Original Research Article

The role of platelet-lymphocyte ratio and neutrophil-lymphocyte ratio in early gestational week in predicting missed abortion

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ABSTRACT

Background: The definition of abortion was made by the World Health Organization based on the weight of the pregnancy material or the duration of pregnancy. According to this expression, the expulsion of all or some of the pregnancy material weighing less than 500 grams or before the 20th week of pregnancy from the uterine cavity is called abortion. Platelet-lymphocyte ratio (PLR) and neutrophil-lymphocyte ratio (NLR), which are among the inflammation parameters likely to be increased in abortion, were compared in groups that resulted in abortion and did not result in abortion.
Methods: The study included 120 patients who had a diagnosis of <14 weeks of abortion and 120 healthy pregnant women who applied to the gynecology and obstetrics clinic of a tertiary care hospital between January 2018 and December 2021. Those who had a previous fetal heartbeat or intracavitary pregnancy and aborted before the 14th gestational week were included in the selection of the abortus group.
Results: NLR and PLR were analyzed with ROC curve analysis. The area under the curve (AUC) for NLR was 0.498, with 95% confidence intervals (0.424-0.572), and was not statistically significant (p=0.38). The area under the curve (AUC) for PLR was 0.480 at 95% confidence intervals (0.406-0.557), and was not statistically significant (p=0.38).
Conclusions: NLR and PLR ratios were similar in both groups. As a result of the present study, it was found that there were no significant differences between the abortion NLR and PLR values between the groups (p>0.05).

Keywords: Missed abortion, NLR, PLR

INTRODUCTION

The definition of abortion was made by the World Health Organization based on the weight of the pregnancy material or the duration of pregnancy. According to this expression, the expulsion of all or some of the pregnancy material less than 500 grams or before the 20th gestational week from the uterine cavity is called abortion.[1] Spontaneous abortions are among the most common complications of pregnancy, and approximately 13-26% of all pregnancies and 8-20% of clinically diagnosed pregnancies result in abortion.[2] Among the etiopathogenesis of abortion, chromosomal anomalies are the most common cause by 75-90%.[3-5] Other causes include uterine anomalies, immunological causes, vaginal infections, hypertension, thrombophilia, inflammation, cardiovascular diseases, hematological diseases, endocrine causes, and traumas.[6-8]

Parameters of complete blood count such as platelet, MPV, PDW, NLR, and PLR increase in inflammation and ischemia.[9,10] MPV and PDW indirectly indicate

platelet consumption and platelet activation.[11,12] Neutrophils are the progenitor cells of the immune system and are produced in the bone marrow. Cytokine has important roles in the pathogenesis of many diseases, including chemokine synthesis, infections caused by intracellular pathogens, autoimmunity, chronic inflammation, and cancer.[13] NLR is related to the pathophysiological mechanism of systemic inflammatory response syndrome, which is characterized by an increased number of neutrophils, which is the first step of the antimicrobial defense, and the increased number of circulating leukocytes and is used as the index in systemic inflammation.[14,15] PLR is associated with inflammatory diseases and cancer.[16] The purpose of the study was to evaluate inflammatory parameters such as NLR, PLR, and complete blood count (CBC) in patients with missed abortions.

METHODS

The ethical approval was obtained from the Ethics Committee of ÇOMÜ Health Practice and Research Hospital for this retrospective case-control study (ethics committee decision number: 2011-KAEK-27/2022-2200006101, approval date: 02.02.2022). The study was conducted in line with the Principles of the Declaration of Helsinki. The study included 120 patients who had a diagnosis of <14 weeks of abortion and 120 healthy pregnant women who applied to the Gynecology and Obstetrics Clinic of ÇOMÜ Health Application and Research Hospital between January 2018 and December 2021. Those who had a previous fetal heartbeat or intracavitary pregnancy and aborted before the 14th gestational week were included in the selection of the abortus group. Those with anembryonic pregnancy, thyroid dysfunction, hematological disease, thrombosis history, systemic lupus erythematosus, multiple pregnancies, uterine anomalies, metabolic disease, chronic systemic disease, smoking during pregnancy, gestational diabetes mellitus, preeclampsia, hyperemesis gravidarum, alcohol use during pregnancy were excluded from the study. The demographic data such as age, gravida, parity, and the number of abortions were recorded. Ultrasound imaging was performed by the same sonographer with the same device (Voluson p6). All images were acquired with a 3.5 MHz convex transabdominal transducer and by using a 5 MHz vaginal probe in cases where abdominal diagnosis could not be made reliably. Hemoglobin, hematocrit, PLT, MPV, PDW, PLR, and NLR parameters were recorded in laboratory tests.

The statistical analyses were performed by using the SPSS version 25.0 software (IBM-SPSS, Chicago, IL). The data were presented as Mean±standard deviation (SD) for continuous variables. The normality of the data was evaluated with the Shapiro-Wilk test. The Mann-Whitney U test was used to compare the data that were not normally distributed according to the paired groups. The ROC analysis was used to determine NLR and PLR

cut-off values in the missed abortion group. The significance level was taken as p<0.05.

RESULTS

When the demographic findings of abortion and healthy pregnancy group were evaluated in the study, it was found that the distribution of age, gravida, parity, and gestational week (day) was homogeneous (p>0.05). The number of previous abortions between the groups was 0.82 in the abortion group and 0.50 in the healthy pregnancy group, and a high and statistically significant difference was detected in this respect (p=0.007) (Table 1).

Table 1: Demographic parameters of groups.

Variables	Abortion (n=120)	Healthy pregnant (n=120)	P value
Age	29.03±5.1	29.32±5.05	0.67
Gravidity	2.22±1.3	1.98±1.1	0.12
Parity	1.01±0.9	0.9±0.7	0.8
History of Abortion	0.82±0.89	0.5±0.85	0.007
Gestational age (days)	66.71±25.69	74.62±81.41	0.49

When the hematological parameters of the abortion and healthy pregnancy group were evaluated; p values of hemoglobin, hematocrit, platelet, MPV, PDW, neutrophil, NLR, and PLR values were similar; p=0.7, p=0.32, p=0.93, p=0.43, p=0.68, p=0.05, p=0.96, p=0.59, respectively (p>0.05). The lymphocyte level was found to be lower in the missed abortion group at a statistically significant level (1.89) when compared to the healthy pregnancy group (2.13) (p=0.01) (Table 2).

Table 2: Hematologic parameters of groups.

Variables	Missed abortion (n=120)	Healthy pregnant (n=120)	P value
Hemoglobin (gm/dl)	12.2±1.20	12.4±0.95	0.7
Hematocrit (%)	37.3±3.54	37.0±2.55	0.32
Platelet (10^3/µl)	250±73.24	243±60.62	0.93
MPV (fL)	10.45±1.31	10.50±1.09	0.43
PDW (%)	16.1±0.31	16.0±0.30	0.68
Neutrophil (10^3/µl)	5.51±2.65	6.38±1.83	0.05
Lymphocyte (10^3/µl)	1.89±1.98	2.13±1.65	0.01
NLR	2.77±2.07	2.76±1.28	0.96
PLR	111.94±72.26	115.92±41.55	0.59

NLR and PLR were analyzed with ROC curve analysis. The area under the curve (AUC) for NLR was 0.498, with

95% confidence intervals (0.424-0.572), and was not statistically significant (p=0.38). The area under the curve (AUC) for PLR was 0.480 at 95% confidence intervals (0.406-0.557), and was not statistically significant (p=0.38) (Figure 1).
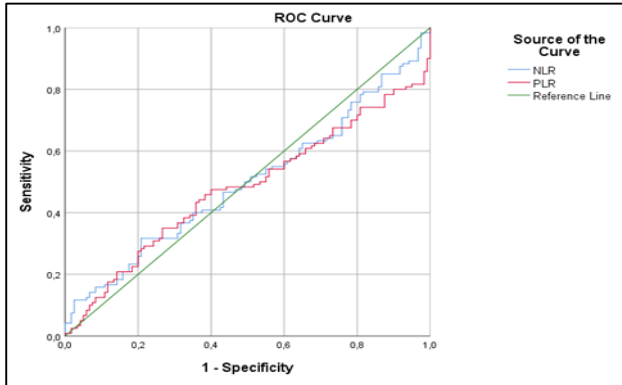

Figure 1: NLR and PLR ROC curve analysis.

DISCUSSION

Inflammation is essential for successful implantation and maintenance of pregnancy and is based on the balance between the immune system and immune tolerance. It is already known that as well as components of inflammation, it is important for the tight regulation of maternal immune function, and any imbalance between proinflammatory and anti-inflammatory cytokines and chemokines can cause the abnormal inflammation often seen in complicated pregnancies. Failure in creating a local inflammatory response in the first week of pregnancy may cause abortion.[17,18] In the first two months of pregnancy, syncytiotrophoblasts surround the gestational sac, and in this way, protect the fetus from free oxygen radicals with teratological potential for fetal structures and prevent continuous and high-pressure blood flow to the intervillous space.[19] The low-resistance vascular structure is provided in the uteroplacental circulation by relaxin and other mediators until the 12th gestational week.[20]

NLR, PLR, PDW, and MPV are markers of the systemic inflammatory response.[9,10] Leukocyte activation causes increased inflammatory parameters in the blood and thrombosis, leading to ischemia of fetal tissues.[19,21] The increased leukocyte is reflected in the ratio of PLR and NLR, and maternal systemic inflammatory response increases. Boilard et al advocated that NLR and PLR can be used as a marker in inflammatory diseases, Feng et al in cancer, and Gogoi et al in preeclampsia.[22-24] Kim compared the NLR and PLR values of 280 patients who had abortion and delivery and showed that there was a difference between the groups.[25] However, Christoforaki et al compared the NLR and PLR values of 129 patients who resulted in abortions and gave birth in the first trimester.[26] They reported that there were no significant differences between the groups.

CONCLUSION

In the present study, the purpose was to contribute to the literature to understand the value of NLR and PLR, which are hemogram parameters measured between the 5th and 13th gestational weeks, in predicting abortion. As a result of the present study, it was found that there were no significant differences between the abortion NLR and PLR values between the groups (p>0.05). No statistically significant differences were detected between NLR and PLR at a 95% confidence interval in the area under the curve in the ROC analysis (p<0.05). Since the calculation of NLR and PLR values is affected by the change in neutrophil count, patients with hematological diseases, uterine anomalies, metabolic diseases, chronic systemic diseases, preeclampsia, hyperemesis gravidarum, and a history of alcohol use during pregnancy were excluded from the study. We may not have detected significant differences in NLR and PLR values because of the exclusion of diseases with increased neutrophils. More studies are needed to understand the role of platelet-lymphocyte ratio and neutrophil-lymphocyte ratio in early pregnancy week in predicting missed abortion.

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