Journal of Islamic Medicine
Volume 10 (01) (2026), Pages 61-71
e-ISSN: 2550-0074

doi: 10.18860/jim.v10i1.41541
Submitted date: March 2026
Accepted date: March 2026

Neutrophil-to-Lymphocyte Ratio as a Prognostic Biomarker in Cervical Cancer: a Literature Review of Current Evidence

Salsabila Ariefani[1*], Putri Rahmadhanita[1], Floera Finalita[1]

[1] Program Studi Kedokteran, Fakultas Kedokteran, Universitas Islam Negeri Sulthan Thaha Saifuddin Jambi
Jl. Lintas Jambi - Ma. Bulian KM. 16, Simpang Sei. Duren, Kec. Jambi Luar Kota, Kab. Muaro Jambi, Jambi

**Corresponding author*
Email: dr.salsaariefani@uinjambi.ac.id

Keyword :
Cervical cancer, inflammatory markers, neutrophil-to-lymphocyte ratio

A b s t r a c t

Background: *The neutrophil-to-lymphocyte ratio (NLR) is a simple systemic inflammatory marker that reflects the balance between pro-tumor inflammation and anti-tumor immunity. Previous studies have shown that a high pre-treatment NLR is associated with poor survival outcomes and advanced clinical stage in cervical cancer.* ***Objective****: This review aims to evaluate the prognostic role of NLR and its impact on patient survival.* ***Methods:*** *A literature search was conducted in PubMed/MEDLINE for studies published between 2021 and 2026 using predefined inclusion and exclusion criteria. A total of eight relevant articles were included in this review.* ***Results:*** *The included studies consistently demonstrated that a high pre-treatment NLR is an independent predictor of poor survival in patients with cervical cancer.* ***Conclusion:*** *NLR appears to be a promising prognostic biomarker for cervical cancer; however, the lack of standardized cut-off values limits its current clinical application.*

Kata kunci :
Kanker serviks, *neutrophil-to-lymphocyte ratio,* penanda inflamasi

A B S T R A K

Latar belakang: *Neutrophil-to-lymphocyte ratio* (NLR) merupakan marker inflamasi sistemik sederhana yang mencerminkan keseimbangan antara inflamasi pro tumor dan imunitas anti-tumor. Penelitian sebelumnya telah menunjukkan bahwa NLR pra-perawatan yang tinggi dikaitkan dengan hasil kelangsungan hidup yang buruk dan stadium klinis lanjut pada kanker serviks. **Tujuan:** Tinjauan ini bertujuan untuk mengevaluasi peran prognostik NLR dan pengaruhnya terhadap kelangsungan hidup pasien. **Metode:** Penelusuran literatur dilakukan untuk penelitian yang diterbitkan antara tahun 2021 dan 2026 menggunakan database PubMed/MEDLINE dengan kriteria inklusi dan eksklusi yang telah ditentukan. Sebanyak tujuh artikel yang relevan dimasukkan dalam review ini. **Hasil:** Penelitian secara konsisten menunjukkan bahwa NLR pra-perawatan yang tinggi adalah prediktor independen dari kelangsungan hidup yang buruk pada pasien dengan kanker serviks. **Kesimpulan:** NLR terbukti efektif dalam memprediksi prognosis buruk serta progresivitas lesi pada kanker serviks, namun belum ada standardisasi nilai ambang.

BACKGROUND

Cervical cancer remains a leading cause of morbidity and mortality in women worldwide, particularly in low- and middle-income countries, where access to cytology screening, colposcopy, and advanced molecular markers remains limited.[1,2] Most cases are associated with persistent high-risk human papillomavirus (HPV) infection, which triggers a chronic inflammatory process and premalignant changes in the form of cervical intraepithelial neoplasia (CIN) to invasive cancer.[2] Reactive oxygen species can cause progressive tissue damage and regeneration as a result of chronic inflammation, which is a low-grade, protracted inflammatory response. As a result, cytokines are secreted in the inflammatory area. One of the main causes of the start of carcinogenesis is chronic inflammation.[3] Therefore, simple, inexpensive, and easily accessible biomarkers are needed to assist in early detection, staging, and risk stratification of cervical cancer patients.

One of the biomarkers that has been widely studied is the neutrophil-to-lymphocyte ratio (NLR), which is the ratio of neutrophils to lymphocytes in peripheral blood and reflects systemic inflammatory status and antitumor immune balance.[4] Several cancer studies have shown that high NLR is associated with systemic pro-tumor inflammation, immunosuppression, and worse clinical outcomes, including decreased overall survival and progression-free survival.[4–6] Recent evidence in cervical cancer supports the role of NLR as a prognostic biomarker. A higher NLR is associated with more advanced clinical stage and more severe disease; for example, an NLR $\geq$ 2.0 significantly increases the odds of having advanced stage disease.[7] In patients undergoing concomitant chemoradiotherapy, the combination of NLR and pre-therapy platelet to lymphocyte ratio (PLR) predicted 10-year survival and disease-free survival, where the group with a high NLR PLR had a significantly lower survival.[5] In addition, NLR before and during radiotherapy was shown to be an independent factor influencing overall survival and progression-free survival in cervical cancer patients.[8]

NLR also appears to be associated with HPV-related lesion progression on the pre-invasive side. Elevated NLR values are associated with p16 and HPV DNA positivity and demonstrate moderate diagnostic accuracy for identifying high-risk CIN.[2] In patients undergoing conization, a higher preoperative NLR was significantly associated with malignant histopathological findings, with certain threshold values providing sensitivity and specificity for predicting the presence of cervical cancer.[1]

These findings suggest that NLR has the potential to be a non-invasive biomarker that is inexpensive and easily integrated with other parameters (e.g., PLR, albumin status, immune organ metabolic PET/CT, or HPV molecular markers) to improve the accuracy of prognostic assessment and help personalize cervical cancer management, especially in resource-limited settings.[1,2,4,5,7] However, the variation in cut-off values and the predominance of retrospective study design emphasize the need for further study and standardization before NLR can be widely implemented in clinical practice. Therefore, this review aims to summarize current evidence regarding the prognostic role of NLR in cervical cancer and its potential clinical implications.

METHODS

This study was conducted as a literature review using a structured search strategy. The search strategy used the following keywords: ("cervical cancer" OR "cervical carcinoma") AND ("neutrophil to lymphocyte ratio" OR "NLR") AND ("prognosis" OR "survival"). The search was conducted in PubMed/ MEDLINE, Web of Science, and Google Scholar with inclusion criteria of publications within the last 5 years (2021-2026), full-text access,

and original articles or review articles in English or Indonesian.

The article selection process consisted of the following steps: (1) Searching for articles using the keywords and criteria above, (2) Eliminating duplicate articles, (3) Screening the substance of articles by looking at the title and abstract, (4) Extracting data based on the suitability of the article title with the research objectives so that relevant articles are obtained, (5) Analyzing and synthesizing the substance of the articles.

The total number of final literature used to review the effect of the neutrophil-to-lymphocyte ratio (NLR) on overall survival is 7 articles.

The literature search initially identified 327 records from three databases. After removing 183 duplicate records, 144 articles were screened based on title and abstract. A total of 21 full-text articles were assessed for eligibility, of which 13 were excluded due to irrelevance to the research topic or insufficient data. Finally, 8 studies were included in the qualitative synthesis.

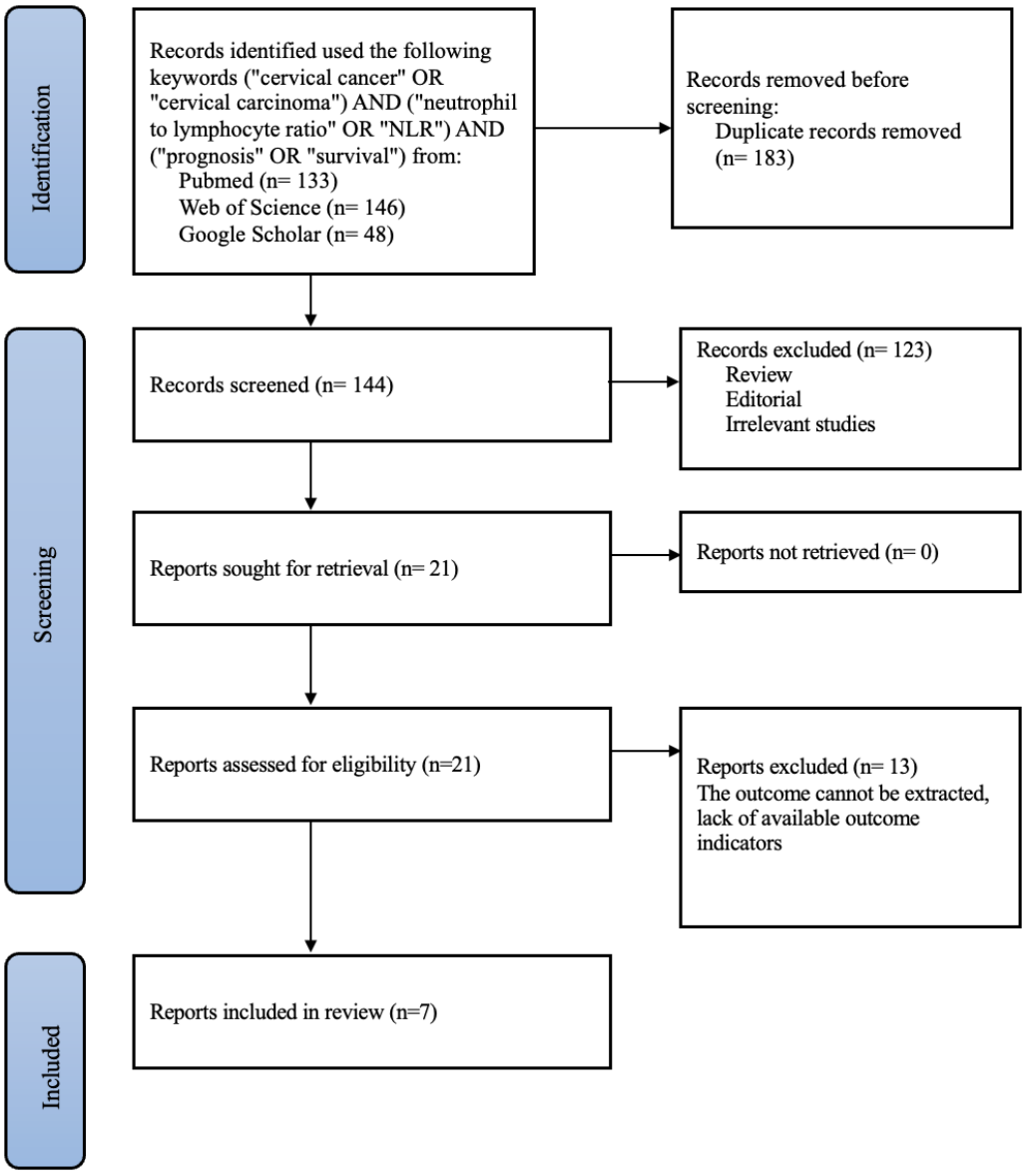

Figure 1. Flowchart for the literature search

RESULTS

Role of NLR in the Clinical Spectrum of Cervical Cancer

The role of the neutrophil-to-lymphocyte ratio (NLR) in the clinical spectrum of cervical cancer appears to encompass almost the entire disease course, from precancerous lesions to advanced invasive disease and response to therapy. In precancerous and early evaluation stages, several conization- and LEEP-based studies have shown that the NLR serves as a marker of systemic inflammation associated with high-risk HPV infection activity and lesion progression: a higher NLR was found in patients with malignant conization results, with a cut-off of ≥2.86 significantly predicting the presence of cervical cancer and ROC analysis showing moderate diagnostic accuracy (AUC 0.734; optimal sensitivity 87% at a cut-off of ≥1.865).[1]

Another study in stage IB2–IIB cervical cancer patients receiving radical chemoradiotherapy showed that pre-treatment NLR and PLR were not only correlated with neoadjuvant response but were also independent factors influencing DFS, with an NLR cut-off of approximately 2.89 and an area under the curve (AUC) of 0.848 for predicting the effect of therapy. In addition, during radiotherapy, the minimum lymphocyte count and the accompanying NLR also have predictive value: patients with higher lymphocyte counts and lower NLR during therapy have a better OS and PFS prognosis, while a low NLR before and during radiotherapy was identified as an independent factor associated with these outcomes. [9]

However, NLR cannot be used to differentiate the main histopathological types of cervical cancer; a study at Margono Soekarjo Hospital showed overlapping NLR ranges between squamous cell carcinoma (1.55–25.99) and adenocarcinoma (1.32–11.99), so it was concluded that NLR cannot differentiate between these two types. [10]

Studies in patients with cervical precancerous lesions have shown that the NLR increases as the lesion worsens. In the SCOPE study, a higher NLR was significantly associated with p16 and HPV DNA positivity, with a mean NLR of 2.15 in HPV-positive patients compared to 1.61 in HPV-negative patients, and moderate diagnostic accuracy (AUC 0.61) for predicting p16 positivity[8]. This supports the role of systemic inflammation in the persistence of HPV infection and the progression of CIN. Another study also found that NLR values increased significantly from CIN1 to CIN2 and CIN3, and a higher NLR independently predicted higher grades of CIN and the persistence of HPV16 infection[11]. Additional studies measuring several inflammatory indices (NLR, MLR, PLR, SII) showed that all of these indices were significantly higher in invasive cervical cancer than in CIN, with an NLR cut-off of approximately 2.39 (sensitivity 91.3%, specificity 63.8%, AUC 0.79) for distinguishing cervical cancer from precancerous lesions [12]. Overall, these findings suggest that an elevated NLR reflects the chronic inflammatory state and impaired antitumor immunity that accompany the transition from CIN to invasive cervical cancer[8,11,12]

Across the included studies, the reported cut-off values for NLR varied considerably, ranging from approximately 2.0 to 2.9. Several studies reported optimal thresholds such as 2.34, 2.39, 2.86, and 2.89 for predicting survival outcomes or disease progression. This variability may reflect differences in study populations, disease stages, treatment modalities, and statistical methods used to determine optimal cut-off values.

Prognostic Significance of NLR on Survival Rate (OS, PFS, and DFS)

A comprehensive meta-analysis involving 38 cohort studies with a total of 10,246 patients concluded that an increased pre-treatment NLR was strongly associated with decreased survival. Patients with a high NLR had a significantly greater risk of death with decreased OS (HR = 1.58, 95%

CI: 1.44-1.74; p < 0.00001) and worsened PFS (HR = 1.48, 95% CI: 1.34-1.63; p < 0.00001).[9] In addition to pre-treatment measurements, NLR dynamics during therapy also have prognostic value. In patients undergoing radiotherapy, a lower pre-radiotherapy NLR value (<3.029) independently predicted improved PFS (p=0.000), while a lower NLR value during radiotherapy (<5.071) was an independent predictor of improved OS (p=0.042).[4]

A high NLR also affects disease-free survival (DFS) and relapse interval. A meta-analysis showed that an elevated NLR significantly decreased DFS (HR: 1.79; p = 0.006), increased relapse rate (HR: 2.18; p = 0.001), and worsened recurrence-free survival (HR: 3.05; p < 0.0001).[9] In cervical cancer patients receiving radiotherapy/CCRT, lower NLR before and during radiotherapy was associated with better overall survival (OS) and progression-free survival (PFS), and a high NLR emerged as an independent prognostic factor in multivariate analysis [4]. Another study in advanced cervical cancer patients undergoing CCRT found that the pre-therapy NLR was an independent predictor of PFS and OS, both alone and when combined with PET/CT parameters (spleen SUV, metabolic tumor volume) in a nomogram; this model achieved an AUC of 0.86–0.88 and a C-index of approximately 0.80 for predicting PFS/OS. [13]

High NLR value reflects an imbalance in the immune system, with an increased inflammatory response that triggers pro-tumor (neutrophilia) and a decreased anti-tumor immune response (lymphopenia). This tumor microenvironment promotes cancer cell growth, angiogenesis (formation of new tumor blood vessels), metastasis, and resistance to treatments such as chemoradiotherapy, ultimately manifesting as a poor prognosis for OS, PFS, and DFS.[1,4,14]

Prognostic Value of NLR in Cervical Cancer Staging and Therapy

In invasive cervical cancer, several studies have shown that the NLR before and during therapy is associated with long-term outcomes. NLR is a strong indicator of more advanced disease stage and greater tumor burden. Several studies have confirmed that an increase in NLR before treatment (and during radiotherapy) significantly correlates with more advanced FIGO stage, patients with locally advanced or metastatic cervical cancer generally have a significantly higher NLR than patients with early-stage cervical cancer, larger primary tumor size, deeper cervical stromal invasion. Other adverse clinical markers, such as higher Squamous Cell Carcinoma Antigen (SCC-Ag) levels and low pre-therapy hemoglobin levels (anemia).[14]

The preoperative NLR has been shown to be a valuable non-invasive predictor for evaluating the pathological outcome of conization procedures, such as the Loop Electrosurgical Excision Procedure (LEEP). In patients with suspected cervical intraepithelial neoplasia (CIN) or precancerous stages, the intensity of systemic inflammation has been shown to align with the lesion's transition to malignancy.[1]

A study of 374 patients showed that NLR values were significantly higher in malignant conization tissue compared to mild or moderate dysplasia. Using an NLR cutoff of 2.86 or higher, this parameter significantly predicted the presence of invasive cervical cancer in the removed tissue (p=0.045). Logistic regression analysis demonstrated that each one-unit increase in NLR increased the likelihood of a cancer diagnosis by 37.2%. A high NLR at this stage also strongly correlated with active high-risk HPV infection (characterized by HPV DNA positivity and the p16 biomarker), which drives cells toward malignant transformation.[1,8]

In the treatment of locally advanced cervical cancer (such as stages IB2 to IVA), concurrent chemoradiotherapy (CCRT) is the standard treatment. Pretreatment NLR evaluation serves as a highly sensitive

indicator for predicting the effectiveness of this decreased clinical remission rate. Studies in stage IB2-IIB patients show that the group of patients with a pretreatment NLR ≥ 2.89 had a much lower percentage of therapy effectiveness (combined Complete Remission and Partial Remission), namely only 68.57%, compared to the group with a low NLR which reached 85.33%.[15] A high NLR indicates a predominance of neutrophils that release pro-tumor factors (such as cytokines and VEGF), thus making cancer cells more resistant to the cytotoxic effects of chemotherapy and radiation.[14]

In addition to measuring pre-treatment values, NLR fluctuations during the radiation therapy process provide critical insights into the immunological status of patients who are under stress due to treatment. Radiotherapy inherently causes lymphopenia (a drastic decrease in the number of lymphocytes), which is manifested by a spike in the NLR value. The nadir (lowest) of these lymphocytes generally occurs between the third and fifth weeks of radiotherapy. Studies have shown that a high NLR value specifically during radiotherapy (≥ 5.071) is an independent predictor of poorer overall survival and progression-free survival. Furthermore, a high NLR during radiotherapy is significantly associated with a distant relapse pattern post-treatment. [4]

This relationship occurs because the extreme suppression of lymphocytes (especially CD8+ T cells responsible for killing tumors) due to radiation exposure, allows pro-tumor neutrophils to act unhindered. The dominant neutrophils trigger matrix tissue remodeling and angiogenesis (formation of new blood vessels for the tumor) which ultimately facilitates the release of remaining tumor cells into the systemic circulation, leading to metastasis in distant organs. Continuous monitoring of NLR levels after therapy is also recommended. A decrease in NLR levels after surgery or chemoradiotherapy indicates a favorable response to treatment, while a persistently high NLR level is a red flag for potential treatment resistance or disease progression requiring further intervention.[4,14]

Studies of the combination of NLR and PLR pre-CCRT also showed that groups with both high NLR and PLR had significantly lower 10-year OS and DFS (63.6% and 63.3%) compared to groups with at least one low index (86.2% and 77.5%), and the combination of high NLR and PLR was an independent predictor of death (HR 2.44) [7] Overall, this evidence confirms that a high NLR reflects a pro-tumor inflammatory environment and is associated with more advanced FIGO stage, a greater risk of recurrence, and shorter survival in cervical cancer [4,7,13] The following table explains the role of NLR in cervical cancer (table 1), the next table (table 2) discusses the role of NLR in other cancers.

NLR can be calculated from routine blood work, making it an inexpensive and readily accessible biomarker, making it attractive for integration into clinical practice, particularly in resource-limited countries. In the precancerous stage, an NLR cut-off of around 2–2.4 can aid in triaging patients with cervical lesions: high values suggest the possibility of high-grade CIN or invasive cancer, while low values have a high negative predictive value and may help avoid unnecessary invasive procedures [8,16]

In invasive cervical cancer, NLR measurements before and during CCRT can be used for risk stratification: patients with a high NLR tend to require closer monitoring, possibly considering therapy intensification, or combination with other biomarkers such as PLR, LMR, and PET/CT parameters in a prognostic nomogram [5,15]

Table 1. NLR Values in Cervical Cancer

Author (Year)	Study Design	Population	Role of NLR	Cut off NLR	Outcome	Conclusion
Vida et al., 2025	Retrospective study	374 patients	Cancer diagnostic	2.86	Each 1% increase in NLR increases the risk of cancer by 37.2%; AUC 0.734; optimal cut-off 1.865	Pre-op NLR: A non-invasive biomarker with moderate accuracy for predicting cervical cancer in conization
Toth et al., 2025	Retrospective study	395 patients	HPV/p16 Inflammation	1.85	NLR was higher in p16+ & HPV+ patients; AUC was 0.610	NLR reflects HPV-related inflammation and CIN progression.
Zhao et al., 2023	Retrospective study	202 patients	Prognostic overall survival and progression-free survival	3.02-5.07	Low NLR before & during RT, Better OS/PFS; NLR before & during RT Independent factors	Dynamic NLR during RT is an important prognostic factor for cervical cancer.
Lee and Seol, 2021	Retrospective study	148 patients	Combination of NLR+PLR pretreatment	2.34	High NLR-PLR, 10-year OS/DFS lower; HR OS 2.435	Concurrent increases in NLR and PLR are associated with poorer survival after CCRT.
Sinaga et al., 2024	Retrospective study	68 patients	Prognostic	No new cut-off (Referring to cut-off 3.38 from other studies)	NLR SCC 1.55–25.99 and adenocarcinoma 1.32–11.99; Mann–Whitney test p=0.645 (not significantly different)	NLR cannot statistically differentiate SCC and cervical cancer adenocarcinoma.
Yu et al, 2024	Retrospective study	180 patients	Prognostic factors and predictors of therapeutic effects	2.89	NLR and PLR were significantly associated with the neoadjuvant effect and were independent factors influencing DFS. (AUC 0.848)	Pre-therapy NLR and PLR can predict DFS of stage IB2–IIB cervical cancer patients.
Zhuang et al., 2024	Retrospective study	10.246 patients (38 studies)	Prognostic	>3	High NLR decreased OS (HR 1.58) and PFS (HR 1.48) and was associated with worse DFS, recurrence, RFS, and distant metastases.	High pre-treatment NLR is strongly associated with decreased OS and PFS; confirming NLR as an important prognostic marker in cervical cancer

Table 2. NLR Values in Other Cancer

Author (Year)	Study Design	Cancer Type	Role of NLR	Outcome	Conclusion
Buonacera et al., 2022	Retrospective study	Cancer	Biomarkers of systemic inflammation	NLR reflects inflammatory status; it is associated with mortality and prognosis in many cancers.	Strengthening the biological basis of NLR as a cancer prognostic marker.
Naszai et al, 2021	Retrospective study	Colorectal	Prognostic	High NLR, OS HR 1.57; SE HR 1.38 after bias correction	NLR as a prognostic biomarker easily accessible in colorectal cancer
Teketelew et al., 2025	Retrospective study	Thyroid	Diagnostic	NLR sens 75%, spes 62%, AUC 0.75; PLR lower	NLR is better than PLR for distinguishing benign from malignant, but its accuracy is moderate.
Polho et al., 2025	Retrospective study	TNBC	Prognostic	NLR ≤2 Higher pCR; better 5-year OS & EFS; multivariate significance	NLR >2 is an independent risk factor for worse survival in early TNBC.

DISCUSSION

The ratio of pro-tumor neutrophils to anti-tumor lymphocytes in peripheral blood is reflected in the NLR. Neutrophils contribute to tumor progression by secreting cytokines, growth factors, and proteolytic enzymes that promote angiogenesis and tumor invasion. An increased NLR reflects the dominance of systemic inflammation and impaired anti-tumor immune response. This was clearly demonstrated in a large meta-analysis combining 38 retrospective studies with 10,246 patients, in which a high pre-therapy NLR was consistently associated with decreased overall survival (HR 1.58) and progression-free survival (HR 1.48), as well as worsened disease-free survival, increased recurrence rates, decreased recurrence-free survival, and increased incidence of distant metastases. [5,9,17]. On the other hand, the anti-tumor immune response relies heavily on lymphocytes, such as effector T cells and natural killer (NK) cells; lymphopenia is a sign of compromised host immunity.[2,18,19] A high NLR is typically interpreted as a state of pro-tumor inflammation with reduced adaptive immune capacity, a condition theoretically favorable for cancer growth and spread. This association has been widely confirmed across various malignancies, including colorectal, gastric, breast, hepatocellular carcinoma, and others.[6,16,20] In the context of cervical cancer, the interplay of HPV-related chronic inflammation, changes in the cervical microenvironment, and the systemic immune response makes the NLR a biologically plausible indicator of prognosis.[1]

In the context of therapy, several studies have highlighted that both the baseline NLR value and its changes during treatment are closely related to response to chemoradiotherapy and survival. In stage IB2–IIB cervical cancer patients undergoing radical chemoradiotherapy, a pre-treatment NLR with a cut-off of 2.89 provided an AUC of 0.848, with a sensitivity of approximately 0.892, in predicting neoadjuvant success, and the NLR was shown to be an independent factor influencing disease-free survival, alongside classic clinical factors such as lymphatic metastasis, depth of invasion, and tumor size. [14,15] These findings are reinforced by a study in patients receiving definitive CCRT, in which the combination of pre-therapy NLR and PLR (high NLR-PLR group) was associated with a significant reduction in 10-year overall survival and disease-free survival compared to the low NLR-PLR group; high NLR-PLR emerged as an independent predictor of OS in multivariate analysis, indicating that the combined inflammatory markers are able to capture the degree of tumor aggressiveness and host immune weakness better than either index alone. [7,14] In addition, another study that monitored the minimum lymphocyte count and NLR during radiotherapy found that patients with higher lymphocyte counts and lower NLR during therapy had significantly better OS and PFS prognosis, and that the minimum lymphocyte count and NLR before and during radiotherapy were independent prognostic factors, which underscores the importance of longitudinal monitoring of the systemic immune response during treatment. [4,6]

One of the biggest challenges in the clinical application of NLR is the lack of standardized cut-off values, which vary widely across studies depending on clinical objectives, statistical methods used (such as ROC curves or Youden's index), and treatment phase. Comprehensive meta-analyses report that NLR cut-off values range widely, ranging from 1.6 to 6.91.[9] Screening/Pre-cancer phase, in patients with Cervical Intraepithelial Neoplasia (CIN) undergoing a conization procedure (LEEP), the cut-off tends to be lower. Studies have found a cut-off of ≥ 1.530 to be optimal for predicting positivity for the oncogenic activity marker p16,[8] while a cut-off of ≥ 2.86 has been shown to significantly predict the presence of

invasive cancer on pathological findings of conization.[1] Chemoradiotherapy (CCRT) / Radiotherapy phase, in patients with invasive stage disease undergoing definitive therapy, the cut-off value used is generally higher. A study in China set a cut-off of 2.89 to evaluate the effectiveness of neoadjuvant therapy in stages IB2-IIB.[15] In Korea, researchers used a cut-off of 2.34 (combined with a Platelet-to-Lymphocyte Ratio/PLR ≥ 148.89) as a predictor of survival outcomes in patients with stages IB-IVA.[7] A study by Zhao et al. provided a temporal dimension by comparing values before and during therapy. They found a cut-off of 3,029 for NLR before radiotherapy, which then jumped to 5,071 for NLR measurements midway through radiotherapy due to the immunosuppressive effects (lymphopenia) of radiation.[4]

Overall, the available evidence suggests that NLR is a promising inflammatory biomarker for cervical cancer, with a dual role as a risk indicator in precancerous lesions and as a strong prognostic marker in invasive disease and during therapy. Its main advantages are its low cost, ease of acquisition from routine blood counts, and the ability to be combined with other indices such as PLR or with molecular biomarkers to improve the accuracy of risk stratification.[1]

Several limitations should be considered in this review. First, most of the included studies were retrospective in design, which may introduce selection bias. Second, the cut-off values of NLR varied widely among studies, limiting the generalizability of the findings. Third, systemic inflammatory conditions unrelated to cancer may influence NLR values. Future prospective multicenter studies are needed to establish standardized NLR cut-off values and to validate the role of NLR as part of integrated prognostic models combining clinical, molecular, and imaging biomarkers.

CONCLUSION

The neutrophil-to-lymphocyte ratio (NLR) is a simple inflammatory biomarker that shows consistent associations with poor prognosis in cervical cancer. Evidence from recent studies indicates that elevated pre-treatment NLR is linked to advanced disease stage, reduced survival outcomes, and progression of cervical lesions. Because NLR can be easily obtained from routine blood tests, it may serve as a practical tool for risk stratification and prognostic assessment in clinical practice, particularly in resource-limited settings. However, variability in cut-off values and the predominance of retrospective study designs remain important limitations. Future large-scale prospective studies are required to establish standardized thresholds and validate the clinical utility of NLR in cervical cancer management.

REFERENCES

1. Seb B, Vida B, Keszthelyi E, et al. The Neutrophil-to-Lymphocyte Ratio (NLR) as a Potential Predictor in Conization Outcomes for Cervical Cancer. Published online 2025:1-16.
2. Wu J, Chen M, Liang C, Su W. Prognostic value of the pretreatment neutrophil-to-lymphocyte ratio in cervical cancer : a meta-analysis and systematic review. 2017;8(8):13400-13412.
3. Umami Z. Peran Vitamin D Terhadap Kanker : Sebuah Tinjauan Literatur The Role of Vitamin D on Cancer : A Literature Review. 2024;8(2):83-94.
4. Zhao M, Gao Z, Wang S, Fu J. Predictive significance of lymphocyte level and neutrophil- - lymphocyte ratio values during radiotherapy in cervical cancer treatment. 2023;(June):15820-15830. doi:10.1002/cam4.6221
5. Huang Q, Man Q, Hu J, Yang Y, Zhang Y, Wang W. Prognostic significance of neutrophil-to-lymphocyte ratio in cervical cancer : A systematic review and meta-analysis of observational

studies. 2017;8(10):16755-16764.
6. Cupp MA, Cariolou M, Tzoulaki I, Aune D, Evangelou E, Berlanga-taylor AJ. Neutrophil to lymphocyte ratio and cancer prognosis : an umbrella review of systematic reviews and meta-analyses of observational studies. Published online 2020:1-16.
7. Lee JW, Seol KH. Pretreatment Neutrophil-to-Lymphocyte Ratio Combined with Platelet-to-Lymphocyte Ratio as a Predictor of Survival Outcomes after Definitive Concurrent Chemoradiotherapy for Cervical Cancer. Published online 2021.
8. Seb B, Tóth Z, Lotti L, et al. Neutrophil / Lymphocyte Ratio (NLR) as a Predictive Marker for p16 Positivity and Cervical Cancer Progression : Insights from the SCOPE Study. Published online 2025.
9. Zhuang X, Li Y, Zheng H, Fu L. Evaluating the prognostic relevance of neutrophil-to- lymphocyte ratio in cervical cancer : a systematic review and meta-analysis. 2024;(December). doi:10.3389/fonc.2024.1461175
10. Sinaga RA, Kurniadi A. Neutrophil-lymphocyte Ration Difference in Squamous Cell Carcinoma and Adenocarcinoma of Cervical Cancer Perbedaan Rasio Neutrofil Limfosit pada Kanker Serviks Tipe Karsinoma Sel Skuamosa dan Tipe Adenokarsinoma. Published online 2022:391-396.
11. Xu L, Song J. Elevated neutrophil – lymphocyte ratio can be a biomarker for predicting the development of cervical intraepithelial neoplasia. :1-5.
12. Study AC, Afsar S, Turan G, Guney G, Sahin G, Talmac MA. The Relationship between Furin and Chronic Inflammation in the Progression of Cervical Intraepithelial Neoplasia to Cancer : Published online 2023.
13. Li Y, Wang X, Li Y, et al. The Combined Prognostic Value of 18 F- - FDG PET / CT Metabolic Parameters of Immune Organs and Hematological Immune- - Related Markers in Patients With Locally Advanced Cervical Cancer. Published online 2025. doi:10.1002/cam4.70650
14. Obeagu EI. Integrating neutrophil-to-lymphocyte ratio into cervical cancer management : implications for prognostic assessment and therapeutic strategies – a narrative review. :7406-7412.
15. Yu J, Huang L, Dong T, Cao L. Prediction of outcomes after chemoradiotherapy for cervical cancer by neutrophil-to-lymphocyte ratio and platelet-to-lymphocyte ratio. *J Obstet Gynaecol (Lahore)*. 2024;44(1). doi:10.1080/01443615.2024.2361858
16. Polho GB, Murazawa LK, Oliveira VV, et al. Neutrophil-to-lymphocyte ratio predicts long-term survival in early triple negative breast cancer treated with neoadjuvant chemotherapy. Published online 2025:1-11.
17. Teketelew BB, Berta DM, Chane E, et al. Diagnostic accuracy of neutrophil-to- lymphocyte and platelet-to-lymphocyte ratios in differentiating thyroid tumors : A systematic review and meta-analysis. Published online 2025:1-18. doi:10.1371/journal.pone.0322382
18. Seb B. The Lymphocyte-to-Monocyte Ratio (LMR) as a Novel Biomarker for Cervical Cancer Risk Stratification in Conization Patients. Published online 2025:1-17.
19. Buonacera A, Stancanelli B, Colaci M. Neutrophil to Lymphocyte Ratio : An Emerging Marker of the Relationships between the Immune System and Diseases. Published online 2022.
20. Maughan TS. The prognostic utility of pre- - treatment neutrophil- - ratio (NLR) in colorectal cancer : A systematic review and meta- - analysis. 2021;(June):5983-5997. doi:10.1002/cam4.4143.