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ORIGINAL ARTICLE



Perinatal outcomes according to the mode of delivery in women with a triplet pregnancy in The Netherlands

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ABSTRACT

Objective: In women with a triplet pregnancy, there is debate on the preferred mode of delivery. We performed a nationwide cohort study to assess the impact of mode of delivery on perinatal outcome in women with a triplet pregnancy.

Methods: Nationwide cohort study on women with a triplet pregnancy who delivered between 26 + 0 and 40 + 0 weeks of gestation in the years 1999–2008. We compared perinatal outcomes according to the intended mode of delivery and the actual mode of delivery. Outcome measures were perinatal mortality and neonatal morbidity. Perinatal outcomes were analyzed taking into account the dependency between the children of the same triplet pregnancy (“any mortality” and “any morbidity”) and were also analyzed separately per child.

Results: We identified 386 women with a triplet pregnancy in the study period. Mean gestational age at delivery was 33.1 weeks (SD 2.5 weeks; range 26.0–40.0 weeks). Perinatal mortality was 2.3% for women with a planned caesarean section and 2.4% in women with a planned vaginal delivery (aOR 0.37; 95% confidence interval (CI) 0.09–1.5) and neonatal morbidity was 26.0% versus 36.0%, (aOR 0.88; 95% CI 0.51–1.4) respectively. In the subgroup analyses according to gestational age and in the analysis of perinatal outcomes per child separately, there were also no large differences in perinatal outcomes. The same applied for perinatal outcomes according to the actual mode of delivery.

Conclusion: In this large cohort study among women with a triplet pregnancy, caesarean delivery is not associated with reduced perinatal mortality and morbidity.

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Mode of delivery; perinatal outcome; triplet pregnancy

Introduction

Multiple gestation has increased over the years, mainly due the growing use of assisted reproductive technologies and due to the increased maternal age at first pregnancy [1]. This increase in multiple gestation is a concern in obstetrical practice, as multiple pregnancies are associated with poorer maternal and perinatal outcomes than singleton pregnancies, mainly due to prematurity [2]. In women with a triplet pregnancy, the incidence of overall preterm deliveries is approximately 90%; with a risk of extreme preterm birth <28 weeks and very preterm birth (28–32 weeks) 13-fold and almost 20-fold, respectively, when compared with women with a singleton pregnancy [3].

Another issue in women with a multiple pregnancy is the mode of delivery. In women with a twin pregnancy, a recent large randomized clinical trial found

no difference between planned caesarean section and planned vaginal delivery [4]. That study has been criticized, as women were randomized from 32-week onwards and the mortality and morbidity rates in the study were mainly driven by babies delivered at 32, 33, and 34 weeks [5]. Indeed, in the subgroup of women randomized after 37 weeks, the Twin birth study showed non-significant benefit of caesarean section (RR 0.3; 95% confidence interval (CI) 0.06–1.4). A recent Australian cohort study showed a better perinatal outcome of caesarean section in women with a twin pregnancy at term [6].

In women with a triplet pregnancy, the preferred route of delivery has not been determined [7]. In an effort to minimize intrapartum fetal complications, there has been a tendency to caesarean delivery in women with a triplet pregnancy [8]. There are studies that report an improved outcome by planned

Table 1. Description of the studies on women with a triplet pregnancy according to the mode delivery.

Authors	Period	Number of patients included	Main outcome of the study
Loucopoulos and Jewelewicz (9)	1965–1981	35	Study includes also quadruplets and quintuplets Overall mortality 14.8%
Feingold et al. (10)	1977–1986	15	Lower combined perinatal mortality and morbidity in CS as compared with VD
Crowther and Hamilton (11)	1975–1984	105	Study in Zimbabwe; mortality for triplet one 0/15 (0%) in CS versus 22/72 (30.6%) in VD, mortality of triplet two in CS 1/17 (5.9%) and for VD 22/72 (30.0%); triplet three 2/17 (11.8%) versus 27/70 (38.6%)
Vintzileos et al. (12)	1995–1998	7067	95% caesarean section. Vaginal delivery was associated with increased risk stillbirth RR 5.7; neonatal death <28 d RR 2.8 and infant death <1 year RR 2.3
Ron-El et al. (13)	1970–1978	25	Triplets (19) and quadruplets (6) 44% caesarean delivery; no differences in perinatal outcome
Clarke and Roman (14)	1981–1992	19	63% caesarean delivery; perinatal death 6/36 (17%) in CS and 0/21 (0%) in VD; greater maturity of the infants delivered vaginally appeared to be the major factor for the lower neonatal mortality.
Wildschut et al. (15)		69	84% caesarean delivery; perinatal mortality significantly higher in caesarean section $p = .02$
Alran et al. (16)	1989–2001	93	71% vaginal deliveries; no differences in perinatal outcome: 9/234 (3.8%) in VD and 0/45 (0%) in CS. Neonatal deaths were not related to the mode of delivery
Ziadeh (17)	1994–1999	41	49% caesarean section; perinatal mortality 30.0% in caesarean section and 22.2% in vaginal delivery.
Grobman et al. (18)	1993–1997	66	50% caesarean delivery. In both groups % perinatal mortality and no differences in perinatal and maternal morbidity
Machtinger et al. (19)	1997–2005	73	Perinatal mortality 4/78 (5.1%) in VD and 0/141 (0%) in CS. Composite adverse neonatal outcome 29/78 (37.2%) and 45/141 (31.9%), respectively
Alamia et al. (8)	1995–1997	23	No cases of perinatal mortality in planned CS and planned VD; no differences in neonatal morbidity.

caesarean section, but also studies that suggest a lower perinatal morbidity following vaginal delivery [9–19] (Table 1). In a very large series of 7000 women, Vintzileos et al. showed an increase in intrapartum death and neonatal mortality after vaginal delivery. Other studies showed absolute risks to be small, thus also allowing a policy of vaginal delivery if the woman opted to do so.

The aim of the present study was to evaluate the association of (intended) mode of delivery and perinatal mortality and morbidity in a large national cohort of women who delivered a triplet pregnancy in The Netherlands.

Materials and methods

This study was performed using data from a retrospective national cohort registered in the Netherlands Perinatal Registry (PRN). The PRN consists of population-based data containing information on pregnancies, deliveries, and (re)admissions until 28 d after birth.

The PRN database is obtained by a validated linkage of three different registries: the midwife registry (LVR 1), the obstetricians registry (LVR 2), and the neonatology registry (LNR) of hospital admissions of newborn infants [20]. The coverage of the PRN is approximately 96% of all deliveries in the Netherlands

and currently includes over 1.9 million records derived from deliveries in the last decade.

All PRN data are recorded by the caregivers during prenatal care, delivery and the neonatal period. The data are annually sent to the national registry office, where a number of range and consistency checks are conducted. Institutional review board approval was not necessary since the data were used anonymous, thus exempting ethics approval in the Netherlands.

For this study, we included all women with a triplet pregnancy who delivered beyond 26 weeks between 1 January 1999 and 31 December 2008. Women were included independently of chorionicity and mode of conception. Exclusion criteria were severe congenital abnormalities and intrauterine fetal death.

Neonatal outcomes were intrapartum death and neonatal death up to 28 d after birth. Neonatal morbidity was defined as Neonatal Intensive Care Units (NICU) admission, neonatal sepsis, intraventricular hemorrhage (IVH), bronchopulmonary dysplasia (BPD), and infant respiratory distress syndrome (IRDS). We excluded women who delivered before 26⁺⁰ weeks of gestation because in the time period of the study active management between 24⁺⁰ and 26⁺⁰ weeks was not general practice in the Netherlands. According to the national guidelines in that period, tocolytics (atosiban or nifedipine according to the Dutch guidelines) and antenatal corticosteroids to enhance fetal

lung maturity were recommended from 25⁺⁰ to 33⁺⁶ weeks of gestation for a period of 48 h in women with symptoms of threatened preterm birth. Threatened preterm birth is defined as preterm contractions combined with dilatation or cervical length shortening below 25 mm or preterm premature rupture of membranes (PPROM).

Women at risk for preterm delivery before 32 weeks of gestation are referred to tertiary centers that are equipped with NICU. After 32 weeks of gestation delivery can take place in a general hospital (secondary care). Magnesium sulfate for fetal neuroprotection was not common practice in the Netherlands during the study period.

Analysis

We studied the impact of the intended mode of delivery (planned caesarean section versus planned vaginal delivery) and of the actual mode of delivery (planned caesarean section, vaginal delivery, emergency caesarean section, and vaginal delivery of one or two children followed by emergency caesarean section) on perinatal outcome. The coding in the PRN is such that women who never have the intention to deliver vaginally are coded as a planned caesarean section, and women who intend to deliver vaginally but who then have a caesarean section are coded as an emergency caesarean section. Perinatal outcomes were clustered: taking into account the dependency between the children of the same mother/same triplet pregnancy. These clustered outcome measures are “any mortality”, “any morbidity” and “any mortality or morbidity”. Furthermore we analyzed perinatal outcomes separately per child. We calculated odds ratios with 95% CI to determine the precision of each odds ratio. We adjusted for gestational age (weeks). We also made a subgroup analysis according to gestational age, which was divided into the following classes: 26–32 weeks, 32–37 weeks and >37 weeks. We used statistical software SPSS[®] for analysis (SPSS, Chicago, IL).

Results

We identified 386 women with a triplet pregnancy in our nationwide database who delivered between 1999 and 2008, delivering 1158 children. Mean gestational age at delivery was 33.1 weeks (SD 2.5 weeks, range 26.0–40.0 weeks) (Figure 1).

There were 219/386 women (57%) with a planned caesarean section and 167/386 women (43%) with a planned vaginal delivery. The baseline characteristics of these women are listed in Table 2. The planned

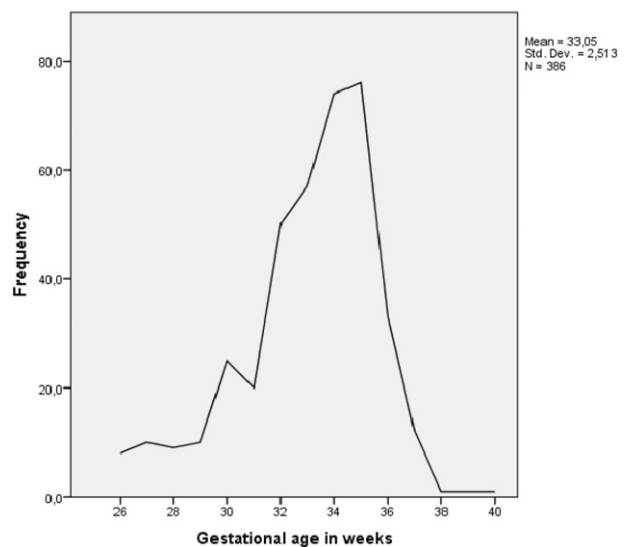


Figure 1. Gestational age at delivery in women with a triplet pregnancy in the Netherlands.

caesarean delivery group contained more nulliparous women (129/219; 59%) as compared to the planned vaginal delivery group (77/167; 46%) ($p = .06$). Mean gestational age at delivery was higher in women with a planned caesarean section (33.5 weeks) as compared with women with a planned vaginal delivery (32.4 weeks) ($p \leq .001$). The same applied for mean birth weight of all children ((1962 versus 1769 g, $p \leq .001$), (1910 versus 1768 g, $p = .005$), and (1900 versus 1746 g, $p = .002$)) for the first, the second, and the third child, respectively.

The clustered data (taking into account the dependency between children of the same mother/triplet pregnancy) according to the intended mode of delivery showed in the overall group a mortality rate of 2.3% in planned caesarean section versus 2.4% in planned vaginal delivery, (aOR 0.37; 95% CI 0.09–1.5); any morbidity in 26% versus 36%, (aOR 0.88; 95% CI 0.51–1.4) and any mortality and morbidity of 25% for planned caesarean section as compared with 34% for planned vaginal delivery (aOR 1.2; 95% CI 0.72–2.2). In the subgroup analysis according to gestational age, there were also no large differences for any mortality, any morbidity and any mortality or morbidity in planned caesarean section as compared with planned vaginal delivery.

When we compared the first, the second, or the third child separately, there were no statistically significant differences in perinatal mortality ((1.4% versus 2.4%, aOR 1.6; 95% CI 0.32–8.3), (0.91% versus 0.60%, aOR 3.7; 95% CI 0.30–44.9), and (0.46% versus 1.2%, aOR 1.16; 95% CI 0.10–13.7)), respectively, for planned caesarean section as compared with planned vaginal delivery. Neonatal morbidity per child also showed no

Table 2. Baseline characteristics of women with a triplet pregnancy.

	Planned Caesarean section <i>N</i> = 219	Planned Vaginal delivery <i>N</i> = 167	<i>p</i> Value
Mean maternal age, years (SD)	32.5 (4.1)	31.7 (4.2)	.09
Parity			.06
Nulliparous, <i>n</i> (%)	129 (59)	77 (46)	
Parous, <i>n</i> (%)	90 (41)	90 (54)	
Chorionicity			.45
TCTA, <i>n</i> (%)	87 (40)	70 (42)	
DCTA, <i>n</i> (%)	65 (30)	47 (28)	
MCTA, <i>n</i> (%)	11 (5)	6 (4)	
Unknown, <i>n</i> (%)	56 (25)	44 (26)	
Conception			.71
Spontaneous, <i>n</i> (%)	69 (31)	63 (38)	
ART, <i>n</i> (%)	148 (68)	103 (61)	
Unknown, <i>n</i> (%)	2 (1)	3 (1)	
Ethnicity			.46
Western, <i>n</i> (%)	206 (94)	160 (96)	
Non-western, <i>n</i> (%)	13 (6)	7 (4)	
Hypertension			.55
Yes, <i>n</i> (%)	39 (18)	25 (15)	
No, <i>n</i> (%)	180 (82)	142 (85)	
Maternal diabetes			.45
Yes, <i>n</i> (%)	2 (1)	1 (1)	
No, <i>n</i> (%)	154 (70)	127 (76)	
Unknown, <i>n</i> (%)	63 (29)	39 (23)	
Mean birth weight, grams (SD)			
Foetus 1	1962 (432)	1769 (492)	<.001
Foetus 2	1910 (482)	1768 (499)	.005
Foetus 3	1900 (476)	1746 (501)	.002
Mean gestational age at delivery, weeks (SD)	33.5 (2.1)	32.4 (2.9)	<.001
Gestational age at delivery			<.001
26 + 0–31 + 6 weeks, <i>n</i> (%)	27 (12)	55 (33)	
32 + 0–36 + 6 weeks, <i>n</i> (%)	183 (84)	107 (64)	
37 + 0–40 + 0 weeks, <i>n</i> (%)	9 (4)	5 (3)	

TCTA: trichorionic triamniotic; CTA: dichorionic triamniotic; MCTA: monochorionic triamniotic; ART: assisted reproductive technologies.

significantly different outcomes for the first, the second, and the third child (14% versus 21%, aOR 0.78; 95% CI 0.41–1.5), (16% versus 24% aOR 0.91; 95% CI 0.50–1.7), and (18% versus 2%, aOR 0.73; 95% CI 0.40–1.3) for planned caesarean section as compared with planned vaginal delivery. The same applied for all perinatal outcomes according to gestational age (Table 3).

In the analysis according to the actual mode of delivery in the whole study population, any mortality was not significantly different in women who delivered by planned caesarean section, emergency caesarean section, vaginal delivery of one or two children followed by emergency caesarean section as compared with vaginal delivery (2.3% versus 1.4%, aOR 4.2; 95% CI 0.43–40.9), (1.4% versus 1.4%, aOR 0.78; 95% CI 0.04–13.9), and (8.7% versus 1.4%, aOR 5.8; 95% CI 0.39–85.6), respectively (Table 4).

The same applied for any morbidity (26% versus 32%, aOR 0.89; 95% CI 0.38–2.1) for women who delivered by planned caesarean section, for women who delivered by emergency caesarean section (37% versus 32%, aOR 0.99; 95% CI 0.34–2.8) and women who delivered by vaginal delivery and emergency caesarean section (44% versus 32%, aOR 0.64; 95% CI

0.15–2.7) as compared with vaginal delivery. The subgroup analysis according to gestational age also showed no large differences in perinatal outcomes. The analysis for every child of the triplet pregnancy separately showed a significantly increased risk for perinatal morbidity of the third child in emergency caesarean section as compared to vaginal delivery (17% versus 27%, aOR 3.8; 95% CI 1.3–11.4). All other perinatal outcomes were not significantly different (Table 4).

Discussion

This population based cohort study of perinatal outcomes in women with a triplet pregnancy in the Netherlands shows an overall perinatal mortality rate of 2.3% in planned caesarean section versus 2.4% in planned vaginal delivery and a neonatal morbidity rate of 26% versus 36%, respectively. Perinatal mortality for the first child was 1.4% versus 2.4%, for the second child 0.91% versus 0.60% and for the third child 0.46% versus 1.2%.

In many countries women with a triplet pregnancy deliver by planned caesarean section [21]. The high vaginal delivery rate in The Netherlands gave us the

Table 3. Perinatal mortality^a and neonatal morbidity^b in women with a triplet pregnancy according to the intended mode of delivery.

	Planned CS	Planned VD	OR (95% CI)	aOR (95% CI) ^c
Overall 26–40 weeks	N = 219	N = 167		
Any mortality	5/219	4/167	0.95 (0.25–3.6)	0.37 (0.09–1.5)
Any morbidity	56/219	60/167	0.61 (0.40–0.95)	0.88 (0.51–1.4)
Any mortality or morbidity	55/219	56/167	0.66 (0.43–1.04)	1.2 (0.72–2.2)
Perinatal death first child, n%	3/219	4/167	0.57 (0.12–2.6)	1.6 (0.32–8.3)
Perinatal death second child, n%	2/219	1/167	1.5 (0.14–17.0)	3.7 (0.30–44.9)
Perinatal death third child, n%	1/219	2/167	0.38 (0.03–4.2)	1.16 (0.10–13.7)
Neonatal morbidity first child, n %	31/219	35/167	0.62 (0.37–1.1)	0.78 (0.41–1.5)
Neonatal morbidity second child, n%	35/219	40/167	0.65 (0.39–1.1)	0.91 (0.50–1.7)
Neonatal morbidity third child, n%	39/219	39/167	0.71 (0.43–1.2)	0.73 (0.40–1.3)
26–31 + 6 weeks	N = 27	N = 55		
Any mortality	3/27	4/55	1.6 (0.33–7.7)	3.5 (0.55–22.5)
Any morbidity	21/27	43/55	0.02 (0.00–0.11)	0.78 (0.24–2.5)
Any mortality or morbidity	21/27	40/55	1.3 (0.44–3.9)	1.7 (0.55–5.5)
Perinatal death first child, n%	2/27	4/55	1.02 (0.17–5.9)	2.0 (0.27–15.0)
Perinatal death second child, n%	1/27	1/55	2.1 (0.12–34.5)	3.5 (0.19–64.4)
Perinatal death third child, n%	1/27	2/55	1.02 (0.09–11.8)	1.7 (0.13–21.4)
Neonatal morbidity first child, n %	16/27	28/55	1.4 (0.55–3.6)	0.48 (0.17–1.4)
Neonatal morbidity second child, n%	15/27	31/55	0.97 (0.38–2.5)	0.83 (0.31–2.2)
Neonatal morbidity third child, n%	13/27	30/55	0.77 (0.31–1.9)	0.96 (0.34–2.7)
32–36 + 6 weeks	N = 183	N = 107		
Any mortality	2/183	0/107	–	–
Any morbidity	34/183	16/107	1.3 (0.67–2.5)	0.74 (0.37–1.5)
Any mortality or morbidity	33/183	15/107	1.3 (0.70–2.6)	1.4 (0.70–2.9)
Perinatal death first child, n%	1/183	0/107	–	–
Perinatal death second child, n%	1/183	0/107	–	–
Perinatal death third child, n%	0/183	0/107	–	1.01 (0.84–1.2)
Neonatal morbidity first child, n %	15/183	6/107	1.5 (0.57–4.0)	0.64 (0.24–1.7)
Neonatal morbidity second child, n%	19/183	9/107	1.3 (0.55–2.9)	0.77 (0.33–1.8)
Neonatal morbidity third child, n%	25/183	9/107	1.7 (0.77–3.8)	0.56 (0.24–1.3)
>37 weeks	N = 9	N = 5		
Any mortality	0/9	0/5	–	–
Any morbidity	1/9	1/5	–	–
Any mortality or morbidity	1/9	1/5	–	–
Perinatal death first child, n%	0/9	0/5	–	–
Perinatal death second child, n%	0/9	0/5	–	–
Perinatal death third child, n%	0/9	0/5	–	–
Neonatal morbidity first child, n %	0/9	1/5	–	–
Neonatal morbidity second child, n%	1/9	0/5	–	–
Neonatal morbidity third child, n%	1/9	0/5	–	–

^aPerinatal mortality is defined as intrapartum mortality and neonatal mortality <28 d.

^bNeonatal morbidity is defined as NICU admission, neonatal sepsis, IVH, BPD, and IRDS.

^cAdjusted for gestational age in weeks.

unique opportunity to study the effect of the mode of delivery on perinatal outcomes in women with a triplet pregnancy. In our study population of 386 women with a triplet pregnancy, almost half of the women had an intended vaginal delivery. Of these women with an intended vaginal delivery 44% had an actual vaginal delivery, while 56% had an emergency caesarean section after vaginal birth of one or two children.

Mean gestational age at delivery in our study was 33.1 weeks, which is comparable with other studies on perinatal outcomes in women with a triplet pregnancy [13,17]. Remarkable in our cohort is that we identified a relatively high percentage of women with a triplet pregnancy who delivered beyond 37 weeks of gestation (16/386, 4.1%).

A limitation of this study is the fact that this is a retrospective cohort study with different baseline characteristics for both groups, with a significantly higher

mean gestational age at delivery and higher mean birth weight of all children in women who delivered by planned caesarean section as compared with planned vaginal delivery. The lower birth weight and the lower gestational age at delivery in the women who delivered vaginally might contribute to a poorer outcome.

Another limitation is that from our database we were not able to determine what criteria were used in the decision of the mode of delivery: what was the profile of women who were allowed to deliver vaginally and what were the reasons for a planned caesarean section.

A potential disadvantage of caesarean delivery in women with threatened preterm labor is timing of the delivery. In case caesarean delivery is done preterm, one is never sure whether preterm delivery actually would occur. As our dataset only registered the exact

Table 4. Perinatal mortality^a and neonatal morbidity^b in women with a triplet pregnancy according to the actual mode of delivery.

	Planned CS	VD	Emergency CS	VD + ECS	OR (95% CI) ^c CS versus VD	OR (95% CI) ^c ECS versus VD	OR (95% CI) VD + ECS versus VD
Overall 26–40 weeks	N = 219	N = 74	N = 70	N = 23			
Any mortality	5/219	1/74	1/70	2/23	4.2 (0.43–40.9)	0.78 (0.04–13.9)	5.8 (0.39–85.6)
Any morbidity	56/219	24/74	26/70	10/23	0.89 (0.38–2.1)	0.99 (0.34–2.8)	0.64 (0.15–2.7)
Any mortality or morbidity	55/219	23/74	24/70	9/23	1.3 (0.63–2.7)	0.98 (0.42–2.3)	1.05 (0.27–4.0)
Perinatal death first child, n%	3/219	1/74	1/70	2/23	2.5 (0.23–28.4)	0.78 (0.4–13.9)	5.8 (0.39–85.6)
Perinatal death second child, n%	2/219	0/74	0/70	1/23	–	–	–
Perinatal death third child, n%	1/219	0/74	1/70	1/23	–	–	–
Neonatal morbidity first child, n %	31/219	14/74	16/70	5/23	0.75 (0.32–1.8)	0.91 (0.36–2.3)	1.3 (0.30–6.0)
Neonatal morbidity second child, n%	35/219	17/74	16/70	7/23	0.97 (0.45–2.1)	1.3 (0.5–3.4)	0.87 (0.25–3.0)
Neonatal morbidity third child, n%	39/219	20/74	12/70	7/23	1.1 (0.55–2.3)	3.8 (1.3–11.4)	1.3 (0.34–5.1)
26–32 weeks	N = 27	N = 21	N = 25	N = 9			
Any mortality	3/27	1/21	1/25	2/9	5.8 (0.41–83.7)	0.73 (0.04–14.7)	4.3 (0.23–84.3)
Any morbidity	21/27	16/21	19/25	8/9	1.2 (0.22–6.8)	1.2 (0.23–6.6)	0.46 (0.04–6.1)
Any mortality or morbidity	21/27	15/21	17/25	8/9	2.1 (0.83–2.1)	0.79 (0.21–3.0)	2.4 (0.52–1.4)
Perinatal death first child, n%	2/27	1/21	1/25	2/9	3.4 (0.21–56.1)	–	4.4 (0.23–84.3)
Perinatal death second child, n%	1/27	0/21	0/25	1/9	–	–	–
Perinatal death third child, n%	1/27	0/21	1/25	1/9	–	–	–
Neonatal morbidity first child, n %	16/27	10/21	13/25	5/9	0.38 (0.09–1.5)	0.86 (0.25–3.0)	1.5 (0.17–13.1)
Neonatal morbidity second child, n%	15/27	12/21	13/25	6/9	0.89 (0.26–3.1)	1.4 (0.38–5.1)	0.74 (0.14–3.9)
Neonatal morbidity third child, n%	13/27	14/21	10/25	6/9	2.0 (0.55–7.2)	8.1 (1.4–47.3)	1.6 (0.24–10.3)
32–37 weeks	N = 183	N = 50	N = 44	N = 13			
Any mortality	2/183	0/50	0/44	0/13	–	–	–
Any morbidity	34/183	8/50	6/44	2/13	0.69 (0.22–2.2)	0.88 (0.20–3.9)	0.37 (0.05–3.0)
Any mortality or morbidity	33/183	8/50	6/44	1/13	1.2 (0.51–3.0)	0.86 (0.26–2.8)	0.47 (0.05–4.4)
Perinatal death first child, n%	1/183	0/50	0/44	0/13	–	–	–
Perinatal death second child, n%	0/183	0/50	0/44	0/13	–	–	–
Perinatal death third child, n%	0/183	0/50	0/44	0/13	–	–	–
Neonatal morbidity first child, n %	15/183	4/50	2/44	0/13	0.93 (0.29–3.0)	1.8 (0.30–10.6)	–
Neonatal morbidity second child, n%	19/183	5/50	3/44	1/13	0.90 (0.31–1.4)	1.5 (0.33–6.7)	1.2 (0.12–12.0)
Neonatal morbidity third child, n%	25/183	6/50	2/44	1/13	0.81 (0.30–2.2)	2.9 (0.53–16.5)	1.4 (0.14–14.9)
>37 weeks	N = 9	N = 3	N = 1	N = 1			
Any mortality	0/9	0/3	0/1	0/1	–	–	–
Any morbidity	1/9	0/3	1/1	0/1	–	–	–
Any mortality or morbidity	1/9	0/3	1/1	0/1	–	–	–
Perinatal death first child, n%	0/9	0/3	0/1	0/1	–	–	–
Perinatal death second child, n%	0/9	0/3	0/1	0/1	–	–	–
Perinatal death third child, n%	0/9	0/3	0/1	0/1	–	–	–
Neonatal morbidity first child, n %	0/9	0/3	1/1	0/1	–	–	–
Neonatal morbidity second child, n%	1/9	0/3	0/1	0/1	–	–	–
Neonatal morbidity third child, n%	1/9	0/3	0/1	0/1	–	–	–

^aPerinatal mortality is defined as intrapartum mortality and neonatal mortality <28 d.

^bNeonatal morbidity is defined as NICU admission, neonatal sepsis, IVH, BPD, and IRDS.

^cAdjusted for AD in weeks.

moment of delivery, we could not correct for the potential advantage of a further delay of pregnancy with some days. Obviously, caesarean delivery should be delayed as much as possible, specifically in women at very low gestational ages.

When we compare our study to the studies that have been published until now, our study describes a relatively large cohort. This is the first study in which a large proportion of the cohort (43%) has a vaginal delivery and thus the largest cohort of vaginal triplet deliveries. The largest study on mode of delivery in triplet gestation was published by Vintzileos et al. and compared perinatal outcomes in a cohort of more than 7000 women with a triplet pregnancy [12]. However, of these women, only 5% had a vaginal delivery. Perinatal mortality was significantly higher in

vaginal delivery as compared to caesarean section. Therefore, the authors concluded that vaginal delivery should be avoided in women with a triplet pregnancy. All other studies published until now are much smaller, with sample sizes varying from 15 till 105 women. Three of these studies favor caesarean section [9–11], six studies favor vaginal delivery [8,14–18] and two studies concluded that the preferable mode of delivery cannot be stated [13,19]. Obviously, possible future pregnancies should play a role in the decision, especially at lower gestational ages where the chance of fetal loss is high.

In conclusion, we found no benefits of planned caesarean section, as compared with planned vaginal delivery, for the delivery of a triplet pregnancy between 26 and 40 weeks of gestation.

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