Arch Gynecol Obstet (2008) 278:47–51
DOI 10.1007/s00404-007-0530-2

ORIGINAL ARTICLE

The clinical significance of bleeding during the second trimester of pregnancy

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Received: 8 November 2007 / Accepted: 20 November 2007 / Published online: 8 December 2007

Abstract
Objective This study aimed at investigating the clinical importance and pregnancy outcome in women suffering from bleeding during the second half of their pregnancies.
Methods A population-based study including all deliveries between the years 1988 and 2005 was conducted. Comparison was performed between patients with and without vaginal bleeding during the second half of pregnancy. Pregnancies, which terminated before 22 weeks, multiple gestations and women lacking prenatal care were excluded from the analysis. Stratified analyses, using the Mantel–Haenszel technique, and a multiple logistic regression model were performed to control for confounders.
Results During the study period, 175,093 singleton deliveries occurred in our institute. Of these, 2,010 (1.1%) were complicated with bleeding upon admission during the second half of pregnancy. The cases were mostly attributed to placental abruption (63.5%; $n = 1{,}276$) and placenta previa (36.5%; $n = 734$). Independent risk factors associated with bleeding, using a backward, stepwise multivariate analysis were oligohydramnios, polyhydramnions, [odds ratio (OR) = 1.6; 95% confidence interval (CI) 1.2–2.0; $P = 001$ and 1.5; 1.2–1.8; $P < 0.01$, respectively], suspected intra uterine growth restriction (IUGR, 3.2; 2.6–4.0; $P < .001$), gestational age, previous abortions and maternal age. These patients subsequently were more likely to deliver by cesarean section (CS, 72.9 vs. 12.1%, OR = 19.5; 95% CI 17.6–19.9; 14.9 vs. 1.1%; $P < 0.001$). Perinatal mortality among patients admitted due to second half bleeding was significantly higher as compared to patients without bleeding ($P < .001$).
Conclusion Bleeding upon admission during the second half of pregnancy is an independent risk factor for perinatal mortality. Careful surveillance, including fetal monitoring, is suggested in these cases in order to reduce the adverse perinatal outcome.

Keywords Second trimester bleeding · Perinatal mortality · Cesarean delivery

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Introduction

Vaginal bleeding is not a rare phenomenon, which has been shown to appear in 1–22% of all pregnancies, occurring mainly during the first trimester [1]. Several studies have shown that peripartum maternal mortality is higher in women who experience vaginal bleeding during the second half of their pregnancy [2, 3], especially in cases of recurrent bleeding [4]. Vaginal bleeding can appear at any stage of pregnancy and requires an extensive work-up in order to recognize the cause and to establish an efficacious therapeutical approach [5]. The etiology of vaginal bleeding in the second half of pregnancy is varied and can originate from the uterus, cervix, and vagina or as a consequence of a systemic disorder [3–12].

The prevalence of deliveries with Apgar scores lower than 7 at 5 min is higher in neonates born to women who had experienced vaginal bleeding in the second half of their pregnancies in comparison to pregnancies without vaginal bleeding [2].

Preterm deliveries are more prevalent in women who experienced vaginal bleeding during the second half of pregnancy [2–4] and two to four times higher in women who bleed during the second trimester of pregnancy [1, 13].

Higher rates of low birth weight and lower rates for gestational age newborns have been found among neonates born to women who had vaginal bleeding during the second trimester of their pregnancy [2]. Moreover, a higher prevalence of slight neuro-developmental damage was found in children of 2 years old, born weighting less than 2,500 g in pregnancies with vaginal bleeding during the third trimester of pregnancy as opposed to pregnancies without such bleeding [12]. Prevalence of congenital abnormalities is also high in women who experience bleeding during pregnancy and is specifically high if the bleeding occurred during the second or third trimester of pregnancy [1].

A correlation between vaginal bleeding during the second half of pregnancy and complications in the course of labor was also suggested [2]. The rates of cesarean deliveries (CD) and labor induction are higher in women who experience vaginal bleeding in comparison to women who do not experience vaginal bleeding at all.

The present population-based study was aimed to investigate the clinical significance of bleeding during the second trimester of pregnancy.

Methods

In this population-based study, all deliveries that took place in the Soroka University Medical Center between 1988 and 2005 were examined. A comparison was performed between women with and without second trimester bleeding. The study group consisted of pregnancies of at least 22 weeks old and vaginal bleeding occurring during the second half of pregnancy. The comparison group consisted of pregnancies of at least 22 weeks old without vaginal bleeding during pregnancy.

Pregnancies that terminated before 22 weeks, multiple gestations and women lacking prenatal care were excluded from the analysis.

Data

Demographic indices, including maternal and gestational age, ethnic origin (Bedouin Arabs vs. Jewish), previous pregnancies and deliveries, were examined. Also, a comparison was held regarding obstetrical, maternal, and fetal criteria.

Maternal and obstetrical characteristics included incidence of diabetes, oligohydramnions, polyhydramnions, PROM (premature rupture of membranes), recurrent abortions, hypertensive disorders during pregnancy, IUGR (Intrauterine growth restriction), mal-presentation, induction of labor, placenta previa, placental abruption, cervical tear, uterine rupture and mode of delivery.

Perinatal characteristics include perinatal mortality, blood transfusion, Apgar score <7 at 1 min, Apgar score <7 at 5 min and congenital malformations

Statistical analysis

The analyses were performed using SPSS program. Statistical significance was examined using the Chi-square test or Fisher's exact test for categorical variables or using analysis of variance (ANOVA) for quantitative variables. Stratified analysis was performed using the Mantel–Haenszel test and multiple logistic regression models. P values<0.05 were considered statistically significant.

Results

Vaginal bleeding during the second half of pregnancy complicated 1.13% (n = 1,580) of singleton pregnancies during the study period (n = 175,093). The cases were attributed to placental abruption (63.5%; n = 1276) and placenta previa (36.5%; n = 734).

Table 1 illustrates the demographic and clinical data of pregnancies in which vaginal bleeding occurred in the second half of pregnancies as compared to pregnancies without vaginal bleeding. Significant statistical (but not clinical) difference was observed in maternal age and gestational age. A significant statistical difference was also present in fetal birth weight, with special importance to birth weights lesser than 2,500 g. No statistical difference was noted between the groups concerning variables of neonate gender and ethnical group.

Table 2 characterizes the gestational risk factors between the two groups. Women with vaginal bleeding had a higher statistically significant prevalence of oligo/ployhydramnios, recurrent abortions and blood pressure disorders in comparison to the control group. Pregnant women (n = 10,667) who suffered from hypertensive disorders were 6.1%. The rate of vaginal bleeding among women with hypertensive disorders was 2.2% as compared to 1.1% in women without hypertension during pregnancy (n = 164,426).

Pregnancies in which vaginal bleeding was observed had a high frequency of IUGR, pathologic lie in comparison to the control group. The prevalence of caesarian sections was higher among women with bleeding events in the second half of pregnancy.

Table 1 Demographic and clinical characteristics of pregnancies with and without vaginal bleeding

Characteristics		Without vaginal bleeding (n = 173,083)	With vaginal bleeding (n = 2,010)	P value
Maternal age (years)	Mean ± sd	28.3 ± 5.9	30.5 ± 6.3	0.001
Gestational age (weeks)	Mean ± sd	39.2 ± 2.3	35.0 ± 2.7	<0.001
Gravidity	Mean ± sd	3.8 ± 2.8	4.6 ± 2.8	<0.001
Parity	Mean ± sd	3.4 ± 2.5	3.8 ± 2.5	<0.001
Ethnicity				
Fetal birth weight (g)	<2,500	7.3%	50.1%	
	2,500–3,999	87.8%	48.5%	<0.001
	4,000+	4.9%	1.4%	
Neonatal gender	Male	51.3%	53.4%	
	Female	48.7%	46.6%	0.52
Ethnicity	Jewish	55.6%	55.4%	
	Bedouin	44.4%	44.6%	0.87

Data are presented as numbers and percentages or mean ± standard deviations

Table 2 Obstetrics and perinatal factors among women with and without vaginal bleeding

Characteristic	Without vaginal bleeding (n = 173,083)	With vaginal bleeding (n = 2010)	OR	95% CI	P value
Obstetrical					
Diabetes	5.5%	6.3%	1.165	0.9–1.4	0.054
Oligohydramnios	2.4%	4.6%	1.96	1.6–2.4	<0.001
Polyhydramnios	4.2%	6.3%	1.5	1.2–1.8	<0.001
Reccurent abortions	5.3%	9.6%	1.9	1.6–2.2	<0.001
Hypertensive disorders	6.0	11.7	2.0	1.7–2.3	<0.001
IUGR	2.0%	6.7%	3.5	2.9–4.3	<0.001
Malpresentetion	5.2%	19.3%	4.3	3.9–5.0	<0.001
PROM	6.6%	7.5%	1.14	1.1–1.6	0.064
Preterm labor	6.9%	51.5%	14.3	13.0–15.9	<0.001
Induction of labor	28.5%	15.2%	0.45	0.4–0.5	<0.001
Cervical tear	0.3%	0.6%	2.1	1.2–3.7	0.010
Uterine rupture	0 %	0.3%	6.6	2.9–15.2	0.001
Blood transfusion	1.1%	16.9%	17.6	15.3–19.9	<0.001
Mode of delivery					
Partus spontaneus	85.9%	14.1%	0.08	0.07–0.09	<0.001
Vacuum delivery	1.9%	1.5%	0.8	0.5–1.2	0.22
Forceps delivery	0.1%	0.1%	0.8	0.1–6.0	0.661
Cesarean delivery	12.1%	72.9%	19.5	17.6–19.9	<0.001
Perinatal					
Perinatal mortality	1.1%	14.9%	15.5	13.6–17.6	<0.001
Apgar score <7 at 1 min.	3.7%	30.4%	11.3	10.2–12.5	<0.001
Apgar score <7 at 5 min.	0.5%	6.9%	15.1	12.4–18.3	<0.001
Congenital malformations	4.7%	13.8%	3.2	2.7–3.8	<0.001

CI confidence interval; data are expressed as percentages and odds ratio, 95% confidence interval and *P* values for statistical significance. *PROM* Premature rupture of membranes, *IUGR* intra uterine growth restriction

Fetal blood transfusions, perinatal fetal mortality and rate of Apgar scores lower than 7 at 1 and 5 min among neonates born to mothers who had vaginal bleeding during second half of pregnancy, was significantly higher in comparison to the control group.

Independent risk factors for vaginal bleeding in the second half of pregnancy obtained in logistic regression analysis are presented in Table 3. Variables that were found to be significant in uni-variable analyses and remained significant in multi-variable analyses were intra uterine growth

Table 3 Independent risk factors for vaginal bleeding during the second half of pregnancy: results from a multivariable logistic regression model

Characteristics	OR	95% CI	*P* value
IUGR	3.2	2.6–4.0	<0.001
Oligohydramnios	1.6	1.2–2.0	0.001
Polyhydramnios	1.5	1.2–1.8	<0.001
Recurrent abortions	1.8	1.1–2.1	<0.001
Gestational age	1.3	1.1–1.6	0.013
Maternal age	1.02	1.01–1.03	<0.001

IUGR Intrauterine growth restriction. *CI* Confidence interval; data are expressed as odds ratio, 95% confidence interval and *P* values for statistical significance

restriction, oligo/polyhydramnions, premature rupture of membranes, recurrent abortions, maternal age, gestational age and ethnical group (Jewish).

Tables 4 and 5 show the correlation between vaginal bleeding in the second half of pregnancy and the frequency of cesarean sections and perinatal mortality after controlling for the effect of variables such as oligohydramnions, premature rupture of membranes, IUGR, umbilical chord prolapse and premature labor using the Mantel–Haenszel tests. Women who were hospitalized as a result of vaginal bleeding in the second half of their pregnancies had a higher rate of cesarean deliveries than the control group.

Table 4 Crude and adjusted odds ratios for cesarean delivery among patients with and without vaginal bleeding

Characteristics	OR	95% CI	*P* value
Crude OR for cesarean delivery	16.7	15.1–18.6	<0.001
OR adjusted for			
IUGR	15.7	14.0–17.5	<0.001
Oligohydramnios	16.2	14.6–18.1	<0.001
Premature rupture of membranes	16.5	14.9–18.4	<0.001
Cord prolapse	16.4	14.7–18.3	<0.001
Preterm delivery	10.1	9.1–11.3	<0.001

Table 5 Crude and adjusted odds ratios for perinatal mortality among patients with and without vaginal bleeding

Characteristics	OR	95% CI	*P*
Crude OR for perinatal mortality	7.9	6.6–9.4	<0.001
OR adjusted for			
IUGR	7.5	6.3–9.0	<0.001
Oligohydramnios	7.6	6.3–9.1	<0.001
Premature rupture of membranes	7.9	6.6–9.7	<0.001
Cord prolapse	7.7	6.5–9.3	<0.001
Preterm delivery	2.5	2.0–3.0	<0.001

Perinatal mortality among these women was significantly high in comparison to women without vaginal bleeding.

Discussion

The major finding of our population-based study was that vaginal bleeding during the second half of pregnancy is an independent risk factor for perinatal mortality. Using a multivariable analysis, second trimester bleeding was found to be related to oligohydramnions and polyhydramnions, PROM and recurrent abortions.

An increased prevalence of preterm deliveries was found among women with bleeding in comparison to the control group. This finding constitutes possible explanation to the higher prevalence of low birth weight and lower Apgar scores found among women with vaginal bleeding in comparison to women without vaginal bleeding.

Hypertensive disorders and advanced maternal age were also found to be related to vaginal bleeding during the second half of pregnancy. Naeye [3] assumed that excessive blood pressure and advanced maternal age might harm placental blood flow. This might be a possible reason for IUGR among women with vaginal bleeding in comparison to those without bleeding (6.7% vs. 2.0%). The prevalence of fetal growth restriction as a gestational complication was found to be significantly high in comparison to the control group ($P < 0.001$). This finding was supported by the results of the study by Spinillo et al. [12] who examined the relation between vaginal bleeding and neuro-developmental disorders.

It is not surprising that the rate of cesarean sections among women with vaginal bleeding was found to be higher in comparison to women without bleeding (72.9% vs. 12.1%). This is because the group of women with bleeding included all cases of placenta previa and premature placental abruption. Cesarean delivery is indicated in women with vaginal bleeding due to placental disorders, and this is in parallel to the stabilization of their condition [7, 9, 10].

Even while controlling for possible confounders, using the Mantel–Haenszel technique, vaginal bleeding increased the prevalence of perinatal mortality. Additional possible explanations for the high rate of perinatal mortality among women with vaginal bleeding are the creation of microscopic infarctions in the placenta or placental atherosclerotic changes and even tiny regions of abruption, unrecognizable by clinical or imaging means. These changes can possibly cause a reduction in placental function [2, 9, 14]. These explanations are compatible with the fact that the vaginal bleeding group was found to have a higher rate of IUGR.

In summary, vaginal bleeding is a dangerous complication related to high prevalence of cesarean sections and

constitutes a risk factor for perinatal mortality. Independent risk factors of the idiopathic vaginal bleeding in the second half of pregnancy are fetal growth restriction, oligohydramnions, and premature rupture of membranes, premature contractions, umbilical chord prolapse, Jewish population and high risk pregnancies. These findings obligate physicians who take care of such cases to be extremely precautious and set a strict gestational follow-up. It is necessary to enhance the awareness of pregnant women to the dangers concealed in vaginal bleeding and the urgent need for gestational surveillance in order to minimize the rate of the obstetrical complications.

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