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# The effects of subchorionic hematomas on the future of pregnancies with threatened miscarriage

Zeynep Seyhanli[a,*], Gulsan Karabay[a], Mevlut Bucak[a], Gizem Aktemur[a], Merve Yalcinkaya[b], Serap Topkara Sucu[b], Busra Demir Cendek[b], Ali Turhan Caglar[a]

[a] *Ankara Etlik City Hospital, Department of Perinatology, Ankara, Türkiye*
[b] *Ankara Etlik City Hospital, Department of Obstetrics and Gynecology, Ankara, Türkiye*

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## Abstract

**Aim:** The clinical significance of first trimester subchorionic hematoma, which is worrisome to pregnant women in terms of the outcome of the pregnancy, still remains unclear. The objective of this study is to examine the association between subchorionic hematomas in patients with threatened miscarriage and adverse pregnancy outcomes.

**Materials and Methods:** The retrospective cohort study was conducted in a tertiary center from September 2022 to January 2024. 200 patients who were hospitalized with threatened miscarriage during the sixth to fourteenth week of a singleton pregnancy were included. The individuals that satisfy the established criteria for the study were categorized into two groups with threatened miscarriage based on the ultrasound examination: the study group, which included patients with subchorionic hematoma and the control group, which included patients without subchorionic hematoma. Demographic information, maternal and neonatal outcomes were compared for both groups.

**Results:** Maternal age, BMI, parity, gestational age at diagnosis, history of abortus were similar for both groups ($p>0.05$). Miscarriage rates were higher in the group with SCH than without SCH (28% vs. 25%, $p= 0.631$), but no statistical significance was observed. The frequencies of intrauterine death, gestational age at delivery, preterm delivery, mode of delivery, hypertensive disorders of pregnancy, placenta previa-placenta accreta spectrum, gestational diabetes mellitus, intrauterine growth restriction were not statistically significant ($p>0.05$) between groups. The hematoma sizes did not show any statistically significant difference between those whose pregnancies led to miscarriage and those whose pregnancies did not ($29.6\pm14.30$ mm vs. $27.1\pm14.58$ mm, respectively; $p = 0.367$). The subchorionic hematoma diameters did not show any correlation with the gestational age at delivery, birth weight, APGAR scores at 1st and 5th minute.

**Conclusion:** Our study suggests that detection of threatened miscarriage with subchorionic hematoma did not result in an elevation in miscarriage rates, maternal and neonatal complications.



## Introduction

Threatened miscarriage is a highly prevalent pregnancy complications. The clinical diagnosis is established by observing the presence of bloody secretions from the vagina or hemorrhage through an enclosed cervical os throughout the first half of pregnancy [1]. A threatened miscarriage affects around one in every five pregnant women during the first trimester [2]. Research studies have linked this particular condition to an elevated likelihood of developing hypertensive disorders during pregnancy, experiencing preterm delivery, preterm premature rupture of membranes (PPROM), antepartum hemorrhage, intrauterine growth restriction, and requiring Caesarean section [1,3].

A subchorionic hematoma (SCH) is the result of the chorionic membrane and the decidua being separated, leading to the accumulation of blood and the formation of a hematoma [4]. The incidence varies considerably, from 0.46 percent to 39.5 percent [5]. In ultrasonographic evaluation, SCH may appear as an anechoic or hypoechoic crescent-shaped region situated across the the uterine cavity and the gestational sac [6]. Although the incidence of SCH is common, its etiology is not yet clear and its clinical significance is still controversial. Many studies have been reported in the literature on the pregnancy outcomes

*Corresponding author:
*Email address:* drzeynepseyhanli@gmail.com (Zeynep Seyhanli)

of the presence of SCH, but conflicting results have been reported regarding whether SCH elevates the likelihood of pregnancy complications including spontaneous miscarriage, preterm delivery, preeclampsia and, PPROM [7–11]. In addition, some studies have examined whether the size and location of the hematoma, as well as the existence of SCH, affect poor pregnancy outcomes [1,12]. An elevated risk of miscarriage of the pregnancy is linked to subchorionic hematoma, specifically when it comprises 25 percent or more of the gestational sac volume [13]. Since there are conflicting data in the literature concerning the perinatal outcomes of pregnancies with subchorionic hemorrhage, this causes difficulties for clinicians in counseling such patients.

The study aimed to determine the correlation between subchorionic hematomas and adverse pregnancy outcomes, under the hypothesis that the presence of a subchorionic hematoma during the first trimester could be linked to a negative perinatal outcome.

## Materials and Methods

A retrospective cohort study was undertaken between September 2022 and August 2024 at Ankara Etlik City Hospital, a tertiary referral center in Turkey. The Institutional Ethical Committee of Ankara Etlik City Hospital granted approval for the study protocol (No: AEŞH-BADEK-2024-270). The research was carried out in adherence to the Helsinki criteria.

All participant demographic information, laboratory parameters, perinatal outcomes, and ultrasonography measurements were retrospectively extracted from hospital's electronic records. Only intrauterine singleton pregnancies between 6 and 14 weeks gestation with a diagnosis of threatened miscarriage were included in the study. Exclusion criteria encompassed pregnant women with intrauterine infections, fetal anomalies, recurrent pregnancy loss, systemic disorders, multiple pregnancies, any bleeding disorders, in vitro fertilization and smoking. In our retrospectively designed study, the number of cases was determined by taking all patients who met the study criteria among the patients who were admitted to the perinatology clinic and received treatment due to threatened miscarriage between September 2022 and August 2024. The study excluded 11 patients due to multiple pregnancy, 25 patients due to concomitant comorbidities, 17 patients due to smoking, and 9 patients due to recurrent pregnancy loss. The study comprised 200 pregnancies who satisfied the necessary criteria.The patients were subsequently divided into two groups based on the ultrasonographic evaluation of subchorionic hematoma: the presence (n:100 in the study group) or absence (n:100 in the control group). Gestational age was ascertained through one of two methods: observation of the first day of the last menstrual period; performance of a first trimester ultrasound scan in accordance with the guidelines [14]. Upon admission, all patients took progesterone medication either orally or vaginally. This treatment was continued following their release, provided that no miscarriage occurred.

Demographics including maternal age, body mass index (BMI), gravidity, parity, week of gestation and history of miscarriage, adverse pregnancy outcomes, including miscarriage, placenta previa, hypertensive disorders of pregnancy (gestational hypertension, preeclampsia), intrauterine growth restriction (IUGR), intrauterine death, gestational diabetes mellitus, preterm delivery, placenta acreata spectrum disorders, mode and gestational age at delivery, fetal distress, birth weight, Low birth weight (<2500 gram), APGAR score at 1 and 5 minutes, respiratory distress syndrome, phototherapy for neonates, neonatal intensive care unit admission (NICU) were collected from medical records of all participants. Preterm delivery is defined as the occurrence of delivery at a gestational age that is below 37 weeks. The subchorionic hematoma diameter in study groups was determined using the largest value derived from the two-dimensional measurement in the hematoma region during the ultrasonographic evaluation performed after the physical examination on all patients. All ultrasound examinations were conducted by attending physicians specializing in maternal–fetal medicine using a Voluson S10 Expert sonography machine (GE Healthcare, Milwaukee, WI).

### *Statistical analysis*

The RStudio integrated development environment for statistical computation was utilized to conduct all statistics analysis. To ascertain whether the variables followed a normal distribution, both visual (histogram, probability plots) and analytic techniques (Kolmogrov-Simirnov/Shapiro-Wilk's test) methodologies were applied. Utilizing the Levene test, the homogeneity of the variance was evaluated. Means and standard deviations were utilized to represent descriptive analyses for variables that adhered to a normal distribution. The independent samples t-test was employed to compare the aforementioned parameters. Descriptive analyses were employed to depict the non-normally distributed numerical data by utilizing medians and quartiles (Q1-Q3). In order to compare these parameters across groups, the Mann-Whitney U tests were applied. Descriptive analyses were conducted on the categorical variables by employing frequency and percentage measures. The Chi-square test or Fisher's exact test was used for categorical variables. In situations where the latter was not suitable due to low anticipated cell counts, the former was employed instead. During the investigation of the associations between variables that did not follow a normal distribution, the Spearman test was employed to compute the correlation coefficients and determine their significance. A p-value below 0.05 was deemed to indicate a result that was statistically significant.

## Results

The current retrospective study comprised a cohort of 200 pregnant patients who had been issued a diagnosis of threatened miscarriage. The study group consisted of 100 patients who had SCH as detected by ultrasonography; the control group comprised 100 patients who did not have SCH. The attributes of the two groups are exhaustively outlined in Table 1. A comparison of 100 cases from the TM with SCH (study groups) and TM without

**Table 1.** Demographic and clinical characteristics of the pregnant woman included in the study.

| | TM with SCH (Study Group) | TM without SCH (Control Group) | p |
|---|---|---|---|
| Maternal age (year) | 28 (25-32) | 28 (25-33) | 0.584[a] |
| BMI (kg/m$^2$) | 27.8 (24.8-31.2) | 27.1 (23.9-31.1) | 0.368[b] |
| Parity n (%) | | | |
| Nulliparous | 47 (47) | 53 (53) | 0.322[c] |
| Multiparous | 53 (53) | 47 (47) | |
| Gestational age at diagnosis (week) | 8.7±2.43 | 9.2±2.31 | 0.088[b] |
| History of miscarriage median (min-max) | 0 (0-3) | 0 (0-4) | 0.650[a] |

TM, Threatened Miscarriage; SCH, Subchorionic Hematoma; BMI, Body mass index. Data are expressed as mean±SD, median (minimum-maximum) or number (percentage) where appropriate. A p value of <0.05 indicates a significant difference. Statistically significant p-values are in bold. P Value: significant if < 0.05. [a]Mann-Whitney U test; [b]Independent sample t test; [c]Chi-square test.

**Table 2.** Maternal and neonatal outcomes between study and control groups.

| | TM with SCH (Study Group, n: 200) | TM without SCH (Control Group, n: 200) | p |
|---|---|---|---|
| Miscarriage rate, n (%) | 28 (28) | 25 (25) | *0.631*[b] |
| Intrauterine death, n (%) | 2 (2) | 0 (0) | *0.497*[b] |
| Preterm delivery, n (%)* | 21 (30) | 15 (20) | *0.230*[b] |
| Term delivery, n (%)* | 49 (70) | 60 (80) | *0.230*[b] |
| Gestational age at delivery (week) | 38 (36-39) | 38 (37-39) | 0.500[a] |
| Mode of Delivery | 27 (37.5) | 26 (34.7) | 0.708[b] |
| SVD | 26 (36.1) | 32 (42.7) | |
| CS (first) | 19 (26.4) | 17 (22.7) | |
| CS (more than one) | | | |
| Hypertensive disorders of pregnancy | 3 (3) | 3 (3) | N.A. |
| Gestational diabetes mellitus | 2 (2) | 5 (5) | 0.455[b] |
| Placenta Previa- Placenta accreta spectrum | 0(0) | 1 (1) | N.A. |
| Intrauterine growth restriction** | 7 (9.7) | 5 (6.7) | 0.708[b] |

TM, Threatened Miscarriage; SCH, Subchorionic Hematoma. DM, Diabetes Mellitus; SVD, Spontaneous Vaginal Delivery; CS, Cesarean Section. Data are expressed as mean±SD, median and quartiles (Q1-Q3), or number (percentage) where appropriate. A p value of <0.05 indicates a significant difference. *calculated as a percentage of live births. **Calculated as a percentage of live births and intrauterine deaths. [a]Mann-Whitney U test; [b]Chi-square test.

**Table 3.** Comparison of subchorionic hematoma diameter between patients with or without miscarriage.

| | Patients with miscarriage n:28 | Patients without miscarriage n:72 | p |
|---|---|---|---|
| Subchorionic hematoma diameters (mm) | 26 (13-80) | 25 (5-80) | 0.367[a] |
| median (min-max) | 29.6±14.30 | 27.1±14.58 | |
| mean±SD | | | |

P-values < 0.05 are statistically significant. [a]Mann-Whitney U test.

SCH (control groups) did not yield any statistically significant differences in the following maternal and perinatal characteristics: maternal age, BMI, parity, gestational age at diagnosis, or history of abortus (p>0.05) (Table 1). In the evaluation of pregnancy outcomes, the frequencies of miscarriage rate, intrauterine death, preterm delivery, term delivery, gestational age at delivery, mode of delivery, hypertensive disorders of pregnancy, gestational diabetes mellitus, placenta previa- placenta accreta spectrum, intrauterine growth restriction were not statistically significant (p>0.05) (Table 2). The SCH group had a 28% incidence of miscarriage cases, which was not statistically significant when compared to the control group's 25%. The occurrence of preterm delivery was 30% among pregnant women in the group with SCH, whereas in the other group, it was 20%. However, there was no statistically significant disparity between the two groups. Only two patients in the SCH group showed intrauterine death, whereas only one patient in the control group displayed placenta acreta spectrum disorder. The incidence of IUGR was 9.7% in

**Table 4.** Neonatal outcomes in between study and control groups (n=200).

| | TM with SCH (Study Group) | TM without SCH (Control Group) | p |
|---|---|---|---|
| Birth weight (gram) | 2905 (2610-3378) | 3000 (2600-3380) | 0.524[a] |
| Low birth weight (<2500 gram) * (n,%) | 12 (17.1) | 14 (18.7) | 0.982[b] |
| Gestational age at delivery (week) | 38 (36-39) | 38 (37-39) | 0.500[a] |
| Female Gender* | 38 (52.8) | 34 (45.3) | 0.367[b] |
| APGAR score at 1st minute* | 9 (9-9) | 9 (8-9) | 0.139[a] |
| APGAR score at 5th minute* | 10 (10-10) | 10 (9-10) | 0.054[a] |
| Respiratory distress syndrome* | 8 (11.1) | 7 (9.3) | 0.934[b] |
| Phototherapy for neonates* | 3 (4.3) | 7 (9.3) | 0.329[b] |
| NICU Admission * | 10 (14.3) | 21 (28) | 0.070[b] |

TM, Threatened Miscarriage; SCH, Subchorionic Hematoma; NICU, Neonatal Intensive Care Unit. Data are expressed as median and quartiles (Q1-Q3), or number (percentage) where appropriate. A p value of <0.05 indicates a significant difference. *calculated as a percentage of live births. [a]Mann-Whitney U test; [b]Chi-square test.

**Table 5.** Spearman's correlation between Subchorionic hematoma (SCH) and maternal-perinatal characteristics.

| | r | p |
|---|---|---|
| Gestational age at delivery | 0.100 | 0.405 |
| Birth weight | 0.092 | 0.447 |
| APGAR score at 1st minute | 0.038 | 0.756 |
| APGAR score at 5th minute | 0.072 | 0.550 |

the SCH group and 6.7% in the control group. Nevertheless, the lack of statistical significance can be attributed to the limited sample sizes in each individual cell. The occurrence rate of cesarean section was similar in both groups. Specifically, 62.5% of patients with SCH group underwent cesarean section, whereas the non-SCH group had a frequency of 65.4% (Table 2). Comparison of hematoma diameters in pregnant women with SCH, those whose pregnancies ended in miscarriage and those whose pregnancies did not. No statistically significant difference was detected between the groups (29.6±14.30 mm vs. 27.1±14.58 mm, respectively; $p = 0.367$) (Table 3). Table 4 displays the neonatal outcomes of the both groups. Birth weights of newborns were similar in both groups. The presence of low birth weight was 17.1% and 18.7% in those with and without SCH, respectively. No difference was observed in the 1st and 5th minute APGAR scores of the newborns in groups. However, 14.3% of newborns in the SCH group required admission to the NICU, while this rate was 28% in the control group, but there was no statistically significant difference. Not statistically significant ($p > 0.05$) were the frequencies of respiratory distress syndrome, neonatal phototherapy. When all pregnancies with SCH were evaluated, the subchorionic hematoma diameters did not show any correlation with the gestational age at delivery, birth weight, APGAR score at 1st and 5th minute (Table 5).

## Discussion

According to the findings of our research, the identification of SCH via ultrasonography does not appear to be associated with an elevated risk of miscarriage in patients who have been diagnosed with threatened miscarriage. Similarly, no increase in complications such as preterm delivery, hypertensive disorders of pregnancy, gestational diabetes mellitus, placenta previa- placenta accreta spectrum and intrauterine growth restriction was detected. Additionally, we did not detect a significant relationship between the magnitude of the hematoma and the occurrence of miscarriage.

The detection of hematoma during ultrasonographic examinations during the first trimester of pregnancy is an aberrant finding that warrants careful consideration. In recent times, technological advancements have contributed to a daily increase in the rate at which SCH is detected via ultrasonography. In regards to the impact of these SCHs identified during the first trimester on pregnancy outcomes, the findings are contradictory. The literature has extensively examined whether the incidence of miscarriage rises in the presence of SCH. Some studies investigating the relationship between SCH and miscarriage reported that the rate of miscarriage increased with SCH [4,8,15,16], while some studies reported that they did not increase the rate of miscarriage [17,18]. According to our study, the miscarriage rate among pregnant women followed up with a diagnosis of threatened miscarriage was found to be 26.5%, and although it was slightly higher in the group with SCH, no statistical difference was found between pregnancies with and without SCH. A history of abortus, maternal age, and gestational age are recognized as risk factors for miscarriage [19,20]. The present study found that gestational age, maternal age, and history of abortion were comparable between the two groups; this similarity reduces the likelihood that these variables were causal in the observed abortion cases. Whether there is a relationship between hematoma size and adverse perinatal outcomes, as well as the presence of SCH, has also been a subject of research. Similar to the studies [10,16], there was no correlation between hematoma size and adverse pregnancy outcomes in our study. However, the study conducted by Gu et al. found a significant correlation between the volume of SCH and miscarriage rates [21].

There are studies stating that one of the underlying mechanisms of SCH may be defective placentation [1]. Therefore, we examined the relationship between SCH and conditions such as preeclampsia, gestational diabetes melli-

tus, placenta previa-placenta acratea spectrum disorders, intrauterin growth restriction that may be related to impaired placentation, but we did not detect a relationship between these diseases and SCH. In direct contrast to our study, some studies found a relationship between SCH and preeclampsia, small for gestational age (SGA) [8,10]. Another study demonstrated a correlation between SCH and SGA, although no significant connection was found with preeclampsia [22]. Also in the recent study conducted by Araujo et al., similar to our study, no relationship was shown between subchorionic hematoma and hypertension during pregnancy [23]. It remains unclear whether these pregnancies are prone to result in preterm labor in the presence of SCH. There is no consensus on this issue between SCH and preterm birth in the literature. While some studies state that there is no difference between groups with and without SCH [14], some studies have found that, on the contrary, the rate of preterm birth increases in the presence of SCH [11]. In our study, no statistical increase in the frequency of preterm birth was detected between the groups.

The retrospective design and relatively small sample size which yielded findings that lacked statistical significance, despite their clinical significance, were the limitations of our study. Another limitation was that hematoma sizes were measured two-dimensionally in patients hospitalized with threatened miscarriage and the actual full volume of the hematoma could not be calculated and the location of the hematoma could not be identified. Also, we could not obtain information and analyze how long it takes for SCHs to resolve or whether they are permanent. Our research makes a valuable contribution to the current scholarly literature by demonstrating that the presence of SCH does not result in an increase in the rate of miscarriage or maternal and neonatal complications in cases with threatened miscarriage. Another strength of our study is that it provides information about the results of many maternal and neonatal parameters in the presence of SCH in cases of threatened miscarriage.

## Conclusion

Threatened miscarriage is a common pregnancy difficulty that elicits maternal worry pertaining to the consequences of the pregnancy. Information on the outcomes of ongoing pregnancies following the presence of SCH is important for planning prenatal care and counseling these pregnant women regarding pregnancy outcomes. According to the findings of our study, there was no statistically significant change observed in the incidence of miscarriage among pregnant women who were diagnosed with threatening miscarriage, maternal and newborn outcomes regardless of whether they had SCH or not. To determine the prognosis of pregnancies afflicted with SCH, the execution of extensive prospective randomized trials is imperative.

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*Ethical approval*

Ethics committee approval was received from the Ankara Etlik City Hospital Institutional Ethics Committee (No: AEŞH-BADEK-2024-270).

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