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Title:

Association between planned mode of delivery and severe maternal morbidity in women with breech presentations: a secondary analysis of the PREMODA prospective general population study

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The authors report no conflict of interest

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ABSTRACT

Background: Neonatal morbidity among fetuses in breech presentation is not associated with planned mode of delivery in France. Data about consequences to these mothers are sparse.

Methods: The prospective PREMODA study took place in France and Belgium (2001-2002) in 138 maternity units and included all women with a singleton fetus in breech presentation ≥ 37 weeks of gestation (n=8105). We excluded women with more than one previous cesarean delivery, an in utero fetal death, or for whom cesarean delivery or induction of labor was planned due to maternal disease. The composite variable "severe acute maternal morbidity" (SAMM) grouped severe events. Associations between planned modes of delivery and SAMM were estimated from multivariable Poisson regression models adjusted for potential confounders. A control group with fetuses in cephalic presentation enabled us to compare maternal complications by fetal presentation.

Results: Among the 7564 women included in the analysis, 5098 (67.4%) had a planned cesarean and 2466 (32.6%) a planned vaginal delivery; their SAMM rates did not differ: 48/8098 (0.9%) versus 17/2466 (0.7%), respectively, with an adjusted risk ratio (aRR) of 1.60, 95% confidence interval (95% CI) 0.81-3.15. The SAMM rate was significantly higher in the planned vaginal breech group than in the planned vaginal cephalic group: 17/2466 (0.7%) versus 39/10156 (0.4%) (aRR 2.10, 95% CI 1.18-3.74).

Conclusion: In women with a fetus in breech presentation at term, the short-term risk of severe maternal morbidity did not differ significantly according to planned mode of delivery.

KEYWORDS:

breech, cesarean, severe maternal morbidity, planned vaginal delivery

Introduction

The debate about the mode of delivery for fetuses in breech presentation has focused principally on perinatal complications. An observational prospective study, PREMODA, [1] with high-quality data concerning obstetric practices in France and Belgium, showed that neonatal morbidity was not higher for women with a planned vaginal delivery (PVD) compared with a planned cesarean delivery (PCD) [1]. Nonetheless, in discussing the choice of mode of delivery with women whose fetus is in breech presentation, the benefits and risks of the alternatives must be assessed for the mother as well as her child. The literature about the assessment of maternal complications according to planned mode of delivery for these women is quite sparse. Moreover, the extrapolation of results found in populations in cephalic presentation is difficult because the indications for planned mode of delivery and the course of labor may have some specificities for breech presentations, such as a lower rate of maternal or obstetric disease among the planned cesareans, or a shorter labor in PVD.

The available data come principally from the international multicenter randomized controlled Term Breech Trial, which found no difference in maternal morbidity and mortality according to the planned mode of delivery [2]. The principal limitations of this secondary analysis of the Term Breech Trial were the small number of women included for estimating severe acute maternal morbidity (SAMM), the high rate of cesareans during labor, and a definition of maternal morbidity that combined events corresponding to very variable degrees of severity. Moreover, women were recruited primarily in middle-income countries. Data from observational studies also exist, with contradictory results and other limitations, including their retrospective nature, with a posteriori determinations of the planned mode of delivery, small numbers of subjects, and debatable definitions of maternal morbidity [3–13].

The main objective of this secondary analysis of the PREMODA cohort was to assess the association between maternal morbidity and planned mode of delivery in cases of breech

presentation. The constitution of a control group with fetuses in cephalic presentation also makes it possible to compare maternal complications in PVD according to fetal presentation.

Material and methods:

The population was that of the prospective PREMODA (PREsentation and MODe of delivery) study, which took place between June 1, 2001, and May 31, 2002, in 138 volunteer maternity units in France (including 232,999 births), and during the full year of 2002 in 36 volunteer maternity units in Belgium (31,106 births). The PREMODA study enabled us to collect prospective data from a questionnaire specifically designed to assess the management of labor and delivery, neonatal health status, and maternal complications in pregnancies with a singleton fetus in breech presentation at term. The study included all women giving birth in one of the participating maternity units to a singleton fetus in breech presentation at term (≥ 37 weeks of gestation), alive or not (n=8105). The PCD group comprised the deliveries by cesareans performed before labor, cesareans that were planned but performed on an emergency basis after the onset of labor, and the vaginal deliveries performed even though a cesarean delivery had been planned. All other women were considered to belong to the PVD group.

To limit indication bias for this secondary analysis, we excluded the women for whom a cesarean or induction of labor took place because of maternal disease (n=285) (Figure 1). Moreover, we excluded women with a medically-indicated termination of pregnancy or in utero fetal death (n=20) and the women with more than one previous cesarean delivery (n=212). Finally, we excluded women with missing data for the principal endpoint (n=24). Accordingly the population study comprised 7564 women, 5098 (67.4%) in the PCD group and 2466 (32.6%) in the PVD group.

A control group included 11,310 singleton pregnancies in cephalic presentation at more than 37 weeks, in the same units over the same period, who were assigned a delivery record

number that was a multiple of 20. This procedure provided a random selection of 5% of all the singleton cephalic term births (Figure 1). The same exclusion criteria were used for the fetuses in cephalic and in breech presentation. The comparison with the women with breech presentation only concerned the 10,156 women who had PVDs (Figure 1).

The principal endpoint of short-term severe acute maternal morbidity (SAMM) was a composite variable defined by the onset of at least one of the following events: maternal death, maternal transfer to intensive care, severe postpartum hemorrhage involving a blood transfusion (defined as the transfusion of at least one unit of packed red blood cells), a severe perineal complication associated with a transfusion (pelvic hematoma, major vaginal laceration), intraoperative complications of cesareans associated with a transfusion (uterine pedicle wound, hemostatic problems, bladder or ureteral wound), reoperation in surgical room with anesthesia whatever the mode of delivery, or pulmonary embolism.

Moreover, we used a composite criterion of less severe maternal morbidity which is a broader definition of severe maternal morbidity with a higher incidence and which closed to that used in the Term Breech Trial, which we call SAMM-TBT. It included the onset of at least one of the following events: maternal death, transfer to the ICU, fever lasting more than 48 hours or endometritis, postpartum hemorrhage or surgical blood loss of 1000 ml or more, abscess of the abdominal wall or episiotomy, pelvic hematoma (thrombus), major vaginal laceration, reoperation, deep phlebitis of the lower limbs, pulmonary embolism, intraoperative complications of a cesarean delivery (uterine pedicle wound, hemostatic difficulties, bladder or ureteral wound).

Among singleton pregnancies in breech presentation, we compared the characteristics of the women, pregnancies, neonates, and hospitals according to the planned mode of delivery, based on Chi2 or Fisher's exact tests for categorical variables and Student’s or Wilcoxon's rank sum tests for quantitative variables, as appropriate. To assess the association between the

planned mode of delivery and SAMM, while controlling for confounding by indication, we used multivariable Poisson regression modeling to estimate the risk ratios (RR) and 95% confidence intervals (95% CI) and to adjust for prognostic covariates, with a random intercept model to take variability between centers into account [14]. The reference group was the PVD. Potential confounders determined from previous literature included maternal country of birth (France, Belgium, other), maternal age (continuous variable), parity and previous cesarean delivery (nulliparous, parous without previous cesarean, parous with previous cesarean), birth weight (continuous variable), size of the maternity ward (<1000 deliveries per year, [1000-2000[, ≥2000). We also assessed the association between the actual mode of delivery and SAMM in women with PVD. The same analysis strategy was used to assess the association between fetal presentation and SAMM in women with PVD.

The proportion of women with missing data for each covariate ranged from 0% to 6%. Full data were available for 93% of women, and their characteristics were similar to those of the women with missing data. We used multiple imputation-chained equations to impute missing data and generated 7 independent imputation data sets.

All tests were two-sided with *P*-values ≤0.05 defined as statistically significant. STATA 13 software (StataCorp LP, College Station, TX, USA) was used for the descriptive and multivariable analyses. The National Commission for Data Protection approved the study on May 9, 2001.

Results :

Among the 7564 women included, 5098 (67.4%) comprised the PCD group and 2466 (32.6%) the PVD group. Compared with the PCD group, women in the PVD group were more often born in France, had a lower educational level, were parous with no previous cesarean, had a fetus in frank breech presentation, were at a gestational age beyond 39 weeks, had a birth weight <90th percentile for gestational age and gave birth more often in maternity units

performing more than 2000 deliveries per year (Table 1). In the PVD group, the cesarean rate during labor was 711/2466 (28.8%), with their principal indication lack of progress in dilation. In the PCD group, the rate of cesareans during labor was 734/5098 (14.4%). The principal indications for planned cesareans were breech presentation (2043/5098; 47.1%), fetopelvic disproportion (900/5098; 20.7%), and maternal request (464/5098; 10.7%).

The SAMM rate was similar in the PCD and PVD groups in the univariate (respectively 48/8098 (0.9%) and 17/2466 (0.7%); *P*=0.26) and multivariable (aRR 1.60, 95% CI 0.81-3.15) analyses (Table 2). The principal maternal complication in both groups was reoperation: 0.5% in the PCD group and 0.4% in the PVD group. Results were also similar with the SAMM-TBT outcome: 122/5098 (2.4%) in the PCD group versus 78/2466 (3.2%) in the PVD group (*P*= 0.0504; adjusted RR: 0.77, 95% CI 0.53-1.12) (Appendix 2).

In the PVD group, the SAMM rate did not differ significantly between cesarean or vaginal deliveries: 1/711 (1.0%) versus 10/1755 (0.6%) respectively (*P*=0.26; aRR: 1.14, 95% CI 0.38-3.41). On the other hand, cesarean deliveries were significantly associated with an increased risk of SAMM-TBT compared with vaginal deliveries: 39/711 (5.5%) versus 39/1755 (2.2%) respectively (*P*=0.001). This significant difference persisted in the multivariable analysis (aRR 2.21, 95% CI 1.43-3.40).

Table 3 reports the general and obstetric characteristics of women with PVD according to fetal presentation. The cesarean rate was significantly higher in the group with breech than with cephalic presentations: 711/2466 (28.8%) versus 806/10156 (7.9%) ($P < 0.001$). The characteristics of the maternity units did not differ between these groups. The SAMM rate was significantly higher in the breech than in the cephalic group: respectively, 17/2466 (0.7%) versus 39/10156 (0.4%) (cRR: 1.80, 95% CI 1.02-3.17). This significant difference persisted in the multivariable analysis (aRR: 2.10, 95% CI 1.18-3.74) (Table 4). In particular, the breech group underwent more reoperations than the cephalic group: 9/266 (0.4%) versus

11/10156 (0.1%). The SAMM rate for cesareans was low and similar in the breech and cephalic groups in PVD (1.0 vs 1.1% respectively, *P*=0.80) (Appendix 3). Results were similar with the SAMM-TBT outcomes (Appendix 4).

Discussion

Among women with a fetus in breech presentation at term, the short-term risk of SAMM did not differ significantly according to the planned mode of delivery.

This result is consistent with those from the randomized Term Breech Trial [2]. Nonetheless its results were difficult to generalize. That is, besides the use of different obstetric practices during labor, the intrapartum cesarean rate in their PVD group was different from that observed in French practice (36.1% compared with 29.0% in PREMODA) [1, 2]. Another limitation of the Term Breech Trial was its definition of maternal morbidity to include events with varying degrees of severity; for example, it combined a *postpartum hemorrhage* >1 L and such wall complications as a simple scar dehiscence. In the retrospective studies published, planned mode of delivery was defined a posteriori, and the results are difficult to interpret because of the different definitions of maternal morbidity, the highly various obstetric practices with very different rates of PVD and actual vaginal delivery [3–13]. Among the women with PVD, we found no differences in SAMM between cesarean and vaginal deliveries, but this result must be interpreted with prudence, for this broad definition of maternal morbidity (SAMM-TBT) produces a significant excess of maternal complications in the women with cesareans.

Maternal morbidity according to planned mode of delivery for cephalic presentation has been extensively studied with results that are difficult to interpret because of potentially strong indication bias for the planned cesareans. Only a few studies have taken this indication bias into account to be able to provide high-quality data. A retrospective Chinese study that

198 compared PCDs for maternal convenience to PVDs did not find a difference in the onset of
199 maternal morbidity events [17]. Nonetheless the generalization of these results was limited by
200 the single-center nature of the study and the absence of information about the risk level of the
201 study population. A Canadian study in the general population compared PCDs for breech
202 presentation to PVDs, mostly of fetuses in cephalic presentation, after the exclusion of
203 potential indication biases; it showed an excess risk of SAMM in the PCD group [15]. A
204 French case-control study in the general population took indication bias into account by
205 selection of the population and by a propensity score analysis. It reported an excess risk of
206 SAMM for PCDs compared with PVDs among women aged 35 years and older [16].
207 Accordingly, the data tend to indicate that PCD is associated with an excess rate of SAMM.
208 Compared with the situation with cephalic presentations, the risk of SAMM according to
209 planned mode of delivery for fetuses in breech presentation may be different. On the one
210 hand, indications for PCDs are different than those in situations involving cephalic
211 presentation and are often unrelated to maternal risks. On the other hand, in PVDs, the
212 decisions and obstetric practices for breech and cephalic deliveries differ, such as those for the
213 duration of the first and second stage of labor and for the risk of cesarean and operative
214 vaginal deliveries. Accordingly, as for perinatal risk, knowledge of maternal risk specifically
215 in the case of breech presentation is important to enable women to make their decisions about
216 mode of delivery in this situation.
217 An excess of maternal complications in breech compared with cephalic presentations among
218 women with PVD has also been reported in a retrospective hospital study in Norway with a
219 rather small number of individuals [13]. The excess in the Danish study was explained by the
220 higher frequency of cesareans for breech presentations and the higher risk of maternal
221 morbidity in cesarean compared with vaginal deliveries, regardless of presentation. Our study
222 reports similar results with, in addition for the PVDs, a risk of SAMM that, while not

223 significant, was twice as high in breech as in cephalic presentations. Other factors may help to
224 explain the excess of SAMM in the cases of PVD for the breech deliveries. Accordingly,
225 some risk factors for hemorrhage have been reported to be associated with breech
226 presentation, such as fibroids or a low-lying placenta [18-21]. These results comparing
227 SAMM according to fetal presentation must be explored in other databases with larger
228 numbers of individuals. Finally, this excess maternal risk for breech compared with cephalic
229 presentations is information that is difficult to integrate into the decision for mode of delivery
230 specifically for breech because the alternative is not the presentation but the planned mode of
231 delivery.
232 Our study has several strengths. Its prospective nature enabled a reliable characterization of
233 the actual plans for delivery. The PREMODA general population study is representative of
234 the population of French pregnant women except for the proportion of deliveries in private
235 establishments [1]. The inclusion of all the pregnancies with a fetus in breech presentation in
236 each maternity ward during the study period ensures that these results are representative of the
237 obstetric practices of the participating maternity units and enabled the inclusion of enough
238 women to provide a power of 78% to show a doubling of the risk of SAMM in the PCD group
239 (with a risk of 0.7%). The definition of the SAMM takes into account only severe events that
240 affect maternal health and that are simultaneously independent of obstetric practices. Finally,
241 the indication bias was taken into account by excluding the situations at risk of SAMM and by
242 adjusting for the available confounding factors.
243 This study has several limitations. The data are old, although we note that obstetric practices
244 for breech presentation have changed little in France. Management of labor is probably the
245 same, in the absence of new guidelines from CNGOF, and the cesarean rate for breech
246 presentations has not changed over the past decade [28,29]. Inversely, practices during labor
247 for cephalic presentations have changed, with longer durations of labor authorized, especially

248 in view of recent guidelines by the ACOG and the SMFM, as well as by the CNGOF and the
249 CNSF [30,31]. We had only sparse specific data about maternal complications during
250 pregnancy, although they might be a source of indication bias. Accordingly, our criteria for
251 exclusion and for adjustment are limited. As the assessment of maternal morbidity was not the
252 principal objective of the PREMODA study, some maternal morbidity events may not have
253 been collected. Moreover, this data collection was limited to the immediate postpartum
254 period. We were also unable to study SAMM with a validated definition, such as that
255 resulting from the EPIMOMS Delphi process [32]. Finally our results can be extrapolated
256 only to centers with similar obstetric practices.
257 The results we report are important in the debate about the mode of delivery for fetuses in
258 breech presentation, in view both of the very sparse data reported in the literature about
259 SAMM according to planned mode of delivery in this setting and of the improbability of new
260 data from a new randomized trial or prospective study in the general population. Finally, in
261 the PREMODA study, we found no association between planned mode of delivery and either
262 maternal or neonatal short-term acute morbidity among breech presentations. Our results have
263 implications for clinical practice and can be useful when discussing choices of planned mode
264 of delivery with women.

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Figure 1: Study population

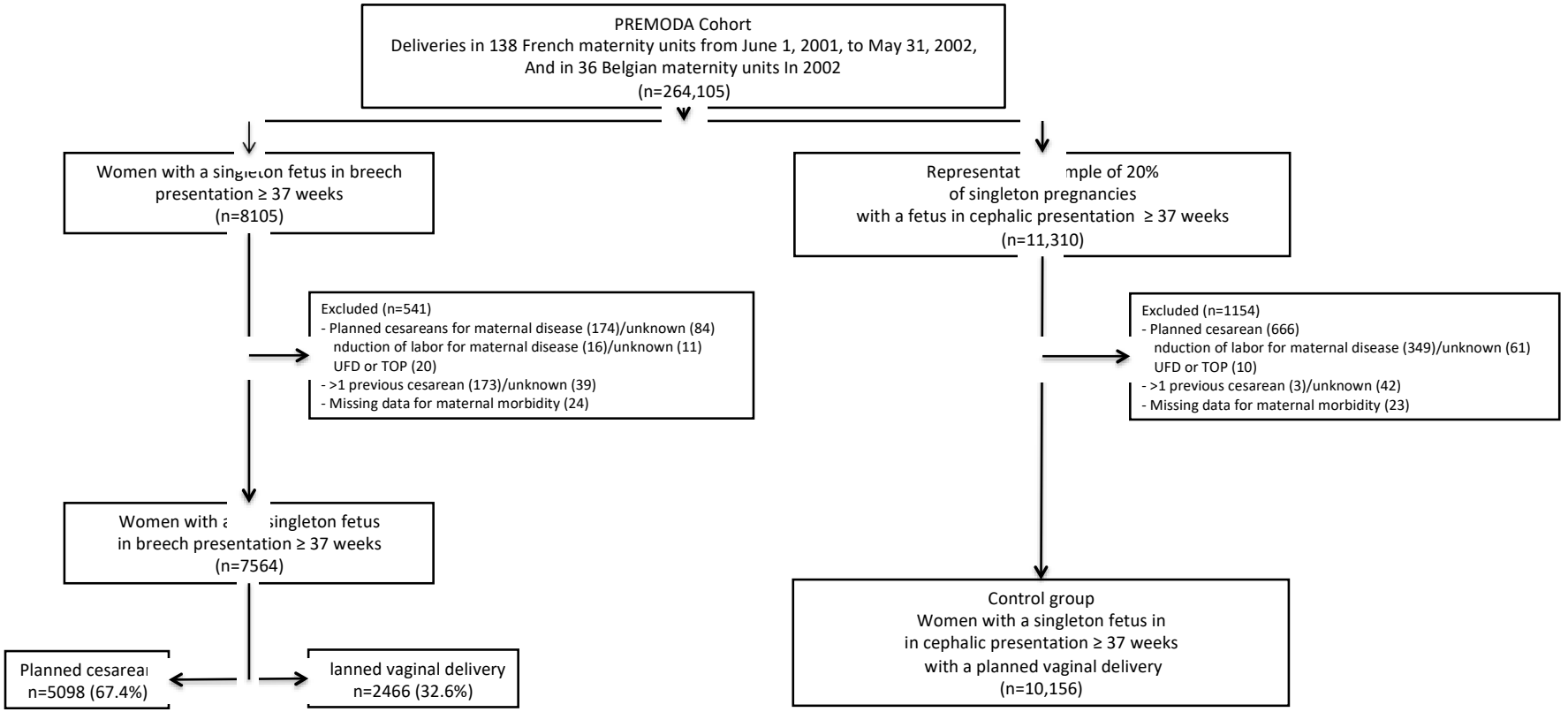


Table 1: Characteristics of mothers, pregnancies, deliveries, and newborns according to planned mode of delivery in women with breech pregnancy

		Planned mode of delivery		*P*
		Planned caesarean N = 5098 n (%)	**Planned vaginal N = 2466 n (%)**	
Maternal age	mean +/- DS (years)	29.5+/-5.0	29.4+/-5.0	0.292
	<21 y	268 (5.3)	162 (6.7)	0.061
	22-34 y	3 990 (79.0)	1 895 (77.9)	
	≥35 y	794 (15.7)	375 (15.4)	
Geographic origin				<0.001
	French	3445 (61.4)	1766 (75.4)	
	Belgian	599 (12.4)	143 (6.1)	
	European	232 (4.8)	108 (4.6)	
	North African	291 (6.0)	182 (7.8)	
	Sub-Saharan African	109 (2.3)	57 (2.4)	
	Other	152 (3.2)	86 (3.7)	
Educational level				0.001
	Primary school or less	151 (3.0)	96 (3.9)	
	Middle school	805 (15.8)	445 (18.1)	
	Secondary school	852 (16.7)	348 (14.1)	
	Postsecondary	1685 (33.1)	842 (34.1)	
	Not specified	1605 (31.5)	735 (29.8)	
Parity and previous cesarean				<0.001
	Nulliparous	3083 (60.7)	1165 (47.3)	
	Parous without previous cesarean	1309 (25.8)	1256 (51.0)	
	Parous with previous cesarean	691 (13.6)	41 (1.7)	
Type of breech				<0.001
	Complete breech	1273 (30.3)	621 (26.3)	
	Frank breech	2808 (66.8)	1633 (69.1)	
	Unspecified	122 (2.9)	108 (4.6)	
Mode of delivery				<0.001
	Cesarean before labor	4339 (85.1)	0	
	Cesarean during labor	734 (14.4)	711 (28.8)	
	Vaginal delivery	25 (0.5)	1755 (71.2)	
Reasons for cesarean before labor				
	Breech	2043 (47.1)	0	
	Fetopelvic disproportion	900 (20.7)	0	
	Previous cesarean	398 (9.2)	0	
	Patient's request	464 (10.7)	0	
	Fetal condition	177 (4.1)	0	
	Maternal gestational disease	0	0	

	Other reasons	357 (8.3)	0	
Reasons for cesarean during labor				
	Planned cesarean section	734	0	
	Failure to progress	0	179 (25.4)	
	FHR anomalies	0	77 (11.4)	
	Failure to progress and FHR anomalies	0	100 (14.8)	
	Other reasons	0	321 (47.4)	
Episiotomy, simple tear		42 (1.0)	1469 (62.8)	<0.001
Repair of anal sphincter (partial or complete)		1 (0.02)	11 (0.5)	<0.001
Gestational age				<0.001
	<39 weeks	2476 (48.6)	759 (30.8)	
	39-40 weeks	2356 (46.3)	1377 (55.9)	
	≥41 weeks	260 (5.1)	329 (13.4)	
Birth weight for gestational age				
	mean +/- DS (grams)	3189 +/- 449	3149 +/- 429	<0.001
	<10th	212 (4.2)	145 (5.9)	
	≥10th and <90th	4197 (82.8)	2109 (86.1)	
	≥90th	657 (13.0)	196 (8.0)	
Maternity hospital				
Size of the maternity ward (births per y)				<0.001
	<1000	630 (12.4)	232 (9.4)	
	1000 and 2000	2241 (44.0)	1069 (43.4)	
	≥2000	2227 (43.7)	1165(47.2)	
Maternity level of care				0.218
	I	810 (19.0)	417 (18.7)	
	II	1980 (46.5)	1000 (44.7)	
	III	1468 (34.5)	819 (36.6)	

Table 2: Rate and components of severe acute maternal morbidity according to the planned mode of delivery in women with a fetus in breech presentation

	Planned cesarean **n=5098** **n (%)**	**Planned vaginal delivery** **n= 2466** **n (%)**	**crude RR (95% CI)**	**adjusted RR:* (95% CI)**
Composite criterion of severe maternal morbidity and mortality	48 (0,9)	17 (0,7)	1,37 (0,79-2,37)	1.60 (0.81-3.15)
Maternal death	0	0		
Transfer to the ICU	12 (0.2)	4 (0.2)		
Reoperation	24 (0.5)	9 (0.4)		
Postpartum hemorrhage and blood transfusion	10 (0.2)	5 (0.2)		
Intraoperative complications if cesarean and transfusion	14 (0.3)	2 (0.1)		
Severe perineal complications and transfusion	0	0		
Pulmonary embolism	4 (0.08)	1 (0.04)		

*adjusted for geographic origin, maternal age, parity and previous cesarean, size of the maternity ward, birth weight

Table 3: Characteristics of mothers, pregnancies, deliveries, and neonates according to fetal presentation in women with planned vaginal delivery

	Breech N = 2466 n (%)	Cephalic N = 10,156 n (%)	p
Maternal age			
mean +/- DS	29.4+/-5.0	29.0 +/- 5.2	<0.001
<21 y	162 (6.7)	796 (7.9)	0.082
22-34 y	1895 (77.9)	7786 (77.5)	
≥35 y	375 (15.4)	1467 (14.6)	
Geographic origin			<0.001
French	1766 (72.4)	6728 (66.9)	
Belgian	143 (5.9)	766 (7.6)	
European	108 (4.4)	461 (4.6)	
North African	182 (7.5)	867 (8.6)	
Sub-Saharan African	57 (2.3)	347 (3.5)	
Other	86 (3.5	399 (4.0)	
Unspecified	99 (4.1)	486 (4.8)	
Educational level			<0.001
Primary school or less	96 (3.9)	444 (4.4)	
Middle school	445 (18.1)	1785 (17.6)	
Secondary school	348 (14.1)	1458 (14.4)	
Postsecondary	842 (34.1)	2995 (29.5)	
Not specified	735 (29.8)	3474 (34.2)	
Parity and previous cesarean			<0.001
Nulliparous	1165 (47.3)	4452 (43.9)	
Parous without previous cesarean	1256 (51.0)	5143 (50.7)	
Parous with previous cesarean	41 (1.7)	540 (5.3)	
Gestational age			<0.001
<39 weeks	759 (30.8)	2074 (20.5)	
39-40 weeks	1377 (55.9)	6124 (60.6)	
≥41 weeks	329 (13.4)	1912 (18.9)	
Induction of labor	199 (8.1)	2095 (20.6)	<0.001
Rupture of membranes			<0.001
Premature	490 (21.3)	1608 (16.2)	
Spontaneous during labor	1203 (52.3)	2815 (28.3)	
Artificial during labor	525 (22.8)	5470 (55.1)	
During cesarean	84 (3.7)	41 (0.4)	
Lack of progress in dilatation			<0.001
None	1789 (79.5)	7775 (83.2)	
At least 1 failure to progress ≥1 h	221 (9.8)	701 (7.5)	
At least 1 failure to progress ≥2 h	208 (9.1)	681 (7.3)	
At least 2 episodes of failure to progress ≥1 h	35 (1.6)	190 (2.0)	
Oxytocin augmentation without labor induction	1272 (71.3)	5467 (65.4)	<0.001

Mode of delivery			<0.001
Cesarean during labor	711 (28.8)	806 (7.9)	
Vaginal delivery	1755 (71.2)	9350 (92.1)	
Cervical dilation of cesarean during labor	5.9	5.5	0.001
Reasons for cesarean during labor			<0.001
Failure to progress	179 (26.4)	258 (33.0)	
FHR anomalies	77 (11.4)	219 (28.0)	
Failure to progress and FHR anomalies	100 (14.8)	221 (28.3)	
Other reasons	321 (47.4)	84 (10.7)	
Birth weight for gestational age			
Mean +/- DS	3149 +/- 429	3352 +/- 442	<0.001
<10th	145 (5.9)	285 (2.6)	<0.001
≥10th and <90th	2 109 (86.1)	8 191 (81.2)	
≥90th	196 (8.0)	1 645 (16.3)	
If vaginal delivery			
Duration of first stage of labor between 5 and 10 cm dilation			0.026
<4h	1166 (81.3)	6880 (84.1)	
4-6 h	244 (17.0)	1170 (14.3)	
≥7 h	24 (1.7)	131 (1.6)	
Duration of passive phase of second stage of labor			<0.001
<30 min	1049 (63.5)	6102 (69.0)	
30-60 min	298 (18.0)	1342 (15.2)	
≥60 min	306 (18.5)	1396 (15.8)	
Duration of active phase of second stage of labor			<0.001
<30 min	1608 (93.9)	8167 (89.4)	
30-60 min	101 (5.9)	926 (10.1)	
≥60 min	4 (0.2)	43 (0.5)	
Episiotomy, simple perineal tear	1469 (62.8)	6097 (61.1)	0.136
Repair of anal sphincter (partial or complete)	11 (0.5)	86 (0.9)	0.054
Maternity hospital			
Size (births per y)			0.21
<1000	232 (9.4)	1039 (10.2)	
1000 and 2000	1069 (43.4)	4500 (44.3)	
≥2000	1165(47.2)	4617 (45.5)	
Maternity level of care			0.794
I	417 (18.7)	1624 (18.1)	
II	1000 (44.7)	4067 (45.4)	
III	819 (36.6)	3266 (36.5)	

* Many teams have a set of maneuvers they use routinely for breech deliveries, even when no difficulties arise.

Table 4: Rate and components of severe acute maternal morbidity according to fetal presentation in women with planned vaginal delivery

	Breech	**Cephalic**	**Crude RR (95% CI)**	**Adjusted RR* (95% CI)**
	n= 2466	**n=10,156**		
	n (%)	**n (%)**		
Composite criterion of severe maternal morbidity and mortality	17 (0.7)	39 (0.4)	1.80 (1.02-3.17)	2.10 (1.18-3.74)
Maternal death	0	0		
Transfer to the ICU	4 (0.2)	16 (0.2)		
Reoperation	9 (0.4)	11 (0.2)		
Postpartum hemorrhage and blood transfusion	5 (0.2)	16 (0.2)		
Intraoperative complications and transfusion	2 (0.08)	3 (0.03)		
Severe perineal complications and transfusion	0	2 (0,02)		
Pulmonary embolism	1 (0.04)	0		

*adjusted for geographic origin, maternal age, parity and previous cesarean, size of the maternity ward, birth weight

Appendix 1:

1.A. PREMODA Study Group

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1.C. List of 36 Belgian maternity units participating in PREMODA study:

Belgium Coordinator: Pr Foidart: CH Luxembourg (Dr Arendt), Hôpital St Nikolaus Eupen (Dr Chantraine), Hôpital Ste Anne-St-Remi Bruxelles (Dr Befahy), CH Etterbeek-Ixelles (Dr Houben), Hôpital Braine l'Alleud Waterloo Lillois (Dr Busine), Hôpital St Elisabeth Bruxelles (Dr Depierreux), CHR War quignies Boussu (Dr Mathieu), IFAC Ste Thérèse Bastogne (Dr Colin), RHMS La Madeleine Ath (Dr Coulon), CHU Saint-Pierre Bruxelles (Dr Barlow), RHMS Tournai (Dr Delvoye), CH Françoise Rabelais Cesar de Paepe Bruxelles (Dr Verougstraete), CH Peltzer La Tourelle Verviers (Dr Deville), Centre de Sante´ des Fagnes Chimay (Dr Dewille), CHR Namur (Dr D'Huslt), Hôpital St Joseph Mons (Dr du Bois d'Enghien), CHU Liège (Pr Foidart), CHU Tivoli La Louvère (Dr Francotte), CHR Haute Senne Soignies (Dr Gielen), IFAC Princesse Paola Marche (Dr Gilles), CHR Val de Sambre Auvelais (Dr Verheyen), Cliniques Universitaires St Luc Bruxelles (Pr Bernard, Pr Hubinont), CH Mouscron (Dr Jacob), Hôpital Reine Astrid Malmedy (Dr Lavalleye), CHU Brugmann Bruxelles (Pr Vokaer), Hôpital St Pierre Ottignies (Dr Longueville), CH Jolimont (Dr

Guilmot), CHU Erasme Bruxelles (Dr Kirkpatrick), CH Notre Dame Charleroi (Dr Sartenaer), CH Hornu-Frameries (Dr Semoulin), CHBA Seraing (Pr Van Cauwenberge), Hôpital St Jean Bruxelles (Dr Venderick), CH François Rabelais Français Reine Elisabeth Bruxelles (Dr Vermeulen), Hôpital Notre Dame des Bruyères Chenée (Dr Vigis), Hôpital Notre Dame Tournai (Dr Wauters), Hôpital Notre Dame Hermalle (Dr Romedenne).

Appendix 2: Rate and components of acute maternal morbidity as defined in the Term Birth Trial, according to planned mode of delivery for women with a fetus in breech presentation

	Planned cesarean n=5 098 n (%)	Planned vaginal delivery n= 2 466 n (%)	crude RR (95% CI)	adjusted RR:* (95% CI)
SAMM-TBT	122 (2.4)	78 (3.2)	0.76 (0.57-1.00)	0.77 (0.53-1.12)
Fever for more than 48 hours or endometritis	37 (0.7)	31 (1.3)		
Third-stage hemorrhage or surgical blood loss ≥ 1000 ml	45 (0.9)	32 (1.3)		
Transfusion	14 (0.3)	6 (0.3)		
Pelvic hematoma (thrombus), 4th-degree perineal lacerations, major vaginal lacerations	1 (0.02)	4 (0.2)		
Abscess of abdominal wall or episiotomy	19 (0.4)	17 (0.7)		
Reoperation	24 (0.5)	9 (0.4)		
Deep phlebitis of the lower limbs	1 (0.02)	2 (0.08)		
Pulmonary embolism	4 (0.08)	1 (0.04)		
Intraoperative complications of cesarean	32 (0.7)	8 (0.4)		
Transfer to the ICU	12 (0.2)	4 (0.2)		
Maternal death	0	0		

*adjusted for geographic origin, parity and previous cesarean, size of the maternity ward, birth weight

Appendix 3: Risk of SAMM according to mode of delivery for PVD

	Breech	Cephalic	p
	N=2466	N=10,156	
	n (%)	n (%)	
PLANNED VAGINAL DELIVERY			
Vaginal delivery	**10/1755 (0.6)**	**30/9350 (0.3)**	**0.11**
Cesarean delivery	**7/711 (1.0)**	**9/806 (1.1)**	**0.80**

Appendix 4: Rate and components of acute maternal morbidity as defined in the Term Birth Trial, according to planned mode of delivery for women with planned vaginal delivery

	Breech n= 2466 n (%)	**Cephalic n=10,156 n (%)**	**Crude RR (95% CI)**	**Adjusted RR* (95% CI)**
Composite criterion	78 (3.2)	265 (2.6)	1.21 (0.95-1.55)	1.32 (1.04-1.67)
Fever for more than 48 hours or endometritis	31 (1.3)	64 (0.6)		
Third-stage hemorrhage or surgical blood loss ≥ 1000 ml	32 (1.3)	148 (1.5)		
Transfusion	6 (0.3)	27 (0.3)		
Pelvic hematoma (thrombus). 4^{th}-degree perineal lacerations. major vaginal lacerations	4 (0.2)	26 (0.3)		
Abscess of abdominal wall or episiotomy	17 (0.7)	19 (0.2)		
Reoperation	9 (0.4)	11 (0.1)		
Deep phlebitis of the lower limbs	2 (0.08)	4 (0.04)		
Pulmonary embolism	1 (0.04)	0		
Intraoperative complications of cesarean	8 (0.4)	8 (0.1)		
Transfer to the ICU	4 (0.2)	16 (0.2)		
Maternal death	0	0		

*adjusted for geographic origin, maternal age, parity and previous cesarean, size of the maternity ward, birth weight