

Date: 15th September-2026

VITAMIN D AND HEMOSTATIC MARKERS AS POTENTIAL PREDICTORS OF RETROCHORIONIC HEMATOMA FOLLOWING ASSISTED REPRODUCTIVE TECHNOLOGY

Sharipova F.X..

Bukhara Maternity Complex. Bukhara, Uzbekistan.

Background. Retrochorionic hematoma (RCH) is a common ultrasound finding during early pregnancy and may be associated with an increased risk of pregnancy complications. Pregnancies achieved through assisted reproductive technology (ART) require particular attention because of the specific characteristics of embryo implantation, hormonal support, and early placental development. Identification of laboratory markers associated with RCH may improve early risk stratification and enable closer monitoring of high-risk pregnancies. Vitamin D and hemostatic parameters are of particular interest because of their involvement in immune regulation, endothelial function, placentation, and coagulation processes. The combination of vitamin D deficiency and changes in hemostatic parameters may reflect the interaction of several biological mechanisms involved in early placental development. Vitamin D is involved in the regulation of endothelial function, vascular remodeling, angiogenesis, and maternal immune adaptation, whereas activation of the coagulation system may contribute to local microvascular disturbances at the maternal–chorionic interface. Their combined assessment may therefore provide additional information for identifying women at increased risk of RCH following embryo transfer.

Objective. To evaluate vitamin D levels and selected hemostatic parameters in pregnant women following ART and to assess their potential value as predictors of retrochorionic hematoma.

Materials and Methods. A prospective comparative study included 75 pregnant women at early gestational ages following ART who were observed at the Bukhara City Maternity Complex from 2025 to July 2026. The study group consisted of 40 women with ultrasound-confirmed RCH, while 35 pregnant women without RCH constituted the control group. Clinical and reproductive history was assessed. Serial ultrasound examinations were performed to determine the presence, location, and size of the hematoma and to evaluate its dynamics. Laboratory assessment included vitamin D, D-dimer, activated partial thromboplastin time (aPTT), thrombin time (TT), prothrombin time/prothrombin index, fibrinogen, β -hCG, and progesterone.

Results. The mean age of the participants was 28.6 ± 5.06 years, with an age range of 19–40 years. Patients with RCH more frequently had a history of intrauterine procedures, previous early reproductive losses, a family history of thrombotic complications, and multigenic thrombophilia.

The analysis of hemostatic parameters demonstrated significant differences between the groups. The mean D-dimer concentration was 740 in women with RCH compared with 430 in the control group ($p < 0.05$). The mean aPTT was 27.1 s in the RCH group versus 28.4



Date: 15th September-2026

s in controls, while TT was 14.0 s versus 15.3 s, respectively ($p<0.05$). These findings indicate increased coagulation activity among women who developed RCH.

A difference was also observed in vitamin D status. Reduced vitamin D levels were detected in 26 women in the RCH group compared with 9 women in the control group. Vitamin D levels below 20 ng/mL were more frequently observed among patients with RCH. Considering the immunoregulatory, endothelial, angiogenic, and placentation-related functions of vitamin D, its deficiency may represent an additional factor associated with impaired early maternal–placental interaction.

The combination of vitamin D deficiency and changes in hemostatic parameters may reflect the interaction of several biological mechanisms involved in early placental development. Vitamin D is involved in the regulation of endothelial function, vascular remodeling, angiogenesis, and maternal immune adaptation, whereas activation of the coagulation system may contribute to local microvascular disturbances at the maternal–chorionic interface. Their combined assessment may therefore provide additional information for identifying women at increased risk of RCH following embryo transfer.

Serial ultrasound monitoring demonstrated different patterns of RCH progression. In some patients, the hematoma gradually decreased and subsequently regressed completely, whereas in others it persisted or increased in size. These observations indicate that the combination of laboratory parameters with dynamic ultrasound assessment may provide more clinically useful information than an isolated laboratory measurement.

The combination of vitamin D deficiency and changes in hemostatic parameters may reflect the interaction of several biological mechanisms involved in early placental development. Vitamin D is involved in the regulation of endothelial function, vascular remodeling, angiogenesis, and maternal immune adaptation, whereas activation of the coagulation system may contribute to local microvascular disturbances at the maternal–chorionic interface. Their combined assessment may therefore provide additional information for identifying women at increased risk of RCH following embryo transfer.

Discussion. The observed increase in D-dimer together with changes in aPTT and TT suggests that activation of the coagulation system may contribute to the development of RCH following ART. At the same time, the more frequent reduction of vitamin D in women with RCH highlights the potential role of this factor in the complex regulation of immune, endothelial, and placentation-related processes. The simultaneous assessment of vitamin D and hemostatic parameters may therefore represent a promising approach to early identification of women requiring intensified monitoring.

Conclusion. Reduced vitamin D levels and changes in selected hemostatic parameters were more frequently observed in pregnant women with RCH following ART. Increased D-dimer levels and shortened aPTT and TT, together with reduced vitamin D status, may serve as potential components of a multifactorial predictive model for RCH. Further studies with larger cohorts and assessment of additional molecular and immunological markers are required to determine their independent predictive value and develop personalized risk-stratification strategies for pregnancies following ART.

