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Factors influencing delivery in women with multiple fetus pregnancy

Faktory ovplyvňujúce spôsob vedenia pôrodu u žien s viacplodovou graviditou

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Summary: Objective: This paper aims to analyze the factors that can influence the method of childbirth in women with multiple pregnancies. **Materials and methods:** Retrospective analysis of selected parameters in women with multiple pregnancies who gave birth at the 2nd Clinic of Gynecology and Obstetrics of the Faculty of Medicine (FM), Comenius University (CU) and University Hospital (UH) Bratislava in the years 2010–2022. **Results:** Between 2010 and 2022, at the 2nd Clinic of Gynecology and Obstetrics of the FM CU and UH in Bratislava, 1.13% of births were multiple pregnancies. After statistical data processing, primiparity appeared statistically significant as a risk of acute caesarean section (C-section); multiparous women had a higher probability to give birth vaginally. Since 2017, the clinic has had a decreasing trend in the number of caesarean sections. Women with an acute caesarean section, in turn had on average a lower pH of both fetuses compared to vaginal delivery. However, the incidence of asphyxia in fetuses was not statistically significantly different. We found no risk factor increasing the likelihood of acute caesarean section for fetus B in twins. **Conclusion:** Multiple pregnancy has a higher morbidity not only for the woman but also for the fetuses. The incidence of multiple pregnancies is influenced by assisted reproduction. Delivery method depends on various factors such as chorionicity, fetal presentation, and history of a previous caesarean section.

Key words: twin pregnancy – *in vitro* fertilization – vaginal delivery – caesarean section – newborn condition

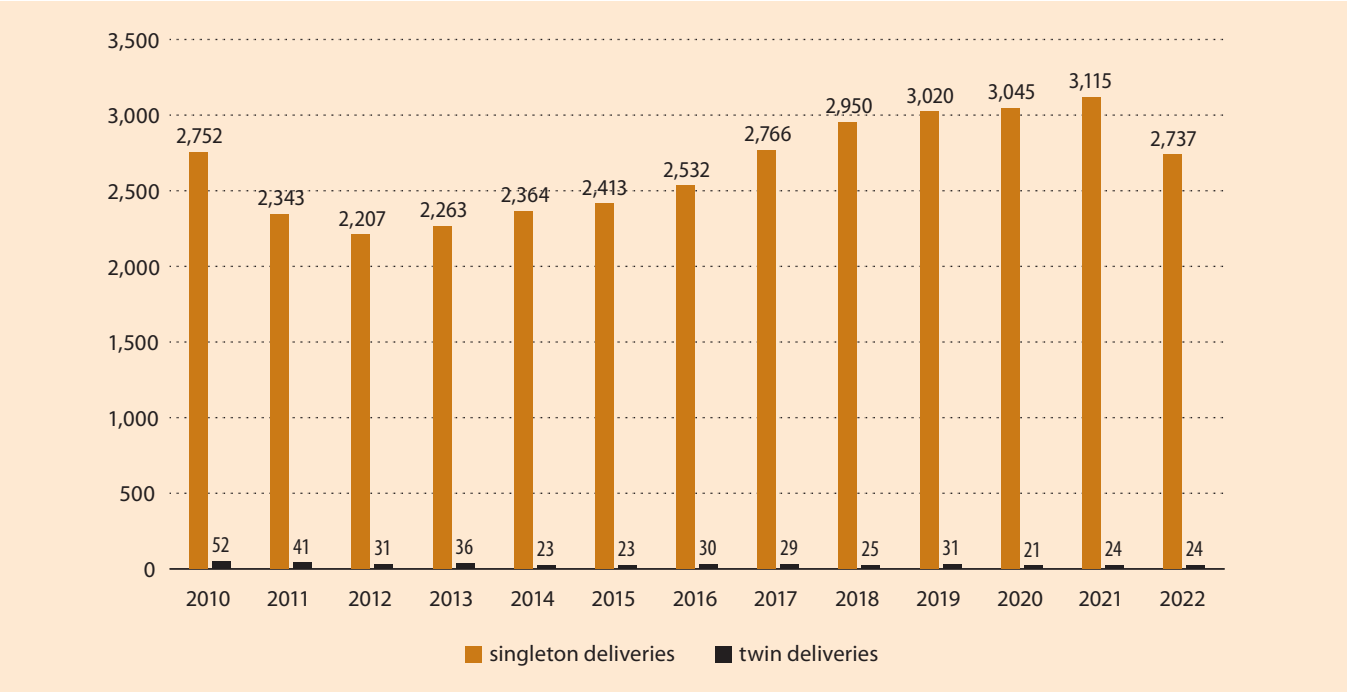
Súhrn: Cieľ: Cieľom tejto práce je analýza faktorov, ktoré môžu ovplyvniť spôsob vedenia pôrodu u žien s viacplodovou graviditou. **Súbor a metodika:** Retrospektívna analýza vybraných parametrov u žien s viacplodovou graviditou, ktoré porodili na II. Gynekologicko-pôrodníckej klinike Lekárskej fakulty Univerzity Karlovy (LF UK) a Univerzitnej Nemoncice (UN) Bratislava v rokoch 2010–2022. **Výsledky:** Za obdobie 2010–2022 na II. Gynekologicko-pôrodníckej klinike LF UK a UN Bratislava bolo 1,13 % pôrodov viacplodovej gravidity. Po spracovaní štatistických údajov sa štatisticky významne javila primiparita ako riziko akútneho cisárskeho rezu, multipary mali vyššiu pravdepodobnosť porodiť vaginálne. Od roku 2017 mal na klinike počet cisárskych rezov klesajúci trend. Ženy s akútnym cisárskym rezom mali priemerne nižšie pH oboch plodov oproti vaginálnemu pôrodu, avšak výskyt asfyktických plodov nebol štatisticky významne rozdielny. Nezistili sme žiadny rizikový faktor zvyšujúci pravdepodobnosť akútneho cisárskeho rezu na plod B u gemín. **Záver:** Viacplodová gravidita má vyššiu morbiditu nielen pre ženu ale aj pre plody. Výskyt viacplodovej gravidity je ovplyvnený asistovanou reprodukciou. Spôsob vedenia pôrodu závisí na rôznych faktoroch ako chorionicita, poloha plodov a anamnéza predošlého cisárskeho rezu.

Kľúčové slová: dvojplodová gravidita – *in vitro* fertilizácia – vaginálny pôrod – cisársky rez – stav novorodenca

Introduction

Multiple pregnancy is a condition in which more than one fetus develops intrauterine – twins (gemini), triplets (trigemini), and quadruplets (quadrigemini). A multiple pregnancy has higher demands on the mother's body and has a higher risk of complications. This type of pregnancy is generally considered at risk [1]. Ovarian stimulation as a method of assisted reproduction or embryo transfer affects the increase in multiple pregnancies. In assisted reproduction, the risk of multiple pregnancy can be reduced by implementing single embryo transfer [2].

Prenatal care of women largely depends on chorionicity, amnionicity, and associated pathologies. Early diagnosis of multiple pregnancy is essential, as well as early diagnosis of hypertension, preeclampsia, gestational diabetes, anemia, and risk factors for preterm birth [3].



Graph 1. Numbers of singleton and twin deliveries during the observed period.
Graf 1. Počty jednoplodových a dvojplodových pôrodov za sledované obdobie.

The average length of twin gestation is 35.3 weeks [4]. Delivery method is influenced by several factors, such as gestational week, chorionicity, amnionicity, fetal presentation, fetal size, condition of the birth canal, and associated fetal or maternal complications. Early termination of pregnancy may be indicated, for example, due to preeclampsia or HELLP syndrome (Hemolysis, Elevated Liver enzymes and Low Platelets) of the mother, intrauterine fetal growth restriction, pathological Doppler flow values in the arteria umbilicalis, signs of fetal distress, etc. [5].

Presentation of fetuses may vary. Most often, both fetuses are in the cephalic presentation (45%); in 35% of cases of twin pregnancy, one fetus is in the cephalic presentation, and the other fetus is in the breech presentation; and in 10%, both fetuses are in the breech presentation. The remaining 10% of cases are less common presentations, such as oblique or transverse lie [1]. If the first fetus is in the breech presentation and the second fetus is in the cephalic presentation, a collision of the twins may occur at birth. Therefore, caesarean section is always indicated [1,5].

In twin bichorionic pregnancy, termination of pregnancy is planned by the 39th gestational week. Delivery is possible vaginally or by caesarean section. Vaginal delivery may be chosen if the first fetus is in the cephalic presentation and the woman has no history of a previous caesarean section. Pregnancy with monochorionic diamniotic twins is planned to terminate by the 37th gestational week. Childbirth can also be managed vaginally or by caesarean section. Pregnancy in monochorionic monoamniotic twins should always be terminated by caesarean section by the 35th gestational week due to possible umbilical complications. Triplet and multiple pregnancies are always terminated by caesarean section [3,6,7].

Materials and methods

This is a retrospective study of multiple pregnancies. All women with twin pregnancies who gave birth at the 2nd Clinic of Gynecology and Obstetrics of the Faculty of Medicine (FM), Comenius University (CU) and University Hospital (UH) Bratislava in the years 2010–2022 were included in the study.

Parameters that were observed:

1. demographic parameters: age and parity of the woman;
2. obstetric parameters: method of conception (natural, ovulation stimulation, *in vitro* fertilization – IVF), chorionicity, fetal presentation, and gestational week;
3. progress and completion of labor;
4. newborn status: weight and length, Apgar score, pH in the a. umbilicalis.

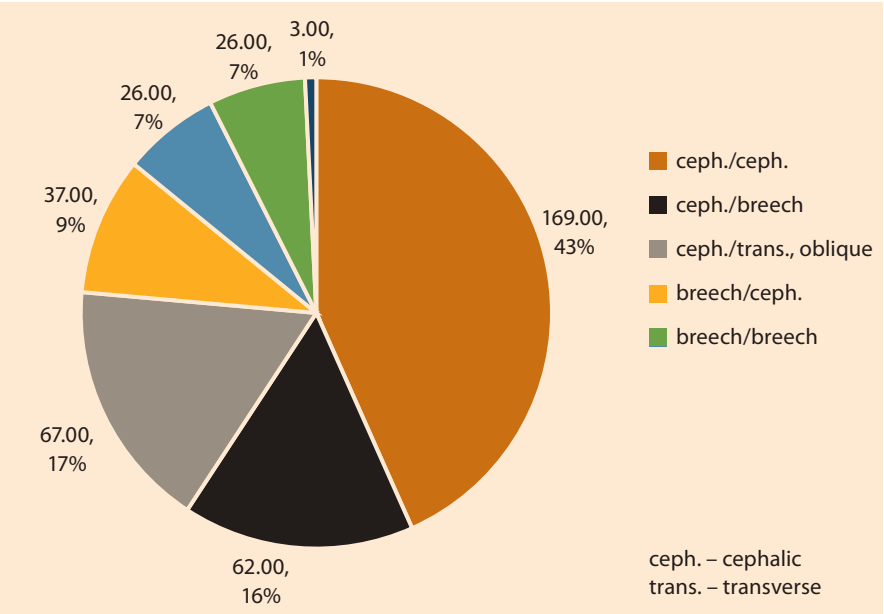
Results

In 2010–2022, 34,507 births occurred at the 2nd Clinic of Gynecology and Obstetrics of the FM CU and UH in Bratislava, of which 390 (1.13%) were twin pregnancies (Graph 1). All the observed parameters are presented in Tab. 1 – there were 56 monochorionic pregnancies (14.3%), conception after IVF accounted for 25.6% of pregnancies, average age of the mother with a twin pregnancy was 32.1 years, primiparous mothers accounted for 52.6% of cases, mean gestational age was 36.9 weeks, mean weight

Tab. 1. Characteristics of the twin set in individual years of the study and for the whole period.
Tab. 1. Charakteristika súboru gemín v jednotlivých rokoch štúdie a za celé obdobie.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Number	52	41	31	36	23	23	30	29	25	31	21	24	24	390
Monochorionic	5 (9.6%)	3 (7.3%)	2 (6.4%)	5 (13.9%)	6 (26.1%)	0	7 (23.3%)	2 (6.9%)	2 (8.0%)	5 (16.1%)	5 (23.8%)	5 (20.8%)	9 (37.5%)	56 (14.3%)
After IVF	19 (36.5%)	17 (41.5%)	10 (32.2%)	10 (27.8%)	6 (26.1%)	9 (39.1%)	7 (23.3%)	5 (17.2%)	5 (20.0%)	5 (16.1%)	3 (14.3%)	2 (8.3%)	2 (8.3%)	100 (25.6%)
Mean maternal age (years)	31.7	31.0	33.4	31.0	30.2	32.8	32.4	31.2	32.6	31.0	31.9	32.2	32.2	32.1 (19–43)
35 years and more	11 (21.1%)	9 (21.9%)	14 (45.2%)	10 (27.8%)	5 (21.7%)	10 (43.5%)	9 (30.0%)	6 (20.7%)	9 (36%)	9 (29.0%)	5 (23.8%)	9 (37.5%)	9 (37.5%)	116 (29.7%)
Primiparity	36 (69.2%)	28 (68.3%)	12 (38.7%)	19 (52.8%)	14 (60.9%)	14 (60.9%)	14 (46.7%)	15 (51.7%)	9 (36%)	16 (51.6%)	10 (47.6%)	6 (25.0%)	12 (50.0%)	205 (52.6%)
Mean gestational age (weeks)	36.8	37.4	36.7	37.1	36.2	37.2	36.8	37.2	36.7	36.6	36.9	36.7	36.7	36.9 (26–41)
Mean weight of fetus A (grams)	2,542.4	2,672.9	2,582.9	2,690.8	2,427.4	2,606.1	2,595.7	2,516.2	2,506.8	2,493.5	2,637.1	2,472.9	2,472.9	2,570.3 (850–3,600)
Mean weight of fetus B (grams)	2,430.2	2,558.0	2,457.7	2,482.2	2,303.5	2,595.7	2,564.7	2,491.2	2,458.0	2,570.3	2,486.7	2,545.4	2,545.4	2,503.4 (780–4,030)
Average difference of weights (grams)	333.7	411.9	307.7	391.4	330.9	283.5	331.7	287.4	300.0	261.9	365.7	330.8	330.8	327.4 (0–2,560)
Difference 25% and more	4 (7.6%)	4 (9.7%)	2 (6.4%)	5 (13.9%)	1 (4.3%)	1 (4.3%)	4 (13.3%)	2 (6.9%)	1 (4.0%)	0	3 (14.3%)	2 (8.3%)	2 (8.3%)	31 (7.9%)
C-section both fetuses	42 (80.8%)	33 (80.5%)	26 (83.9%)	30 (83.3%)	16 (69.5%)	18 (78.3%)	25 (83.3%)	18 (62.1%)	12 (48.0%)	17 (54.8%)	10 (47.6%)	8 (33.3%)	16 (66.7%)	271 (69.5%)
Planned C-section	40 (76.9%)	29 (70.7%)	24 (77.4%)	29 (80.5%)	14 (60.9%)	17 (60.9%)	21 (70.0%)	17 (58.6%)	10 (40.0%)	16 (51.6%)	10 (47.6%)	8 (33.3%)	16 (66.7%)	251 (64.3%)
C-section fetus B	1 (1.9%)	1 (2.4%)	0	0	0	1 (4.3%)	1 (3.3%)	2 (6.9%)	0	0	1 (4.8%)	2 (8.3%)	3 (12.5%)	12 (3.1%)
Asphyxia of at least one fetus (pH < 7.00)	0	0	0	0	0	0	0	2 (6.9%)	0	0	0	0	0	2 (0.5%)

IVF – *in vitro* fertilization



of fetus A was 2,570.3 g, mean weight of fetus B was 2,503.4 g, and the mean difference in weights of fetuses was 327.4 g. Pregnancy was terminated by caesarean section of both fetuses in 69.5% of cases; elective caesarean section accounted for 64.3%, and caesarean section of fetus B was performed in 3.1% of cases. Asphyxia of at least one fetus was present in two cases (0.5%).

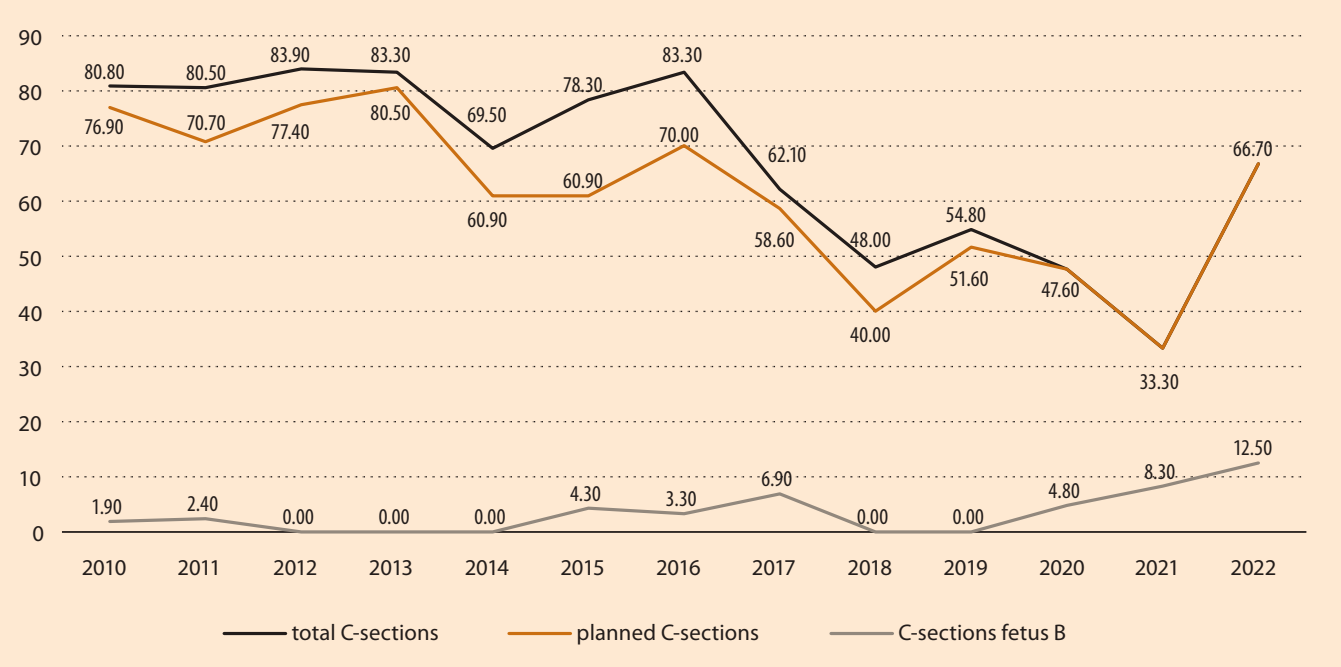
The most common fetal presentation (Graph 2) was cephalic (43.3%). Collision position was recorded in 9.5% of cases.

Graph 2. Fetal presentations in the observed group.
Graf 2. Polohy plodov v sledovanej skupine.

Tab. 2. Twins – fetus A by cephalic delivery without history of C-section, comparison of vaginal delivery vs. C-section.
Tab. 2. Gemini – plod A hlavičkou bez anamnézy cisárskeho rezu, porovnanie vaginálneho pôrodu vs. cisársky rez.

	Planned C-section (N = 139)	Planned spontaneous birth (N = 133)	P; OR
Monochorionic	23 (16.5%)	20 (15.0%)	0.7374
IVF	58 (41.7%)	16 (12.0%)	P < 0.0001; OR: 5.24; 95% CI: 2.81–9.75
Mean age	31.8 (20–41)	32.1 (19–43)	0.0403
35 years and more	37 (26.6%)	39 (29.3)	0.6224
Primiparity	110 (79.1%)	54 (40.6%)	P < 0.0001; OR: 5.55; 95% CI: 3.25–9.48
Mean gestational age (weeks)	36.4 (28–39)	37.3 (26–41)	P < 0.0001
Fetus B presentation other than cephalic	71 (51.1%)	50 (37.6%)	0.0262; OR: 1.73; 95% CI: 1.07–2.81
Mean fetus A weight (grams)	2,534.4 (1,200–3,530)	2,682.0 (860–4,030)	0.0082
Mean fetus B weight (grams)	2,450.9 (1,080–3,810)	2,579.3 (800–4,030)	0.0307
% weight difference (mean)	13.5 (0–60.6)	9.8 (0–56.5)	0.0002
Difference 25% and more	19 (13.7%)	3 (2.2%)	0.0004; OR: 6.86; 95% CI: 1.98–23.77
Mean pH of fetus A	7.28 (7.04–7.40)	7.28 (7.10–7.43)	0.9845
Mean pH of fetus B	7.26 (7.02–7.50)	7.23 (6.90–7.39)	0.0005
Fetal hypoxia (pH < 7.00)	0	2 (1.5%)	0.2382

IVF – *in vitro* fertilization, N – number, OR – odds ratio, P – P-value



Graph 3. Frequency of C-sections in the twin pregnancy group by year. Shown are the total C-sections by which both fetuses were delivered, planned C-sections, and C-sections for a single fetus.
Graf 3. Frekvencia cisárskych rezov v skupine dvojplodových tehotností v jednotlivých rokoch. Zobrazené sú celkovo cisárske rezy, pomocou ktorých sa rodili oba plody, plánované cisárske rezy a cisárske rezy na jeden plod.

When a woman was given the option of natural delivery (N = 133), 19 women (14.3%) ended up with an acute caesarean section of both fetuses, and 11 women (8.2%) ended up with a vaginal delivery of fetus A and a caesarean section of fetus B. Overall, at least one fetus was delivered by caesarean section in 30 women (22.5%) (Tab. 2). The frequency of caesarean sections had a decreasing trend over the study period (Graph 3).

Primiparity was statistically significant; multiparous women had higher odds of vaginal delivery of both fetuses

Tab. 3. Risk factors for acute C-section in twins.
Tab. 3. Rizikové faktory akútneho cisárskeho rezu u gemín.

	Acute C-section (N = 30)	Vaginal birth of both fetuses	P; OR
Monochorionic	4 (13.3%)	16 (15.5%)	0.8009
IVF	5 (16.7%)	11 (10.7%)	0.3915
Mean age (years)	32.2 (25–38)	32.1 (19–43)	0.8955
35 years and more	9 (30.0%)	30 (29.1%)	0.9155
Primiparity	19 (63.3%)	35 (34.0%)	0.0050; OR: 3.36; 95% CI: 1.44–7.83
Mean gestational age (weeks)	37.8 (34–40)	37.2 (26–41)	0.9999
Fetus B presentation other than cephalic	10 (33.3%)	40 (38.8%)	0.5976
Mean fetus A weight (grams)	2,810.0 (1,690–3,590)	2,644 (850–3,590)	0.0827
Mean fetus B weight (grams)	2,641.0 (1,710–3,410)	2,561 (800–4,030)	0.3988
% weight difference (mean)	9.6 (0.7–21.5)	9.8 (0–56.5)	0.8726
Difference 25% and more	0	3 (2.9%)	0.4614
Mean pH of fetus A	7.25 (7.12–7.34)	7.29 (7.10–7.43)	0.0010
Mean pH of fetus B	7.20 (6.99–7.31)	7.24 (6.97–7.39)	0.0034
Fetal hypoxia (pH < 7.00)	1 (3.3%)	1 (1.0%)	0.4511

IVF – *in vitro* fertilization, N – number, OR – odds ratio, P – P-value

Tab. 4. Risk factors for acute C-section of fetus B in twins.
Tab. 4. Rizikové faktory akútneho cisárskeho rezu plodu B u gemín.

	Acute C-section of fetus B (N = 11)	Vaginal birth of both fetuses (N = 103)	P; OR
Monochorionic	2 (18.2%)	16 (15.5%)	0.7865
IVF	1 (9.1%)	11 (10.7%)	0.9510
Mean age	32.4 (26–38)	32.1 (19–3)	0.8376
35 years and more	5 (45.4%)	30 (29.1%)	0.2918
Primiparity	5 (45.4%)	35 (34.0%)	0.4663
Mean gestational age (weeks)	37.7 (36–39)	37.2 (26–41)	0.4037
Fetus B presentation other than cephalic	6 (54.5%)	40 (38.8%)	0.3366
Mean weight of fetus A (grams)	2,777.3 (1,690–3,590)	2,644.0 (850–3,590)	0.3761
Mean weight of fetus B (grams)	2,656.3 (1,710–3,350)	2,561.0 (800–4,030)	0.5256
% weight difference (mean)	7.7 (0.7–19.8)	9.8 (0–56.5)	0.4011
Difference 25% and more	0	3 (2.9%)	0.7355
Mean pH of fetus A	7.23 (7.12–7.34)	7.29 (7.10–7.43)	0.0052
Mean pH of fetus B	7.17 (6.99–7.31)	7.24 (6.97–7.39)	0.0061
Fetal hypoxia (pH < 7.00)	1 (9.1%)	1 (1.0%)	0.1930

IVF – *in vitro* fertilization, N – number, OR – odds ratio, P – P-value

compared to primiparous women with an OR of 3.36. Women with an acute caesarean section, in turn had on average a lower pH of both fetuses versus vaginal delivery, but the incidence of asphyxia in fetuses was not statistically significantly different (one fetus in each group) (Tab. 3).

We found no risk factor increasing the likelihood of acute caesarean section for fetus B in twins. Fetuses delivered vaginally had statistically significantly higher umbilical cord blood pH levels, but the difference in the group of asphyxia in fetuses (pH less than 7.0) was not statistically significant (Tab. 4).

Discussion

Multiple pregnancy is considered risky due to increased maternal and fetal morbidity. Multiple pregnancy

is significantly affected by assisted reproduction [8].

The proportion of multiple pregnancies in all births in the Slovak Republic in the years 2015–2018 was between 1.23–1.29%; in the Czech Republic, the proportion of multiple pregnancies had a decreasing trend (1.49–1.34%) [9]. At the 2nd Clinic of Gynecology and Obstetrics of the FM CU and UH in Bratislava between 2010 and 2022, the proportion of multiple pregnancies was 1.13%, and a decreasing trend could also be observed.

Monochorionic twins after spontaneous conception occurred in 0.4% of cases. However, the literature reported that the frequency of monozygotic twins may be up to 10 times higher in pregnancies after infertility treatment [10]. In our observed group, the prevalence of monochorionic pregnancy was 14.3%. The higher value may be caused by the fact that almost one third of twin pregnancies occurred after IVF (25.6%).

Globally, the proportion of multiple pregnancies has been rising due to assisted reproduction techniques [11]. In the Czech Republic, the number of multiple pregnancies increased until 2010, when the proportion was 2.13%, the highest in all of Europe. After adopting measures in assisted reproduction centers in 2011 – increasing the number of IVF cycles covered by health insurance from three to four cycles in case only one embryo was transferred in the first two cycles – a decreasing trend in the number of multiple pregnancies was recorded [8]. The number of women with multiple pregnancies after IVF in our study group had a decreasing trend after 2015, which may be related to the change in the number of embryos transferred from two to one.

According to the Statistical Office of the Slovak Republic, the average age of Slovak mothers was 29.7 years [9,12]. In Slovakia, there is a decline in the birth rate in women under 30 years of age and an increase in women aged 30 and older. In 2007, most children were born to women aged 25–29 years and in 2015, most children were born to women aged 30–34 years [9]. The mean age of mothers in our group was 32.1 years. The higher value may be due to the fact that up to one third of women became pregnant by assisted reproduction methods, which may predict a higher age of women – 29.7% of women were 35 years of age or older.

The average length of a twin pregnancy is 35.3 weeks [4]. In our study group, the mean length of pregnancy was 36.9 weeks, which is consistent with the literature.

The method of delivery in women with bichorionic twins can be vaginal or by caesarean section. Vaginal delivery is recommended if fetus A is in the cephalic presentation. If fetus A or both fetuses are in the breech or transverse presentation, caesarean section is indicated. Vaginal birth in monochorionic diamniotic twins can be performed if both fetuses or fetus A are in the cephalic presentation, if both fetuses have an estimated fetal weight (EFW) of more than 1,500 g, and if the mother consents to vaginal birth after caesarean section (VBAC). Caesarean section is indicated for failed induction and fetal presentation collision if the EFW of one of the twins is less than 1,500 g, and if the weight discrepancy of both twins is more than 20%. Termination of pregnancy with monochorionic monoamniotic twins is possible only by caesarean section [12]. During the observed period, 69.5% of caesarean sections were performed in women with twin pregnancies at the 2nd Clinic of Gynecology and Obstetrics of the FM CU and UH in Bratislava. A total of 133 women were given the option to give birth vaginally, of which 19 women (14.3%) had an acute caesarean section on both fetuses, 11 women (8.2%) had an acute caesarean section on fetus B, and 30 women (22.5%) had a caesarean section on at least one fetus. Since 2017, there has been a decrease in the frequency of caesarean sections by adopting a new philosophy of the department, aiming to maintain an adequate level of births per C-section. Primiparity appeared to be a statistically significant risk factor for caesarean section in our study group. A Finnish study looking at risk factors for failed vaginal delivery of twins also noted primiparity as a risk factor. In this study, fetus B presentation, other than cephalic, was reported as a second risk factor [13]. Multiparous women were more likely to give birth vaginally. We did not find any risk factor increasing the risk of acute caesarean section of fetus B.

Women with acute caesarean section had, on average, a lower pH of both fetuses compared to vaginal delivery. However, there was no statistically significant difference in the incidence of newborns with asphyxia. In our study group, 0.25% were newborns with asphyxia compared to the literature, which reports the incidence of perinatal asphyxia in twins at 4% [14].

Conclusion

Multiple pregnancy has a higher morbidity not only for the woman but also for the fetuses. The incidence of multiple pregnancies is affected by assisted reproduction. Delivery method depends on various factors, such as chorionicity, fetal presentation, and history of a previous caesarean section. In our study group, primiparity appears to be a risk factor for failed vaginal delivery. Women with an acute caesarean section had lower pH of both fetuses compared to vaginal delivery, but the incidence of newborns with asphyxia was not statistically significant.

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