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Neutrophil-Lymphocyte Ratio as a Screening Test for Preeclampsia in the First and Early-Third Trimesters of Pregnancy: A Cohort Study GMJ

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trimesters, respectively (Table-4).

Discussion

Totally, 449 pregnant women were followed prospectively, of whom 90.9%, 2.4%, and 6.7% had normal hypertension, gestational HTN, and PEC, respectively. Maternal age, BMI, and parity did not differ among the normotensive, PEC, and gestational HTN groups. The serum levels of the WBC count, neutrophil, and NLR increased significantly from the first to the early-third trimesters of pregnancy; however, the lymphocyte decreased. The WBC count, neutrophil, and NLR were significantly higher in the PEC group compared to the normotensive group in the first and early-third trimesters; however, the lymphocyte was lower. The NLR and neutrophil cut-off points for predicting PEC were 2.79 and 69.5% in the first, and 3.2 and 72.5% in the early-third trimesters, respectively.

NLR is proven as a marker of the SIR and is reported in some diseases, including appendicitis, advanced stages of cancer, acute myocardial infarction, acute pulmonary embolism, and ulcerative colitis [25-28].

Various studies have shown that WBC types, e.g., neutrophils, are associated with inflammatory responses, namely atherogenesis and atheroma thrombosis [29]. Maternal leukocytes are activated during pregnancy as well as PEC [29, 30]. Kurt *et al.* reported higher neutrophils in patients with PEC, indicating an increased inflammatory status [31].

In PEC, hyper-activation of the inflammatory cell and immunological responses are the causes of releasing inflammatory cytokines, antibodies, and oxidative agents, resulting in endothelial dysfunction [15]. PEC is associated with impaired regulation of TH₁ and TH₂ as inflammatory responses and consequently increased NLR [14-17, 19].

Yavuzcan *et al.* reported that, though not statistically significant, NLR was higher in PEC women than normal women [32]; however, several authors have reported a statistically significant positive association, suggesting that NLR could predict PEC and

its severity [33-35].

Kang *et al.* showed that the amount of NLR was higher in patients with PEC, especially in severe cases [15]. While Kurt *et al.* reported that NLR was not significantly different between PEC and normal groups, but the neutrophil was significantly higher in the group with PEC [31]. However, recently published articles have reported that NLR was significantly higher in PEC women [36, 37]. Also, in the current study, the neutrophil showed a more accurate predictive value for PEC in both the first and early-third trimesters. In other words, the sensitivity and specificity of the neutrophil were more than those of NLR. In line with our study, Canzoneri *et al.* showed that neutrophils increased in PEC [38]. Also, they reported leukocytosis in PEC patients, which is associated with the severity and degree of thrombocytopenia in Hemolysis, Elevated Liver enzymes, and Low Platelets syndrome [38, 39].

Although we performed this study with a large sample size and prospective design, an underestimation in reporting the prevalence of HPD due to excluding the high-risk women from the study should be considered as the main limitation of our study.

Conclusion

Regarding routine CBC checking in the first trimester and 24-28 weeks of pregnancy, measured NLR and neutrophil in the first and early-third trimesters of pregnancy could be accurate predictions of PEC in a normal population.

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Conflict of Interest

The authors declared no competing interest in the study.