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# Predictors of adverse outcomes in pregnant women with intrauterine hematoma

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**Abstract**

To investigate the relationship between clinical features evaluated at presentation and the presence of adverse maternal or perinatal outcomes in pregnant women with intrauterine hematoma (IUH). Pregnant women aged 18 years and over who were diagnosed with IUH and had a single live fetus of six to 12 weeks at that time were retrospectively reviewed for the period from January 1, 2019 to July 30, 2021. The patients were divided into two groups according to the presence or absence of adverse pregnancy outcomes after IUH. The clinical features of the patients were evaluated. The effect of clinical factors on adverse pregnancy outcomes was determined using the logistic regression analysis. We found adverse pregnancy outcomes in 31.6% (n=42) of 133 patients included in the study. According to the multiple logistic regression analysis, age≥35 years [odds ratio (OR): 2.62, 95% confidence interval (CI): 1.16-4.37, p<0.001], presence of vaginal bleeding (OR: 2.53, 95% CI: 1.34-3.89, p=0.001), hematoma size≥4 cm (OR: 2.38, 95% CI: 1.08-4.15, p=0.023) and presence of retroplacental hematoma (OR: 2.44, 95% CI: 1.68-3.56, p<0.001) were risk factors for adverse pregnancy outcomes. In the presence of IUH, pregnant women aged ≥35 years and those with vaginal bleeding, hematoma size of ≥4 cm, and retroplacental hematoma are at risk of adverse pregnancy outcomes. These factors can help identify pregnant women who require close monitoring.

**Keywords:** adverse outcome, intrauterine hematoma, pregnancy, predictors

## 1. Introduction

Intrauterine hematoma (IUH), which is usually detected on routine obstetric ultrasonography, is a common complication in early pregnancy (1). The incidence of IUH varies according to populations, ranging from 0.5% to 39.5% (2). Multiple hematomas may develop in the maternal-placental-fetal unit. IUHs are generally seen as subchorionic (between the chorion and uterine wall) and retroplacental (between the placenta and myometrium) (3). More than half of hematomas occur in the first trimester and typically disappear within the first three months after diagnosis.

In the literature, different results have been reported from studies investigating the effect of IUH on pregnancy outcomes. Some studies have shown that IUH may be associated with complications such as miscarriage, premature rupture of membranes, (PROM) preterm birth, small for gestational age (SGA), gestational hypertension, preeclampsia, neonatal asphyxia, and fetal death (4, 5). However, there are also studies suggesting that IUH is not associated with adverse pregnancy outcomes (6, 7). The aim of the current study was to define the population of pregnant women followed up with IUH in our clinic and determine the risk factors of IUH that can predict adverse maternal or perinatal outcomes in these patients.

## 2. Materials and methods

### 2.1. Patient selection

This retrospective study was carried out in the Gynecology and Obstetrics Clinic of our hospital between January 1, 2019 and July 30, 2021, and ethical approval was obtained from the local ethics committee (number: 2021/11-05). The study population consisted of pregnant women who had a single live fetus of six to 12 week according to the crown-rump length measurements performed on transvaginal ultrasound (TVUSG) imaging. Pregnant women (age ≥ 18 years) diagnosed with IUH by TVUSG and gave birth in our hospital were included in the study group. Patients whose records could not be reached, cases in which TVUSG did not show fetal heartbeat, and women with multiple pregnancies and fetal congenital malformations were excluded from the study.

### 2.2. Data collection and processing

Cases were identified using the electronic medical database of the obstetric department of the hospital. The patients' age, parity, gestational week when IUH was detected, gestational week at delivery, mode of delivery, pregnancy outcomes and complications, fetal birth weight, APGAR score, and obstetric ultrasonography results were recorded. The patients were divided into two groups according to the presence or absence of adverse maternal or perinatal outcomes after IUH. The

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maternal and perinatal outcomes of IUH were compared between the two groups.

### 2.3. Definitions

SGA was defined as birth weight below the 10th percentile at a given gestational age (2), preterm birth as delivery before 37 weeks of gestation, miscarriage as the termination of pregnancy before 24 weeks or when the fetus weighed less than 500 grams, and stillbirth as a baby being born without a heartbeat after the 24th gestational week (8). The patients' hematoma size was categorized as small (<4 cm) and large (>4 cm) (9).

**Table 1.** Demographic and obstetric characteristics of the study population

| Variables | Total (n = 133) | Presence of adverse outcomes | | P-value |
|---|---|---|---|---|
| | | Yes (n = 42) | No (n = 91) | |
| Maternal age (years) | 28.7±2.8 | 28.2±2.6 | 28.9±2.6 | 0.160 |
| Age > 35 years | 26 (19.5%) | 18 (42.9%) | 8 (8.8%) | <0.001 |
| Systolic blood pressure (mmHg) | 125±9 | 122±7 | 126±10 | 0.102 |
| Diastolic blood pressure (mmHg) | 87±3 | 88±4 | 87±3 | 0.101 |
| Heart rate (per minute) | 93±8 | 95±8 | 92±8 | 0.094 |
| Body mass index (kg/cm$^2$) | 25 (23-26) | 24 (23-25) | 25 (23-26) | 0.316 |
| **Parity** | | | | |
| Nulliparous | 22 (16.5%) | 4 (9.5%) | 18 (19.8%) | 0.436 |
| 1 | 62 (46.6%) | 23 (54.8%) | 39 (42.9%) | |
| 2 | 33 (24.8%) | 10 (23.8%) | 23 (25.3%) | |
| 3+ | 16 (12.0%) | 5 (11.9%) | 11 (12.1%) | |
| **Complaints** | | | | |
| Vaginal bleeding | 53 (51.1%) | 31 (73.8%) | 22 (24.2%) | <0.001 |
| Pelvic pain | 77 (57.9%) | 23 (54.8%) | 54 (59.3%) | 0.619 |
| **Presence of risk factors** | | | | |
| Previous miscarriages | 25 (18.8%) | 12 (28.6%) | 13 (14.3%) | 0.045 |
| Hypertension | 3 (2.3%) | 1 (2.3%) | 2 (2.2%) | 0.947 |
| Smoking | 5 (3.8%) | 2 (4.8%) | 3 (3.3%) | 0.680 |
| Diabetes (pregestational and gestational) | 8 (6.0%) | 3 (7.1%) | 5 (5.5%) | 0.710 |
| Artificial pregnancy | 1 (0.8%) | 1 (2.4%) | 0 | 0.140 |
| **Size of hematoma** | | | | |
| <4 cm | 73 (54.9%) | 14 (33.3%) | 59 (64.8%) | 0.001 |
| ≥4 cm | 60 (45.1%) | 28 (66.7%) | 32 (35.2%) | |
| **Localization of hematoma** | | | | |
| Anterior | 81 (60.9%) | 32 (76.2%) | 49 (53.8%) | 0.014 |
| Posterior | 52 (39.1%) | 10 (23.8%) | 42 (46.2%) | |
| **Position of hematoma** | | | | |
| Retroplacental | 42 (31.6%) | 28 (66.7%) | 14 (15.4%) | <0.001 |
| Subchorionic | 91 (68.4%) | 14 (33.3%) | 77 (84.6%) | |
| **Gestational age at first visit** | | | | |
| 6 0/7-6 6/7 | 13 (9.8%) | 5 (11.9%) | 8 (8.8%) | 0.985 |
| 7 0/7-7 6/7 | 27 (20.3%) | 9 (21.4%) | 18 (19.8%) | |
| 8 0/7-8 6/7 | 42 (31.6%) | 13 (31.0%) | 29 (31.9%) | |
| 9 0/7-9 6/7 | 16 (12.0%) | 5 (11.9%) | 11 (12.1%) | |
| 10 0/7–10 6/7 | 19 (14.3%) | 6 (14.3%) | 13 (14.3%) | |
| 11 0/7–11 6/7 | 16 (12.0%) | 4 (9.5%) | 12 (13.2%) | |
| **Mode of delivery** | | | | |
| C/S | 37 (27.8%) | 13 (31.0%) | 24 (26.4%) | 0.584 |
| NSD | 96 (72.2%) | 29 (69.0%) | 67 (73.6%) | |
| Gestational age at delivery | 38.0 (36.7-39.0) | 38.2 (37.7-39.5) | 38.0 (36.0-38.9) | 0.117 |
| Birth weight (g) | 3433±810 | 3171±786 | 3554±796 | <0.001 |
| Admission to NICU | 3 (2.3%) | 2 (4.8%) | 1 (1.1%) | 0.186 |

Data are presented as mean ± standard deviation, median (25%–75% quartiles) or n (%), C/S: Cesarean delivery, NSD: Normal spontaneous delivery, NICU: Neonatal intensive care unit

### 2.4. Outcome measures

The primary outcome was the presence of adverse maternal or perinatal outcomes after IUH development during pregnancy. Adverse maternal or perinatal outcomes were defined as spontaneous abortion, PROM, placental abruption, delivery before 37 weeks of gestation, SGA, fetal distress, low fifth-minute APGAR score, fetal or neonatal death, and maternal death. The secondary outcome was the relationship between adverse pregnancy outcomes and demographic data, clinical features, and obstetric ultrasonography results.

### 2.5. Statistical methods

All statistical data were analyzed using SPSS for Windows, version 22.0 (SPSS Inc.; Chicago, IL, USA). First, the descriptive statistics [number (n), frequencies (%), mean and standard deviation] of the variables were calculated. Pearson's chi-square or Fisher's test was used to compare categorical data. The normality of data distribution was tested with the Kolmogorov-Smirnov test. Student's t-test was used to compare normally distributed data, and the Mann-Whitney U test was used to compare non-normally distributed data. Univariate and multivariate logistic regression analyses were performed to determine the relationship between the presence of adverse maternal or perinatal outcomes after IUH development during pregnancy and clinical risk factors. Variables with a p value of <0.05 in the univariate logistic regression analysis were included in the multivariate logistic regression analysis. The statistical significance limit was taken as $p < 0.05$.

## 3. Results

The study included 133 patients who met the criteria. The rate of adverse pregnancy outcomes after IUH was 31.6% (42/133). The mean (±standard deviation) maternal age was 28.2 ± 2.6 years in the group with adverse pregnancy outcomes and 28.9 ± 2.6 years in the group without adverse pregnancy outcomes. In both groups, IUH was most detected at gestational weeks 8 0/7–8 6/7. The demographic and clinical characteristics of the cases are shown in Table 1. Vaginal bleeding was found at a higher rate (73.8%) in the group with adverse pregnancy outcomes. The most common adverse pregnancy outcome was abortion at 26.2% (n = 11). Table 2 presents the distribution of adverse pregnancy outcomes due to IUH.

**Table 2.** Type and rate of adverse outcomes following intrauterine hematoma in the study population

| Adverse pregnancy outcomes | Number of cases* n (%) |
|---|---|
| Spontaneous abortion | 12 (28.6%) |
| Placental abruption | 4 (9.5%) |
| Delivery <37 weeks | 9 (21.4%) |
| Small for gestational age (<10$^{th}$ percentile) | 7 (16.7%) |
| Premature rupture of membrane | 4 (9.5%) |
| Apgar score < 7 at 5 min | 5 (11.9%) |
| Fetal distress | 7 (16.7%) |
| Fetal or neonatal death | 1 (2.4%) |
| Maternal death | 0 |

* Some women had more than one adverse outcome; therefore, the total of all adverse outcomes exceeded the number of women with adverse outcomes (n = 42).

The effect of clinical factors on adverse pregnancy outcomes was determined using the logistic regression analysis and are listed in Table 3. In the regression analysis, age ≥ 35 years [odds ratio (OR): 2.62, 95% confidence interval (CI): 1.16-4.37, p < 0.001], presence of vaginal bleeding (OR: 2.53, 95% CI: 1.34-3.89, p = 0.001), hematoma size ≥ 4 cm (OR: 2.38, 95% CI: 1.08-4.15, p = 0.023), retroplacental hematoma (OR: 2.44, 95% CI: 1.68-3.56, p < 0.001) were determined to increase the likelihood of developing adverse pregnancy outcomes among the women with IUH. Table 4 shows the distribution of the number of risk factors according to the study groups.

**Table 3.** Univariate and multivariate analyses of predictive factors for adverse pregnancy outcomes

| Variables | Univariate logistic regression | | | Multivariate logistic regression | | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | P value | OR | 95% CI | P value |
| Age ≥ 35 years | 3.29 | 1.48-8.64 | <0.001 | 2.62 | 1.16-4.37 | <0.001 |
| Vaginal bleeding | 2.94 | 1.57-5.46 | <0.001 | 2.53 | 1.34-3.89 | 0.001 |
| Previous miscarriages | 1.14 | 1.03–2.57 | 0.045 | 1.04 | 0.95-3.76 | 0.214 |
| Size of hematoma ≥ 4 cm | 2.71 | 1.21-4.85 | 0.001 | 2.38 | 1.08-4.15 | 0.023 |
| Anterior localization | 2.12 | 1.64-4.76 | 0.014 | 1.65 | 0.85–5.94 | 0.117 |
| Retroplacental hematoma | 2.87 | 1.54-3.88 | <0.001 | 2.44 | 1.68-3.56 | <0.001 |

OR: odds ratio; CI: confidence interval

**Table 4.** Number of risk factors present in patients

| Number of risk factors | Total (n=133) | Presence of adverse outcomes | |
|---|---|---|---|
| | | Yes (n = 42) | No (n = 91) |
| No risk factor | 38 (100%) | 2 (5.3%) | 36 (94.7%) |
| One risk factor | 49 (100%) | 6 (12.2%) | 43 (87.8%) |
| Two risk factors | 20 (100%) | 12 (60.0%) | 8 (40.0%) |
| Three risk factors | 16 (100%) | 13 (81.3%) | 3 (18.8%) |
| Four risk factors | 10 (100%) | 9 (90.0%) | 1 (10.0%) |

## 4. Discussion

IUHs are common findings in routine obstetric ultrasonography, especially in the first trimester of pregnancy. It has been shown that there may be a significant association between IUH and adverse pregnancy outcomes (5, 8). Although IUHs often spontaneously disappear without causing any problems, the main challenge for clinicians is to identify patients at high risk of adverse pregnancy outcomes. Therefore, the identification of reliable positive or negative predictors of

adverse pregnancy outcomes in patients who have developed IUH is necessary to prevent possible complications. In this study, we found adverse pregnancy outcomes in 31.6% (n = 42) of the pregnant women that developed IUH. We observed that in the presence of IUH, maternal age, hematoma size, hematoma position, and vaginal bleeding were associated with adverse pregnancy outcomes in the later weeks of gestation.

The mechanism of the relationship between IUH and adverse perinatal outcomes had not yet been clearly elucidated (2). The development of placental vascular structures starts from the fifth gestational week. A large hematoma formed in the early weeks may disrupt the invasion of the extravillous trophoblast, leading to the loss of placental function by affecting the physiology of spiral arteries in later weeks. Studies evaluating the size of the hematoma have reported that the presence of large hematoma is associated with adverse pregnancy outcomes (10-12). It has been reported that the probability of abortion was higher in large hematomas (13). It has also been shown that maternal age, presence of vaginal bleeding and gestational week at which hematoma is observed are associated with adverse pregnancy outcomes in early pregnancy (14). However, discussions continue concerning the prognostic value of hematoma size, gestational week at which bleeding is observed, and presence of concurrent vaginal bleeding (15). The literature also contains studies reporting that adverse pregnancy outcomes, such as abortion, preterm labor, and PROM have no significant relationship with hematoma size, gestational week, and bleeding time (9, 16). In the current study, we compared the baseline clinical data of patients with and without adverse pregnancy outcomes and determined that age, presence of vaginal bleeding, and hematoma position and size might be good predictive parameters for adverse pregnancy outcomes. The presence of these risk factors can help identify pregnant women who require close monitoring.

Some studies have shown that the presence of IUH in pregnancies is associated with increased adverse pregnancy outcomes, such as preeclampsia, miscarriage, preterm delivery, intrauterine growth restriction, abruption, SGA, cesarean section, and low one-minute and five-minute APGAR scores (13, 14). The early perfusion of the intervillous space, impaired trophoblast invasion, impaired angiogenesis, and weakness of the retroplacental space may be possible mechanisms for adverse perinatal outcomes (5, 17). The main effect of IUH on early pregnancy is pregnancy loss (18). On the other hand, there are also researchers suggesting that there is no significant relationship between IUH and adverse pregnancy outcomes (18, 19). The location of IUH within the placenta or the uterine wall is another prognostic factor associated with obstetric complications. Al-Memar et al. showed that the size of IUH did not affect pregnancy outcomes, but the presence of retroplacental IUH was associated with an increased risk of antenatal complications (8). Similarly, Nagy et al. reported that retroplacental hematomas were significantly associated with an increased risk of adverse maternal and neonatal complications (10). Our results confirm that the presence of retroplacental hematoma is associated with adverse pregnancy outcomes.

This study has certain limitations. First concerns the limited number of patients who met the inclusion criteria. The sample comprised a relatively small study population since we only included pregnant women had a live fetus of six to 12 weeks of age at the time of IUH development. Second, the study was conducted in a single center. Third, the retrospective nature of the study limited data to those routinely collected. Finally, sonographic evaluations were undertaken by different physicians, which may have cause variability in measurements.

We determined that 31.6% of the pregnant women who developed IUH had adverse pregnancy outcomes. In most cases, IUH spontaneously disappears without causing any problems, but obstetric complications related to the mother and fetus are not uncommon in these patients. In the presence of IUH, pregnancy age ≥ 35 years, vaginal bleeding, hematoma size ≥ 4 cm, and retroplacental hematoma constitute a higher risk for adverse pregnancy outcomes. The presence of these risk factors can help identify pregnant women who require close monitoring

**Conflict of interest**

All authors report no conflict of interest.

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