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Risk Factors and Outcomes for Placental Abruption in Different Gestational Age Groups

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Abstract

Objective: To examine risk factors for placental abruption in different gestational age groups.

Study design: Data were derived from a national perinatal registry to compare the selected maternal factors and neonatal outcomes associated with placental abruption at gestational age groups < 32, 32 – 36, and >37 weeks.

Results: A total of 1936 abruption cases in singleton pregnancies were available for analysis, including 311 (16.1 %) at < 32 weeks, 457 (23.6 %) at 32 - 36 weeks, and 1168 (60.3 %) at ≥ 37 weeks of gestation. Generally, only preterm rupture of the membranes (none in the very preterm group) and chorioamnionitis (only in the very preterm group) showed a cluster effect in each gestational age group. Perinatal mortality was 4.5 times (95% CI 2.9, 7.1) higher among very preterm abruptions compared to preterm cases and 13-fold (95 % CI 8.2-20.4) compared to term abruptions. Similar trends were observed for the incidence of depressed (Apgar scores < 7 at 5 min) neonates and of admissions to the NICU.

Conclusions: Risk factors for placental abruption are not gestational age-related, whereas perinatal outcomes are.

Keywords: placental abruption, risk factors, neonatal outcomes, gestational age groups

Introduction

Placental abruption, defined as premature separation of the placenta from the uterine wall, is still an unpredictable and mostly unpreventable pregnancy complication and, as such, one of the important causes of maternal morbidity and perinatal mortality. Roughly 0.4 – 1 % of pregnancies are complicated by placental abruption, and this incidence is lower in Nordic countries (0.38 - 0.51%) compared with the USA (0.6 - 1.0 %) **[1]**. The exact cause of abruption is not entirely clear, but several risk factors appear to be associated with this complication. These factors include older maternal age, history of the previous abruption, multiple pregnancies, Hypertensive disorders, diabetes, thrombophilia, uterine malformations, trauma, cigarette smoking, drug abuse, polyhydramnios, premature rupture of membranes and chorioamnionitis **[2-7]**.

Many studies have examined the impact of an individual risk factor on placental abruption; however, data are still being determined as to whether any of the individual elements are more common in a particular gestational age group. We sought to evaluate a large population-based dataset to identify such risk factors.

Materials and Methods

We analyzed data from the Slovenian National Perinatal Information System (NPIS), which registers all deliveries ≥ 22 weeks' gestation or when the neonate weighs 500 g or more. Registration is mandatory by law, and more than 140 variables are entered immediately postpartum into a computerized database. Our study population comprised singleton pregnancies delivered during the period 2002 to2016.

We evaluated the following variables: maternal age, parity, maternal body mass index (BMI), pregestational/ gestational diabetes mellitus (DM), hypertensive disorders, smoking, polyhydramnios, premature rupture of the membrane, chorioamnionitis, mode of delivery, birth weight, Apgar score < 7 at 5 min, perinatal mortality (stillbirths plus early neonatal deaths until 28 days postpartum) and admission to the neonatal intensive care unit (NICU).

BMI was defined as the individual's body mass divided by the squareof height (kg/m2). The pregravid BMI was categorized according to the Institute of Medicine criteria **[8]** as underweight (< 18.5 kg/m2), average (18.5 - 24.9 kg/m2), overweight (25 - 29.9 kg/m2), and obese(≥ 30 kg/m2). Chronic hypertension was defined as hypertension before pregnancy or before 20 weeks gestation, gestational

hypertension is defined as hypertension diagnosed after 20 weeks gestation, and preeclampsia was defined according to the American College of Obstetricians and Gynecologists **[9]**. Until 2012, gestational DM was analyzed by the two-step approach, and since 2012, gestational DM has been diagnosed by the 75-g OGTT. Chorioamnionitis was interpreted by the key findings, which include fever, uterine tenderness, maternal tachycardia (> 100/min), fetal tachycardia (> 160/min), and purulent or foul-smelling amniotic fluid **[10]**.

Results

We identified 2028 deliveries with placental abruption, 0.7 % of all 297146 deliveries between 2002 and 2016. We focused on 1936 singleton deliveries (0.7 % of 291854 singletons). We excluded 92 cases of abruption in twins (1.8 % of 5292 twin deliveries). A total of 311 (16.1 %) singletons were born very preterm (< 32 wks) at a mean gestational age of 27.7 ± 2.4 wks and mean birth weight of 1083 ± 390 g; 457 (23.6 %) were born preterm (32 - 36 wks) at a mean gestational age of 34.4 ± 1.4 wks and mean birth weight of 2312 ± 458 g, and were born at term (≥ 37 wks) at a mean gestational age of 39.1 ± 1.3 wks and mean birth weight of 3258 ± 504 g. **Table 1** shows that maternal age, BMI, parity, and incidence of chronic diseases (chronic hypertension, pre-gestational diabetes) were similar among all gestational age groups. This was also the case for gestational hypertension and diabetes, as well as polyhydramnios. We found a significantly different incidence of preeclampsia between abruption cases before 32 and > 37 weeks. Interestingly, chorioamnionitis was associated with abruption only in the very preterm group, whereas spontaneous preterm rupture of the membranes has not occurred in this subgroup of abruption cases.

The incidence of neonatal outcomes was significantly gestational age-related, despite similar cesarean section rates. Notably, the perinatal mortality was 4.5 times higher among very preterm abruptions compared to preterm cases and 13-fold compared to term abruptions. Similar trends were observed for the incidence of depressed (Apgar scores < 7 at 5 min) neonates and for admissions to the NICU.

The selected maternal and neonatal characteristics and outcomes were compared among three gestational age groups: > 37, 32 - 36, and < 32 weeks. Statistical analysis was performed using SPSS software (Chicago, IL, US) for Windows 19. The association between maternal characteristics, neonatal characteristics, and outcomes among abruption cases were expressed as odds ratio (OR) and 95 % confidence interval (CI). Statistical significance was defined as p values less than 0.05.

This retrospective study of anonymous entries was exempt from approval by the ethical committee.

Table 1: Maternal and neonatal characteristics in cases with placental abruption in singleton pregnancies separated into three gestational age groups. BMI: body mass index; GDM: gestational diabetes mellitus; SROM- spontaneous rupture of membranes; NICU: neonatal intensive care unit. Data are presented in mean ± SD or N (%). Statistics are shown as OR (95 % CI).

Gestational age (wks)	<32	32-36	≥37
N (%)	311 (16.1)	457 (23.6)	1168 (60.3)
Maternal age (yrs)	30.9 ± 5.2	29.9 ± 5.1	30.5 ± 5.2
Nulliparas	167 (53.7)	215 (47.0)	596 (51.0)
Underweight	19 (6.1)	27 (5.9)	58 (5.0)
Normal weight	205 (65.9)	322 (70.4)	799 (68.4)
Overweight	57 (18.3)	82 (17.9)	218 (18.7)
Obese	30 (9.6)	26 (5.7)	93 (8.0)
Smokers	51 (16.4)	80 (17.5)a	142 (12.2)a
Chronic hypertension	8 (2.6)	9 (2.0)	18 (1.5)
Gestational hypertension	9 (2.9)	11 (2.4)	42 (3.6)
Preeclampsia	28 (9.0)b	29 (6.3)	40 (3.4)b
Pre-GDM	2 (0.6)	3 (0.7)	4 (0.3)
GDM	11 (3.5)	18 (3.9)	57 (4.9)
Polyhydramnios	2 90.6)	5 (1.1)	12 (1.0)
SROM	—	131 (28.7)c	406 (34.8)c
Chorioamnionitis	5 (1.6)	—	—
Cesarean birth	179 (57.6)	296 (64.8)	614 (52.6)
5-min Apgar <7	97 (31.2)de	43 (9.4)df	56 (4.8)ef
NICU admissions	246 (79.1)gh	208 (45.5)gi	95 (8.1)hi
Perinatal mortality	75 (24.1)jk	30 (6.6)jl	28 (2.4)kl

a: 1.5 (1.1, 2.1); b: 2.8 (1.7, 4.6); c: 0.7 (0.6, 0.9); d: 4.4 (2.9, 6.5); e: 9.0 (6.8, 12.9); f: 2.1 (1.4, 3.1); g: 4.5 (3.2, 6.3); h: 42.7 (30.3, 60.3); i: 9.4 (7.1, 2.5); j: 4.5(2.9, 7.1); k: 12.9 (8.2-20.4); l: 2.9 (1.7, 4.8)

Discussion

Many studies focused on the relationship between several risk factors in placental abruption **[1]**. Admittedly, whereas some risk factors appear to be strongly associated, most have yet to have an excellent biological explanation and might be confounded by other variables. For example, cord length and subtle abdominal trauma are not consistently measured or reported in most studies, including ours, and therefore a short umbilical cord and trauma might confound the genuine cause-and-effect relationship described for many associated factors. Studying the association between maternal characteristics and abruption in different gestational age groups was intended to determine whether a given element is clustered in each gestational age group or whether the incidence of a given factor increases with increasing gestational age. In our study, we found that preterm premature spontaneous rupture of the membrane is clustered after 32 weeks of gestation and bears a higher incidence with increasing gestational age. Chorioamnionitis as an associated factor was diagnosed only in the very preterm group.

Preeclampsia occurs less frequently before 32 weeks (the so-called "early onset preeclampsia"), and not surprisingly, there was a significantly higher incidence of preeclampsia among abruption cases at > 37 as compared to < 32 weeks of gestation.

The incidence of other factors in our study did not change with advancing gestational age. This does not mean they are not genuine risk factors but merely that they have the same (irrespective of extent) incidence during pregnancy. Finally, in contrast to the so-called risk factors, all perinatal outcomes were highly related to gestational age, regardless of the mode of delivery.

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