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Prediction of cesarean section risk in women with gestational hypertension or mild preeclampsia at term



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ABSTRACT

Objective: In a recent randomized controlled trial we found that induction of labor in women with gestational hypertension (GH) or mild (preeclampsia) PE at term prevented high risk situations without increasing the cesarean section (CS) rate. We aimed to assess the predictability of the risk of CS.

Study design: We used multivariable logistic regression analysis to identify predictive factors. Two models were created, one including antepartum and one including antepartum and intrapartum variables. The predictive capacity was assessed with ROC analysis and calibration.

Results: 126 (17%) of the 756 women delivered by CS. In multivariable analysis parity (OR 5.4), ethnicity (OR 2.4), previous miscarriage (OR 1.7), creatinine (OR 1.02), proteinuria (OR 2.4), cervical length (OR 1.02), engagement (OR 0.5) and dilatation (OR 0.7) were independent antepartum predictors. Intrapartum variables were parity (OR 3.6), ethnicity (OR 1.9), previous miscarriage (OR 1.5), gestational age at delivery (OR 1.2), antibiotic use (OR 8.0), disease progression (OR 2.4), uric acid (OR 1.4), proteinuria (OR 3.50) and dilatation (OR 0.76). Both models showed good discrimination (AUC 0.74 and 0.80) but calibration was moderate (Hosmer–Lemeshow *P*-value 0.42 and 0.70).

Conclusion: In women with GH or mild PE at term, the risk of CS can be predicted.

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Introduction

In obstetrics induction of labor is a common procedure, with rates increasing nationwide from 9.5% to 21% between 1990 and

2003 [1]. This great rise in inductions is mainly ascribed to widespread availability of cervical ripening agents, elective reasons, pressure from patients and conveniences to physicians. Apart from that, medically indicated inductions, for a variety of maternal or fetal reasons, are increasing.

Induction of labor in pregnancies complicated by hypertensive disorders is thought to prevent severe maternal and neonatal complications, but it may also increase the risk of cesarean delivery and thereby generate additional morbidity [2–4]. Maternal risk factors for cesarean delivery include parity, maternal age, Body

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Mass Index (BMI), Bishop Score and its individual components, duration of induction, and epidural analgesia. Specific maternal underlying diseases such as diabetes may also play a role. Among the fetal factors associated with a risk of cesarean section are gestational age and birth weight [5–9].

Recently we performed a randomized clinical trial in which women with gestational hypertension (GH) or mild preeclampsia (PE) beyond 36 weeks gestation were randomly allocated to induction of labor or expectant monitoring. We reported that induction of labor reduces the risk of high risk situations for the mother, mainly episodes of high blood pressure, without increasing the risk of cesarean section in these women [10]. This is an important finding since current literature may lead physicians to think that induction of labor will increase the cesarean section rate. In the present study we aim to assess whether the need for cesarean section in women with GH or mild PE at term can be predicted.

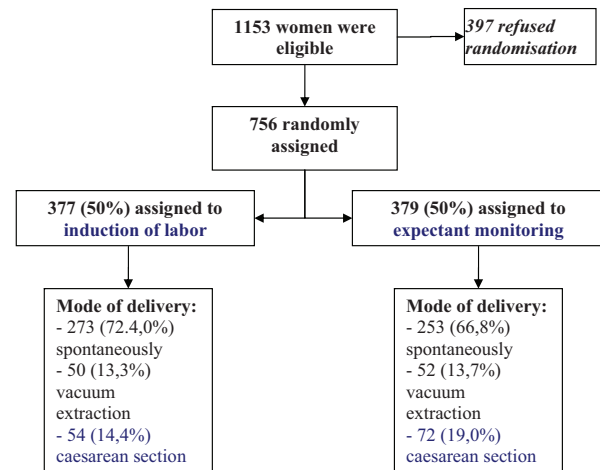


Fig. 1. Trial profile of the Hypitat trial.

Materials and methods

Data were obtained from patients of the HYPITAT trial [10], a Dutch multicentre randomized controlled trial, conducted between October 2005 and March 2008. Patients with a single, cephalic pregnancy that was complicated by GH or mild PE between 36 and 41 weeks gestation were randomly assigned to induction of labor or expectant monitoring. Patients who did not give informed consent, but did authorize us to use their medical data, received treatment in accordance with local protocol. GH was defined as diastolic blood pressure (BP) equal to or above 95 mmHg measured at two occasions at least 6 h apart. Mild PE was defined as diastolic BP equal to or above 90 mmHg measured at two occasions at least 6 h apart combined with proteinuria. Proteinuria was defined as $\geq 2+$ protein on dipstick, >300 mg total protein in a 24 h urine collection and/or protein/creatinine ratio > 30 mg/mmol. Exclusion criteria were severe

hypertensive disease, defined as diastolic BP ≥ 110 mmHg, systolic BP ≥ 170 mmHg and/or proteinuria ≥ 5 g in 24 h, pre-existent hypertension treated with anti-hypertensive drugs, HELLP-syndrome, use of intravenous anti-hypertensive medication and a previous cesarean section. More study information of the trial is reported elsewhere [10,11].

In the present study we investigated the occurrence of a cesarean section and evaluated whether the need for cesarean section was predictable. We created two prediction models, one for the antepartum period one for the intrapartum period using clinical data, including patient (maternal age, ethnicity, parity, smoking, education level, body mass index, diastolic BP and systolic BP) and delivery characteristics (gestational age at delivery, meconium stained amniotic fluid (MSAF), use of oxytocin, pain relief, temperature, use of antibiotics, duration of dilatation and bearing down, rupture of membranes > 24 h or progression to a high risk situation (defined as the occurrence of any of the

Table 1
Baseline patient characteristics: cesarean section versus no cesarean section.

Variable	Cesarean section (n = 126, 16.7%)		No cesarean section (n = 630, 83.3%)		P
	Value	Patients with available data n (%)	Value	Patients with available data	
Clinical characteristics					
Nulliparous	114 (90.5%)	126 (100)	427 (67.8%)	630 (100)	<.001
Maternal age (y)	30.0 (20–39)	126 (100)	29 (22–38)	630 (100)	.80
Gestational age (weeks)	38.3 (36.1–40.6)	126 (100)	38.3 (36.4–40.4)	630 (100)	1.0
Previous miscarriage	42 (33.3%)	126 (100)	158 (25.1%)	630 (100)	.06
Maternal smoking	16 (13.1%)	122 (97)	86 (14.6%)	591 (94)	.68
Body Mass Index (kg/m ²)	32.8 (24.8–46.0)	86 (68)	32.2 (24.6–41.9)	359 (57)	.33
Ethnic origin					
Caucasian	94 (80.3%)	117 (93)	521 (89.8%)	580 (92)	.004
Non-Caucasian	23 (19.7%)	117 (93)	59 (10.2%)	580 (92)	
Education level					
High	24 (28.6%)	84 (67)	118 (30.5%)	387 (61)	.73
Low	60 (71.4%)	84 (67)	269 (69.5%)	387 (61)	
Blood pressure (mmHg)					
Systolic	145 (125–165)	126 (100)	140 (125–161)	629 (100)	.38
Diastolic	98 (90–105)	126 (100)	95 (90–105)	630 (100)	.64
Laboratory findings					
Hemoglobin (mmol/L)	7.8 (6–>8)	121 (96)	7.8 (6–>8)	600 (95)	.62
Hematocrit (L/L $\times 10$)	3.5 (3.0–4.1)	107 (85)	3.6 (3.0–4.1)	549 (87)	.40
Platelets ($\times 10^9$ /L)	228 (140–364)	119 (94)	231 (137–347)	594 (94)	.56
Uric acid (mmol/L $\times 10$)	3.2 (2.3–5.0)	112 (89)	3.1 (2.1–4.5)	574 (91)	.09
Creatinine (μ mol/L)	63.0 (45.9–91.0)	116 (92)	59.0 (45.0–84.0)	559 (89)	.03
Aspartate aminotransferase (U/L)	19.0 (11.0–40.0)	101 (80)	20.0 (10.0–39.0)	493 (78)	.86
Alanine aminotransferase (U/L)	13.0 (6.0–33.5)	105 (83)	12.0 (6.0–31.0)	516 (82)	.22
Lactate dehydrogenase (U/L)	268 (155–502)	84 (67)	291 (152–474)	439 (70)	.31
Dipstick	+ (neg-+++)	98 (78)	trace (neg-+++)	507 (80)	.006
Bishop score	2 (0–6)	112 (89)	3 (0–6)	560 (89)	.02

Data are median (5th–95th percentile) or number (%).

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