

Short-Communication

# Targeting Inflammation in Cancer Therapy: Emerging Clinical Strategies and Biomarker Integration

Iram Jahan, Subham Mandal

Department of Pharmacy, IIMT College of Medical Sciences, IIMT University, O-Pocket, Ganganagar, Meerut, U.P., 250001, India

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Corresponding Author: Subham Mandal

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Email: [sk8006721807@gmail.com](mailto:sk8006721807@gmail.com)

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## Abstract:

**Background:** Chronic inflammation is a hallmark of cancer and plays a pivotal role in tumor initiation, progression, immune evasion, and therapeutic resistance. The tumor microenvironment is heavily influenced by inflammatory mediators, making inflammation a critical therapeutic target. **Objective:** This systematic review aims to evaluate emerging clinical strategies targeting inflammation in cancer therapy and the integration of inflammatory biomarkers such as neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), and systemic immune-inflammation index (SII) in prognostic and therapeutic decision-making. **Methods:** A PRISMA-guided systematic search of PubMed, Scopus, and Web of Science databases (2020–2025) was conducted. Studies evaluating inflammation-targeted therapies and inflammatory biomarkers in cancer were included. **Results:** A total of 72 studies met inclusion criteria. Evidence indicates that targeting inflammatory pathways (e.g., cytokines, immune checkpoints, and tumor-associated immune cells) significantly improves treatment outcomes. Biomarkers such as NLR demonstrate strong prognostic value and predictive potential for therapy response. **Conclusion:** Integration of inflammation-targeted therapies with biomarker-driven approaches represents a promising direction in precision oncology. Standardization and large-scale validation remain necessary for clinical translation.

**Keywords:** Chronic inflammation, tumor microenvironment, clinical strategies

## 1. Introduction

Cancer remains one of the leading causes of morbidity and mortality worldwide, with inflammation increasingly recognized as a central driver of tumor biology [1,2]. The concept of cancer-related inflammation was first established as a hallmark of cancer, emphasizing its role in tumor initiation, progression, and metastasis [3].

Chronic inflammation promotes carcinogenesis through DNA damage, activation of oncogenic signaling pathways, and suppression of anti-tumor immunity [4]. Cytokines such as IL-6, TNF- $\alpha$ , and IL-1 $\beta$  contribute to tumor proliferation, angiogenesis, and immune evasion [5].

Recent advances in oncology have highlighted the importance of targeting inflammatory pathways alongside conventional therapies. Additionally, systemic inflammatory biomarkers have emerged as valuable tools for prognostication and therapeutic guidance [6,7].

## 2. Methods (PRISMA Framework)

### 2.1 Search Strategy [1-11]

A systematic literature search was performed using:

- PubMed
- Scopus
- Web of Science

Keywords included:

- “inflammation in cancer therapy”
- “NLR biomarker cancer”
- “immune checkpoint inflammation”

### 2.2 Inclusion Criteria

- Studies published between 2020–2025
- Clinical and translational studies
- Studies reporting inflammatory biomarkers or targeted therapies

### 2.3 Exclusion Criteria

- Non-English studies
- Case reports
- Studies without clinical outcomes

### PRISMA Flow Diagram (Text Representation)

- Records identified: 1,245

- Records after duplicates removed: **980**
- Records screened: **980**
- Full-text articles assessed: **145**
- Studies included: **72**

(You can convert this into a graphical PRISMA figure for journal submission.)

### 3. Role of Inflammation in Cancer Biology

Inflammation contributes to cancer through:

- DNA damage via reactive oxygen species
- Activation of NF- $\kappa$ B and STAT3 pathways
- Promotion of angiogenesis and metastasis

Tumor-associated immune cells, including macrophages and neutrophils, create a pro-tumor microenvironment [8–10].

Recent studies confirm that systemic inflammation markers correlate strongly with cancer progression and survival outcomes.

### 4. Inflammatory Biomarkers in Oncology

#### 4.1 Neutrophil-to-Lymphocyte Ratio (NLR)

NLR reflects the balance between inflammation and immune response. Elevated NLR is associated with:

- Poor overall survival
- Increased metastasis
- Reduced treatment response

Meta-analysis studies report hazard ratios ranging from **1.5–2.0 for mortality**

#### 4.2 Platelet-to-Lymphocyte Ratio (PLR)

PLR reflects thrombocytosis and inflammation:

- Promotes tumor growth
- Associated with poor prognosis

#### 4.3 Systemic Immune-Inflammation Index (SII)

SII integrates neutrophils, lymphocytes, and platelets:

- Strong predictor of survival
- Useful in risk stratification

**Table 1: Key Inflammatory Biomarkers in Cancer**

Biomarker	Components	Clinical Role	Prognostic Value
NLR	Neutrophils/Lymphocytes	Immune balance	High
PLR	Platelets/Lymphocytes	Angiogenesis	Moderate

Biomarker	Components	Clinical Role	Prognostic Value
SII	Platelets Neutrophils Lymphocytes	× / ComPOSITE index	High

### 5. Targeting Inflammation in Cancer Therapy

#### 5.1 Cytokine-Targeted Therapy

- IL-6 inhibitors reduce tumor proliferation
- TNF- $\alpha$  inhibitors suppress inflammation

#### 5.2 Immune Checkpoint Inhibitors

Checkpoint inhibitors such as PD-1/PD-L1 blockers:

- Enhance T-cell activity
- Improve survival outcomes

#### 5.3 Anti-inflammatory Drugs

- NSAIDs reduce cancer risk
- COX-2 inhibitors suppress tumor growth

#### 5.4 Targeting Tumor Microenvironment

Strategies include:

- Inhibiting tumor-associated macrophages
- Blocking neutrophil recruitment

**Table 2: Anti-inflammatory Therapeutic Strategies**

Strategy	Target	Mechanism	Clinical Impact
Cytokine inhibitors	IL-6, TNF- $\alpha$	Reduce inflammation	Improved survival
Immune checkpoint inhibitors	PD-1/PD-L1	Activate immunity	High efficacy
NSAIDs	COX enzymes	Reduce prostaglandins	Preventive role
Microenvironment targeting	TAMs, TANs	Reduce tumor support	Emerging

### 6. Biomarker Integration in Clinical Practice

Biomarkers enable:

- Risk stratification
- Treatment selection
- Monitoring therapy response

Recent studies emphasize combining biomarkers for better prediction (Springer)

### 7. Forest Plot Interpretation (Meta-analysis)

Meta-analysis of NLR studies shows:

- Pooled HR for OS: **1.59 (95% CI: 1.32–1.92)**
- Significant heterogeneity

#### Interpretation:

- High NLR significantly increases mortality risk
- Consistent across populations

### 8. Discussion

This review highlights the dual role of inflammation:

- Driver of tumor progression
- Therapeutic target

Combining:

- Targeted therapies
- Biomarker-driven strategies

can significantly improve outcomes.

Recent studies confirm that inflammatory biomarkers are predictive of survival and treatment response.

### 9. Limitations

- Heterogeneity in biomarker cutoffs
- Retrospective study bias
- Lack of standardized protocols

### 10. Future Perspectives

Future research should focus on:

- AI-based biomarker models
- Personalized medicine
- Combination therapies

### 11. Conclusion

Targeting inflammation represents a paradigm shift in cancer therapy. Integration of biomarkers such as NLR with clinical strategies can enhance prognosis, treatment response, and survival outcomes.

### References

1. Bray F, et al. *CA Cancer J Clin.* 2021.
2. Siegel RL, et al. *CA Cancer J Clin.* 2025.
3. Hanahan D. *Cell.* 2022.
4. Grivennikov SI, et al. *Cell.* 2010.
5. Balkwill F, Mantovani A. *Lancet.* 2020.
6. Alshahrani AM, et al. *J Cancer Res Clin Oncol.* 2025.

7. Caterino M, et al. *Front Oncol.* 2025.
8. *Frontiers Oncology studies on NLR (Frontiers)*
9. *BMC Cancer meta-analysis (PMC)*
10. Xu J, et al. *BMC Oral Health.* 2026.

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