Received: 28 April 2020 | Revised: 21 August 2020 | Accepted: 21 August 2020

DOI: 10.1111/apa.15553

REGULAR ARTICLE

ACTA PÆDIATRICA NURTURING THE CHILD WILEY

Breastfeeding following in vitro fertilisation in Switzerland—Does mode of conception affect breastfeeding behaviour?

Livia Amanda Purtschert[1,2,3] | Vera Ruth Mitter[1,4] | Jarmila Anna Zdanowicz[5] | Mirja Amadea Minger[1,2,6] | Anna Spaeth[7,8] | Michael von Wolff[1] | Alexandra Sabrina Kohl Schwartz[1,9]

[1]Division of Gynaecological Endocrinology and Reproductive Medicine, Department of Gynaecology and Obstetrics, Bern University Hospital, University of Bern, Inselspital, Bern, Switzerland

[2]Medical Faculty, University of Bern, Bern, Switzerland

[3]Department of Internal Medicine Nidwalden, Luzerner Kantonsspital and University of Zurich, Stans, Switzerland

[4]Graduate School for Health Sciences, University of Bern, Bern, Switzerland

[5]Department of Obstetrics and Gynaecology, Bern University Hospital, University of Bern, Inselspital, Bern, Switzerland

[6]Department of Paediatric Surgery, Bern University Hospital, University of Bern, Inselspital, Bern, Switzerland

[7]Swiss Tropical and Public Health Institute, Basel, Switzerland

[8]University of Basel, Basel, Switzerland

[9]Division of Reproductive Medicine, Luzerner Kantonsspital, Frauenklinik, University of Zurich, Lucerne, Switzerland

Correspondence
Alexandra Sabrina Kohl Schwartz, Division of Gynaecological Endocrinology and Reproductive Medicine, Department of Gynaecology, Bern University Hospital, University of Bern, Inselspital, Friedbuehlstrasse 19, 3010 Bern, Switzerland.
Emails: alexandra.kohl-schwartz@insel.ch; alexandra.kohlschwartz@luks.ch

Funding information
Data evaluation was supported by a grant from Merck (Switzerland) AG, Zug, Switzerland, who had no role in the design or the paper. The PhD of Vera Mitter was supported by an unrestricted grant from IBSA Biochimique SA. The funder did not have any influence on the conduct of the study.

Abstract

Aim: Breastfeeding has numerous advantages. Our aim was to investigate whether breastfeeding initiation and duration in women with pregnancies conceived through in vitro fertilisation differ from spontaneously conceived pregnancies.

Methods: This is a comparative cross-sectional study about breastfeeding behaviour performed at the Bern University Hospital including mothers of singletons conceived by in vitro fertilisation (n = 198) with or without gonadotropin stimulation between 2010 and 2016 (in vitro fertilisation group). They were compared to a population-based control group (n = 1421) of a randomly selected sample of mothers in Switzerland who delivered in 2014.

Results: A total of 1619 women were included in this analysis. Breastfeeding initiation rates were high, similar between the in vitro fertilisation group (93.4%) and the control group (94.8%). No increased risk of stopping breastfeeding earlier after in vitro fertilisation treatment compared to the control group could be found over the observational period of 12 months (HR = 1.00, 95% CI 0.83-1.20, $P = .984$). There was no difference in breastfeeding initiation or duration after gonadotropin-stimulated vs unstimulated in vitro fertilisation.

Abbreviations: ART, assisted reproductive technology; BMI, body mass index; EK, ethics commission; hCG, human chorionic gonadotropin; HMG, human menopausal gonadotropin; HR, hazard ratio; IU, international units; IVF, in vitro fertilisation; KEK, Cantonal ethics commission; SWIFS, Swiss infant feeding study.

Conclusion: In Switzerland, in vitro fertilisation treatments were not associated with earlier breastfeeding cessation. This result is reassuring for mothers undergoing in vitro fertilisation.

KEYWORDS
breastfeeding duration, breastfeeding initiation, gonadotropins, in vitro fertilisation, lactation

1 | INTRODUCTION

The World Health Organization recommends exclusive breastfeeding for a minimum of six months after delivery, followed by continuation of breastfeeding for up to two years or more after introducing complementary food.[1] Numerous advantages of breastfeeding have been shown, not only for the health and well-being of the infant, but also for the mother and mother-infant relationship.[2,3] This includes short-term advantages such as decreased risk of respiratory infections as well as long-term benefits such as a lower mean blood pressure, lower prevalence of diabetes and decreased risk of becoming overweight in adulthood.[2,3] Consequently, it is crucial to identify possible risks groups for unfavourable breastfeeding outcomes.

Previous studies on breastfeeding showed that preterm infants, low birthweight infants, males and infants with health issues following delivery have a decreased probability of being breastfed, as well as a shorter mean breastfeeding duration.[4] Maternal factors associated with breastfeeding outcomes included maternal age, smoking, obesity and low level of maternal education.[2,4,5] Furthermore, caesarean section was reported to be associated with lower breastfeeding initiation rate and shorter mean breastfeeding duration.[2,4,5]

The effect of fertility treatment on breastfeeding initiation and duration had been only sparsely studied and results were contradictory. Infertility and infertility treatments such as in vitro fertilisation (IVF) impose substantial distress.[6] Previous studies showed that infertility and its treatment affect breastfeeding behaviour.[5,7-11] Moreover, pregnancies after IVF showed a higher risk for small for gestational age infants, low birthweight, caesarean sections and preterm births.[12,13] These risk factors, especially when tied to gonadotropin hyperstimulation,[13,14] could possibly increase the likelihood of less breastfeeding initiation and shorter breastfeeding duration.

This study addressed two questions. First, which factors influence breastfeeding behaviour: infertility and IVF treatment or its associated obstetric and perinatal conditions?

The largest study to date with 15 615 participants was an American cross-sectional study, which showed lower odds of breastfeeding at eight weeks among women who conceived using fertility treatments; however, this difference was no longer significant after adjustment for multiple births and preterm deliveries.[11] Studies with a longer assessment time showed an increased likelihood of shorter breastfeeding duration after fertility treatments at four,[9,15] six[8] or eight[10] months. A small Canadian study with 76 infants conceived by IVF did not show a difference regarding breastfeeding outcomes and difficulties compared to spontaneously conceived infants.[16] On the whole, the question was not resolved, and given the great importance of breastfeeding, further research was needed.

Key notes

- Our cross-sectional study found that breastfeeding initiation and duration are not affected by undergoing in vitro fertilisation.
- High-dose gonadotropin stimulation was not associated with the ability to breastfeed
- Mothers and healthcare professionals who might be concerned about an adverse impact of in vitro fertilisation on breastfeeding ability can be reassured.

Second, what is the effect of high-dose fertility treatment on breastfeeding behaviour? Considering the effect of gonadotropin stimulation on obstetric and perinatal outcomes, there is need for further investigation of its effect on breastfeeding outcomes.

To answer these two questions, our study investigated whether breastfeeding initiation and duration in women with pregnancies after IVF differ from the breastfeeding behaviour in a randomly selected sample of mothers. Additionally, we assessed the possible effect of gonadotropin stimulation.

2 | METHODS

2.1 | Setting

Our study was a comparison of two cross-sectional surveys about initiation and duration of breastfeeding, which included 1619 mothers. The women either underwent fertility treatment at the Division of Endocrinology and Reproductive Medicine at the Department of Gynaecology at the University Hospital Bern (IVF population) or participated as a population sample in the Swiss infant feeding study (SWIFS population),[2] as seen in Figure 1.

2.2 | Population

We included 198 women with singleton live births in the period from 2010 to 2016 who conceived using assisted reproductive

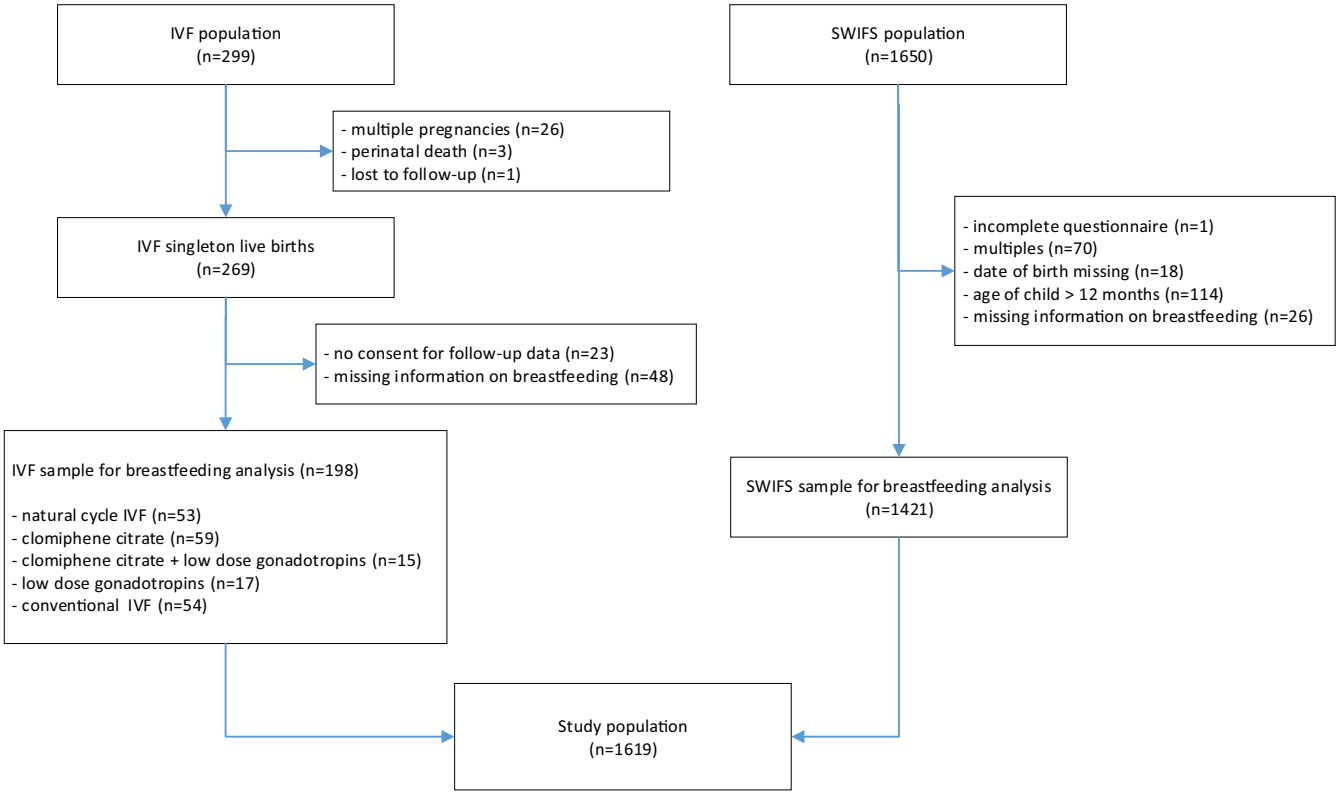

FIGURE 1 Study population flow chart

technology (ART), with or without hormonal stimulation, followed by a fresh embryo transfer. Fertilisation was achieved either by IVF or by intracytoplasmic sperm injection. Conventional IVF treatment was conducted according to standard agonist or antagonist protocols using ≥150 international units (IU) of human menopausal gonadotropin (HMG) for hormonal stimulation and urinary human chorionic gonadotropin (hCG) for ovulation induction.[13] In natural cycle IVF, which avoids gonadotropin stimulation to enable spontaneous follicular recruitment,[17] a trigger of 5000 IU urinary hCG for ovulation induction was applied when the follicular maturity was achieved.[13,17] Women with a regular menstrual cycle chose either natural cycle IVF or conventional IVF according to their preference.[13,17]

Pregnancies originating from cryopreserved embryo transfers and pregnancies resulting in miscarriages, perinatal deaths or multiples were excluded.

The SWIFS population (n = 1421) served as the control population. The SWIFS is a national cross-sectional study about early infant feeding in Switzerland, conducted by the Federal Food Safety and Veterinary Offices.[2] The survey included mothers with infants <12 months of age born in Switzerland in 2014.[2] Mother/infant pairs were randomly selected from local birth registers, generating a representative sample from all regions of Switzerland, seeFigure 1.[2] Women with missing information on either breastfeeding initiation or breastfeeding duration were excluded.

2.3 | Data collection

Data on breastfeeding initiation and duration were collected from questionnaires mailed to the patients. We used fixed-choice questions. The mothers were asked if they had ever breastfed their baby and if they answered yes, they were asked for how long. The possible answers were as follows: <one month, one month, two months, three months and so on, up to 12 months or >12 months. Non-respondents were contacted by phone. Demographic data and data on medical and obstetric history, including pregnancy and delivery outcomes, as well as information on IVF treatment were collected from individual medical records from the delivery clinic. Data were collected using the REDCap electronic data capture tool (REDCap 8.5.19 Vanderbilt University, Nashville, USA).

2.4 | Outcomes

The primary outcomes were defined as first breastfeeding initiation rate and second duration of breastfeeding. Primary outcomes were compared between the IVF group and the SWIFS population as well as between mothers who underwent conventional IVF treatment with gonadotropin stimulation vs natural cycle IVF.

Breastfeeding initiation was defined as receiving any breast milk after delivery (breastfed or pumped). Breastfeeding duration was defined as the period of time infants received any breast milk (later in infancy, additional to food or other liquids).

TABLE 1 Characteristics of IVF and SWIFS (Swiss infant feeding study) population

	IVF[a] Group n = 198 n/μ[b]	%/SD[c]	SWIFS Group n = 1421 n/μ[b]	%/SD[c]	*P*-value
Demographics					
Maternal age (years) (n = 1615)	34.79	3.76	32.23	4.30	<.001*
Maternal smoking during pregnancy	5	2.53	168	11.84	<.001*
Maternal BMI (kg/m^2)[d] (n = 1563)	21.97	3.29	22.51	3.64	.047*
Maternal education in categories[e] (n = 1569)					
High	71	44.10	757	53.76	.003*
Medium	89	55.28	600	42.61	
Low	1	0.62	51	3.62	
Fertility status					
Parity (n = 1607)					
Primiarous	157	79.29	751	53.30	<.001*
Multiparous	41	20.71	658	46.70	
Delivery details					
Gestational age (days) (n = 1533)	274.59	13.02	276.23	12.37	.085
Gestational age in categories					
≥37 gestational weeks	187	94.44	1239	92.81	.047*
33-37 gestational weeks	9	4.55	87	6.52	
29-32 gestational weeks	1	0.51	9	0.67	
24-28 gestational weeks	1	0.51	0	0.00	
Preterm birth[f] (n = 1542)	11	5.56	96	7.14	.412
Delivery mode (n = 1619)					
Spontaneous vaginal delivery	80	40.40	843	59.32	<.001*
Instrumental vaginal delivery[g]	28	14.14	159	11.19	
Caesarean Section	90	45.45	419	29.70	
Infant					
Birthweight (gram) (n = 1588)	3274.99	580.12	3321.16	505.99	.239
Birthweight in categories					
Normal	186	93.94	65	4.68	.396
Low	12	6.06	1325	95.32	
Infant sex					
Female	89	44.95	704	49.61	.219
Male	109	55.05	715	50.39	

Note: Values are presented as means with standard deviations or n with proportions (%).

P-values marked with asterisks (*) are significant ($P < .05$).

[a]In vitro fertilisation.

[b]n/μ = number or mean.

[c]Standard deviation.

[d]Body mass index kg/m^2

[e]Maternal level of education was defined as follows: high (graduation from a university), medium (apprenticeship or high school diploma), low (basic school diploma or no diploma).

[f]Preterm delivery ≤37 weeks

[g]including vacuum extraction and forceps.

The following factors associated with breastfeeding were assessed: maternal age, level of education, smoking during pregnancy, body mass index (BMI), parity, mode of delivery, gestational age of infant, birthweight and sex of the infant.[2,5] Within the IVF population, we also assessed duration of preceding infertility (≤24 months and >24 months) and cause of infertility (male, female or idiopathic).

A high level of education was defined as graduation from a university, a medium level of education as apprenticeship or high school diploma and a low level of education as a basic school diploma or no

diploma. BMI categories were defined as underweight (<18.5/m^2), overweight (25.1-29.9/m^2) or obese (≥30 kg/m^2). Low birthweight was defined as below 2500 g, preterm delivery was defined as delivery before 37 completed gestational weeks.

2.5 | Statistical analysis

Statistical analysis was performed using Stata 16.0 (StataCorp LLC). To compare groups, the chi-square test was used for categorical variables, and univariable linear regression was used for continuous variables. Time-to-event analysis using Kaplan-Meier survival estimates was performed to compare the duration of breastfeeding between the two groups. Follow-up time started at delivery, and the event of interest was the complete cessation of breastfeeding. In the SWIFS, breastfeeding duration was recorded in weeks and for the IVF population in months. This was retained for the analysis in order not to lose any information. For women who did not initiate breastfeeding at all, the duration was set to 0.01. This allowed the survival probabilities to reflect the true proportion of women breastfeeding at each stage. Risk of breastfeeding cessation was evaluated using multivariable Cox regression to adjust for confounding factors. Results were considered significant when $P \leq .05$.

To analyse the effect of stimulation, as well as perinatal and neonatal outcomes, three statistical models were built. The first model included important maternal characteristics (age, BMI, smoking, education) as determinants, the second focused on delivery characteristics (parity, delivery mode, gestational age), and the third included perinatal characteristics (birthweight, infant's sex). All significant determinants in each model were introduced in the final model.

2.6 | Ethics

The study was approved by the cantonal ethics committee (KEK Bern, 397/15) on January 26, 2016, and again on August 29, 2019 (3rd Amendment). SWIFS was approved by the ethics commission of Basel (EK 259/13) on October 17, 2013.

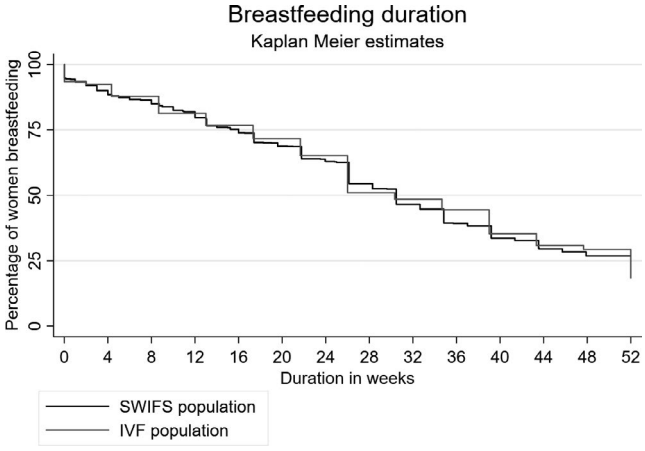

FIGURE 2 Kaplan-Meier curve displaying the proportion of women breastfeeding over time after delivery

3 | RESULTS

3.1 | Characteristics of study populations

The population characteristics are summarised in Table 1. Mothers in the IVF population were on average 2.6 years older than SWIFS mothers, smoked less often during pregnancy and had on average a lower BMI. The level of education was higher in the SWIFS population, as was parity. The proportion of Caesarean section deliveries was higher after IVF, but the proportion of preterm deliveries was not different.

3.2 | Breastfeeding initiation

In both groups, a very high percentage of mothers started breastfeeding, with 93.4% among the IVF group and 94.8% among the control group ($P = .427$). Overall, maternal smoking during pregnancy as well as increased maternal BMI was strongly associated with lower breastfeeding initiation. Eleven per cent of mothers who smoked during pregnancy did not initiate breastfeeding vs only 4.7% of non-smokers ($P = .001$). Mean BMI of breastfeeding mothers was 22.4 vs 23.5 in mothers not breastfeeding ($P = .008$). Only 4.0% of mothers with a higher level of education did not start breastfeeding, compared to 7.2% of mothers with low or medium education ($P = .015$). Furthermore, nulliparous women were more likely to initiate breastfeeding than primi- or multiparous women (95.6% vs 93.3%; $P = .042$). Mothers undergoing caesarean section had a higher risk of not initiating breastfeeding compared to mothers undergoing vaginal deliveries (92.4% vs 95.7%; $P = .006$). Preterm vs term birth (89.7% vs 95.2%; $P = .014$) and low vs regular birthweight (89.6% vs 94.9%; $P = .044$) were important factors, which indicated a negative influence on breastfeeding initiation. Mothers who had undergone conventional IVF (92.6%) started breastfeeding as often as mothers who had undergone natural cycle IVF (93.8%).

3.3 | Breastfeeding duration

The duration of breastfeeding did not differ between the IVF group and the control group in the first year after delivery (Figure 2). At four weeks after delivery, 92.4% of the women who conceived by IVF and 88.5% of the women in the control group were still breastfeeding their infants. Similar results were also seen at 12 weeks (IVF 81.3% vs control 79.7%), 24 weeks (IVF 65.2% vs control 62.9%) and 32 weeks (IVF 48.5% vs control 46.5%). After the 10th month, 35.4% of the IVF population were still breastfeeding and 29.3% continued breastfeeding up to one year postpartum. In the control group,

one-third of the infants were still being breastfed after 10 months and 26.9% after 12 months.

There was no difference between conventional IVF and natural cycle IVF in the duration of breastfeeding. Four weeks postpartum, 88.9% of the mothers after conventional IVF treatment were breastfeeding their infants vs 93.8% after natural cycle IVF. Similar results were seen at 12 weeks (conventional IVF 81.5 vs natural cycle IVF 81.3), 24 weeks (conventional IVF 59.3% vs natural cycle IVF 66.1) or 52 weeks (conventional IVF 16.7% vs natural cycle IVF 17.9%).

Factors associated with a shorter duration of breastfeeding were smoking during pregnancy (HR 1.68), increased BMI (HR 1.04) and caesarean section (HR 1.29). In our population, no difference in breastfeeding duration between male and female infants could be found.

The higher the gestational age (HR 0.99) and the birthweight (HR 1.0) were, the longer the infants were breastfed. Preterm birth was not significantly associated with shorter breastfeeding duration, but low birthweight was (HR 1.37), see Table 2.

For the final model adjusting for the important influencing factors on breastfeeding duration, the HR of IVF was not changed (Table 2).

In the analysis of the IVF population only, cause of infertility did not influence breastfeeding initiation or duration. Where male infertility was the reason for IVF treatment, mothers breastfed in 94.02% of cases, compared to 90.57% of cases of female infertility. The duration of preceding infertility of ≤24 months had no influence on breastfeeding outcomes compared to longer duration of infertility (≤24 months 93.42% vs >24 months 93.44%).

4 | DISCUSSION

This study analysed the influence of IVF treatment on breastfeeding behaviour in Switzerland by comparing a random population sample from the SWIFS to the population of the Bern IVF cohort. In Switzerland, the proportion of mothers initiating breastfeeding is 95%,[2,18] which is very high in comparison with other countries such as France (60.2%) or Germany (90%).[2,5,19] In our sample, breastfeeding initiation was similarly high among the IVF group and the SWIFS population sample.

Our results indicate that mode of conception does not affect breastfeeding duration—a reassuring fact for mothers and healthcare professionals concerned about an adverse impact of IVF on breastfeeding.

These findings are in line with four important previous studies, presenting similar breastfeeding initiation rates and breastfeeding durations when comparing mothers who conceived through fertility treatments and mothers with spontaneous conceptions.[16,20-22] First, in a Calgary cohort study from 2012, O'Quinn found that 54.1% of the infants who were conceived through ART (n = 76) and 59.7% of the infants conceived spontaneously (n = 150) were breastfed at four months postpartum, and no differences existed regarding breastfeeding initiation, breastfeeding duration or breastfeeding difficulties.[16] However, their study population was very small.[16] The study of O'Quinn was the only among them who had focused on breastfeeding rates, difficulties and duration as primary outcomes.[16] The other three studies collected information on breastfeeding as covariates, but their focus was growth or aspects of development of the child.[20-22] Second, an Australian controlled clinical study focusing on the psychological adjustment to early motherhood. They showed that women after conception by IVF (n = 65, 68.8%) were as likely as women after spontaneous conception (n = 62, 74.6%) to breastfeed their infants at four months postpartum.[20] Furthermore, there was a third, prospective cohort study in Belgium (ART: n = 118, non-ART: n = 59),[22] and a fourth, cross-sectional study from France (ART: n = 66, non-ART: n = 33).[21] They found no differences in breastfeeding behaviour between the two groups. However, both studies had small sample sizes and primary outcome was the psychomotor development in infants, breastfeeding was only examined as a covariate.

In addition to our findings being in line with four previous studies, another strength of our study was the confirmation of previous risk factors for impaired breastfeeding. In line with a recent meta-analysis that showed a relative risk (RR) of 1.23 for caesarean section to be associated with shorter breastfeeding duration, our study also found caesarean section to be a risk factor for earlier breastfeeding cessation (HR 1.22).[23] Furthermore, our data confirm that the higher the gestational age (HR 0.99) and the birthweight (HR 0.99), the longer babies were breastfed, as described in previous research.[4] However, as the number of these specific cases in our study was limited, these associations were only significantly different in the unadjusted analysis. Women in our IVF group had a higher rate of caesarean sections and infants with slightly lower gestational age. Both had been described previously as some of the most important influencing factors for breastfeeding duration, especially after fertility treatment.[8,11] Despite the higher incidence of these risk factors in the IVF group, breastfeeding initiation and duration were not affected in either the unadjusted or in any of the adjusted models. This kind of overcompensation can be due in part to the strong internalised pressure to not fail further at motherhood, which is often reported by mothers after fertility treatment.[16,24]

In line with existing literature, our study further confirmed that lifestyle and demographic factors are critical factors with regard to breastfeeding duration, also for women who have undergone fertility treatment.[23,25,26] In our study, smoking during pregnancy was associated with earlier breastfeeding cessation (HR 1.71), in agreement with the findings of Cohen (RR 1.91).[23] The HR of 1.04 for shorter breastfeeding duration in obese women confirmed the findings of a large systematic review, with HR ranging from 1.24 to 2.54.[26] However, it was difficult to disentangle the different risk factors within the IVF group (more caesarean sections/lower gestational age) as they smoked less and had a lower BMI—both factors that influence breastfeeding positively.[23,26] As seen already in the meta-analysis from Cohen (RR 1.68), our results further confirmed that women with low level of education breastfeed for a shorter time period (HR 1.48).[23]

A further important factor which positively influence breastfeeding behaviour is the support of the healthcare system.[27] In

TABLE 2 Multivariable Cox regression models for the duration of breastfeeding

	Unadjusted HR[a] (95% CI[b]) (for each covariate individually)	*P*-value	Model I Adjusted for maternal characteristics HR[a] (95% CI[b])	*P*-value	Model II Adjusted for delivery characteristics HR[a] (95% CI[b])	*P*-value	Model III Adjusted for perinatal characteristics HR[a] (95% CI[b])	*P*-value	Final model Adjusted HR[a] (95% CI[b])	*P*-value
In vitro fertilisation	1.0 (0.83-1.20)	.984	1.04 (0.85-1.28)	.698	0.96 (0.80-1.16)	.695	1.00 (0.83-1.21)	.968	1.05 (0.87-1.27)	.615
Maternal demographics										
Maternal age (years)	0.98 (0.97-1.00)	.054	0.99 (0.98-1.01)	.438						
Maternal education[c]										
High	1.0		1.0							
Medium	1.41 (1.23-1.62)	<.001*	1.31 (1.13-1.52)	<.001*						
Low	1.83 (1.25-2.67)	.002*	1.48 (0.97-2.25)	.067						
Maternal factors										
Smoking during pregnancy (yes/no)	1.68 (1.37-2.06)	<.001*	1.60 (1.30-1.99)	<.001*					1.71 (1.38-2.13)	<.001*
BMI (kg/m^2)[d]	1.04 (1.02-1.06)	<.001*	1.05 (1.03-1.07)	<.001*					1.04 (1.02-1.06)	<.001*
Fertility status										
Parity (continuous)	0.93 (0.84-1.02)	.108								
Primiparous	1.03 (0.90-1.19)	.601			1.02 (0.88-1.17)	.814				
Multiparous	1.0				1.00					
Delivery										
Mode of delivery										
Spontaneous delivery	1.0				1.00					
Vacuum extr./forceps	1.12 (0.91-1.39)	.276			1.13 (0.91-1.40)	.287				
Caesarean section	1.29 (1.11-1.50)	.001*			1.30 (1.12-1.51)	.001*			1.22 (1.04-1.41)	.012*
Perinatal										
Gestational age (days)	0.99 (0.98-0.99)	.001*					0.93 (0.99-1.00)	.093	1.00 (0.99-1.00)	.299
Gestational age in categories										
≥37 gw[e]	1.0									
33-37 gw	1.06 (0.79-1.43)	.680								
29-32 gw	1.24 (0.55-2.76)	.606								
24-28 gw	2.05 (0.29-14.56)	.474								
Preterm birth[f]	1.09 (0.83-1.44)	.536								

	Unadjusted HR[a] (95% CI[b]) (for each covariate individually)	*P*-value	Model I Adjusted for maternal characteristics HR[a] (95% CI[b])	*P*-value	Model II Adjusted for delivery characteristics HR[a] (95% CI[b])	*P*-value	Model III Adjusted for perinatal characteristics HR[a] (95% CI[b])	*P*-value	Final model Adjusted HR[a] (95% CI[b])	*P*-value
Birthweight (gram)	1.00 (1.00-1.00)*	.003*					1.00 (1.00-1.00)	.166	1.00 (1.00-1.00)	.086
Birthweight in categories										
Normal	1.00									
Low	1.37 (1.02-1.84)	.034*								
Infant sex										
Female	1.0						1.0		1.0	
Male	1.04 (0.91-1.19)	.585					1.07 (0.93-1.23)	.362	1.09 (0.94-1.26)	.256

Note: HR >1 means a higher risk for breastfeeding cessation, so shorter breastfeeding time.

P-values marked with asterisks (*) are significant ($P < .05$).

Model I: adjusted multivariable Cox regression model with breastfeeding duration as outcome and IVF treatment as exposure adjusted for maternal characteristics.

Model II: adjusted multivariable Cox regression model with breastfeeding duration as outcome and IVF treatment as exposure adjusted for delivery characteristics.

Model III: adjusted multivariable Cox regression model with breastfeeding duration as outcome and IVF treatment as exposure adjusted for perinatal characteristics.

Final Model: adjusted multivariable Cox regression model with breastfeeding duration as outcome and IVF treatment as exposure adjusted for smoking, BMI, caesarean section, gestational age, birthweight and infant sex.

[a]Hazard ratio.

[b]Confidence interval.

[c]Maternal level of education was defined as follows: high (graduation from a university), medium (apprenticeship or high school diploma), low (basic school diploma or no diploma).

[d]Body mass index kg/m^2.

[e]Gestational weeks.

[f]Preterm delivery ≤37 weeks.

Switzerland, one-third of all obstetric clinics are certified by the United Nations Children's Fund and the World Health Organization as baby-friendly hospitals, which is a high proportion and an important factor for the high breastfeeding initiation rate.[28,29] Additionally, breastfeeding support in Switzerland includes discussions about breastfeeding during routine pregnancy consultations, support in breastfeeding management postnatally through nursing staff at the delivery clinic, and breastfeeding support through a midwife after discharge.[2,30] These services are covered by health insurance.[2,30]

Our study showed that the factors that critically affect breastfeeding behaviour are the same in women after IVF and after spontaneous conception. The mode of conception itself did not appear to influence breastfeeding behaviour. However, there is controversy in the literature on the effect of the mode of conception.[7-11,15,16,20-22] Six studies on breastfeeding following fertility treatment found differences at certain points during the first-year postpartum.[7-11,15] First, a large Chinese prospective cohort study (N = 935) found lower breastfeeding rates at six months postpartum in the fertility treatment group compared to a spontaneous conception group, but similar breastfeeding rates at 12 months postpartum.[8] Similar to our research, they accounted for confounding factors such as maternal BMI or infant's birthweight.[8] Second, a smaller Italian retrospective case-control study (N = 188) found that a lower percentage of women who had undergone fertility treatment were breastfeeding at six weeks postpartum compared to a spontaneous conception group, but at six months, breastfeeding rates were not different.[7] Third, similar results were reported in an Australian prospective cohort study (N = 183) showing lower percentages of women breastfeeding at six weeks and eight months in the ART group.[10] However, in both latter studies, small sample sizes and a single-centred study design limited their evidence.[7,10] Fourth, another Australian cohort study from 2013 (N = 549) found that women after ART were less likely to be breastfeeding at four months postpartum than women after spontaneous conception, although oversampling of women older than 36 years resulted in limited generalisability.[15] Fifth, Michels showed that mothers who had undergone fertility treatment were more likely to cease breastfeeding before the 12th month after birth, even after adjustment for confounders such as preterm birth.[9] In their large US cohort study including 1361 women who had undergone ART, they accounted for different factors, but not for twins.[9] Contrary to the results of Michels,[9] the sixth study, a recent cross-sectional surveillance study from the United States, reported lower chances of breastfeeding at eight weeks postpartum among women who conceived through fertility treatments (n = 1056), but this difference was no longer significant after adjustment for multiples and preterm birth.[11] However, breastfeeding duration was analysed only at the time point of eight weeks, which is a short time period.[11] Furthermore, both US studies were unable to conclude whether or not a specific treatment or a combination of treatments might impact breastfeeding, as different fertility treatments were grouped (eg intrauterine insemination, ovulation induction only, IVF) in one ART group.[9,11] Details on how specific reproductive treatments may influence breastfeeding ability were not available.[9,11]

Unlike previous studies, we were able to focus on breastfeeding outcomes specifically after IVF treatment only, without summarising different fertility treatment methods into groups. Furthermore, by comparing gonadotropin-stimulated IVF to non-gonadotropin-stimulated IVF, it was possible to assess the effect of high-dose hormones on breastfeeding outcomes. Since this comparison showed no significant impact on breastfeeding initiation and duration in our study, it is reassuring that the use of high doses of hormones does not appear to influence breastfeeding ability.

A weakness of this study was the selection of the participants. First, the randomised sample of mothers in the SWIFS could possibly include infants conceived through fertility treatments, as the SWIFS did not collect information on mode of conception. Because only 2.5% of children born in Switzerland are conceived through fertility treatments, the potential effect on our analysis was very small. Second, a selection bias could not be ruled out, as well-educated women were possibly more interested in research, leading to a higher participation rate in both study groups.

5 | CONCLUSION

Our study provided three findings. First, in Switzerland, IVF treatments were not associated with earlier breastfeeding cessation. Second, in our study, there was no difference in breastfeeding behaviour between mothers undergoing natural cycle IVF and mothers undergoing hormonally stimulated IVF therapy. Third, our results confirmed the findings of other studies: infants with low gestational age and low birthweight as well as infants born by caesarean section were less frequently breastfed. Furthermore, maternal obesity, smoking and low level of education negatively influenced breastfeeding behaviour.

ACKNOWLEDGMENTS

The authors would like to express their gratitude to the participants for their time and interest in the study. Furthermore, we are grateful to Pascale Fasel, Daniela Steiner, Marlene Berchtold, Karin Gross, Julia Dratva and Elisabeth Zemp Stutz for their support in providing the data from the SWIFS.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

ORCID

Livia Amanda Purtschert https://orcid.org/0000-0003-1515-5091
Vera Ruth Mitter https://orcid.org/0000-0002-1483-5020
Jarmila Anna Zdanowicz https://orcid.org/0000-0002-5361-7309
Mirja Amadea Minger https://orcid.org/0000-0002-0022-9580
Michael von Wolff https://orcid.org/0000-0003-4303-2734
Alexandra Sabrina Kohl Schwartz https://orcid.org/0000-0002-7558-1327

REFERENCES

1. Kramer MS, Kakuma R. Optimal duration of exclusive breastfeeding. *Cochrane Database Syst Rev*. 2012;2012:CD003517.
2. Gross K, Spaeth A, Dratva J, Zemp Stutz E.SWIFS - Swiss infant feeding study. Basel Swiss Tropical and Public Health Institute. 2014. https://www.swisstpth.ch/fileadmin/user_upload/SWISSTPH/Projects/SWIFS_Schlussbericht.pdf 15th July, 2017.
3. Horta BL, Loret de Mola C, Victora CG. Long-term consequences of breastfeeding on cholesterol, obesity, systolic blood pressure and type 2 diabetes: a systematic review and meta-analysis. *Acta Paediatr*. 2015;104:30-37.
4. Neifert M, Bunik M. Overcoming clinical barriers to exclusive breastfeeding. *Pediatr Clin North Am*. 2013;60:115-145.
5. Castelli C, Perrin J, Thirion X, Comte F, Gamerre M, Courbiere B. Maternal factors influencing the decision to breastfeed newborns conceived with IVF. *Breastfeed Med*. 2015;10:26-30.
6. Cousineau TM, Domar AD. Psychological impact of infertility. *Best Pract Res Clin Obstet Gynaecol*. 2007;21:293-308.
7. Cromi A, Serati M, Candeloro I, et al. Assisted reproductive technology and breastfeeding outcomes: a case-control study. *Fertil Steril*. 2015;103:89-94.
8. Sha T, Yan Y, Gao X, et al. Association of assisted reproductive techniques with infant feeding practices: a community-based study in China. *Breastfeed Med*. 2019;14:654-661.
9. Michels KA, Mumford SL, Sundaram R, Bell EM, Bello SC, Yeung EH. Differences in infant feeding practices by mode of conception in a United States cohort. *Fertil Steril*. 2016;105:1014-1022.
10. Hammarberg K, Fisher JRW, Wynter KH, Rowe HJ. Breastfeeding after assisted conception: a prospective cohort study. *Acta Paediatr Oslo Nor*. 2011;100:529-533.
11. Barrera CM, Kawwass JF, Boulet SL, Nelson JM, Perrine CG. Fertility treatment use and breastfeeding outcomes. *Am J Obstet Gynecol*. 2019;220:261.e1-261.e7.
12. Pandey S, Shetty A, Hamilton M, Bhattacharya S, Maheshwari A. Obstetric and perinatal outcomes in singleton pregnancies resulting from IVF/ICSI: a systematic review and meta-analysis. *Hum Reprod Update*. 2012;18:485-503.
13. Kohl Schwartz AS, Mitter VR, Amylidi-Mohr S, et al. The greater incidence of small-for-gestational-age newborns after gonadotropin-stimulated in vitro fertilization with a supraphysiological estradiol level on ovulation trigger day. *Acta Obstet Gynecol Scand*. 2019;98:1575-1584.
14. Sunkara SK, Lamarca A, Polyzos NP, Seed PT, Khalaf Y. Live birth and perinatal outcomes following stimulated and unstimulated IVF: Analysis of over two decades of a nationwide data. *Hum Reprod*. 2016;31:2261-2267.
15. Fisher J, Hammarberg K, Wynter K, et al. Assisted conception, maternal age and breastfeeding: an Australian cohort study. *Acta Paediatr*. 2013;102:970-976.
16. O'Quinn C, Malfe A, McDonald SW, Raguz N, Tough SC. Exclusive breastfeeding and assisted reproductive technologies: a Calgary cohort. *Reproductive Sys Sexual Disord*. 2012;S5:002.
17. Von Wolff M. The role of Natural Cycle IVF in assisted reproduction. *Best Pract Res Clin Endocrinol Metab*. 2019;33:35-45.
18. Gubler T, Krähenmann F, Roos M, Zimmermann R, Ochsenbein-Kölble N. Determinants of successful breastfeeding initiation in healthy term singletons: a Swiss university hospital observational study. *J Perinat Med*. 2013;41:331-339.
19. Kohlhuber M, Rebhan B, Schwegler U, Koletzko B, Fromme H. Breastfeeding rates and duration in Germany: a Bavarian cohort study. *Br J Nutr*. 2008;99:1127-1132.
20. McMahon CA, Ungerer JA, Tennant C, Saunders D. Psychosocial adjustment and the quality of the mother-child relationship at four months postpartum after conception by in vitro fertilization. *Fertil Steril*. 1997;68:492-500.
21. Raoul-Duval A, Bertrand-Servais M, Frydman R. Comparative prospective study of the psychological development of children born by in vitro fertilization and their mothers. *J Psychosom Obstet Gynecol*. 1993;14:117-126.
22. Place I, Englert Y. A prospective longitudinal study of the physical, psychomotor, and intellectual development of singleton children up to 5 years who were conceived by intracytoplasmic sperm injection compared with children conceived spontaneously and by in vitro fertilization. *Fertil Steril*. 2003;80:1388-1397.
23. Cohen SS, Alexander DD, Krebs NF, et al. Factors associated with breastfeeding initiation and continuation: a meta-analysis. *J Pediatr*. 2018;203:190-196.
24. Ladores S, Aroian K. First-time mothers with a history of infertility: their internalized pressure to breastfeed. *J Hum Lact*. 2015;31:504-510.
25. Meedya S, Fahy K, Kable A. Factors that positively influence breastfeeding duration to 6 months: a literature review. *Women Birth J Aust Coll Midwives*. 2010;23:135-145.
26. Turcksin R, Bel S, Galjaard S, Devlieger R. Maternal obesity and breastfeeding intention, initiation, intensity and duration: a systematic review. *Matern Child Nutr*. 2014;10:166-183.
27. Sikorski J, Renfrew MJ, Pindoria S, Wade A. Support for breastfeeding mothers: a systematic review. *Paediatr Perinat Epidemiol*. 2003;17:407-417.
28. Merten S, Ackermann-Liebrich U. Exclusive breastfeeding rates and associated factors in Swiss baby-friendly hospitals. *J Hum Lact*. 2004;20:9-17.
29. Bass JL, Gartley T, Kleinman R. World Health Organization baby-friendly hospital initiative guideline and 2018 implementation guidance. *JAMA Pediatr*. 2019;173:93-99.
30. Spaeth A, Zemp E, Merten S, Dratva J. Baby-Friendly Hospital designation has a sustained impact on continued breastfeeding. *Matern Child Nutr*. 2018;14:e12497.

How to cite this article: Purtschert LA, Mitter VR, Zdanowicz JA, et al. Breastfeeding following in vitro fertilisation in Switzerland—Does mode of conception affect breastfeeding behaviour?. *Acta Paediatr*. 2021;110:1171–1180. https://doi.org/10.1111/apa.15553