

# Comparative Study of D-Dimer Changes in Women with Gestational Diabetes and Healthy Women after Elective Cesarean Section

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## ABSTRACT

**Background:** D-dimer levels in the blood are analyzed to diagnose conditions such as deep vein thrombosis, aortic rupture, certain types of acute headaches resulting from vascular disorders, and pulmonary embolism. D-dimer levels can also be a determining factor in the prognosis of various cancers. This study aimed to compare D-dimer changes in women with gestational diabetes mellitus (GDM) to those in healthy women following elective cesarean section.

**Methods:** This study, based on the Iran ICU Registry (IICUR), collected data on women hospitalized in the women's ICU. Data were extracted from the registry using a standardized checklist. The study method involved extracting information on women with GDM and healthy women from the registry checklist and patient clinical records, including laboratory results. All D-dimer measurements were performed using a standardized laboratory kit within the hospital and were documented in the patients' clinical records.

**Results:** The findings showed no significant difference in D-dimer levels on the first day after the CS. Additionally, there was a positive correlation between D-dimer levels and both advanced maternal age and higher BMI, with D-dimer levels rising as age and BMI increased among the study participants.

**Conclusion:** Higher levels of D-dimer were detected in patients with gestational diabetes mellitus (GDM) compared to healthy women after cesarean delivery. These results indicate a potentially elevated risk of deep vein thrombosis (DVT) in women with GDM undergoing elective CS, underscoring the importance of targeted preventive and therapeutic measures.

## Introduction

For a natural birth to occur, the uterus and cervix must undergo specific changes. Cervical ripening, a process that prepares the cervix for labor, is a

critical step in initiating this process. Typically occurring in the final weeks of pregnancy, cervical ripening paves the way for strong uterine contractions, which then cause the cervix to dilate and open [1-3].

A cesarean section is described as the surgical procedure in which a fetus is delivered through an incision made in both the abdominal wall and the uterine

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wall [4]. The primary goal is to reduce complications for the mother and baby in emergency situations. However, the greater than expected trend towards cesarean section as the method of choice for delivery in the last two decades has challenged this goal. Maternal and neonatal complications resulting from cesarean section without indication are higher than those resulting from vaginal delivery [5-7].

Complications of cesarean section include endometritis, fever, prolonged hospital stay, additional costs, complications from long-term antibiotic use, and psychological problems for the patient and his family. Pain is observed in most patients and causes complications on the first day of cesarean section. Pain after cesarean section causes immobility or breathing problems [8-12].

The frequency and seriousness of pregnancy complications are associated with the mother's pre-existing health conditions. These diseases include cardiovascular problems, respiratory problems, immune system problems, diabetes, etc. [13-15]. One of the diseases that may develop in pregnant mothers during pregnancy is GDM. The prevalence of GDM is increasing in many developing countries [16-17]. So that in a study conducted in Iran, 9.4% of pregnant women suffer from GDM [18].

In pregnant women with GDM, it is essential to check the patient's clinical tests carefully. One of these tests is the D-dimer test. Analysis of D-dimer levels in the blood can diagnose deep vein thrombosis, aortic rupture, acute headaches caused by vascular disorders, a determinant of prognosis in many cancers, and pulmonary embolism. On the other hand, diseases during pregnancy such as GDM cause changes in hemostatic parameters such as D-dimer [21, 25-27].

## Methods

In this study inclusion criteria included elective cesarean section for the subjects, age between 20 and 35

years, previous D-dimer test performed and available in the patient's clinical record, GDM in the Control group and no GDM in the Case group. Exclusion criteria included any factor affecting the D-dimer test results, including history of anticoagulant use, history of venous thromboembolism, history of cancer and chemotherapy and radiotherapy, preeclampsia and eclampsia in pregnancy, chronic diseases (including liver, kidney, cardiovascular problems, etc.) (19-22).

The tool used in this study was a checklist of registry data. Some of the checklist questions included questions on maternal age, gestational age, BMI, nationality, cigarette smoking status, water pipe smoking status, and previous pregnancy history.

The study method was as follows: Information about women with GDM and healthy women hospitalized in the ICU was extracted according to the registry checklist and laboratory results in the patient's clinical record. It should be noted that all D-dimer levels performed for patients were performed by a laboratory kit in the hospital and recorded in the patients' clinical record. The data were input into SPSS version 19 and analyzed utilizing regression analysis, correlation, independent t-tests, and chi-square tests.

## Results

According to the findings, among the demographic characteristics of the subjects studied, there was only a difference between BMI and maternal health status ( $P < 0.05$ ) (table 1).

Also result showed, there was no difference in D-dimer levels on the first day, but on the third day, its level was higher in women in the case group (Table 2).

Also, there was a relationship between advanced age and high BMI in women with D-dimer level, and with increasing age and increasing BMI, the D-dimer level of patients increased.

**Table 1- Comparison of demographic characteristics of patients**

Variable		Women with GDM	Healthy women	P value
Age	M(SD)	32.11(3.34)	31.45(2.69)	0.36
BMI	<25	18(51.4)	29(82.9)	0.005
	>_25	17(48.6)	6(17.1)	
Blood loss at delivery (g)	<800	20(57.1)	21(60)	0.81
	>_800	15(42.9)	14(40)	
Cigarette Smoking Status	Yes	1(2.9)	0(0)	0.32
	No	34(97.1)	35(100)	
Water pipe Smoking	Yes	1(2.9)	3(8.6)	0.31
	No	34(97.1)	32(91.4)	
Nationality	Iranian	35(100)	34(97.1)	0.33
	Non-Iranian	0(0)	1(2.9)	
Previous pregnancy history	Yes	13(37.1)	14(40)	0.80
	No	22(62.9)	21(60)	

**Table 2- Investigating the relationship between the D-dimer level and the health status of mothers after cesarean section**

Test time	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence	
							Lower	Upper
Day 1	3.175	0.079	0.248	68	0.805	0.05714	-0.40210	0.51638
			0.248	63.518	0.805	0.05714	-0.40269	0.51697
Day 3	5.620	0.021	15.761	68	0.000	4.22857	3.69320	4.76394
			15.761	55.969	0.000	4.22857	3.69111	4.76603

## Discussion

Identifying factors affecting deep vein thrombosis is one of the priorities of the medical staff and necessary prevention should be carried out in this regard [23-24]. Result showed, factors affecting the increase in D-dimer levels included older age and BMI status of women. In a study by Miyamoto et al., which examined 160 women undergoing CS, factors such as older age and higher BMI were associated with the results related to D-dimer levels [25], which is consistent with the results of this study. Conversely, a study by Zhang et al [26]. involving pregnant women suspected of having pulmonary embolism indicated that factors like older age and BMI were not linked to D-dimer levels, which contradicts the findings of this study.

The results indicated a statistically significant difference in D-dimer levels between women with gestational diabetes and healthy women, with D-dimer levels being higher in women with GDM compared to their healthy counterparts. In the study by Mallah et al. in Iran, the D-dimer level of 150 women before and after CS was examined and compared. According to the findings, in the GDM group, the D-dimer level on the day of hospitalization was 399.45 (25.49), on the first day after surgery it was 429.59 (28.44), on the 7th day after surgery it was 413.78 (26.63) and on the 14th day after surgery it was 400.24 (25.25). While in the healthy women group, the rate on the day of hospitalization was 340.12 (18.19), on the first day after surgery it was 365.88 (21.45), on the seventh day after surgery it was 359.45 (20.59), and on the 14th day after surgery it was 350.88 (21.63) [21].

Result showed, cesarean section increased D-dimer levels in women. In a retrospective study by Matsumura et al., 313 women undergoing cesarean section were examined. According to the findings, pulmonary embolism (PE) and venous thromboembolism (VTE) were observed in 6 of the women. Also, D-dimer levels on days 1, 3, and 5 after cesarean section were good variables for predicting VTE or PE [27]. Additionally, the study by Hedengran et al. found that D-dimer levels were elevated during labor and on the first and second days following a cesarean section. However, it was also demonstrated that repeated D-dimer measurements do not have clinical utility in assessing thromboembolic events during pregnancy [28].

## Conclusion

D-dimer levels in patients with GDM were higher than in healthy women. Therefore, there is a need for preventive and therapeutic measures to prevent DVT in women with GDM undergoing elective cesarean section.

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