

INTRODUCTION

Bladder cancer is one of the most common urological malignancies worldwide. Accurate assessment of tumor stage and grade is essential for treatment planning and prognosis. The neutrophil-to-lymphocyte ratio (NLR) is an inexpensive inflammatory biomarker that has shown potential in predicting tumor aggressiveness. Previous studies have demonstrated associations between elevated NLR and adverse characteristics of urothelial cancer, while systematic reviews have supported its potential prognostic value.^{1–3} However, evidence from South Asian populations remains limited. This study evaluated the association between preoperative NLR and tumor stage and grade.

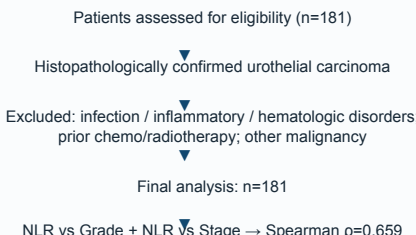
OBJECTIVES

- To determine the association between preoperative NLR and tumor stage and grade in urothelial carcinoma of the urinary bladder.
- To compare NLR among different tumor stages and grades.

METHODOLOGY

- Study design:** Cross-sectional study.
- Setting:** Department of Urology, Ayub Teaching Hospital, Abbottabad.
- Study period:** January 2025 – July 2026.
- Sample size:** 181 patients; expected proportion 36%, 95% confidence level, 7% margin of error. Calculated using WHO statistical calculator.
- Sampling:** Non-probability consecutive sampling.
- Study population:** Histopathologically confirmed urothelial carcinoma undergoing TURBT with preoperative CBC within 7 days.
- NLR:** absolute neutrophil count / absolute lymphocyte count; NLR >3 high, ≤3 low.
- Analysis:** Mann–Whitney U, Kruskal–Wallis and Spearman rank correlation using IBM SPSS 27. (Data was not normally distributed)
- Significance:** p<0.05.
- Ethical approval:** RC-EA-2025/122; written informed consent obtained.
- Inclusion:** age 18–70 years, either gender, confirmed bladder urothelial carcinoma, TURBT and recent CBC.
- Exclusion:** active infection/inflammatory disorder, autoimmune or hematological disorder, previous chemoradiotherapy, or another malignancy.

FLOW OF METHODOLOGY & DATA ANALYSIS



RESULTS

181	3.18	52.5%	$\rho = 0.659$
Total patients	Median NLR	High NLR (>3)	NLR vs stage

PATIENT & TUMOR CHARACTERISTICS

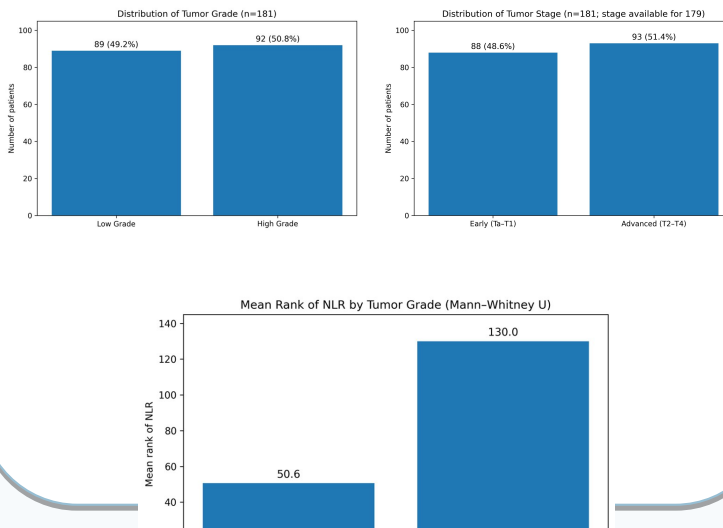
Patient Characteristics

- Median age:** 46 years (IQR 34–57)
- Male:** 90 (49.7%); Female: 91 (50.3%)
- Median BMI:** 27.1 kg/m² (IQR 23.62–30.53)
- Median symptom duration:** 14 weeks (IQR 9–20)
- Low NLR (≤3):** 86 (47.5%); High NLR (>3): 95 (52.5%)

Tumor Characteristics

- High-grade:** 92 (50.8%); **Low-grade:** 89 (49.2%)
- Early stage (Ta–T1):** 88 (48.6%); **Advanced stage (T2–T4):** 93 (51.4%)

VISUAL RESULTS



STATISTICAL FINDINGS

- High-grade tumors had significantly higher NLR than low-grade tumors (Mean Rank 130.0 vs 50.6; Mann–Whitney U=503.0, Z=−10.190, p<0.001).
- NLR differed significantly across tumor stages (Kruskal–Wallis H=103.800, df=4, p<0.001).
- Mean NLR ranks: Ta 50.18, T1 42.06, T2 120.39, T3 124.67, T4 146.27.
- Spearman analysis showed a strong positive correlation between NLR and tumor stage (ρ=0.659, p<0.001).

DISCUSSION

Higher preoperative NLR was significantly associated with higher tumor grade and advanced tumor stage. NLR was significantly higher in high-grade tumors (p<0.001) and increased across tumor stages (p<0.001), with a strong positive correlation with stage (ρ=0.659, p<0.001). Findings are consistent with prior work reporting an association between NLR and tumor stage in patients undergoing TURBT. **Strengths** include 181 histopathologically confirmed cases, standardized pathological assessment, and appropriate non-parametric tests. **Limitations** include the single-center cross-sectional design, one preoperative NLR measurement, possible unrecognized inflammatory influences, and lack of long-term outcomes.

KEY FINDINGS

- Median NLR: 3.18 (IQR 2.20–4.53)
- High NLR (>3): 95 (52.5%)
- High-grade tumors: 92 (50.8%)
- Advanced stage (T2–T4): 93 (51.4%)
- Strong NLR–stage correlation: ρ=0.659, p<0.001
- High-grade tumors showed substantially higher NLR ranks than low-grade tumors.

CONCLUSION

Preoperative NLR is a simple, accessible, and cost-effective biomarker that reflects tumor aggressiveness and may enhance preoperative risk stratification in urothelial carcinoma of the urinary bladder.

REFERENCES

- Zhang Y, Chen T. Prognostic value of neutrophil to lymphocyte ratio for patients with bladder cancer undergoing radical cystectomy: a systematic review and meta-analysis. *Front Oncol.* 2024;14:1463173.
- Huang J, Lin L, Mao D, . Prognostic value of NLR in non-muscle-invasive bladder cancer with intravesical BCG immunotherapy: systematic review and meta-analysis. *Front Immunol.* 2024;15:1464635.
- Marchioni M, Primiceri G, Ingrosso M, Clinical use of NLR in urothelial cancer: a systematic review. *Clin Genitourin Cancer.* 2016;14(6):473–84.
- Tazeh NN, Canter DJ, Damodaran S, NLR at time of TURBT: association with tumor stage and grade. *Bladder Cancer.* 2017;3(2):89–94.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.