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Brief communication

Birth rate among women with fear of childbirth: a nationwide register-based cohort study in Finland

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ABSTRACT

Purpose: The association between fear of childbirth (FOC) and subsequent birth rate is not well studied. The aim of this study is to evaluate the birth rate, and risk for second pregnancy ending in delivery among women with FOC compared to women without FOC in their first pregnancy.
Methods: Data from the National Medical Birth Register were used to evaluate the birth rate after the first pregnancy in women with FOC. Cox regression model was used to evaluate the risk for the second pregnancy ending in delivery in women with FOC compared to reference individuals without FOC. The results were interpreted with adjusted hazard ratios (aHRs) and 95% confidence intervals (CI).
Results: In total, 375,619 women were included in this study. Of these, 9660 (2.6%) had FOC in the first pregnancy (exposed group), and 365,959 (97.4%) had no FOC (non-exposed group). In the exposed group, 3600 (37.3%) women had second pregnancy ending in delivery during the study period, and 206,347 (56.4%) had the second pregnancy ending in delivery in the non-exposed group. The risk for the second pregnancy ending in delivery was lower among women with FOC (aHR 0.61, CI 0.59–0.63).
Conclusions: FOC complicates pregnancy and delivery and is strongly associated with lower likelihood to get pregnant again. Therefore, more research should be focused on the optimal prevention of FOC using a standardized procedure of care and treatment for women with FOC.

Introduction

Fear of childbirth (FOC) is a common obstetrical challenge affecting women's health [1]. In Finland, the incidence of FOC in nulliparous women increased from 1.1% in 1997 to 3.6% in 2010 [2]. In a previous Swedish study, the prevalence of intense FOC was reported to be 15.8% and very intense FOC 5.7% [3]. Furthermore, a study in the Norwegian population reported that 12% of the study participants had FOC [4].

In addition to psychological challenges such as maternal depression [5], FOC has been found to have effect on maternal and neonatal health in numerous ways [6]. According to a case-control study in 2018, maternal FOC is connected to neonatal problems such as preterm childbirth and low birth weight [6]. In addition, FOC has been associated with maternal complications, such as longer birth duration, an increased likelihood of intervention including augmentation of labor, and emergency caesarean section (CS) [7–10] and an increased likelihood of elective CS [11]. According to previous study, FOC was associated with over 4 times higher risk for elective CS [12]. In Finland, FOC is found to be one of the main reasons for requesting elective CS [13]. Higher socioeconomic status, advanced maternal age, and depression have all been reported to be predictive factors for FOC. Other predictive factors for FOC include previous operative deliveries such as vacuum or emergency cesarean delivery [2,14].

Although birth rates have generally been studied well on a national level [15–17], there is a paucity of large studies assessing

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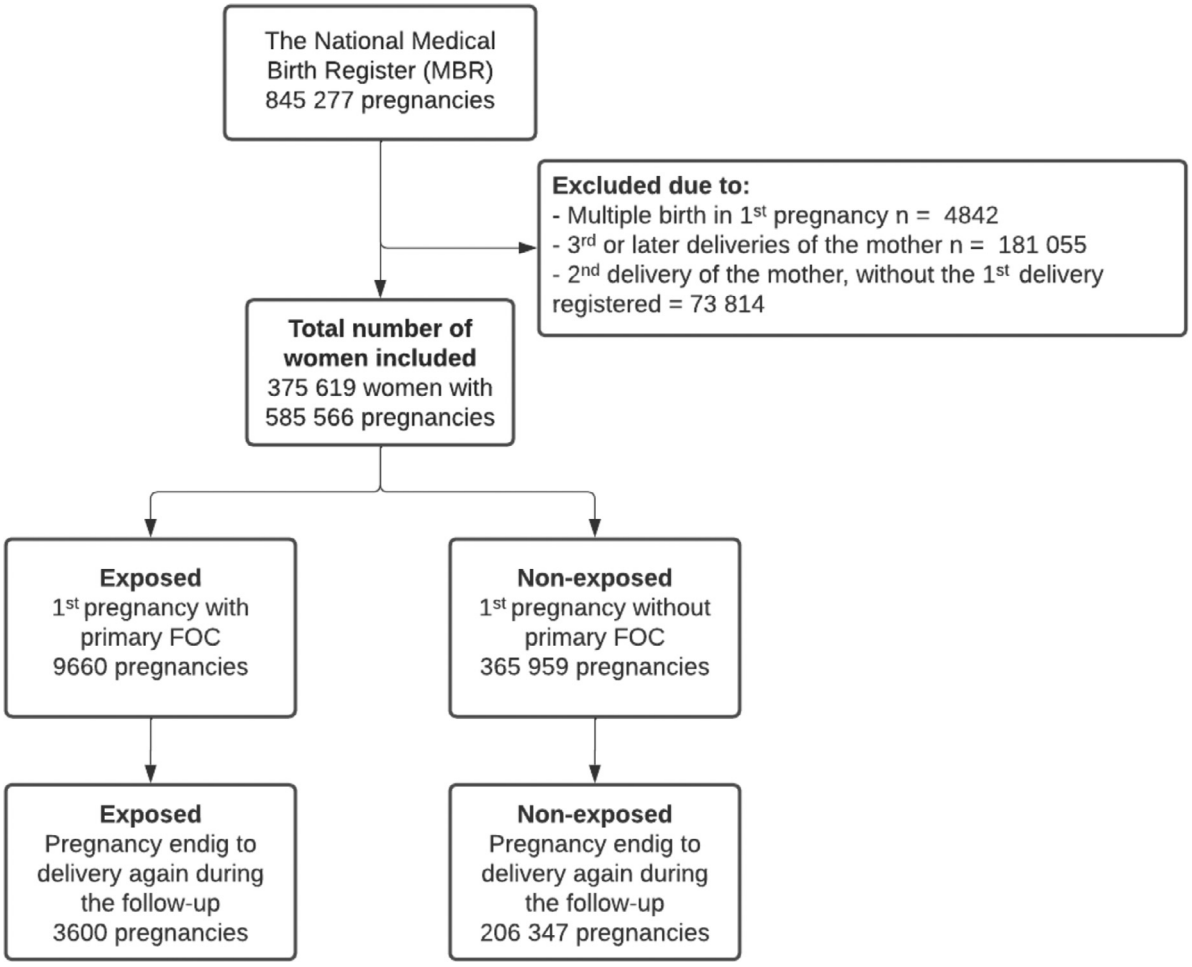

Fig. 1. Flowchart depicting the process used to divide the study population into groups.

the effects of psychological factors, such as FOC, on subsequent birth rate. The knowledge behind the effects of psychological factors on different aspects of health, such as birth rate is still lacking, and therefore, studies on this area are warranted. Previous studies have mainly focused on assessing the risk factors for FOC and the outcomes of pregnancies in women with FOC. However, based on our hypothesis, FOC might affect the likelihood of getting pregnant again. The aim of this study is to evaluate the birth rate, and risk for the second pregnancy ending in delivery among women with FOC compared to women without FOC in their first pregnancy.

Materials and methods

In this nationwide retrospective register-based cohort study, data from the National Medical Birth Register (MBR) were used to evaluate the birth rate and risk for the second pregnancy ending in delivery among women with FOC compared to women without FOC in their first pregnancy. A total of 375,619 women between years 15 and 49, who had their first (singleton) delivery between 2004 and 2016 were included.

The National Medical Birth Register

The MBR is maintained by the Finnish Institute for Health and Welfare (THL). The whole study period was from January 1, 2004, to December 31, 2018. The MBR contains data on pregnancies, delivery statistics, and the perinatal outcomes of all births with a birthweight of $\geq$ 500 grams or a gestational age of $\geq 22^{+0}$ weeks. The MBR has high coverage (nearly 100%) and quality [18, 19]. A total of 845,277 deliveries were found in the MBR during our study period. Exposure variables (FOC in first pregnancy), outcomes (the second pregnancy ending in delivery for the mother), and background variables used for describing cohorts or minimizing the effects of confounding variables (maternal age, smoking status, gestational diabetes, delivery mode, and delivery complications) were collected from the MBR.

Forming of the study cohorts

All first deliveries of women during the years 2004–2016 were included. However, multiple births (n = 4842) were excluded, as they may affect the woman's decision to get pregnant again. For these included women, all second pregnancies ending in delivery were retrieved from the MBR for the years 2004-2018 and combined with the data on the first deliveries. Since pregnancies ending in miscarriage or induced abortions are not available in our data, only pregnancies ending in delivery were included. Stillbirths were, however, also included, but the absolute numbers of these was truly low (<0.1% in exposed group, and 0.3% in non-exposed group). The third or later deliveries of the mother (n = 181,055), as well as the second pregnancies ending in delivery without the first delivery registered (n = 73,814) were excluded from the analysis due to requirements of our study design. The process used to form the study groups are presented as a flowchart in Figure 1.

Diagnosis of FOC

In Finland, all women are asked about any fears they may have about childbirth during visits to the women and child welfare clinics in primary care. Meaning that FOC is screened in these visits. Women who experience FOC during the visits to women and child welfare clinics and/or have requested cesarean section (CS) due to FOC are referred to a secondary / tertiary maternity clinic (in regional delivery hospitals), which contain fear outpatient clinics. In the fear outpatient clinics, FOC is diagnosed, if it is manifested, and dealt with during the visit by a physician or specialized midwife, and the diagnosis is then gathered to the MBR.

Outcomes

The formed groups were then used to evaluate the association between maternal FOC and the birth rate, or risk for second delivery after the first pregnancy. The main outcome for these women was the second pregnancy ending in delivery during years 2004–2018. The birth rate and risk for the second pregnancy ending in delivery between women with FOC in their first pregnancy and women who had no FOC in their first pregnancy was compared.

Statistics

Continuous variables were interpreted as means with standard deviations (SDs) or as a median with an interquartile range (IQR) based on the distribution of the data. The categorical variables are presented as absolute numbers and percentages with 95% confidence intervals (CIs). The CIs for rates were calculated using Poisson regression. The Cox regression model was used to evaluate the risk for the second pregnancy ending in delivery after the first birth in women with diagnosed FOC in relation to reference individuals without FOC in their first delivery. The results were interpreted with adjusted hazard ratios (aHRs) and 95% CIs. Proportional hazards assumption was tested using Schoenfeld residuals, and the supposition was true. The start of the follow-up was the date of giving birth in the first pregnancy. The first birth had to occur during the years 2004–2016, as the women who gave birth after this had no time to become pregnant again in our data. The endpoint of the follow-up was the start of the second pregnancy that ended up in delivery, the end date of our study period (31.12.2018), or the date when the mother turned 50 years, as our data included only women aged 15–49 years. The model was adjusted by maternal age, as this has an effect on the decision and physical ability to get pregnant again, gestational diabetes, as this might have effect on decision to get pregnant again, by the year of the pregnancy in the first pregnancy, because the birth rate has shown a decreasing trend during the last decades [16]. All variables used for adjusting the model are routinely collected in the MBR. In addition, Kaplan-Meier survival curves between the groups were created. The results of this study are reported according to the STROBE guidelines [20]. Statistical analyses were performed using R version 4.0.3 for Windows (R Foundation for Statistical Computing, Vienna, Austria).

Ethics

Both the National Medical Birth Register (MBR) and the Care Register for Healthcare had the same unique pseudonymized identification number for each patient. The pseudonymization was made by the Finnish data authority Findata, and the authors did not have access to the pseudonymization key, as it is maintained by Findata. In accordance with Finnish legislation, no informed written consent was required because of the retrospective register-based study design and because the patients were not contacted. Permission for the use of this data was granted by FINDATA after evaluation of the study protocol (Permission number: THL/1756/14.02.00/2020)

Results

A total of 375,619 women were included in this study. Of these, 9660 (2.6%, CI 2.5–2.6) women who had FOC in the first pregnancy formed the exposed group and 365,959 (97.4%, CI 97.1–97.7) who had no FOC formed the non-exposed group. A total of 3600 (37.3%, CI 36.1–38.5) women in the exposed group and 206,347 (56.4%, CI 56.1–56.6) women in the non-exposed group had the second pregnancy ending in delivery during our study period.

Women with FOC in the first pregnancy ending in delivery were older than those women without FOC in the first pregnancy ending in delivery (mean 30.0 years vs. 28.3 years). Moreover, a higher rate of women was diagnosed with gestational diabetes mellitus (GDM) in the exposed group (13.8%, CI 13.1–14.6 vs. 10.8%, CI 10.7–10.9) compared to the non-exposed group. Among women with FOC, a lower rate of spontaneous vaginal deliveries (34.3%, CI 33.1–35.5 vs. 67.4%, CI 67.1–67.7) and assisted vaginal deliveries (8.6%, CI 8.1–9.2 vs. 14.3%, CI 14.2–14.4) was observed when compared to the non-exposed group. In addition, a notably higher rate of elective CS was observed among women with FOC (41.0%, CI 39.7–42.3 vs. 4.9%, CI 4.9–5.0) compared to the non-exposed group (Table 1).

Women with FOC had a notably lower birth rate throughout the whole follow-up period than women without FOC. After the first pregnancy, the birth rate among women with FOC increased by 42%, which is markedly lower than the rate for those women without FOC (59%) (Fig. 2). Moreover, after 1-year follow-up, a notably lower rate of women with FOC gave birth again (6.9%, CI 6.4–7.4 vs. 12.1%, CI 12.0–12.2) compared to the non-exposed group, and the rate of new pregnancies ending in delivery remained notably lower throughout the whole follow-up period. The mean time between pregnancies ending in delivery was longer among women with FOC (mean 2.3 years vs. 2.1 years). Furthermore, the risk for women to have the second pregnancy ending in delivery after the first delivery was notably lower among women with FOC than among women without FOC in the first pregnancy (aHR 0.61, CI 0.59–0.63).

Discussion

The main finding of this study was that women with FOC have a notably lower birth rate, and lower risk for the second pregnancy ending in delivery, when compared to those without FOC in their first pregnancy. In addition, FOC prolongs the mean time before women deliver again, but the clinical importance of these finding remains unclear. To our knowledge, the association between maternal FOC and birth rate or subsequent risk for giving birth again has not previously been studied. Based on our data, the exact reasons behind the strongly decreased birth rate and risk remain unknown. An uncomfortable birth experience, a general lack of desire to get pregnant again due to existing FOC, or the postoperative challenges caused by CS, could be explanations for this finding. The results of this study further suggest that improving the prevention and treatment of FOC should be emphasized, as the prevalence of FOC has been found to be increasing rapidly in several countries [2,21].

The associated factors with FOC, such as residence, marital status, parity, gestational age, relationship with partner, pregnancy stress, and depressive symptoms are well studied [22]. Therefore, patients with high risk for FOC should be better recognized and treated. Currently, information about services for prevention and management of FOC among pregnant women is lacking [23]. The latest study about the prevention of FOC in 2021 concluded that

Table 1
Background information on the study groups

	Exposed group		Non-exposed group	
Total number of patients	9660		365,959	
	n	% (CI)	n	% (CI)
Age (first pregnancy) (mean; sd)	30.0 (5.8)		28.3 (5.3)	
Smoking status smoker	1927	20.0 (19.1–20.9)	64,879	17.7 (17.6–17.9)
Gestational diabetes in first pregnancy	1335	13.8 (13.1–14.6)	39,551	10.8 (10.7–10.9)
Delivery mode in first pregnancy				
spontaneous vaginal	3310	34.3 (33.1–35.5)	246 599	67.4 (67.1–67.7)
assisted vaginal	834	8.6 (8.1–9.2)	52,412	14.3 (14.2–14.4)
urgent CS	1473	15.3 (14.5–16.1)	43,478	11.9 (11.8–12.0)
emergency CS	82	0.8 (0.7–1.1)	5387	1.5 (1.4–1.5)
elective CS	3961	41.0 (39.7–42.3)	18,060	4.9 (4.9–5.0)
Obstetric challenge in first pregnancy				
uterine curettage	33	0.3 (0.2–0.5)	3279	0.9 (0.9–0.9)
manual placenta removal	80	0.8 (0.7–1.0)	6079	1.7 (1.6–1.7)
3rd– or 4th-degree perineal tear	81	0.8 (0.7–1.0)	4793	1.3 (1.3–1.3)
Available follow-up time (years) (mean; sd)	7.9 (3.9)		9.2 (3.8)	
Time-difference between pregnancies (years) (mean; sd)	2.3 (1.7)		2.1 (1.6)	
Second pregnancy ending in delivery during the study period				
Total	3600	37.3 (36.1–38.5)	206,347	56.4 (56.1–56.6)
after 1 year	663	6.9 (6.4–7.4)	44,387	12.1 (12.0–12.2)
after 3 years	2766	28.6 (27.6–29.7)	166,045	45.4 (45.2–45.6)
after 5 years	3338	35.6 (33.4–35.8)	193,310	52.8 (52.6–53.1)
after 7 years	3517	36.4 (35.2–37.6)	201,971	55.2 (55.0–55.4)
after 10 years	3589	37.2 (36.0–38.4)	205,662	56.2 (56.0–56.4)

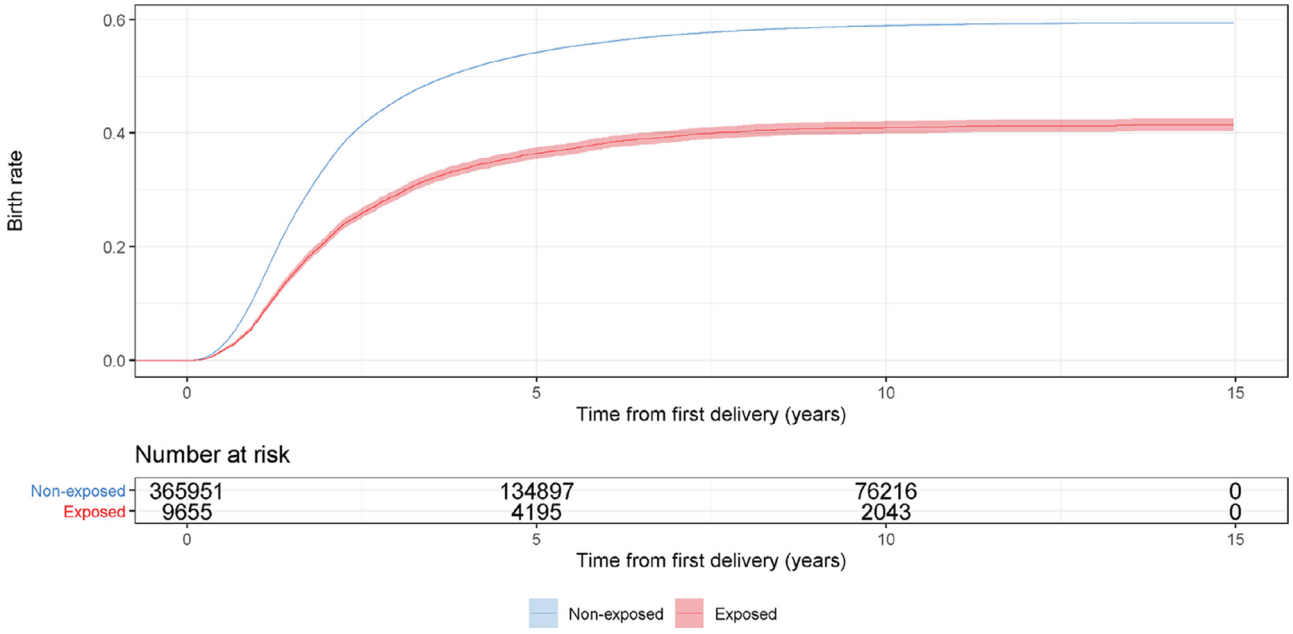

Fig. 2. Kaplan–Meier survival curve (with 95% confidence intervals) for the event of delivering again after the first pregnancy. Women with FOC (exposed group) in the first pregnancy were compared to women without FOC (non-exposed group) in the first pregnancy.

individualized psychological counseling and information-seeking guidance should be provided appropriately and differently for multiparous and nulliparous women [24]. There have been few studies in western countries indicating that the majority of obstetric clinics did not offer special services for FOC, and that the actions to the procedure of care and treatment for women with FOC should be standardized [25,26]. Further research should concentrate on the optimal prevention of FOC using a standardized procedure of care and treatment for women with FOC.

One possible explanation for the lower birth rate among women with FOC might be the notably higher rate of CS, especially elective CS. The reason for this is that women who undergo CS in Finland are recommended to spend 6 to 12 months recovering before becoming pregnant again to allow the uterus time to heal from the surgical operation. According to a study by Eijsink et al. [27], the median interval between the birth of the first child and the beginning of the next pregnancy was 20 months for the CS group and 18 months for the reference group, consisting of vaginal deliveries. In the present study, however, no evidence of a difference between interpregnancy interval was found [27]. This is an important finding, as nearly half of the patients in FOC group gave birth by elective CS. In our study, the birth rate remained lower throughout the whole study period, meaning that this has most likely affected our results during the first year of follow-up. Moreover, in many studies, CS has been associated with subsequent infertility, but the evidence for this has remained contradictory [28].

The strengths of our study are the large nationwide register data used and the long study period, which allowed us to analyze

the rates of FOC using a large study population. The register data used in our study are routinely collected in structured forms using national instructions, which ensures good coverage (over 99%) and reduces possible reporting and selection biases.

The main limitation of this study is that the severity of FOC, and gestational age for FOC assessment is unknown. As there is no uniform criteria or definitions for FOC, the forms, severity, and symptoms can vary between individuals. Indeed, FOC takes different forms in different women and may manifest as physical complaints, nightmares, and difficulties to concentrate [13]. However, the most severe cases of FOC are most likely diagnosed with FOC and registered in the MBR, and as the size of non-exposed group is large, the possible bias of undiagnosed FOC patients should not have major impact on results. Also, possible unidentified cases of FOC in the non-exposed group would most likely lead to results that are biased toward null. A further limitation was that information on the medical conditions before or during pregnancy or long-term illnesses (such as gestational or chronic hypertension, which increases the risk for adverse perinatal outcomes) that might be associated with both FOC and interpregnancy interval was not available in the data. However, according to literature the prevalence rate of such diseases is found to be relatively low [29], which indicates that these have most likely no major effect on the results. Is it good to note though, that women with diagnosed FOC might have higher prevalence of such diseases, which could be a good topic for future studies. In addition, the information on women with induced abortions or miscarriages are unavailable in our data, but in a study between two groups with similar prevalence in terms of these variables, the authors believe that these have no major impact on the results. According to previous literature in Finland, the incidence of miscarriages has been around 5–7 per 1000 pregnancies during last decades [30], but the effects of FOC on the risk for miscarriage is not studied, meaning that there is most likely some miscarriages in both cohorts, but the ratio of these remains unknown. The same most likely applies with induced abortions, as there is no evidence about FOC increasing the rate for abortions in the previous literature. Furthermore, data on the possible date of death and migration were also not available, making it impossible to identify those women who were lost to follow-up.

Conclusions

Women with FOC have a notably lower birth rate and risk for the second pregnancy ending in delivery when compared to those women without FOC in their first pregnancy. FOC should not only be considered as a complicating factor for pregnancy and delivery, but also a factor that strongly affects the desire of women to get pregnant again. Therefore, future research should be focused more on the optimal prevention of FOC using a standardized procedure of care and treatment for women with FOC.

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