

1 First-Trimester Neutrophil-to-Lymphocyte Ratio as an Early Predictor of Preeclampsia: A 2 Hospital-Based Prospective Analytical Study

3 Abstract

4 **Background:** Preeclampsia remains a leading cause of maternal and perinatal morbidity and
5 mortality, particularly in developing countries, and is increasingly understood as a disorder of
6 systemic inflammation and immune dysregulation arising from defective placentation. The
7 neutrophil-to-lymphocyte ratio (NLR), derived from a routine complete blood count, has
8 emerged as a simple, inexpensive marker of this inflammatory milieu. The present study
9 evaluated the predictive value of first-trimester NLR for the development and severity of
10 preeclampsia.

11 **Methods:** A hospital-based prospective analytical study was conducted in the Department of
12 Obstetrics and Gynaecology, Pt. J.N.M. Medical College and Dr. B.R.A.M. Hospital, Raipur
13 (Chhattisgarh) between March 2024 and March 2026. A total of 295 singleton primigravidae
14 between 7 and 14 weeks of gestation were enrolled by consecutive sampling. First-trimester
15 NLR was calculated as the ratio of neutrophil to lymphocyte percentages on a routine complete
16 blood count, and women were followed prospectively until delivery for the development of
17 preeclampsia, classified as mild or severe and as early- or late-onset.

18 **Results:** Twenty-seven women (9.2%) developed preeclampsia, of whom 15 had mild and 12
19 had severe disease. Mean first-trimester NLR was significantly higher in women who later
20 developed preeclampsia than in normotensive women (4.33 ± 0.50 vs 2.70 ± 0.37 ; $p < 0.001$).
21 Mean neutrophil percentage was higher and mean lymphocyte percentage lower in the
22 preeclampsia group, and NLR correlated positively with the occurrence of preeclampsia ($r =$
23 0.490 ; $p < 0.001$). At a receiver-operating-characteristic-derived cut-off of ≥ 3.6 , NLR predicted
24 preeclampsia with a sensitivity of 100%, specificity of 96.3%, negative predictive value of 100%
25 and overall diagnostic accuracy of 96.6% (area under the curve 0.989). Higher NLR values were
26 associated with greater disease severity and a higher proportion of early-onset preeclampsia.

27 **Conclusion:** First-trimester NLR is a simple, inexpensive and highly sensitive screening tool for
28 the early prediction of preeclampsia and its severity. Incorporation of NLR into routine first-

29 trimester antenatal screening may facilitate early risk stratification and targeted preventive care,
30 particularly in resource-limited settings.

31 **Keywords:** *Preeclampsia; Neutrophil-to-lymphocyte ratio; First trimester; Inflammation;*
32 *Pregnancy outcome.*

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