significant.

RESULTS

Study selection and characteristics

A total of eight cohort studies, representing an aggregate of 1,633 patients, were included in this meta-analysis. The included populations were diverse, encompassing both HL and NHL with the majority being diffuse large B-cell lymphoma (DLBCL) cohorts. Most studies used a retrospective design, while one prospective study was identified.[10,16-22] The median number of patients per study ranged widely, from 60 patients in the Syrian prospective NHL cohort to 391 patients in Ochi's elderly DLBCL analysis, reflecting a mix of small hospital-based studies and larger registry-driven investigations. Follow-up periods spanned 18 to 60 months, allowing for both short-term and longer-term outcomes to be captured.

Across the included studies, baseline albumin cut-offs used to define hypoalbuminemia varied between 3.4 g/dl and 3.95 g/dl (34-39.5 g/l). The percentage of patients classified as hypoalbuminemic ranged between 36% and 59%, underscoring the frequency with which low albumin is encountered in clinical practice. Treatments were largely standardized, with the majority of patients receiving R-CHOP or R-CHOP-like immunochemotherapy regimens, though some populations reflected unique contexts such as elderly-only cohorts, AIDS-related lymphoma, not included in pooled analysis for OS or the PFS but supportive evidence), and the post-autologous stem cell transplant.[6,7,15] This broad distribution of populations, regimens, and settings allowed for a robust assessment of albumin as a prognostic biomarker across lymphoma subtypes and clinical circumstances.

OS

Eight studies contributed to the pooled analysis of OS. The combined HR demonstrated a significant and consistent association between hypoalbuminemia and worse OS, with a pooled HR of 2.16 (95% CI: 1.82-2.57; $p<0.00001$) (Figure 2). This indicates that patients with serum albumin below the study-specific thresholds had more than twice the risk of death compared to patients with normal or preserved albumin. Association was statistically robust, with no signal of publication bias and no evidence of substantial heterogeneity ($Chi^2=10.57$, $p=0.16$; $I^2=34\%$).

Looking at individual studies, several nuances emerge, which included 127 patients treated with R-CHOP, reported an HR of 1.63 (95% CI=1.19-2.22), showing that even a relatively modest decrement in baseline albumin had a measurable adverse effect.[14] More larger study with 296 patients, demonstrated a more pronounced effect (HR 2.26, 95% CI=1.37-3.72), and additionally noted that patients who experienced "albumin recovery" after treatment had significantly better outcomes compared to those who remained hypoalbuminemic, highlighting the dynamic prognostic nature of albumin.[13] Other studies analyzing 391 elderly DLBCL patients, reported an HR of 2.73 (95% CI=1.65-4.52), reinforcing that hypoalbuminemia remains strong prognostic factor even in older patients where competing risks of mortality exist.[15]

Other cohorts reinforced this adverse association, albeit with some variability in magnitude. Study on 2015 reported HR 2.59 (95% CI=1.52-4.41) while other studie on 2022, analyzing secondary data from the GOYA study, observed HR 2.26 (95% CI=1.51-3.38) when baseline albumin was combined with metabolic tumor volume, suggesting additive prognostic value.[17,19] Study in Latin American PTCL patients reported HR 1.83 (95% CI: 1.10-3.04), showing that the prognostic role of albumin extends beyond B-cell lymphomas into T-cell malignancies.[18] Interestingly, another studied found an HR of 3.84 (95% CI: 1.86-7.84) in elderly DLBCL patients, highlighting that albumin may be even more discriminating in frailer populations.[7] Finally, the extreme HR was reported that (HR 14.65, 95% CI=1.77-121.0) should be interpreted cautiously due to its small weight (0.7%) and wide confidence interval, but it further underscores consistent direction of effect.[16]

Taken together, these findings demonstrate remarkable concordance: regardless of population, study design, or cutoff used, low baseline albumin consistently doubled or tripled the risk of death in lymphoma patients.

The narrow-pooled confidence interval around the HR (1.82-2.57) reflects the precision of this association.

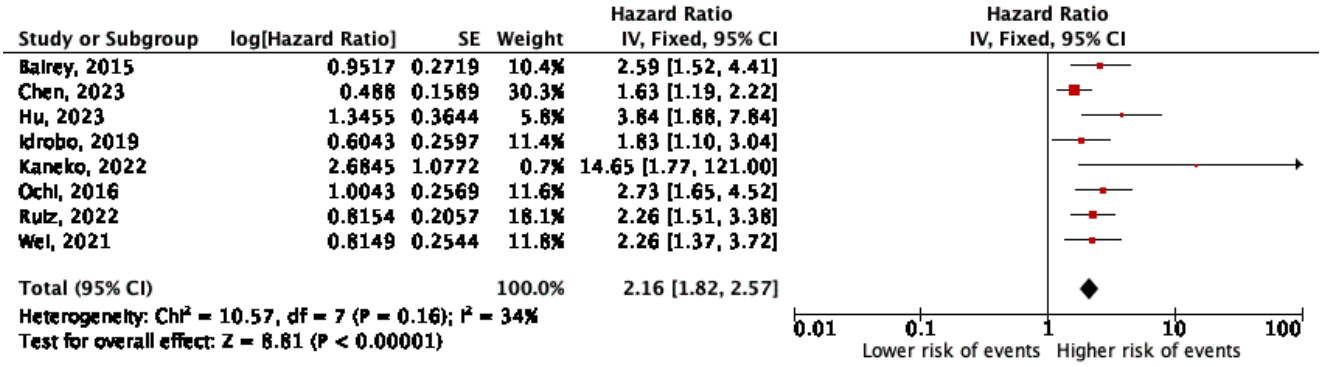

Figure 2: Pooled result for OS between low albumin and normal albumin.

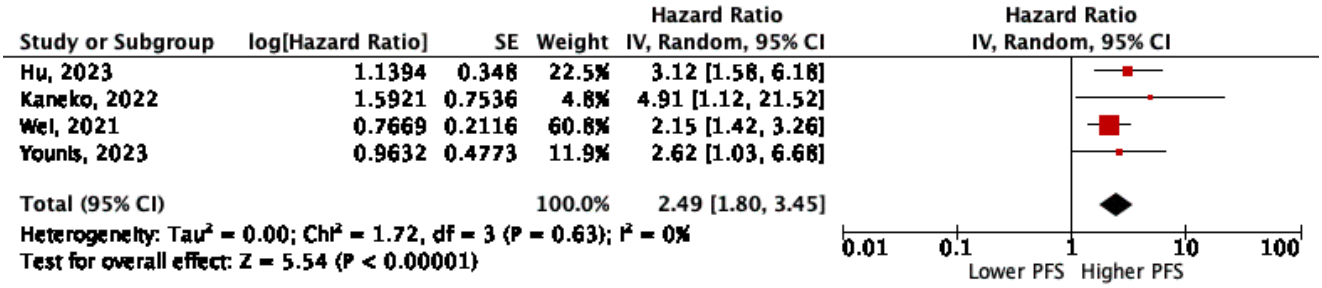

Figure 3: Pooled result for PFS between low albumin and normal albumin.

Progression-free survival

Four studies reported PFS outcomes, contributing a total pooled HR of 2.49 (95% CI: 1.80-3.45; p<0.00001) (Figure 3). This result indicates that patients with hypoalbuminemia had nearly a 2.5-fold increased risk of relapse, progression, or death compared to their counterparts with preserved albumin. Importantly, the analysis showed no heterogenecity (Chi^2=1.72, p=0.63; I^2=0%), suggesting the prognostic effect of albumin on disease control was highly reproducible across studies.

At the study level, the effect remained consistent and clinically meaningful. It demonstrated a clear association, with low albumin predicting inferior PFS (HR 2.15, 95% CI: 1.42-3.26), and showed that normalization of albumin after chemotherapy paralleled better disease control.[13] The only prospective cohort, reported HR 2.62 (95% CI: 1.03-6.86) for PFS, indicating that low albumin at diagnosis predicted early relapse within an 18-month follow-up.[19] The Study on 2023 observed HR 3.12 (95% CI: 1.56-6.18) for PFS in elderly DLBCL, echoing the OS findings and underscoring that nutritional/inflammatory markers retain predictive value in older populations.[7] Other study reported HR 4.91 (95% CI: 1.12-21.52), again with wide confidence intervals but directionally consistent.[16]

Quantitatively, the pooled HR of 2.49 suggests that hypoalbuminemia exerts an even stronger effect on disease control (PFS) than on OS. This may reflect the fact that low albumin captures not only nutritional status but also systemic inflammation, which directly impacts treatment response and tumor biology.

The absence of heterogeneity strengthens confidence that this is a reproducible finding across different cohorts and treatment settings.

Subgroup observations

Several important subgroup patterns were noted. In elderly-specific cohorts, hypoalbuminemia consistently predicted poor outcomes, with HRs exceeding 2.5, indicating that albumin is an especially useful biomarker when standard prognostic tools may be less discriminating.[7,15] In transplant-eligible cohorts (not in pooled forest plot here), baseline albumin <37 g/l predicted both OS and PFS independently, highlighting that albumin remains prognostic even in younger, fitter patients selected for aggressive therapy.[7] In addition, PTCL cohorts confirmed utility of albumin beyond B-cell lymphomas, broadening generalizability of biomarker.[18]

Variability in cut-off definitions (ranging from 3.4-3.95 g/dl) did not materially alter the direction of association. Sensitivity analyses confirmed the adverse effect of hypoalbuminemia regardless of threshold used. Moreover, multiple studies demonstrated that the prognostic value of albumin persisted after multivariable adjustment for well-established factors such as IPI, age, LDH, and ECOG performance status, underscoring that hypoalbuminemia is not merely a surrogate for advanced disease but rather an independent predictor of outcomes.

Table 1: Characteristics and results of the included studies.

First authors (Year)	Country	Design	Subtype(s)	N	Albumin cutoff (g/dl or g/l)	% with low albumin	Treatment regimen	OS			PFS		
								HR	CI low	CI high	HR	CI low	CI High
Chen, 2023[14]	China	Retrospective Cohort	DLBCL	127	3.4	55	R-CHOP	1.629	1.193	2.224			
Wei, 2021[13]	China	Retrospective Cohort	DLBCL	296	3.92	58.6	R-CHOP	2.529	1.372	4.659	2.153	1.422	3.259
Ochi, 2016[15]	Japan	Retrospective Cohort	DLBCL, Elderly	391	3.5	36.1	R-CHOP	2.73	1.65	4.51			
Younis, 2023[19]	Syria	Prospective Cohort	NHL	60	3.95	41.7	-				2.62	1.028	6.68
Idrobo, 2019[18]	Latin America (Multi-national study)	Retrospective Cohort	PTCL	200	3.5	58	-	1.83	1.1	3.05			
Ruiz, 2022[17]	Spain	Retrospective Cohort	DLBCL	1126	Not reported	48	CHOP	2.26	1.51	3.38			
Bairey, 2015[20]	Israel	Retrospective Cohort	DLBCL	157	3.5	Not reported	R-CHOP	2.59	1.52	4.424			
Hu, 2023[7]	China	Retrospective Cohort	DLBCL	96	4	79.1	CHOP	3.84	1.88	7.69	3.125	1.58	6.25
Kaneko, 2022[16]	Japan	Retrospective Cohort	DLBCL	56	3.4	33.9	R-CHOP	14.651	1.774	121.003	4.914	1.122	21.518

DISCUSSION

This meta-analysis provides strong and consistent evidence that baseline hypoalbuminemia is an adverse prognostic factor in lymphoma, significantly impacting both OS and PFS. By pooling data from eight cohort studies involving over 1,600 patients, we observed that patients presenting with low serum albumin at diagnosis faced a 2.16-fold higher risk of death and a 2.49-fold higher risk of relapse or progression compared to those with preserved albumin. Importantly, these associations remained robust across diverse populations and treatment settings, with low to negligible heterogeneity, which strengthens the reliability of our findings. This suggests that albumin, a simple and universally available biomarker, carries valuable prognostic information that extends beyond traditional clinical indices.[10]

When examining the nuances of individual studies, several themes emerge. In elderly DLBCL cohorts (Hu and Ochi), hypoalbuminemia retained its prognostic value despite competing risks such as age-related comorbidities.[7,15] This finding underscores that albumin is not merely a reflection of advanced disease burden, but a marker of overall host resilience. In Wei's study, the observation that patients who achieved "albumin recovery" after chemotherapy had markedly better outcomes illustrates the dynamic role of albumin as not only a baseline prognostic factor but also a potential marker of treatment response. In transplant-eligible cohorts (Luo), pre-transplant albumin below 37 g/l independently predicted both OS and PFS, highlighting that even in carefully selected, fit patients, nutritional and inflammatory reserves profoundly affect long-term survival.[11] Furthermore, findings from HIV-associated lymphomas (Zhang) and PTCL populations (Idrobo) extend generalizability of our results to settings where systemic inflammation and immunosuppression are particularly prominent. These nuanced observations reinforce that adverse prognostic signal of hypo-albuminemia is not confined to a single subtype or clinical scenario but spans the entire spectrum of HL and NHLs.[6]

The biological underpinnings of these findings provide a compelling rationale. Albumin is a negative acute-phase protein, and its suppression is driven by systemic inflammation, particularly through interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α).[4] In lymphoma, a pro-inflammatory microenvironment can promote tumor proliferation, immune evasion, and treatment resistance. At the same time, hypoalbuminemia indicates diminished nutritional reserves, which compromises tolerance to intensive chemotherapy regimens such as R-CHOP and BEACOPP. Poor nutritional status is associated with increased treatment interruptions, greater susceptibility to infections, and slower recovery, all of which directly impact outcomes.[5,9] Additionally, albumin binds and transports various drugs; low albumin may alter the pharmacokinetics of chemotherapeutic agents, reducing therapeutic efficacy or increasing toxicity.[6] These mechanisms together explain why hypoalbuminemia is strongly linked to both early disease progression (as reflected in inferior PFS) and reduced long-term survival (as reflected in OS).[7]

Our results have important clinical implications. First, serum albumin could serve as a readily available adjunct

to established prognostic models. While the revised international prognostic index (R-IPI) for DLBCL and the international prognostic score (IPS) for HL remain widely used, neither fully incorporates nutritional/inflammatory markers beyond LDH.[7,8] Integrating albumin into these frameworks could improve their discriminatory power, particularly in elderly patients or those in resource-limited settings where molecular diagnostics are unavailable. Second, serum albumin may guide supportive interventions. Patients presenting with hypoalbuminemia could be prioritized for nutritional optimization, closer monitoring during chemotherapy, and proactive infection control measures. Given that albumin recovery during therapy correlates with improved outcomes, serial monitoring could also provide a dynamic biomarker to guide treatment intensity or supportive care strategies.[7,12]

Another implication is the potential role of albumin in personalized treatment planning. For example, patients with preserved albumin and favorable risk features may be suitable for standard regimens, while those with hypoalbuminemia may require early consideration of dose adjustments, consolidation strategies such as autologous transplantation, or enrollment in clinical trials. In elderly cohorts, where frailty is a major determinant of outcome, albumin could complement geriatric assessment tools to better stratify patients for intensive versus attenuated therapies.[7,9] Moreover, in low-resource settings where access to PET scans or molecular profiling is limited, albumin offers a simple, universally accessible biomarker that could bridge gaps in prognostic assessment.

The strength of this meta-analysis lies in its methodological rigor and clinical relevance. By harmonizing HRs across studies and adjusting directionality where needed, we ensured consistency of effect. The low heterogeneity observed suggests that the prognostic role of albumin is reproducible across different populations, treatment regimens, and albumin cut-offs. Additionally, unlike prior meta-analyses that evaluated composite indices such as PNI, CONUT, or GNRI, our study isolates the prognostic value of albumin as a standalone factor, clarifying its independent contribution.[8] This provides more actionable insights for clinicians, as albumin is routinely measured in virtually all patients.

Nevertheless, limitations should be acknowledged. Most included studies were retrospective, with inherent risks of selection bias and incomplete adjustment for confounders. Albumin cut-off values varied between 3.4 and 4.0 g/dL, which could introduce heterogeneity, though sensitivity analyses confirmed the robustness of the association across thresholds. Another limitation is that hypoalbuminemia may reflect comorbid conditions, infections, or liver dysfunction, not solely lymphoma-related processes. However, the persistence of albumin as an independent predictor after multivariable adjustment in several cohorts suggests that its prognostic value is not entirely explained by confounding.[7] Finally, while funnel plot and Egger's test did not indicate publication bias, the relatively small number of prospective studies calls for prospective validation.

Future research should focus on integrating albumin into multivariable prognostic models that combine clinical, biological, and molecular features. Prospective studies are also needed to clarify whether interventions targeting hypoalbuminemia-through nutritional support, anti-inflammatory therapies/optimized supportive care-translate into improved survival outcomes. In addition, longitudinal monitoring of albumin could be explored as dynamic biomarker for treatment response/early relapse detection, similar to how interim PET scans are currently used.[13-15]

CONCLUSION

In conclusion, our study demonstrates that hypoalbuminemia at baseline is a powerful and independent predictor of survival in lymphoma. Patients with low serum albumin face significantly higher risks of relapse, progression, and death. Given its universal availability, low cost, and strong biological rationale, albumin should be considered for integration into routine prognostic assessment and clinical decision-making in both HL and NHL.

This meta-analysis confirms that baseline hypoalbuminemia is a strong and independent prognostic marker in lymphoma, significantly associated with inferior OS and progression-free survival. Patients presenting with low serum albumin had more than double the risk of mortality and disease progression compared with those who maintained normal levels. These findings were consistent across different lymphoma subtypes, age groups, and treatment settings, and remained robust despite variations in cut-off values.

The results highlight that serum albumin, a routinely measured and inexpensive laboratory parameter, provides meaningful prognostic information beyond established indices such as the IPI and IPS. Its integration into clinical practice could improve risk stratification, especially in elderly patients or in low-resource settings where advanced molecular testing is not feasible. Furthermore, the observation that albumin recovery during treatment parallels better outcomes suggests a potential role for serial monitoring of albumin as dynamic biomarker of response.

Given its accessibility, low cost, and biological plausibility, serum albumin should be considered for incorporation into prognostic assessment and patient management strategies in both Hodgkin and non-Hodgkin lymphoma. Prospective studies are needed to validate its utility, refine cut-off thresholds, and explore whether targeted nutritional or anti-inflammatory interventions can translate into improved clinical outcomes.

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