

CLINICAL ARTICLE

Obstetrics

Outcomes of subchorionic hematoma-affected pregnancies in the infertile population

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Abstract

Objective: To determine the implications of an incidentally noted subchorionic hematoma on pregnancy outcomes in the infertile population.

Methods: Retrospective cohort study at a tertiary care, university-based facility. All patients with intrauterine pregnancy on initial obstetric ultrasound presenting to an infertility clinic between January 2015 and March 2018 ($n = 1210$), regardless of treatment cycle, were included. Nonviable pregnancies were excluded. The main outcome measured was association between subchorionic hematoma and first trimester miscarriage.

Results: The prevalence of subchorionic hematoma was 12.5% ($n = 151$) and did not differ by type of fertility treatment. There was no association between subchorionic hematoma and first trimester miscarriage; however, among patients with subchorionic hematoma, those who reported both bleeding and cramping had an increased probability of miscarriage compared to those without symptoms (0.62 vs. 0.12, $P < 0.001$). The live birth rate in this sample was 81.3% and there were no statistically significant differences in pregnancy outcomes between those with and without subchorionic hematoma.

Conclusion: Among an infertile population, there was no increased risk of miscarriage when subchorionic hematoma was seen on early ultrasound; however, when patients noted both vaginal bleeding and cramping, their probability of miscarriage was significantly increased.

KEYWORDS

infertility, live birth rate, miscarriage, subchorionic hematoma

1 | INTRODUCTION

A subchorionic hematoma (SCH) is a common finding on obstetric ultrasounds, and the prevalence is often higher among the infertile population—affecting between 18%–40% of those pregnancies in

recent studies.^{1–3} SCHs are collections of fluid seen on ultrasound between the chorion and the uterine wall, representing a collection of blood.⁴ SCH may be noted incidentally at the time of initial obstetric ultrasound or during subsequent ultrasounds, such as when women present for bleeding in the first trimester. Given the

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tendency for early pregnancy ultrasounds in women undergoing fertility treatment, we hypothesized that the detection of SCH may be increased in the infertile patient population without any impact on pregnancy outcomes.

The impact of SCH on early pregnancies has been disputed; prior studies in the fertile population have shown increased rates of pregnancy loss,⁴⁻⁶ while recent studies demonstrate no increased risk.^{1,7} Few studies have evaluated SCH among the infertile population, and these have focused primarily on pregnancies conceived by in vitro fertilization (IVF). Additionally, the majority of these studies have focused on identifying risk factors for SCH and not on evaluating the impact of SCH on pregnancy outcomes such as first trimester loss or live birth rate. Anderson et al. is the only study in the infertile population that included patients' symptoms in their analysis, but it did not analyze how symptoms impacted the rate of miscarriage.³ As such, SCH is of unknown significance when considering pregnancy outcomes among the infertile population.

Given the high reported incidence of SCH among the infertile population, understanding the influence of SCH in these pregnancies is of paramount importance for clinical management, including counseling patients on expectations surrounding pregnancy outcomes. Thus, the objectives of this study were (1) to determine risk factors for development of SCH in the infertile population, (2) to determine whether SCH was associated with first trimester pregnancy loss, and (3) to evaluate pregnancy outcomes of SCH-affected pregnancies.

2 | MATERIALS AND METHODS

This was a retrospective cohort study of all patients who presented to a single fertility clinic between January 2015 and March 2018 for an obstetrical ultrasound between 5 and 9 weeks gestation. Current Procedural Terminology codes (76817, 76815, 76816, 76802, 76801) were used to identify all obstetric scans performed. While ultrasound was routinely performed between 6 and 7 weeks estimated gestational age, it was performed as early as 5 weeks for those with ectopic risk factors or symptoms, and as late as 9 weeks for patients who conceived spontaneously. All images were obtained from a GE Voluson S8 ultrasound system using a combination of C1-5-RS transabdominal probes (2-5 MHz) and IC9-RS transvaginal probes (2.9-9.7 MHz). Pregnancy episodes, defined as the time period from confirmation of an intrauterine pregnancy with a fetal heartbeat until the conclusion of that pregnancy, were included for analysis. Cases were excluded if there was a pregnancy of unknown location, an ectopic pregnancy, or a pregnancy failure, defined according to the guidelines endorsed by the American College of Obstetricians and Gynecologists.^{8,9} For patients who had more than one pregnancy during this time period, subsequent pregnancies were included and considered separate pregnancy episodes in the data analysis if they met the inclusion criteria detailed above.

SCH was defined as a fluid collection visualized on ultrasound between the gestational sac and the uterine wall. The SCH

was recorded as the average size and largest diameter by trained sonographers and all images were reviewed the same day by a Reproductive Endocrinologist. SCH were stratified into small, medium, and large sizes post hoc using the ratio of mean SCH diameter to mean gestational sac diameter with a small SCH comprising <5% of the gestational sac, a medium SCH comprising 5%-25% of the gestational sac, and a large SCH comprising >25% of the gestational sac.⁴ During the ultrasound appointment, patients were routinely asked about the presence of bleeding or cramping symptoms by the sonographer and documented in the ultrasound report.

Chart review was performed by three reviewers with random cross-checks to ensure inter-reviewer consistency. Data on patient demographics, fertility treatments, presence or absence of SCH, symptoms of vaginal bleeding or cramping in the first trimester, and pregnancy outcomes were extracted from the medical record. All fertility treatments were included: natural cycles, oral cycles (clomiphene or letrozole), injectable gonadotropin cycles, hybrid cycles, fresh IVF cycles, frozen IVF cycles, and donor egg cycles. The primary outcome for this study was miscarriage, defined as appropriately decreasing beta-hCG following a previously documented viable intrauterine pregnancy, a pregnancy ≥ 7 mm without a cardiac activity less than 10 weeks (embryonic demise), or a fetal demise or spontaneous loss of a pregnancy between 10-20 weeks.^{9,10} Secondary outcomes included live birth rate and obstetrical complications.

All variables were analyzed using descriptive statistics such as median and proportions, where appropriate. The normality of continuous variables was assessed by inspecting skewness and kurtosis, and by the Shapiro-Wilk test. All continuous variables were non-normally distributed and thus expressed using median and interquartile range; comparisons were performed using Wilcoxon Rank test. Comparisons between categorical variables were performed using Chi-square or Fisher's exact test, where appropriate. Bivariate analysis was performed to compare demographic characteristics, fertility treatments, and pregnancy symptoms between patients with and without SCH. Prevalence of SCH by fertility treatment type was compared using Chi-square or Fisher's exact test. To examine the relationship between pregnancy symptoms (bleeding and/or cramping) and miscarriage among patients with SCH, we adjusted for independent predictors of miscarriage (recurrent pregnancy loss [RPL] and maternal age) and reported the results of the logistic regression models as predicted probabilities. Patients with cramping alone were not included in the logistic regression given the small number of patients with these findings. Bivariate analysis was also performed to compare pregnancy outcomes across patients with and without SCH. All data management and statistical analysis were performed using SAS software version 9.4 (SAS Institute Inc., Cary, NC, USA), and statistical significance interpreted using 95% confidence intervals. Ethical approval of this study was granted by the University of Michigan Institutional Review Board (HUM00150576). Informed consent was waived as this is a retrospective review of existing data included in the standard care of patients.

3 | RESULTS

A total of 1210 viable intrauterine pregnancies were included in the analysis. Women were a median age of 36.7 years old, had a median body mass index of 25.0 kg/m², and were primarily non-Hispanic white (78.0%) and nulliparous (70.4%) (Table 1). The prevalence of SCH was 12.5% ($n = 151$) with 2.7% ($n = 4$), 8.0% ($n = 12$), and 89.4% ($n = 135$) of patients having a small, medium, and large SCH, respectively. Of the 151 patients with SCHs, the SCH was noted to stay the same size in 2.7% ($n = 4$), increase in size in 12.6% ($n = 19$), decrease in size in 9.3% ($n = 14$), and resolve in 15.9% ($n = 24$) of patients on subsequent ultrasounds. The remaining 90 patients either did not have additional ultrasounds at our center or the size of the SCH was not documented. In comparing characteristics of pregnancies with SCH to those without SCH, male factor infertility was more prevalent among patients with SCH (34.4% vs. 24.6%, $P = 0.009$), but there were no other differences in infertility diagnoses across SCH categories. There were no differences in stage of transfer (blastocyst or cleavage); trophoctoderm grade (good, fair, and poor); or simplified SART grade (good, fair, and poor) between IVF patients with SCH and those without.¹¹ Use of 81-162 mg aspirin was more common among patients with SCH compared to those without (49.7% vs. 39.6%, $P = 0.0095$); however, there was no difference in the miscarriage rate for those using aspirin (data not shown). Patients with SCH more often reported vaginal bleeding (40.4% vs. 10.2%, $P < 0.001$) or both vaginal bleeding and cramping (15.9% vs. 9.1%, $P = 0.009$) compared to those without SCH.

Prevalence of SCH did not vary significantly by fertility treatment groups (Figure 1), including direct comparisons between IVF fresh and IVF frozen (11.7% vs. 16.1%, $P = 0.188$); natural cycles and IVF (10.1% vs. 14.5%, $P = 0.078$); natural cycles and oral cycles (10.1% vs. 11.0%, $P = 0.732$); and oral cycles and IVF (11.0% vs. 14.5%, $P = 0.134$).

The overall prevalence of first trimester miscarriage in this population was 17.4% ($n = 210$). There was no relationship between SCH and first trimester miscarriage—19.2% ($n = 29$) of those with SCH and 17.1% ($n = 181$) without SCH ended with first trimester miscarriage ($P = 0.521$) (Table 2). Post hoc power analysis demonstrated an 80% power (alpha error of 5%) to detect a 9.8% increase in miscarriage rate.

To examine the impact of reported symptoms on miscarriage in SCH-affected pregnancies, Figure 2 shows predicted probabilities of miscarriage calculated based on a logistic regression model, adjusted for maternal age and recurrent pregnancy loss. Patients with SCH who reported symptoms of bleeding had no significantly increased predicted probability of miscarriage compared to those with SCH and without bleeding (0.17 vs. 0.12, $P = 0.366$). However, among patients with SCH, those who reported bleeding and cramping had an increased probability of miscarriage compared to those without symptoms (0.62 vs. 0.12, $P < 0.001$).

The live birth rate for the entire cohort was 81.3% and the median gestational age at delivery was 39 weeks. There were no statistically significant differences in pregnancy outcomes between

patients with and without SCH, including live birth rates, gestational age at delivery, preterm birth, birth weight, abruption, placental anomalies, preterm premature rupture of membranes, preterm labor, and maternal comorbidities such as hypertensive disorders and diabetes (Table 2).

4 | DISCUSSION

In this retrospective chart review of over 1200 pregnancies at a single fertility clinic, we found that the presence of SCH did not vary by fertility treatment cycle or infertility diagnosis, aside from male factor infertility. Importantly, we found that incidental SCH in the infertile population was not associated with an increased risk of miscarriage or adverse pregnancy outcomes. However, patients presenting with SCH and both vaginal bleeding and cramping were at an increased risk of miscarriage compared to patients with no symptoms or only vaginal bleeding.

Prior similarly designed studies in the infertile population have found conflicting results regarding risk of SCH by fertility treatment cycle. Truong et al found no difference in rate of SCH by fertility treatment cycle; however, they did not differentiate between fresh and frozen IVF.² Asato et al found the frequency of SCH was significantly higher in the IVF group than the non-IVF group, and upon further analysis, SCH was more prevalent among frozen rather than fresh embryo transfer.¹² A subsequent study found that SCH was more common among fresh embryo transfer rather than frozen embryo transfer,¹³ while a recent study found no difference in these populations.³ Zhou et al proposed that SCH was more common in fresh embryo transfer due to excess exogenous estrogen altering the uterine environment and placental implantation and development. However, a recent study of frozen embryo transfers found that the incidence of SCH was not associated with estradiol levels.¹⁴ As such, the role of exogenous estrogen and mechanism of SCH formation remains unclear in the infertile population. Indeed, it has been suggested that the formation of SCH is likely more complex than just estrogen and progesterone levels or protocols, and may be related to lack of the corpus luteum and factors it produces such as relaxin and vascular endothelial growth factor.¹⁵ While our study did not account for route or dose of supplemental estrogen or progesterone, the finding that SCH did not vary by fertility treatment cycle suggests that it is also not simply related to presence of absence of a corpus luteum.

Instead, factors associated with SCH included male factor infertility and aspirin use. The association of SCH with male factor infertility is a novel finding, as no other study has included infertility diagnoses in their analysis. While it is not entirely clear why male factor infertility would be associated with SCH, sperm defects have previously been associated with RPL. For example, increased DNA fragmentation has been associated with early pregnancy loss¹⁶; thus, there is precedence for sperm contribution to early pregnancy outcomes. Indeed, research is increasingly being focused on identifying male factors beyond semen parameters to better understand this paternal contribution.¹⁷

TABLE 1 Characteristics of pregnancies with and without subchorionic hematoma

Characteristic	Total (n = 1210)	SCH (n = 151)	No SCH (n = 1059)	P-value
Age, years	36.7 (34.0, 39.6)	36.7 (34.0, 39.8)	36.6 (34.0, 39.6)	0.891 ^a
BMI, kg/m ²	25.0 (22.4, 29.7)	24.8 (21.6, 28.3)	25.0 (22.5, 29.9)	0.066 ^a
Race/ethnicity				0.517 ^b
Non-Hispanic white	937 (78.0)	119 (79.3)	818 (77.8)	
Non-Hispanic black	51 (4.2)	5 (3.3)	46 (4.4)	
Hispanic	39 (3.2)	2 (1.3)	37 (3.5)	
Other Non-Hispanic ^c	175 (14.6)	24 (16.0)	151 (14.4)	
Prior miscarriage	210 (17.4)	29 (19.2)	181 (17.1)	0.521
Multiparous	358 (29.6)	51 (33.8)	307 (29.0)	0.228
Cause of infertility				
Male factor	312 (25.8)	52 (34.4)	260 (24.6)	0.009
Endometriosis	78 (6.5)	8 (5.3)	70 (6.6)	0.539
Tubal factor	79 (6.5)	12 (8.0)	67 (6.3)	0.451
Uterine Factor	57 (4.7)	5 (3.3)	52 (4.9)	0.386
PCOS	334 (27.6)	36 (23.8)	298 (28.1)	0.269
Hypothalamic amenorrhea	23 (1.9)	0 (0.0)	23 (2.2)	0.102 ^b
DOR	169 (14.0)	22 (14.6)	147 (13.9)	0.819
RPL	177 (14.6)	27 (17.9)	150 (14.2)	0.227
Genetic testing	17 (1.4)	1 (0.7)	16 (1.5)	0.711 ^b
Prior fertility preservation	10 (0.8)	2 (1.3)	8 (0.8)	0.361 ^b
Gestational carrier	3 (0.3)	0 (0.0)	3 (0.3)	>0.99 ^b
Unexplained	205 (16.9)	30 (19.9)	175 (16.5)	0.306
Other	175 (14.5)	19 (12.6)	156 (14.7)	0.483
D&C or MVA ≥1	255 (21.1)	29 (19.3)	226 (21.4)	0.569
Anticoagulant use				
Any	508 (42.0)	76 (50.3)	432 (40.8)	0.026
Aspirin	494 (40.8)	75 (49.7)	419 (39.6)	0.018
Heparin/Lovenox/Coumadin	21 (1.7)	3 (2.0)	18 (1.7)	0.739 ^b
Currently smoking	34 (2.9)	1 (0.7)	33 (3.2)	0.112 ^b
TSH, units ^a	1.5 (1.1, 2.0)	1.4 (1.0, 1.9)	1.5 (1.1, 2.0)	0.105 ^a
Trophectoderm grade				0.678 ^b
Good	215 (41.4)	31 (39.7)	184 (41.6)	
Fair	291 (56.0)	44 (56.4)	247 (55.9)	
Poor	14 (2.7)	3 (3.9)	11 (2.5)	
SART grade				0.152
Good	276 (53.1)	35 (44.9)	241 (54.5)	
Fair	244 (26.9)	43 (55.1)	201 (45.5)	
Poor	0 (0.0)	0 (0.0)	0 (0.0)	
Stage				0.285 ^b
Blastocyst	520 (91.4)	78 (95.1)	442 (90.8)	
Cleavage	49 (8.6)	4 (4.9)	45 (9.2)	
Number gestations				0.959
Singleton	1108 (92.7)	970 (92.7)	138 (92.6)	
Multiple	87 (7.3)	76 (7.3)	11 (7.4)	

TABLE 1 (Continued)

Characteristic	Total (n = 1210)	SCH (n = 151)	No SCH (n = 1059)	P-value
Symptoms				
Vaginal bleeding only	169 (14.0)	61 (40.4)	108 (10.2)	<0.001
Cramping only	19 (1.6)	3 (2.0)	16 (1.5)	0.722 ^b
Both bleeding and cramping	120 (9.9)	24 (15.9)	96 (9.1)	0.009

Note: All values presented as median (interquartile range) or *n* (%).

Abbreviations: D&C, dilation and curettage; DOR, diminished ovarian reserve; MVA, manual vacuum aspiration; PCOS, polycystic ovary syndrome; RPL, recurrent pregnancy loss; SCH, subchorionic hematoma; TSH, thyroid stimulating hormone.

^aWilcoxon Rank test.

^bFisher's exact test.

^cOther Non-Hispanic category includes Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, Multiracial, or Other.

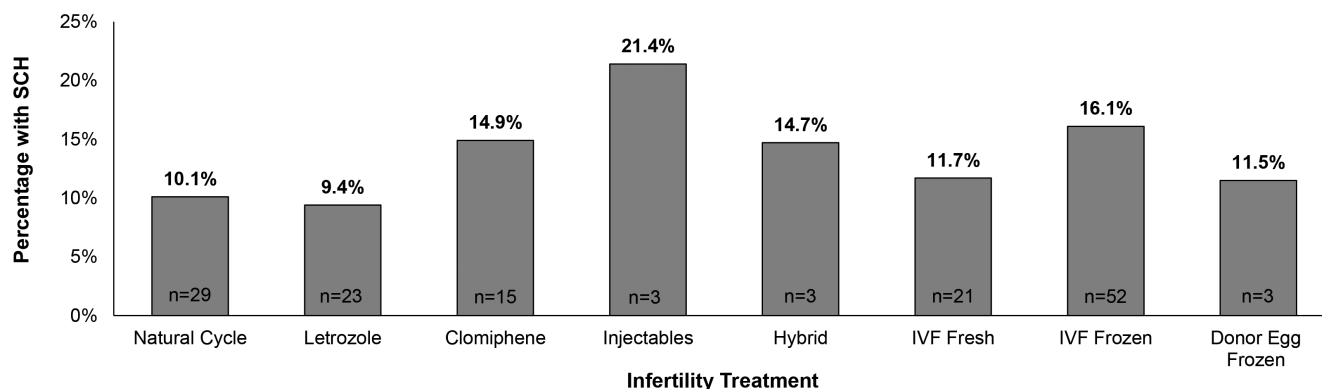


FIGURE 1 Prevalence of SCH by fertility treatment type SCH, subchorionic hematoma

Other studies have considered the role of aspirin in the prevalence of SCH, with similar findings. Truong et al found that aspirin use correlated with increased frequency of SCH in infertile patients and concluded that aspirin should not be routinely recommended to patients undergoing assisted reproduction.² However, they did not evaluate pregnancy outcomes and it was unknown if ongoing aspirin use modulated the risk of miscarriage once SCH developed. In our study, there was no difference in miscarriage rates for patients with SCH who did and did not use aspirin.

In our study, presence of SCH alone was not significantly associated with increased risk of miscarriage. While a prior meta-analysis demonstrated increased risk of miscarriage in the fertile population with SCH,⁵ a 2019 study demonstrated no increased risk.¹ Similarly, in other studies examining only the infertile population, there was no association between SCH and first trimester pregnancy loss.^{3,13,18} Notably, these studies did not assess for the presence of symptoms and whether they impacted risk of miscarriage.

In our sample, when patients with SCH reported symptoms of vaginal bleeding, there was no increased probability of miscarriage compared to those without symptoms. However, when patients reported both bleeding and cramping, the probability of miscarriage was markedly increased. While this is a novel finding in the infertile population, it builds on research in the fertile population. Other studies have shown that, among fertile patients admitted for vaginal

bleeding in the first trimester, those with SCH had significantly increased rates of miscarriage compared to those without SCH¹⁹ and, of patients with SCH, those with vaginal bleeding that prompted antenatal admission were more likely to have a preterm birth.²⁰ Vaginal bleeding alone may not have been significant in our study due to differences in severity of symptoms, with our population having a wider range of vaginal bleeding—from spotting to heavy bleeding—compared to more significant bleeding necessitating inpatient admission. Intuitively, it makes sense that more severe symptoms portend a higher risk of miscarriage. Future research should elicit not just symptoms, but also severity, to understand how they impact risk of miscarriage.

We found that SCH is not associated with adverse pregnancy outcomes in the infertile population and unlike the meta-analysis by Tuuli et al, our study failed to demonstrate a significant increase in the incidence of placenta abruption among patients with SCH, however, only 15 patient experienced placental abruption in our cohort.⁵ Few studies have evaluated outcomes of SCH-affected pregnancies in the infertile population, and these findings have often been limited to birth weight, with contradictory conclusions.^{3,13,21} Previous theories for adverse pregnancy outcomes with SCH included altered trophoblast invasion and angiogenesis, which could lead to fetal oxidative stress and abnormal placentation; however, given the low incidence of obstetric complications, most studies are not

TABLE 2 Pregnancy outcomes among patients with and without subchorionic hematoma

Outcome	Total (n = 1210)	SCH (n = 151)	No SCH (n = 1059)	P-value
Miscarriage < 20 weeks	210 (17.4)	29 (19.2)	181 (17.1)	0.521
Stillbirth ≥ 20 weeks	10 (0.9)	2 (1.4)	8 (0.8)	0.366 ^a
Live birth	946 (81.3)	116 (79.5)	830 (81.6)	0.531
Gestational age at delivery, weeks	39.0 (38.0, 40.0)	39.0 (38.0, 40.0)	39.0 (38.0, 40.0)	0.594 ^b
Preterm birth (<34 weeks)	32 (3.5)	4 (3.5)	28 (3.5)	>0.99 ^a
Preterm birth (<37 weeks)	122 (13.4)	13 (11.4)	109 (13.7)	0.505
Birthweight, g	3315.0 (2930.0, 3660.0)	3302.5 (2910.0, 3660.0)	3315.0 (2935.0, 3665.0)	0.534 ^b
Hypertensive disorder				
Any	202 (19.6)	22 (19.3)	180 (19.6)	0.942
Gestational hypertension	119 (9.8)	17 (11.3)	102 (9.6)	0.530
Pre-eclampsia	27 (2.2)	1 (0.7)	26 (2.5)	0.239 ^a
Severe pre-eclampsia	49 (4.1)	3 (2.0)	46 (4.3)	0.266 ^a
HELLP	4 (0.3)	1 (0.7)	3 (0.3)	0.414 ^a
Placental abruption	15 (1.5)	2 (1.8)	13 (1.4)	0.669 ^a
Placental abnormality				
Any	28 (2.3)	4 (2.7)	24 (2.3)	0.771 ^a
Previa	16 (1.3)	1 (0.7)	15 (1.4)	0.709 ^a
Acreta/percreta/increta	1 (0.1)	0 (0.0)	1 (0.1)	>0.99 ^a
Other	11 (0.9)	3 (2.0)	8 (0.8)	0.148 ^a
PPROM	40 (3.8)	8 (6.9)	32 (3.4)	0.066
Preterm labor	21 (2.0)	2 (1.7)	19 (2.1)	>0.99 ^a
Gestational diabetes				
Any	83 (6.9)	9 (6.0)	74 (7.0)	0.640
Diet-controlled	49 (4.1)	6 (4.0)	43 (4.1)	0.960
Medication-controlled	34 (2.8)	3 (2.0)	31 (2.9)	0.791 ^a

Note: All values presented as n (%) or median (interquartile range).

Abbreviations: HELLP, hemolysis, elevated liver enzymes, low platelet count syndrome; PPROM, preterm premature rupture of membranes; SCH, subchorionic hematoma.

^aFisher's exact test.

^bWilcoxon Rank test.

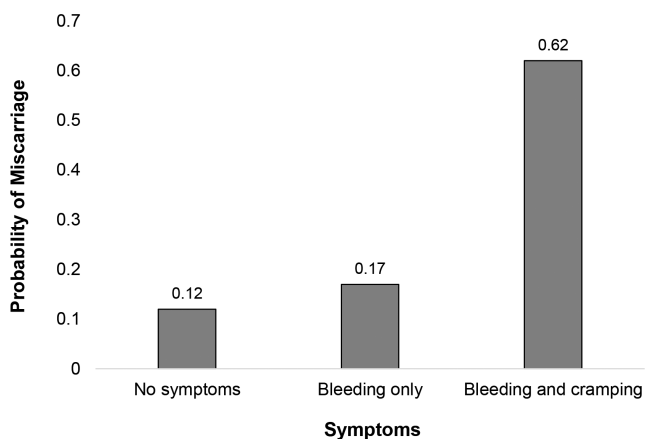


FIGURE 2 Predicted probability of miscarriage in patients with SCH by symptoms SCH, subchorionic hematoma

powered to evaluate these differences. The only study to show that adverse pregnancy outcomes (including gestational hypertension, preeclampsia, oligohydramnios, preterm delivery, and postpartum hemorrhage) increased among IVF patients with SCH was a retrospective case control study and did not comment on the power to detect a difference between these groups.²¹

The strengths of our study include the examination of all infertile patients regardless of fertility treatment type. This allows for increased generalizability to the diverse infertile population and may aid counseling when SCH is detected incidentally on first trimester ultrasound in the fertility clinic. We also examined the role of concurrent symptoms with the finding of SCH, which allows for more targeted counseling for patients.

This study may be limited by a retrospective chart review design, which has inherent risk of bias and errors in data collection. Because we relied on sonographer inquiry of patient symptoms recorded in

a categorical (yes/no) fashion, we are unable to discern the nuances of a miscarriage risk with heavy vaginal bleeding versus simply spotting. Additionally, the evaluation of secondary outcomes has limited statistical power, owing to the rarity of these events. Thus, continued data collection and evaluation of pregnancies affected with SCH is necessary to better assess these outcomes.

The detection of an SCH on an early ultrasound is often distressing for patients. The findings of this study are thus helpful in informing a diverse, infertile patient population on the potential adverse outcomes of SCH. Patients with incidental SCH can be comforted that they are not at increased risk of miscarriage, while patients with both vaginal bleeding and cramping should be considered at higher risk for miscarriage and more thoroughly counseled. Furthermore, patients with SCH can be reassured that there did not appear to be associated adverse maternal or obstetrical outcomes. These findings should inform more focused counseling for highly anxious patients and providers. Future research is needed to examine the impact of these symptoms on SCH-affected pregnancies, with more attention to detail regarding the severity of symptoms.

In conclusion, risk factors for SCH in the infertile population include male factor infertility and aspirin use, but not fertility treatment type or embryo grade. There is no increased risk of miscarriage among pregnancies impacted by SCH, but if patients with SCH report both vaginal bleeding and cramping, their probability of miscarriage is increased. There are no differences in pregnancy outcomes for patients with SCH. These findings should reassure patients and providers with asymptomatic SCH and improve counseling for patients with symptomatic SCH.

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CONFLICTS OF INTEREST

The authors report no conflicts of interest.

AUTHOR CONTRIBUTIONS

Erin R. Inman and Daniel C. Miranian contributed equally in data collection, manuscript writing, and revisions. Micaela J. Stevenson helped with data collection. Emily Kobernik provided statistical support. Molly Moravek assisted in design of the study and manuscript revision. Samantha Schon helped conceive the project and provided project guidance and manuscript revision.

DATA AVAILABILITY STATEMENT

No. Research data are not shared.

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