

ASSOCIATION BETWEEN PLATELET INDICES AND MISSED ABORTION

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Abstract

Background: Missed abortion is accompanied with high maternal morbidity and mortality rates. Earlier detection of women with missed abortion is essential in prevention of co-morbidities and death. **Objective:** To evaluate the role of platelets indices in prediction of missed abortion. **Methodology:** This study was a case control study implemented in Maternity Teaching Hospital in Erbil city-Kurdistan region/Iraq through the period of nine months from 1st of January to 30th of September, 2023convenient sample of 150 pregnant women with missed abortion and 150 healthy pregnant women as controls. The missed abortion was diagnosed by researchers in regard to history, clinical examination and ultrasound examination. **Results:** The means of platelets count, platelets volume and plateletcrit were significantly lower among pregnant women with missed abortion as compared to controls ($p<0.001$). The mean platelets distribution width was significantly higher among pregnant women with missed abortion as compared to controls ($p<0.001$).The current study found that PDW (10.6 fl) of pregnant women was a significant predictor of missed abortion with an appropriate validity finding. **Conclusions:** The platelets parameters are predictors of missed abortion. The platelets width distribution is strongly predicting missed abortion.

Keywords: Missed Abortion, Platelets Indices, Platelets Width Distribution.

INTRODUCTION

Failure of pregnancy is the main complication of pregnancy. Missed abortion is defined as intrauterine death of embryo or fetus weighing 500 gram or less within first twenty-four weeks of pregnancy without expulsion of gestation contents that is usually diagnosed by ultrasound examination ¹. Missed abortion is characterized by restrain of embryonic or fetal development and ultrasonography showed either empty gestational sac or no cardiac activity of embryo or fetus ². This special type of spontaneous miscarriage represented about 15-20% of spontaneous miscarriage in clinically recognized pregnancies ³. Most of first trimester miscarriages are related to missed abortion⁴. The missed abortion is regarded as a common obstetrical disorder occurs with incidence rate reaching to 14.1% and could be complicated by different physical and psychological problems like endometrial injury, coagulation disorders, depression and anxiety ⁵.

The exact cause of missed abortion is still unknown. However, many authors documented the role of chromosomal anomalies, immunological factors, uterine anomalies, endocrine factors, environmental factors and infections in etiology of missed abortion. Some literatures reported that defective placentation caused by different inflammatory responses in pregnant women could lead to missed abortion⁶. The common symptoms of missed abortion are abdominal or pelvic pain with or without vaginal bleeding in women with positive pregnancy test or missed menstrual cycle ⁷. The ultrasound is the gold standard test in evaluating the missed abortion.

Transvaginal ultrasonography with human chorionic gonadotropin level assessment is highly sensitive in checking the gestational sac and confirming the missed abortion⁸.

The complete blood count is a simple and an inexpensive test that includes parameters useful for follow-up of multiple diseases and its use is helpful in screening and diagnosis⁹. The platelet indices which are related to platelet's morphology and proliferation like mean platelets volume (MPV), platelets distributed width (PDW) and plateletcrit (PCT) are inexpensive non-invasive biomarkers used in status assessment of many diseases¹⁰. The MPV is an analyzer-calculated measure of thrombocyte volume, while the PDW is a parameter of volume variability in platelets size and PCT is the volume occupied by platelets in the blood¹¹. These biomarkers predict platelet activation and different diseases such as thrombosis and inflammation¹². It was shown that pregnancy could be complicated with changes in platelet activity and volume and may lead to preeclampsia and intrauterine growth retardation¹³. It was proved that maternal thrombocytopenia increases the chance of miscarriage and other obstetrical complications in pregnancy¹⁴. Some authors reported lower MPV among women with spontaneous miscarriage¹⁵. Others found higher PDW mean among women with spontaneous miscarriage¹⁶. The aim of this study was to evaluate the role of platelets indices in prediction of missed abortion.

PATIENTS & METHODS

Current study was a case control study implemented in Maternity Teaching Hospital in Erbil City-Kurdistan region/Iraq through the period of nine months from 1st of January to 30th of September, 2023. The studied population include 150 pregnant women with missed abortion of 23 weeks of gestation or less who admitted to hospital and accepted in the current study that is regarded as a case study group and another sample 150 healthy pregnant women as a control group. Exclusion criteria were stillbirth fetus, ectopic pregnancy, molar pregnancy, twin pregnancy, women with prosthetic valve and hematological disease. The proposal of the research was approved by Kurdistan Higher Council of Medical Specialist-Family Medicine, approval from hospital authorities and oral informed consent of women in addition to management of women with missed abortion. A sample of 150 pregnant women with missed abortion was enrolled after eligibility to inclusion and exclusion criteria. Another sample of 150 healthy pregnant women was selected from pregnant women attended the outpatient's clinics in hospital as controls.

The data collection was conducted directly by interviewing with pregnant women in a prepared questionnaire designed by the researchers after reviewing by supervisor that include sociodemographic data (age, residence, educational level, occupation and body mass index), gestational characteristics of study participants (gravidity, parity, previous abortion and gestational age), past obstetrical history, past surgical history, previous history of miscarriage curettage and ABO blood groups and investigations measures of study participants (hemoglobin level, platelets count, platelets volume, mean corpuscular volume, platelets width distribution and plateletcrit). The missed abortion was diagnosed by specialist of obstetric in regard to history, clinical examination and ultrasound examination. All investigations were implemented in laboratory of Maternity Teaching Hospital.

The collected data were entered and interpreted statistically by SPSS program²⁶. Suitable statistical tests (Chi square and Fishers exact tests) for categorical variables and independent sample t-test was used for continuous variables. ROC curve was used to assess the predictability of platelets indices. The p value of ≤ 0.05 was regarded as significant.

RESULTS

There was a highly significant association between missed abortion case group and healthy pregnant women control group according to the age, residency, educational level, occupation with the same p value ($p < 0.001$) as shows in (**Table 1**). No significant differences were observed between pregnant women with missed abortion and controls regarding body mass index ($p = 0.9$). (**Table 1**)

Table 1: Distribution of general characteristics according to study groups.

Variable	Study groups				P
	Missed abortion		Controls		
	No.	%	No.	%	
Age					<0.001^S
<20 years	8	5.3	23	15.3	
20-29 years	40	26.7	69	46.0	
30-39 years	75	50.0	50	33.3	
40-43 years	27	18.0	8	5.3	
Residence					<0.001^S
Urban	78	52.0	124	82.7	
Rural	72	48.0	26	17.3	
Educational level					<0.001^S
Illiterate	75	50.0	34	22.7	
Read & write	14	9.3	5	3.3	
Primary level	28	18.7	20	13.3	
Intermediate level	16	10.7	25	16.7	
Secondary level	3	2.0	19	12.7	
Higher education	14	9.3	47	31.3	
Occupation					<0.001^S
Student	0	-	6	4.0	
Private job	5	3.3	15	10.0	
Governmental job	3	2.0	11	7.3	
Housewife	142	94.7	118	78.7	
Body mass index					0.9^{NS}
Normal	50	33.3	50	33.3	
Overweight	59	39.3	57	38.0	
Obese	41	27.3	43	28.7	

S=Significant, NS=Not significant.

There was a highly significant association between missed abortion case group and healthy pregnant women control group according to the (gravity, parity, history of previous abortion and gestational age) with p value (< 0.001 , 0.004 , < 0.001 , < 0.001) respectively as shows in (**Table 2**). Pregnant women with missed abortion had a significantly shorter gestational age than controls ($p < 0.001$) (**Table 2**)

Table 2: Distribution of gestational characteristics according to study groups

Variable	Study groups				P
	Missed abortion		Controls		
	No.	%	No.	%	
Gravidity					<0.001^S
Primigravida	20	13.3	43	28.7	
Gravida 2-4	62	41.3	78	52.0	
Gravida 5 and more	68	45.3	29	19.3	
Parity					0.004^S
Nulliparous	29	19.3	52	34.7	
Para 1-3	78	52.0	72	48.0	
Para 4 and more	43	28.7	26	17.3	
History of previous abortion					<0.001^S
Yes	88	58.7	28	18.7	
No	62	41.3	122	81.3	
Gestational age					<0.001^S
5-14 weeks	135	90.0	97	64.7	
15-23 weeks	15	10.0	53	35.3	

S=Significant.

There was a highly significant association between chronic diseases and pregnant women with missed abortion ($p < 0.001$). A highly significant association was observed between previous history of surgical operation and pregnant women with missed abortion ($p < 0.001$). Previous history of curettage and blood group A were significantly predominant in pregnant women with missed abortion ($p < 0.001$). No significant differences were observed between pregnant women with missed abortion and controls regarding types of chronic diseases ($p = 0.7$). (**Table 3**)

Table 3: Distribution of clinical history according to study groups.

Variable	Study groups				P
	Missed abortion		Controls		
	No.	%	No.	%	
Chronic diseases					<0.001^S
Yes	55	36.7	13	8.7	
No	95	63.3	137	91.3	
Type of chronic disease					0.7^{NS}
HT	16	28.6	5	38.5	
DM	10	17.9	1	7.7	
Hypothyroidism	14	25.0	6	46.2	
Renal disease	2	3.6	0	-	
Asthma	4	7.1	1	7.7	
Migraine	4	7.1	0	-	
Asthma & hypothyroidism	2	3.6	0	-	
Epilepsy	2	3.6	0	-	
HT & DM	2	3.6	0	-	
Previous history of surgical operation					<0.001^S
Yes	117	78.0	54	36.0	
No	33	22.0	96	64.0	
Previous history of miscarriage curettage					<0.001^S
Yes	83	55.3	15	10.0	

No	67	44.7	135	90.0	
Blood group					<0.001^S
A	113	75.3	23	15.3	
B	15	10.0	67	44.7	
AB	4	2.7	12	8.0	
O	18	12.0	48	32.0	

S=Significant, NS=Not significant.

There was a significant association in means and standard deviation of (platelet count, mean platelet volume, platelet distribution width and plateletcrit) between case group of missed abortion pregnant women and control group of healthy pregnant women with (p value <0.001) for all of them respectively. No significant differences were observed between pregnant women with missed abortion and controls regarding hemoglobin level (p=0.19) and mean corpuscular volume (p=0.48). (**Table 4**)

Table 4: Distribution of investigations measures according to study groups.

Investigations	Study groups		P
	Missed abortion	Controls	
	Mean±SD	Mean±SD	
Hemoglobin (g/dl)	12.3±1.3	12.1±1.1	0.19 ^{NS}
Platelets count (x10 ⁹)	228.6±49	253.4±61.7	<0.001^S
MCV (fl)	81±6.6	81.5±7.6	0.48 ^{NS}
MPV (fl)	9.1±1	9.8±1	<0.001^S
PDW (fl)	11.9±1.4	10.78±1.5	<0.001^S
PCT (%)	0.21±0.05	0.24±0.05	<0.001^S

S=Significant, NS=Not significant.

As shown in Figure 1, the platelets count, MPV and PCT of pregnant women were significant predictors of missed abortion (AUC=0.59, 0.55 and 0.63, respectively) with an appropriate validity finding for platelets count cutoff value of (239.5x10⁹) with sensitivity (54%), specificity (53.3%) and accuracy (51%). The appropriate validity findings for MPV cutoff value of (83 fl) were sensitivity (52.7%), specificity (52.7%) and accuracy (52%). The appropriate validity findings for PCT cutoff value of (0.22%) were sensitivity (67.3%), specificity (51.3%) and accuracy (60%).

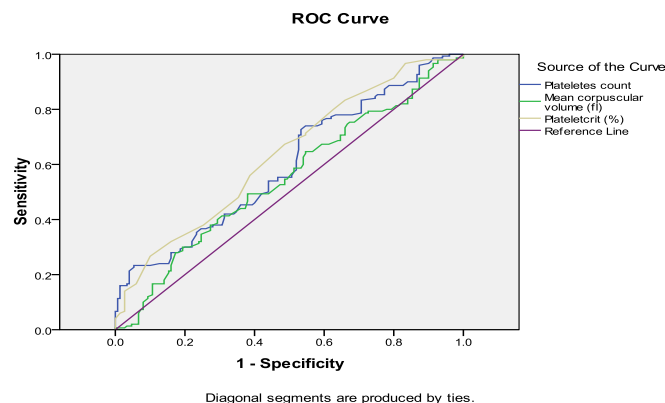


Figure 1: Receiver operating curve in prediction of platelets count, MPV and PCT for missed abortion.

As shown in Figure 2, the PDW of pregnant women was a significant predictor of missed abortion (AUC=0.72) with an appropriate validity findings for platelets count cutoff value of (10.6 fl) with sensitivity (80%), specificity (57.3%) and accuracy (74%).

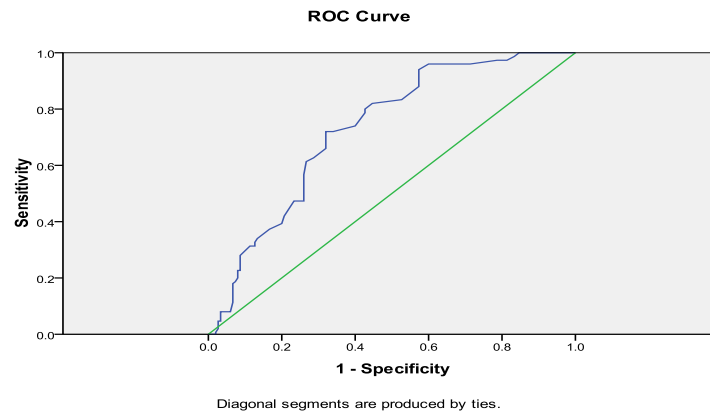


Figure 2: Receiver operating curve in prediction of PDW for missed abortion.

DISCUSSION

Delayed diagnosis of missed abortion could lead to serious health problems for women like coagulation abnormalities, uterine adhesions, disseminated intravascular coagulation and death. For that, the predictive biomarkers of missed abortion are essential in saving women's lives¹⁷.

In present study, there was a highly significant association between older age pregnant women and missed abortion ($p < 0.001$). This result is consistent with that result that done in Norway¹⁸. At the same time there was highly significant association in regulation to rural, residency, illiteracy and their occupation of pregnant women as a housewife between case group of missed abortion pregnant women and control group of healthy pregnant women that is agree with result of study done in china¹⁹, Iran²⁰, Iraq²¹ respectively.

In current study, there was a highly significant association between pregnant women with missed abortion and high gravidity history ($p < 0.001$). This finding coincides with results of study done in China²² which reported that grand multi-gravidity history is related to high risk of missed abortion. This study also showed a significant association between pregnant women with missed abortion and high parity history ($p = 0.004$) that is similarly, to study that done in Indonesia²³ stated that multiparity is a common risk factor for spontaneous miscarriage. Although, there was a highly significant association between pregnant women with missed abortion and history of previous abortion ($p < 0.001$). This finding is parallel to results of study done in Egypt²⁴. which documented that previous history of previous abortion increases risk of missed abortion in subsequent pregnancies. This study showed that early missed abortion were more common than late abortion with highly significant association regularly to this issue between the case and control group of pregnant women and this result is parallel to result of study done in Australia³.

Present study found a highly significant association between chronic diseases and pregnant women with missed abortion ($p < 0.001$). This finding is inconsistent with results of study done in Norway²⁵ which found no significant relationship between

maternal chronic diseases and risk of spontaneous miscarriage, however, they reported that condition related to chronic diseases increases risk of missed abortion. Our study found a highly significant association between previous history of surgical operation and pregnant women with missed abortion ($p < 0.001$). This finding is similar to results of study that done in United States of America²⁶. In our study, Previous history of curettage and blood group A were significantly predominant in pregnant women with missed abortion ($p < 0.001$). These findings are in agreement with results of study done in Brazil²⁷ and study in Libya²⁸ which all reported effect of curettage history and blood groups on incidence of missed abortion.

Current study showed that mean platelets count was significantly lower among pregnant women with missed abortion as compared to controls ($p < 0.001$). This finding coincides with results of study in Turkey²⁹. At the same time, mean platelets volume was significantly lower among pregnant women with missed abortion as compared to controls ($p < 0.001$). This finding is consistent with results of study done in Turkey¹⁵ which revealed a reduction in MPV among pregnant women with spontaneous miscarriage. But regarding to mean platelets distribution width which appear that is significantly higher among pregnant women with missed abortion as compared to controls ($p < 0.001$). Similarly, Salman et al³⁰ prospective case control study found that PDW was a significant predictor of missed abortion. Our study also found that mean plateletcrit was significantly lower among pregnant women with missed abortion as compared to controls ($p < 0.001$). This finding is parallel to results of study done in Turkey³¹ which reported that plateletcrit is strongly related to early pregnancy loss.

The present study showed that platelets count (239.5×10^9), MPV (83 fl) and PCT (0.22%) of pregnant women were significant predictors of missed abortion with an appropriate validity findings. These findings are close to different literatures^{15, 29, 30, 32}. The current study found that PDW (10.6 fl) of pregnant women was a significant predictor of missed abortion with an appropriate validity findings. This finding is close to results of study done in China¹⁶ which reported that PDW is a significant predictor of missed abortion.

CONCLUSION

This study concluded that platelets parameters are predictors of missed abortion. The platelets width distribution is strongly predicting missed abortion. The platelets count, platelets volume and plateletcrit are also useful in prediction of missed abortion.

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