



# Effectiveness of the Trimester MPV/Platelet and PDW/Platelet Ratios in Predicting Abortus Imminens and Abortion

## Birinci Trimester MPV/Trombosit ve PDW/Trombosit Oranlarının Abortus Imminens ve Abortusu Öngörmede Etkinliği

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### ABSTRACT

**Aim:** The aim of this study is to examine the role of platelet value, mean platelet volume (MPV) value, platelet distribution width (PDW) value, MPV/platelet ratio and PDW/platelet ratio in predicting abortus imminens and abortion that may occur during pregnancy.

**Materials and Methods:** Our study was conducted between the years of 2018 and 2020 and 300 pregnant women between the 6<sup>th</sup> and 12<sup>th</sup> gestational weeks, who were admitted to obstetrics outpatient clinics and gave complete blood count test, were included in the study. The patients' ages, number of abortion, gestational weeks, platelet values, MPV values, PDW values, MPV/platelet ratios and PDW/platelet ratios were recorded from the patient files. Patients were divided into 3 groups; abortion, abortus imminens and control groups. All data were analyzed comparatively.

**Results:** There was no significant difference ( $p>0.05$ ) among the abortion group, the abortus imminens group and the control group in terms of platelet values, PDW values, MPV values, PDW/platelet ratios and MPV/platelet ratios. When evaluated in terms of laboratory parameters, the mean platelet value was found as  $256.7\pm 65.6$ , the PDW value as  $12.2\pm 1.8$ , the MPV value as  $10.2\pm 0.8$ , the MPV/platelet ratio as  $0.042\pm 0.011$ , and the PDW/platelet ratio as  $0.051\pm 0.016$ .

**Conclusion:** MPV, PDW and MPV/platelet and PDW/platelet ratios obtained from the complete blood count tests of healthy pregnant women in the first trimester are not effective in predicting the risk of further abortion and abortus imminens.

**Keywords:** Abortion, abortus imminens, mean platelet volume, platelet, platelet distribution

### ÖZ

**Amaç:** Bu çalışmanın amacı, gebelerde birinci trimester döneminde yapılan rutin tam kan sayımı ile elde edilen trombosit değeri, ortalama trombosit hacmi (MPV) değeri, platelet dağılım genişliği (PDW) değeri, MPV/trombosit oranı ve PDW/trombosit oranının gebelik süresince oluşabilecek abortus imminens ve abortus durumlarını öngörmedeki rolünü incelemektir.

**Gereç ve Yöntem:** Çalışmaya gebe polikliniklerinde 2018-2020 yılları arasında gebeliğin 6.-12. haftaları arasında tam kan sayımı örneği veren 300 hasta alındı. Hasta dosyalarından hastaların yaşları, abortus sayıları, gebelik haftaları, trombosit değerleri, MPV değerleri, PDW değerleri, MPV/trombosit oranları ve PDW/trombosit oranları kaydedildi. Hastalar düşük, düşük tehdidi ve kontrol olmak üzere 3 gruba ayrıldı. Tüm veriler karşılaştırmalı olarak analiz edildi.

**Bulgular:** Abortus grubu, abortus imminens grubu ve kontrol grubu arasında trombosit değerleri, PDW değerleri, MPV değerleri, PDW/trombosit oranları ve MPV/trombosit oranları açısından anlamlı ( $p>0,05$ ) bir farklılık gösterilmemiştir. Laboratuvar parametreleri açısından değerlendirildiğinde ise ortalama trombosit değeri  $256,7\pm 65,6$ , PDW değeri  $12,2\pm 1,8$ , MPV değeri  $10,2\pm 0,8$ , MPV/trombosit oranı  $0,042\pm 0,011$  ve PDW/trombosit oranı  $0,051\pm 0,016$  olarak saptanmıştır.

**Sonuç:** Birinci trimesterde sağlıklı gebelerin tam kan sayımı testinden elde edilen MPV, PDW ile MPV/trombosit ve PDW/trombosit oranları ileri dönem abortus ve abortus imminens riskini öngörmede etkin değildir.

**Anahtar Kelimeler:** Abortus, abortus imminens, ortalama trombosit hacmi, trombosit, trombosit dağılım genişliği

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## INTRODUCTION

Vaginal bleeding is observed in approximately 7% to 27% of first trimester pregnancies, and the rate of abortion in pregnancies in this period is approximately 12%<sup>1</sup>. The etiologies of first trimester vaginal bleeding include abortus imminens, abortion, early pregnancy loss and ectopic pregnancy. Physical examination, laboratory tests and ultrasonographic imaging can be used to find the cause of first trimester bleeding and to provide appropriate treatment.

Abortus imminens can be defined as visible vaginal bleeding in which fetal heartbeat is observed but not accompanied by cervical dilatation<sup>2</sup>. Abortion is the most common gynecological emergency seen in approximately 15-20% of imminens pregnancies<sup>3</sup>. Abortion is pregnancy loss that occurs before 20 weeks. Early abortion refers to intrauterine pregnancies without fetal cardiac activity in pregnancies less than 13 weeks<sup>4</sup>. Known risk factors for abortion include genetic anomalies, maternal age (>35 years), high body mass index, low body mass index (<20 kg/m<sup>2</sup>), history of previous abortion, history of ectopic pregnancy, smoking, alcohol use, and cardiovascular diseases<sup>5-7</sup>.

Many biochemical markers have been investigated in order to determine whether abortion or abortus imminens will be observed in the later stages of pregnancy. Among these, the most frequently examined biochemical markers are; serum beta human chorionic gonadotropin (beta HCG), progesterone, estradiol, pregnancy-associated plasma protein A, cancer antigen 125, human placental lactogen, alpha fetoprotein, inhibin A is follistatin and activin A<sup>8</sup>. Despite all the researches, since the underlying mechanisms are still not fully known, findings that can predict abortion imminence and abortion could not be obtained.

Prothrombotic events in pregnancy can change the hemostatic balance in the placental vessels. It is thought that abnormal hemostatic response may play a role in the etiology of abortion cases<sup>9</sup>. Many parameters such as mean platelet volume (MPV), platelet distribution width (PDW), MPV/platelet count ratio (MPR) and PDW/platelet count ratio (PPR) are used in the examination of thromboembolic events.

The aim of this study is to examine the role of MPV value, PDW value, MPR ratio and PPR ratio obtained by routine complete blood count in pregnant women in the first trimester in predicting possible abortion and abortus imminens risk.

## MATERIALS AND METHODS

After obtaining ethics committee approval for the study Maltepe University Clinical Research Ethics Committee (decision number: 2020/900/48, date: 17.06.2020), archive files and digital media data of each patient were reviewed retrospectively. Pregnant women who applied to the pregnant

outpatient clinics between 2018 and 2020 were included in our study. Patients' ages, abortion numbers, weeks of gestation, platelet values, MPV values and PDW values were recorded from patient files and data.

Women who gave complete blood count samples in their routine check-ups between 6<sup>th</sup> and 12<sup>th</sup> weeks of their pregnancy were included in the study. When calculating the gestational week, the gestational week calculated according to the crown-rump length measurement in the first ultrasonography of the patient was taken as basis.

Those who had vaginal bleeding at the time of admission, pregnant women older than 45 years, ectopic, multiple and molar pregnancies, those with thrombotic thrombocytopenic purpura, idiopathic thrombocytopenic purpura and essential thrombocytosis, hypersplenism and hereditary thrombocytopenia, and those with a history of drug use that may affect platelet functions were not included. In addition, patients with missing data or follow-up were excluded from the study.

## Statistical Analysis

Mean, standard deviation, median minimum and maximum values were used in the descriptive statistics of the data. The distribution of variables was measured with the Kolmogorov-Smirnov test. ANOVA, Kruskal-Wallis, and Mann-Whitney U tests were used in the analysis of quantitative independent data. Analyzes were performed using the Statistical Package for the Social Sciences 27.0 statistical program.

## RESULTS

A total of 300 people, including 100 women who had abortion, 100 pregnant women with abortus imminens diagnosis, and 100 healthy women who reached the birth week without abortus imminens diagnosis as the control group, were included in the study. The mean age of the patients was 33.0±4.9 (21-45) years. The mean gestational week of the women included in the study was determined as 8.1±1.6. When all three groups were examined, the patients' ages, weeks of gestation and number of abortions were similar (p>0.05) (Table 1).

When evaluated in terms of laboratory parameters, mean platelet value of all pregnant women included in the study was 256.7±65.6, PDW value was 12.2±1.8, MPV value was 10.2±0.8, MPR rate was 0.042±0.011, and PPR rate was 0.051±0.016 (Table 1). No significant difference was observed between the abortion group, abortus imminens group, and control group in terms of platelet values, PDW values, MPV values, PPR values, and MPR values (p>0.05) (Table 2).

## DISCUSSION

Platelets, which are responsible for the coagulation mechanism, have been shown to have an important role in angiogenesis

	Minimum-maximum	Median	Mean±SD
Age	21.0-45.0	33.0	33.0±4.9
Pregnancy week	6.0-12.0	8.1	8.1±1.6
Number of abortions	0.0-10.0	0.9	0.9±1.2
Platelet	148.0-573.0	256.7	256.7±65.6
PDW	8.5-22.2	12.2	12.2±1.8
MPV	8.0-13.1	10.2	10.2±0.8
PDW/platelet (PPR)	0.017-0.150	0.051	0.051±0.016
MPV/platelet (MPR)	0.016-0.089	0.042	0.042±0.011

MPV: Mean platelet volume, PPR: PDW/platelet count ratio, MPR: MPV/platelet count ratio, PDW: Platelet distribution width, SD: Standard deviation

and cell growth. Vascular endothelial growth factor, epidermal growth factor and basic fibroblast growth factors produced by platelets can be observed at reduced levels in women with a history of pregnancy loss. This resulting platelet hypofunction may weaken uteroplacental formation, decidual vessel formation and trophoblast development. Since all these factors may increase abortion rates, decreased platelet function during pregnancy may serve as a marker for abortion and abortus imminens<sup>10</sup>. Platelet volume indices, including MPV, PDW, and platelet count, are indicators of platelet activity and are routinely reported in complete blood count evaluations.

An increase in MPV is indicative of platelet production or increased platelet destruction. There are many studies in which MPV level is used for predictive, and diagnostic purposes. It has been observed that MPV values are increased in acute infections and septicemia cases, and the increase in thrombocytosis and megakaryocyte ploidy is shown as the cause<sup>11,12</sup>. In studies conducted in the field of obstetrics, it has been found that MPV is associated with premature rupture of membranes, preeclampsia, recurrent pregnancy loss and first trimester abortion risk<sup>13-16</sup>. In a study by Mete Ural et al.<sup>17</sup> in which they examined laboratory parameters in predicting the risk of abortion, no statistically significant difference was observed between the patients who had abortion and the patients in the control group in terms of MPV values, as in our study.

Many studies have also been conducted on the MPV/platelet ratio. It has been reported that the rate of MPR, which is a

thromboinflammatory marker, is significant in conditions such as endothelial dysfunction, thrombosis, and inflammation<sup>18</sup>. In addition, MPR has been found to be increased in patients with hepatocellular carcinoma, with accompanying cirrhosis and with increased fibrosis<sup>19,20</sup>. In addition, the MPR rate was found to be significant in differentiating iron deficiency anemia from other types of anemia<sup>21</sup>. In our study, however, no difference was found between MPR and predicting the risk of abortion. We thought that this difference obtained in our study was due to the variability of predisposing factors.

PDW, a marker showing changes in platelet size and platelet activation, has been reported to be significant in predicting mortality in patients with sepsis and in intensive care units<sup>22-24</sup>. In another study conducted in newborns, it was shown that PDW levels were significantly higher in cases of late-onset neonatal sepsis<sup>25</sup>. High values of PDW indicate the presence of mature and immature cells simultaneously circulating. This increase can also be considered as an indication that an abnormal thrombosis may occur<sup>26</sup>.

Preoperative low PDW value is an indicator of a bad prognostic factor in gastric cancer cases, while a preoperative high PDW value is an indicator of a poor prognostic factor in melanoma and larynx cancer cases<sup>27-29</sup>. In two studies on recurrent pregnancy loss, PDW values were found to be statistically significantly increased compared to control groups<sup>17,30</sup>. In another study showing the prediction of abortion risk, similar

	Abortion		Abortus imminens		Control		p	
	Mean±SD	Median	Mean±SD	Median	Mean±SD	Median		
Platelet	249.7±49.5	240.0	259.5±75.1	232.5	261.0±69.4	250.5	0.811	<sup>K</sup>
PDW	12.2±1.9	12.0	12.1±1.8	12.0	12.2±1.6	12.0	0.950	<sup>K</sup>
MPV	10.2±0.8	10.1	10.1±0.9	10.2	10.1±0.8	10.2	0.946	<sup>K</sup>
PDW/platelet	0.051±0.016	0.050	0.051±0.017	0.052	0.050±0.015	0.047	0.798	<sup>A</sup>
MPV/platelet	0.043±0.010	0.043	0.042±0.012	0.044	0.042±0.011	0.040	0.752	<sup>A</sup>

MPV: Mean platelet volume, PPR: PDW/platelet count ratio, MPR: MPV/platelet count ratio, PDW: Platelet distribution width, SD: Standard deviation  
<sup>A</sup>ANOVA/<sup>K</sup>Kruskal-Wallis (Mann-Whitney U test)

to our study, no significant difference was found in the PDW value<sup>15</sup>.

Although a case-control study showed that high PPR rate at hospital admission was a predictor of mortality, in our study, PPR rate was not found to be significant in predicting abortion and abortion imminence. We attributed this difference to the fact that the people included in our study were included in the study before any thrombocyte process that could pose these risks started<sup>31</sup>.

### Study Limitations

The first limitation of our study is that it is a retrospective study with few series. Second limitation can be due to the difficulty of obtaining precise results at high accuracies with a single measurement of laboratory parameters.

### CONCLUSION

In conclusion, there was no significant effect of MPV and PDW values, MPV/platelet and PDW/platelet ratios in predicting the risk of abortion and abortus imminens in first trimester healthy pregnant women. Large-scale prospective studies are needed to confirm the relationship between abortion risk and laboratory parameters in pregnant women.

### Ethics

**Ethics Committee Approval:** This study was approved by the Maltepe University Clinical Research Ethics Committee (decision number: 2020/900/48, date: 17.06.2020).

**Informed Consent:** Retrospective study.

**Peer-review:** Externally peer-reviewed.

### Authorship Contributions

Surgical and Medical Practices: A.G., E.D.T., Concept: A.G., A.Ç., Design: A.G., A.Ç., Data Collection or Processing: A.G., E.D.T., Analysis or Interpretation: A.G., K.A., A.Ç., Literature Search: A.G., K.A., E.D.T., A.Ç., Writing: A.G., K.A., A.Ç.

**Conflict of Interest:** No conflict of interest was declared by the authors.

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