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ORIGINAL RESEARCH ARTICLE

Fear of childbirth after induced abortion in primiparous women: Population-based register study from Finland

Venla Kemppainen[1] | Maarit Mentula[1] | Tomi Seppälä[2,3] | Mika Gissler[4,5] | Hanna Rouhe[1] | Saisto Terhi[1] | Oskari Heikinheimo[1] | Maarit Niinimäki[6]

[1]Department of Obstetrics and Gynecology, University of Helsinki and Helsinki University Hospital, Helsinki, Finland

[2]Aalto University, Aalto, Finland

[3]University of Eastern Finland, Kuopio, Finland

[4]Finnish Institute of Health and Welfare (THL), Invest Research Flagship and University of Turku, Turku, Finland

[5]Karolinska Institute, Stockholm, Sweden

[6]Department of Obstetrics and Gynecology, PEDEGO Research Unit, Medical Research Center, University of Oulu and Oulu University Hospital, Oulu, Finland

Correspondence

Oskari Heikinheimo, Department of Obstetrics and Gynecology, University of Helsinki and Helsinki University Hospital, PO Box 140 (Haartmaninkatu 2), FI-00029 HUS Helsinki, Finland.

Email: oskari.heikinheimo@helsinki.fi

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Abstract

Introduction: Fear of childbirth (FOC) is a common obstetrical challenge that complicates about every 10th pregnancy. Background factors of FOC are diverse. We evaluated the association of induced abortion (IA) and FOC in subsequent pregnancy.

Material and methods: Population-based register study based on three Finnish national registers: the Register of Induced Abortions, the Medical Birth Register and the Hospital Discharge Register. The study cases were primigravid women undergoing an IA in 2000–2015 and subsequent pregnancy ending in live singleton birth up to 2017. Each case had three controls, matched by age and residential area, whose first pregnancy ended in a live birth. The main outcome was the incidence of FOC in the subsequent pregnancy. In a secondary analysis, we assessed other risk factors for FOC.

Results: The study cohort consisted of 21 455 women and 63 425 controls. Altogether, 4.2% of women had a diagnosis of FOC. The incidence was higher in women with a history of IA than in controls (5.6% vs 3.7%, $P<0.001$). A history of IA was associated with higher odds for FOC: adjusted odds ratio [aOR] 1.20 with 95% confidence interval (CI) 1.11–1.30. In addition, a history of psychiatric diagnosis (aOR 3.48, 95% CI 3.15–3.83), high maternal age, 30–39 years old (aOR 1.55, 95% CI 1.43–1.67; $P<0.001$) and ≥40 years old (aOR 3.00, 95% CI 2.37–3.77; $P<0.001$) and smoking (aOR 1.20, 95% CI 1.11–1.31; $P<0.001$) were associated with increased odds for FOC. Women living in densely populated or rural areas and those with lower socioeconomic class had lower odds for FOC.

Conclusions: A history of IA is associated with increased odds for FOC in subsequent pregnancy. However, the associations of FOC with a history of psychiatric diagnosis and elevated maternal age (especially ≥40 years old) are more pronounced.

KEYWORDS

fear of childbirth, childbirth, induced abortion

Abbreviations: aOR, adjusted odds ratio; FOC, fear of childbirth; IA, induced abortion; ICD-10, International Statistical Classification of Diseases and Related Health Problems; OR, odds ratio; SES, socioeconomic status.

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1 | INTRODUCTION

Fear of childbirth (FOC) is a common obstetrical challenge that complicates about every 10th pregnancy. The reported incidence varies from 2.5% to 20% in different studies, often being higher in questionnaires than in register-based studies.[1–7]

Background factors of FOC are diverse and different between nulliparous and multiparous women. Women with it more often have a history of psychiatric morbidity, such as depression and anxiety, or a history of childhood abuse.[3,5,7–11] A history of induced abortion (IA) has been shown as a risk factor for FOC in a few studies.[4,5] Other risk factors include low or high educational level, lack of social network, dissatisfaction with partnership, and both very young and advanced maternal age.[1,3–5,10] In parous women, previous negative or traumatic delivery experience, and a history of operative delivery (cesarean or operative vaginal delivery such as vacuum extraction) increase the risk in subsequent pregnancies.[1,2,4,5,12]

Women with FOC often wish for a cesarean instead of a vaginal delivery.[2,8,13–16] Furthermore, intended vaginal delivery more often ends in an emergency cesarean, but the risk of fetal distress is not increased.[17] FOC also has long-term effects, such as increased risk of postpartum depression and post-traumatic stress disorder, and it also predicts parenting stress and lower quality of life after birth.[8,18–20]

In the present study, we studied the risk of FOC among women whose first pregnancy ended with an IA compared with primigravid women. A secondary aim was to assess other risk factors of FOC, the mode of delivery and outcomes of the newborn in the subsequent pregnancy following IA.

2 | MATERIAL AND METHODS

The population-based study cohorts were formed by linking data from the Register of Induced Abortions and the Medical Birth Register, both maintained the Finnish Institute for Health and Welfare. The cases included women whose first pregnancy ended in an IA between 2000 and 2015 and their subsequent pregnancy resulting in a live singleton birth between 2000 and 2017. We excluded women who had a history of multiple IAs, registry identifiable miscarriages or prior deliveries.

Three matched controls were identified from the Medical Birth Register for each case. The controls were primigravid women whose pregnancy resulted in a singleton live delivery. The women in the control group had no history of IA as verified from the Register of Induced Abortions. The controls were matched according to the age at the time of delivery and area of residence.

The Hospital Discharge Register, also maintained by the Finnish Institute for Health and Welfare, was linked to both cohorts. The Hospital Discharge Register contains information on all diagnoses made during inpatient care in all hospitals or outpatient care in public hospitals in Finland. We collected all diagnostic codes starting 2 years prior to pregnancy, and during pregnancy and childbirth.

> **Key message**
>
> Fear of childbirth in first-time mothers is associated with a history of induced abortion, psychiatric morbidity and advanced maternal age.

The linkage between the Register of Induced Abortions and the Medical Birth Register using women's unique personal identification numbers was performed by the Finnish Institute for Health and Welfare, as was the identification of the control women. We linked data from the Hospital Discharge Register to each woman using same personal encrypted identification numbers.

The Register of Induced Abortions contains data on all IAs performed in Finland. All live births and stillbirths of at least 22 gestational weeks or birthweight of at least 500 g are reported to the Medical Birth Register. It is mandatory by law to report all IAs and births to these registers. The Hospital Discharge Register contains information on diagnosis using the International Statistical Classification of Diseases and Related Health Problems (ICD-10) diagnostic codes since 1996.

We collected background characteristics of the women at the time of childbirth from the Medical Birth Register. These include woman's age, smoking habits during pregnancy, marital status or cohabitation, type of socioeconomic status (SES) and residential area. We used maternal occupation or educational level at the time of childbirth as an indicator of SES based on Finland's National Classification of Occupations. In those whose SES was registered, it was classified into five classes: upper and lower white-collar workers, blue-collar workers, students and others (eg entrepreneurs, farmers, stay-at-home mothers and unemployed). Those with missing data on SES were classified as unknown and removed from the analyses. The residential area is classified into three types: urban area, densely populated area and rural area. Information on the mode of delivery, performed obstetrical procedures and neonatal outcome was also collected from the Medical Birth Register.

We used the ICD-10 code O99.80 set during pregnancy and childbirth to indicate FOC. The use of this ICD-10 code to indicate FOC is specific for Finland, and it is generally used in hospital maternity clinics. The diagnosis cannot be found in the Hospital Discharge Register if FOC is treated only in primary or private healthcare. In Finland, only public hospitals provide delivery care, so all data on diagnosis during delivery are found from the Hospital Discharge Register. We also searched the diagnoses indicating psychiatric diseases (F00–F99), given in specialized health care, as confounding factors.

2.1 | Statistical analyses

We performed the statistical analysis of the data with SPSS for Windows. We used both univariate logistic regression and

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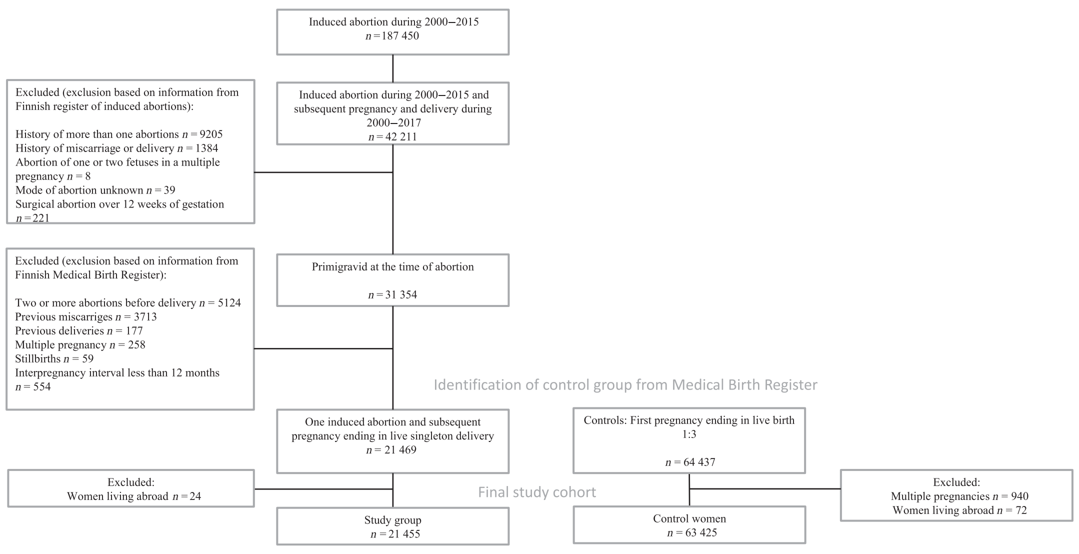

FIGURE 1 Study flow.

TABLE 1 The demographic and background characteristics of the study groups.

Characteristics	History of induced abortion *n* = 21 455	Controls,[a] *n* = 63 425	*P*-value
Woman's age at the time of delivery, years, mean (SD)	26.22 (5.12)	26.19 (5.11)	0.429
Smoking during pregnancy[b]			
Yes	7200 (33.6)	11 421 (18.0)	<0.001
No	13 790 (64.3)	50 631 (79.8)	
Marital status			<0.001
Married or cohabiting	16 762 (78.1)	53 833 (84.9)	
Single or unknown	4693 (21.9)	9492 (15.1)	
Socioeconomic status			
Upper white-collar workers	1629 (7.6)	8774 (13.8)	<0.001
Lower white-collar workers	4726 (22.0)	18 371 (29.0)	
Blue-collar workers	3024 (14.1)	7853 (12.4)	
Students	3102 (14.5)	10 193 (16.1)	
Other	743 (3.5)	251 (4.2)	
Unknown	8231 (38.4)	15 583 (24.6)	
Residential area			
Urban area	16 769 (78.2)	49 574 (78.2)	1.000
Densely populated area	2731 (12.7)	8084 (12.7)	
Rural area	1955 (9.1)	5767 (9.1)	
Psychiatric diagnosis[c]			
Yes	1848 (8.6)	2892 (4.6)	<0.001
No	19 607 (91.4)	60 533 (95.4)	
Psychiatric outpatient visits			
No	19 607 (91.4)	60 533 (95.4)	<0.001
Only before pregnancy	1041 (4.9)	1269 (2.0)	
Only during pregnancy	310 (1.4)	688 (1.1)	
Before and during pregnancy	497 (2.3)	935 (1.5)	

Note: Results are presented as counts and percentage (%) if not otherwise stated.

Abbreviation: SD, standard deviation.

[a]Controls were matched to cases by age at the time of delivery and residential area.

[b]Information is missing from 465 (2.2%) women in the induced abortion group and 1373 (2.2%) in the control group.

[c]Psychiatric diagnosis: includes the diagnoses during the 2 years and during pregnancy leading to childbirth and pregnancy.

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multivariate logistic regression analysis to calculate and compare the odds for the FOC based on different factors. A multivariate logistic regression model was adjusted for maternal age at the delivery, marital status, residential area, SES, smoking, a history of abortion, a history of psychiatric diagnosis and year of delivery.

Multicollinearity of the independent factors in the models was checked, although multicollinearity does not pose problems for estimation accuracy with such large sample sizes that we have. Of all the correlations and biserial correlations between the variables (including dummy variables), none is above 0.2 in absolute value: the highest (biserial) correlation is between the youngest mothers' group and the students' group ($r=0.196$). We conclude that there are no multicollinearity problems related to our independent factors.

2.2 | Ethics statement

The Finnish Institute for Health and Welfare provided permission to use personal data from national registers (THL/1097/5.05.00/2017) on June 5, 2017.

3 | RESULTS

The study cohort consisted of 21 455 women and the control cohort of 63 425 women. The study flow is presented in Figure 1.

The background characteristics of the study groups are shown in Table 1. Women with a history of IA smoked more often (33.6% vs 18.0%, $P<0.001$), were less often married or cohabiting (78.1% vs 84.9%, $P<0.001$) and had a lower SES. Altogether, 5.6% of women ($n=4740$) had at least one psychiatric diagnosis 2 years prior to and/or during the pregnancy. A history of psychiatric diagnosis was more common in women with a history of IA than in controls (8.6% vs 4.6%, $P<0.001$).

Altogether, 4.2% of all women were diagnosed with FOC during pregnancy. The incidence was higher in women with a history of IA than in the controls (5.6% vs 3.7%, $P<0.001$). During the study period, the incidence of FOC increased from 1.7% to 11.2% in women with a history of IA and from 1.8% to 7.4% in control women (Figure 2).

Obstetric and perinatal outcomes of the study groups are presented in Table 2. The rate of cesarean delivery was higher in women with a history of IA (19.2% vs 18.1%, $P<0.001$). Furthermore, rate of elective cesareans was similar between the groups, whereas

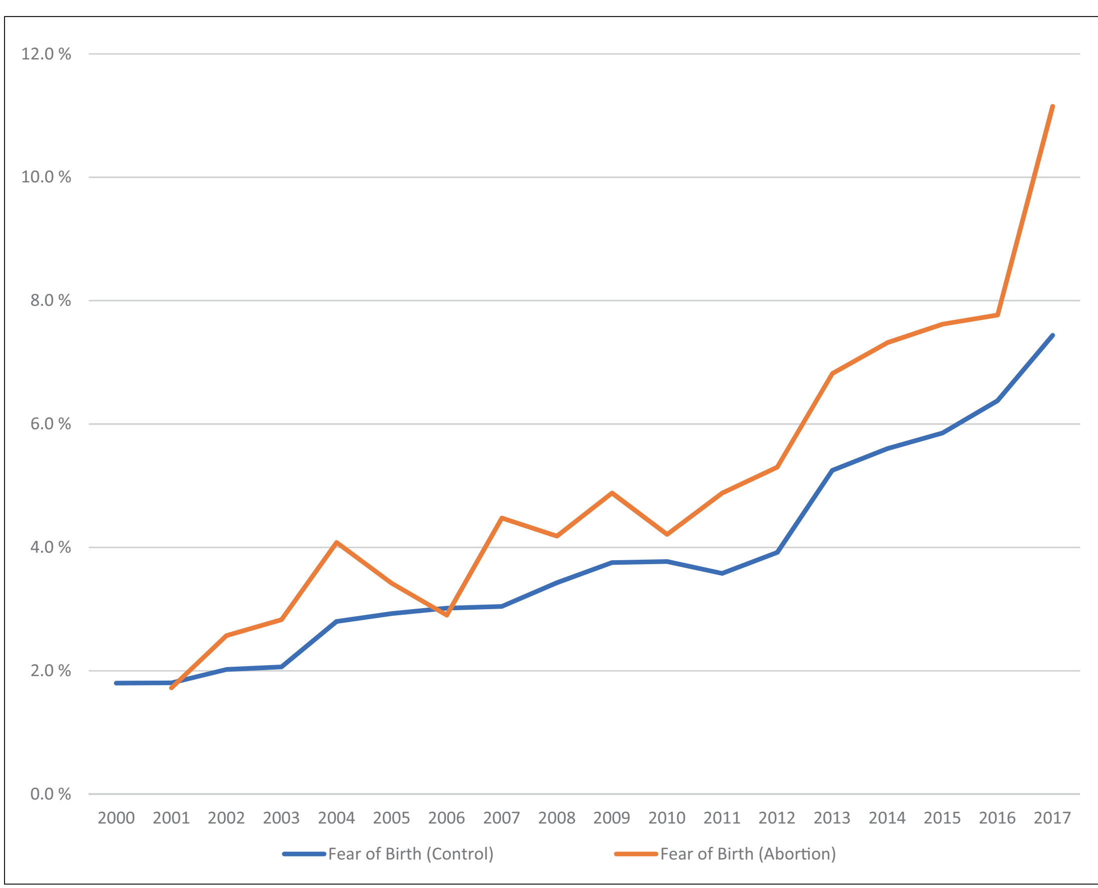

FIGURE 2 Incidence of fear of childbirth during the study period (2000–2017) in Finland.

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TABLE 2 Obstetric and perinatal outcome of the study groups.

Characteristic	History of induced abortion, n = 21 455	Controls, n = 63 425	P-value
Diagnosis of fear of childbirth	1209 (5.6)	2360 (3.7)	<0.001
Duration of gestation at the time of delivery in days, mean (SD)	280 (12.15) n = 21 403	279 (12.98) n = 63 278	<0.001
Mode of delivery			
Vaginal delivery	14 203 (66.2)	42 678 (67.3)	0.003
Assisted vaginal delivery	3135 (14.6)	9274 (14.6)	0.971
Cesarean delivery			
Total	4115 (19.2)	11 454 (18.1)	<0.001
Elective	1085 (5.1)	3258 (5.1)	0.647
Emergency	3030 (14.1)	8196 (12.9)	<0.001
Elective cesarean delivery in women with fear of childbirth[a]	301 (24.9)	538 (22.8)	0.542
Cesarean delivery (overall) in women with fear of childbirth[a]	485 (40.1)	922 (39.1)	0.162
Preterm birth			
<37 weeks of pregnancy	918 (4.3)	3297 (5.2)	<0.001
<32 weeks of pregnancy	115 (0.5)	461 (0.7)	0.003
<28 weeks of pregnancy	39 (0.2)	179 (0.3)	0.012
Newborn outcome			
Apgar 1 minute <7[b]	1555 (7.3)	4704 (7.4)	0.400
Apgar 5 minute <7[c]	493 (2.9)	1336 (3.2)	0.059
Arterial pH <7[d]	134 (0.8)	402 (0.8)	0.399

Note: Results are presented as *n* and % if not otherwise stated.

Abbreviation: SD, standard deviation.

[a]Percentages among women with diagnosis of fear of childbirth in both study groups.

[b]Information is missing from 37 (0.2%) women in the induced abortion group and 151 (0.2%) in the control group.

[c]Information is missing from 4316 (20.1%) women in the induced abortion group and 21 316 (33.6%) in the control group. If a newborn had high 1-minute Apgar scores, a 5-minute Apgar score was not necessarily recorded.

[d]Information is missing from 3911 (18.2%) women in the induced abortion group and 15 025 (23.7%) in the control group.

emergency cesareans were more common in women with a history of IA (14.1% vs 12.9%, $P < 0.001$). Cesarean delivery in women with FOC was common in both groups (40.1% in women with a history of IA and 39.1% in control women, $P < 0.001$). There were no statistically significant differences in newborn outcomes (Apgar points or arteria pH of newborn) between study groups.

Based on the univariate analysis, a history of IA increased the odds for FOC (odds ratio [OR] 1.55, 95% confidence interval [CI] 1.44–1.66, $P < 0.001$). The odds for elective cesarean were also higher in women with FOC than in those without FOC (OR 2.29, 95% CI 1.88–2.80, $P < 0.001$).

Other factors increasing the odds for FOC in the two study groups are presented in Table 3. They include advanced maternal age (both 30–39 years and ≥40 years of age) and living in an urban area. The odds were higher in women with a history of psychiatric diagnosis (OR 3.82, 95% CI 3.48–4.19 in all women, $P < 0.001$) and was seen in both study groups. The odds were highest if a woman had a history of two or more psychiatric visits and if a woman had a visit due to a psychiatric condition both before and during pregnancy, or only during pregnancy. The trend was similar in both study groups.

In multivariate logistic regression model (Figure 3) advanced maternal age (30–39 years old adjusted odds ratio [aOR] 1.55, 95% CI 1.43–1.67, $P < 0.001$, and ≥40 years old aOR 3.00 [2.37–3.77], $P < 0.001$), and a history of psychiatric diagnosis (aOR 3.48, 95% CI 3.15–3.83, $P < 0.001$) had the strongest associations with FOC. The odds were also increased in women with a history of IA (aOR 1.20, 95% CI 1.11–1.30) and among smokers (aOR 1.20, 95% CI 1.11–1.31, $P < 0.001$). The odds were lower in women living in densely populated or rural areas, and in women with lower SES.

4 | DISCUSSION

In our study population, the incidence of FOC was 4.2%. A history of IA was associated with FOC in a subsequent pregnancy. However, the associations of a history of psychiatric disease and advanced maternal age with FOC were more pronounced. We found no clinically significant differences in the mode of delivery or immediate newborn outcomes between primiparous women with or without a history of IA.

The excellent coverage and reliability of the Finnish register data are a strength of our study. As practically all IAs and deliveries are recorded in the registers, a large national cohort and longitudinal follow-up is possible. Still, register data present some

TABLE 3 Odds for fear of childbirth in the two study groups. Results of univariate logistic regression analysis.

Characteristic	History of induced abortion fear of childbirth[a]		Controls fear of childbirth[b]	
Variable	OR (95% CI)	*P*-value	OR (95% CI)	*P*-value
Age at delivery (years)				
<20	0.94 (0.74–1.19)	0.583	1.15 (0.98–1.35)	0.083
20–29	1		1	
30–39	1.51 (1.33–1.72)	<0.001	1.71 (1.56–1.86)	<0.001
≥40	2.93 (1.96–4.40)	<0.001	3.35 (2.55–4.40)	<0.001
Marital status				
Married or cohabiting	1		1	
Single or unknown	1.08 (0.94–1.24)	0.298	1.22 (1.09–1.36)	<0.001
Residential area				
Urban area	1		1	
Densely populated area	0.78 (0.64–0.94)	0.008	0.63 (0.54–0.72)	<0.001
Rural area	0.53 (0.41–0.69)	<0.001	0.56 (0.47–0.66)	<0.001
Socioeconomic status				
Upper white-collar workers	1		1	
Lower white-collar workers	0.63 (0.50–0.80)	<0.001	0.78 (0.68–0.89)	<0.001
Blue-collar workers	0.59 (0.45–0.77)	<0.001	0.73 (0.61–0.86)	<0.001
Students	0.62 (0.47–0.80)	<0.001	0.86 (0.74–1.00)	0.046
Other	0.66 (0.44–0.98)	0.038	0.82 (0.64–1.04)	0.10
Smoking				
No	1		1	
Yes	1.16 (1.03–1.31)	0.016	1.19 (1.08–1.32)	<0.001
Psychiatric diagnosis[c]				
No	1		1	
Yes	2.92 (2.52–3.39)	<0.001	4.21 (3.74–4.74)	<0.001
Psychiatric visits[c]				
No	1		1	
1 visit	2.33 (1.73–3.13)	<0.001	3.82 (3.03–4.32)	<0.001
≥2 visits	3.14 (2.66–3.70)	<0.001	4.34 (3.80–4.96)	<0.001
Psychiatric visits				
No			1	
Only before pregnancy	1	<0.001	2.64 (2.16–3.25)	<0.001
Only during pregnancy	2.05 (1.65–2.55)	<0.001	6.64 (5.45–8.09)	<0.001
Both before and during pregnancy	4.35 (3.24–5.84)	<0.001	4.77 (3.95–5.78)	<0.001
	4.04 (3.17–5.14)			

Note: Study cohort comprises 84 880 women, of whom 3569 had a diagnosis of fear of childbirth.

Abbreviations: CI, confidence interval; OR, odds ratio.

[a]Altogether, 21 455 women with history of abortion, of whom 1209 had diagnosis of fear of childbirth in subsequent pregnancy.

[b]Altogether, 63 425 women in control group, of whom 2360 had diagnosis of fear of childbirth.

[c]Psychiatric diagnosis and psychiatric visits during 2 years before and during pregnancy and childbirth.

limitations. Some information may be missing or be inaccurate due to human error, as information is provided by healthcare professionals or due to reporting bias by pregnant women (eg maternal smoking). Moreover, we could not identify possible IAs performed outside Finland. One-third of women lacked the information of SES in the Medical Birth Register. In Finland, it is not allowed to register ethnicity, thus this information is also lacking.

Some women with FOC are treated in primary healthcare and do not receive a referral to healthcare specialist, and therefore are not registered in the Hospital Discharge Register.[21] However, we argue

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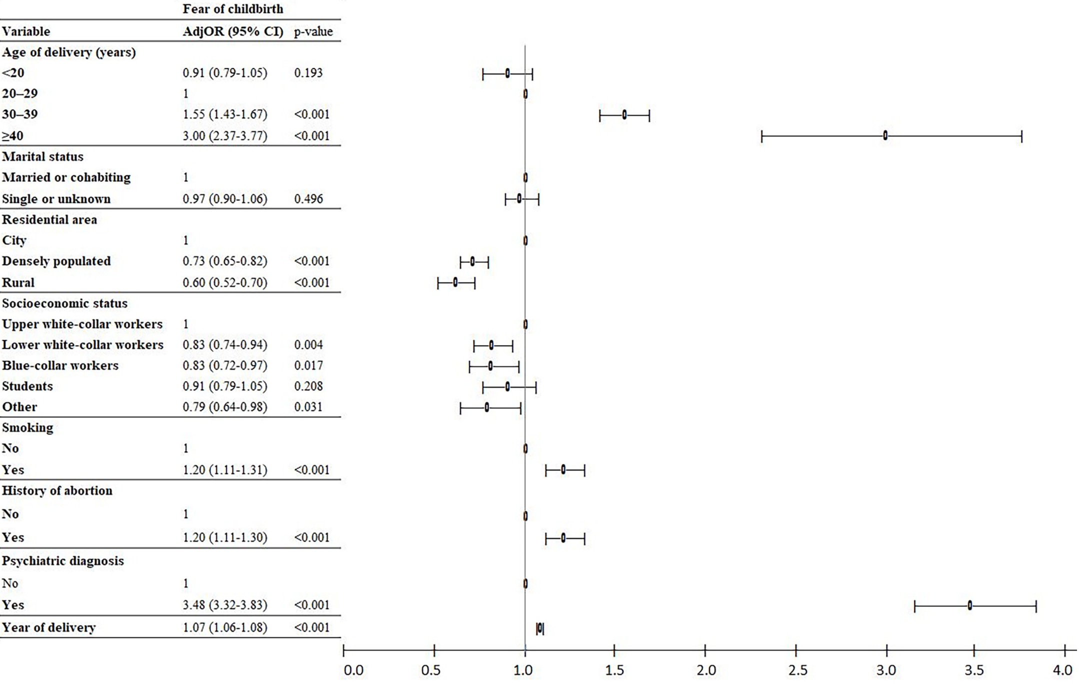

Variable	Fear of childbirth AdjOR (95% CI)	p-value
Age of delivery (years)		
<20	0.91 (0.79-1.05)	0.193
20–29	1	
30–39	1.55 (1.43-1.67)	<0.001
≥40	3.00 (2.37-3.77)	<0.001
Marital status		
Married or cohabiting	1	
Single or unknown	0.97 (0.90-1.06)	0.496
Residential area		
City	1	
Densely populated	0.73 (0.65-0.82)	<0.001
Rural	0.60 (0.52-0.70)	<0.001
Socioeconomic status		
Upper white-collar workers	1	
Lower white-collar workers	0.83 (0.74-0.94)	0.004
Blue-collar workers	0.83 (0.72-0.97)	0.017
Students	0.91 (0.79-1.05)	0.208
Other	0.79 (0.64-0.98)	0.031
Smoking		
No	1	
Yes	1.20 (1.11-1.31)	<0.001
History of abortion		
No	1	
Yes	1.20 (1.11-1.30)	<0.001
Psychiatric diagnosis		
No	1	
Yes	3.48 (3.32-3.83)	<0.001
Year of delivery	1.07 (1.06-1.08)	<0.001

FIGURE 3 Multivariate logistic regression model of the fear of childbirth among study cohort. All the study population was included in the analysis (n = 84 880). Altogether, 3569 women (4.2%) had a diagnosis of Fear of childbirth during pregnancy and childbirth. AdjOR, adjusted odds ratio; CI, confidence interval; n, number of cases. *Psychiatric diagnosis: diagnosis 2 year before or during pregnancy and childbirth.

that severe cases of FOC are referred to specialists and therefore receive a diagnosis made in hospital maternity clinics. Still, the actual incidence of FOC may be higher than seen in our study.

The incidence of FOC was higher in our study than reported in a previous Finnish register cohort (4.2% vs 2.5% in primiparous women),[5] but it was lower than in the questionnaire study from Finland (7.5%).[4] Developments in screening, recognition and treatment of FOC in recent years are likely to increase the incidence of FOC, as reported previously and also seen in the present study.[5,21] In Finland, treatment of FOC typically includes psychoeducation and its goal is to encourage vaginal delivery. However, an elective cesarean is scheduled on the 39th week of gestation if a woman eventually wishes it.

Background factors of FOC are diverse and a history of IA emerged as a risk factor in the present study.[4,5] The vast majority of IAs are performed by means of medical method (combination of mifepristone and misoprostol) in Finland.[22] Our previous study reported that medical abortion during the first or second trimester, was not associated with an increased risk of FOC in subsequent pregnancy when compared with surgical abortion.[23]

In the present study, advanced maternal age (≥30 years) increased the odds for FOC, as seen in a previous Finnish study, whereas the odds were not increased in young women.[5] Women in our study cohort were younger at the time of their first delivery compared with the overall mean age of first delivery in Finland (26.0 vs 29.2 years of age). This might mean that the actual incidence of FOC among pregnant women in Finland is higher than that seen in the present study.

A history of psychiatric diagnoses and especially psychiatric outpatient visit during pregnancy had strong correlation with FOC as shown previously.[3,5,7–11] In the present study, women with a history of IA more often have a history of psychiatric diagnoses. In earlier studies, IA has not been shown to increase the risk of mental disorders or psychological illness in mid pregnancy.[24–26] Smoking, living in a city, and high or unknown SES also emerged as risk factors for FOC. However, we found no multicollinearity related to the independent factors analyzed.

Frequency of cesarean delivery was twice as high in women with FOC, which is also in line with earlier findings.[27] In a previous study from Finland, 45% of primiparous women with FOC had a cesarean delivery and the rate was similar (40%) in the present study.[5] Reassuringly, a history of single IA did not increase the risk for poor newborn outcome (preterm birth or low Apgar scores).[28]

5 | CONCLUSION

A history of IA was associated with increased odds for FOC in subsequent pregnancy in primiparous women. Other, even more prominent factors raising the odds for FOC were psychiatric morbidity, especially during the pregnancy, advanced maternal age, living in a city and smoking. Healthcare professionals treating pregnant

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women should be aware of these factors so as to be able to recognize and treat women with FOC with the best possible practices and offer them relevant support.

AUTHOR CONTRIBUTIONS

VK: conceptualization, methodology, formal analysis, writing—original draft. MM: conceptualization, methodology, writing—review & editing. TS: conceptualization, methodology, software, formal analysis, writing—review & editing. ST: conceptualization, methodology, writing & editing. MG: conceptualization, writing—review & editing. HR: writing—review & editing. OH: conceptualization, writing—review & editing, supervision, obtaining funding. NM: conceptualization, methodology, writing—review & editing, supervision.

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CONFLICT OF INTEREST STATEMENT

OH serves occasionally on advisory boards for Bayer, Gedeon Richter, and Roche, and has lectured at educational events for Bayer, Gedeon Richter, and Sandoz. The other authors have stated explicitly that they have no conflicts of interest in connection with this article.

ORCID

Venla Kemppainen https://orcid.org/0000-0003-2834-6487
Oskari Heikinheimo https://orcid.org/0000-0002-8671-130X
Maarit Niinimäki https://orcid.org/0000-0003-0927-0472

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