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ORIGINAL ARTICLE

Caesarean birth by maternal request: a poorly understood phenomenon in low- and middle-income countries

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Background: While trends in caesarean birth by maternal request in low- and middle-income countries are unclear, age, education, multiple gestation and hypertensive disease appear associated with the indication when compared with caesarean birth performed for medical indications.

Methods: We performed a secondary analysis of a prospectively collected population-based study of home and facility births using descriptive statistics, bivariate comparisons and multilevel mixed-effects logistic regression.

Results: Of 28 751 patients who underwent caesarean birth and had a documented primary indication for the surgery, 655 (2%) were attributed to caesarean birth by maternal request. The remaining 98% were attributed to maternal and foetal indications and prior caesarean birth. In a multilevel mixed effects logistic regression adjusted for site and cluster of birth, when compared with caesareans performed for medical indications, caesarean birth performed for maternal request had a higher odds of being performed among women ≥35 y of age, with a university or higher level of education, with multiple gestations and with pregnancies complicated by hypertension ($P < 0.01$). Caesarean birth by maternal request was associated with a two-times increased odds of breastfeeding within 1 h of delivery, but no adverse outcomes (when compared with women who underwent caesarean birth for medical indications; $P < 0.01$).

Conclusion: Caesarean performed by maternal request is more common in older and more educated women and those with multifoetal gestation or hypertensive disease. It is also associated with higher rates of breastfeeding within 1 h of delivery.

Keywords: caesarean birth, low- and middle-income countries, trends, risk factors, maternal request.

Introduction

Caesarean birth rates within the Global Network for Women's and Children's Health Research (Global Network) have been increasing, paralleling the global trend.[1,2] One potential driver of rising rates is caesarean birth by maternal request (CBMR), which is when pregnant women choose an elective caesarean birth with no other medical indication.[3,4] Caesarean birth performed without a medical indication is advised against by the World Health Organization.[3,5] There are limited studies on the phenomenon and organizations in high-income countries, such as the American College of Obstetricians and Gynecologists, have cited insufficient evidence in the inability to make a recommendation for or against the practice, but they have provided guidelines on criteria for using the procedure.[6] A recent meta-analysis on reasons women choose CBMR concluded that interventions should be designed to reduce this practice and promote vaginal birth.[7]

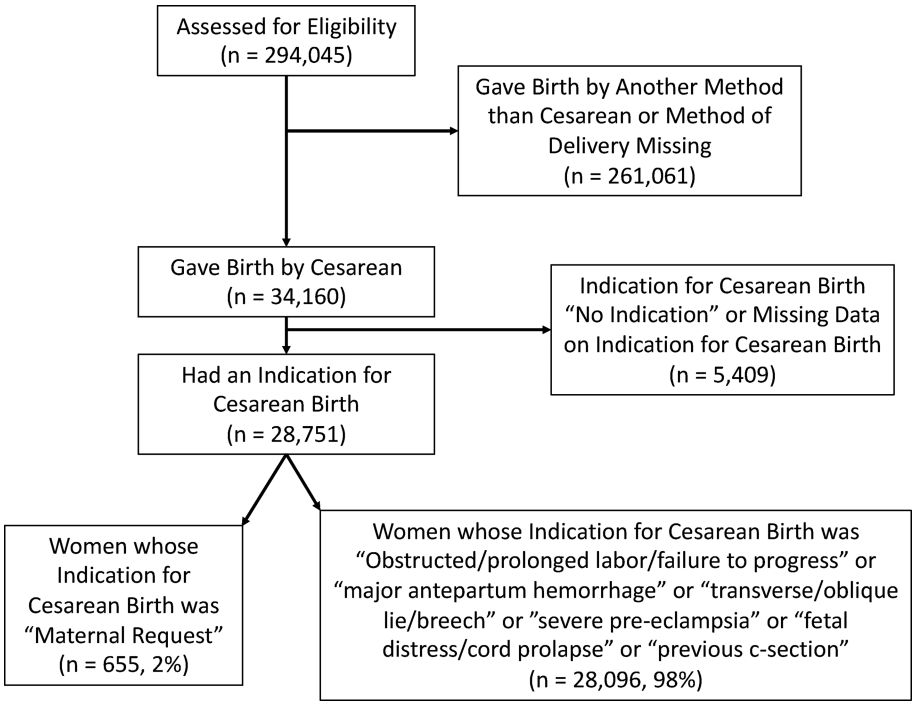

Figure 1. Consort diagram of women included in the analysis.

The Global Network prospectively collects population-based data on home and facility births in six low- and middle-income countries (LMICs) that span Latin America, sub-Saharan Africa and Southeast Asia in an ongoing registry.[8] Data from this Maternal and Child Health Registry (MNHR) within the network was previously analysed to show that over a relatively short period of time (2010–2016), caesarean birth rates doubled at all non-sub-Saharan African sites, almost reaching 30% in one Indian site.[2] Given these trends, we wanted to analyse the rates of caesarean birth by maternal request (CBMR) within the Global Network to observe changes in those rates over time and to observe factors and pregnancy outcomes associated with CBMR.

To conduct this secondary analysis, we aimed to compare antepartum, intrapartum and post-partum factors and outcomes associated with CBMR as compared with the population of women who underwent caesarean birth for a clearly documented indication. Our primary outcome was factors associated with CBMR and our secondary outcome was the association of CBMR with pregnancy outcomes. Our hypothesis was that CBMR has increased within the Global Network over time. Compared with women who underwent caesarean birth for a medical indication, we hypothesized that immediate neonatal outcomes might be better for women who underwent CBMR than in the comparison group based on prior research.[9]

Methods

This was a secondary analysis of the prospectively collected MNHR data from the Global Network between January 2010 and December 2013. The methodology of the MNHR has been published previously.[8] In brief, the MNHR includes pregnancy-related data and outcomes from rural or semi-urban geographical areas. Each site includes between 6 and 24 distinct communities.[8] Each community generally represents the catchment area of a primary healthcare centre and about 300–500 births take place annually in each community.[8] They are located at seven sites in six LMICs (Argentina, Guatemala, Nagpur and Belagavi [India], Kenya, Pakistan and Zambia).[8] The objective of the MNHR is to enrol pregnant women as early as possible during the pregnancy and to obtain data on pregnancy outcomes for all deliveries of registered women, regardless of birth location (i.e. home, health clinic or hospital).[8] Data were obtained through the Data and Specimen Hub (DASH) supported by the Eunice Kennedy Shriver National Institute of Child Health and Human Development through a data use agreement with the University of Colorado.

The primary outcome of this analysis was CBMR, including trends over time, risk factors associated with the indication and outcomes of the indication, all compared with the population of women who underwent caesarean birth for medical indications. Women were categorized as having one of two indications: CBMR or medical indications. Medical indications comprised all other indications for caesarean birth offered on the MNHR form, including 'obstructed/prolonged labour/failure to progress', 'major antepartum haemorrhage', 'transverse/oblique lie/breech', 'severe pre-eclampsia', 'foetal distress/cord prolapse' or 'previous C-section'. Women with 'no indication' or the indication 'other' or who were missing data on the primary indication for caesarean birth were excluded from the analysis.

Table 1. Indications for caesarean birth among those women who underwent caesarean birth at Global Network sites, 2010–2013

Indication for caesarean birth	n (%) (N = 34 160)
Obstructed/prolonged labour/failure to progress	14 366 (42)
Previous C-section	6573 (19)
Transverse/oblique lie/breech	3679 (11)
No clear indication/other	3250 (10)
Severe pre-eclampsia	1473 (4)
Foetal distress/cord prolapse	1408 (4)
Major antepartum haemorrhage	597 (2)
Maternal request	655 (2)
Missing	2159 (6)

Comparisons were made between CBMR and women with a medical indication for caesarean birth in bivariate and multivariable comparisons adjusted for site and cluster of birth. A *P*-value <0.01 was used to determine statistical significance given the large sample size and multiple comparisons. Variables significant in the bivariate analysis to $P < 0.05$ were included in the multivariable model. Stata version 15.2 (StataCorp, College Station, TX, USA) was used for the analysis.

The study protocol was reviewed and approved by the institutional review boards/ethics research committees of the participating institutions approved by the MNHR study initially. Individual informed consent for study participation was requested and obtained from each study participant. A data monitoring committee, appointed by the National Institute of Child Health and Human Development, oversees and reviews the study semi-annually.[7] This de-identified data analysis was reviewed and approved by the Colorado Multiple Institutional Review Board (19-0613).

Results

Figure 1 illustrates the population included in this analysis. Of 294 045 births that occurred in the registry between 2010 and 2013, 34 160 were by caesarean, 28 751 of which included the data necessary to classify them by primary indication for caesarean birth. A total of 655 women (2.3% of the study population) underwent CBMR. The remaining 98% of women (28 096) had a documented primary indication for caesarean birth, shown in Table 1. Obstructed/prolonged labour/failure to progress accounted for the largest proportion of caesarean births with a medical indication (42%), followed by a history of a previous caesarean (19%) and malpresenting foetuses (11%). Haemorrhage, pre-eclampsia and foetal indication were all less prevalent (10% combined).

Figure 2 shows CBMR rates over time within the Global Network; Argentina had a doubling in CBMR rates over the study timeframe. The trend in Guatemala and Southeast Asian sites (India and Pakistan) is unclear, as we did not test the trend, although they appear to be stable or even decreasing at those sites. The sub-Saharan African sites did not have any caesareans attributed to the indication of CBMR in either Zambia or Kenya.

Table 2 shows bivariate comparisons of women who underwent CBMR compared with women who underwent caesarean birth for a medical indication. These comparisons were made using a multilevel mixed effects logistic regression adjusting for site and cluster. The comparisons showed that women ≥35 y of age, those with a university or higher level of education, those with a multiple gestation and those with hypertension were more commonly delivered by CBMR ($P < 0.05$).

Table 3 shows the unadjusted and adjusted results of a multilevel mixed effects regression with the unadjusted model accounting for only site and cluster of delivery and the adjusted model accounting for site, cluster, maternal age and education, number of foetuses and hypertensive disorders of pregnancy. These models reaffirm the results of the univariate comparisons with age >35 y, a university or higher level of education,

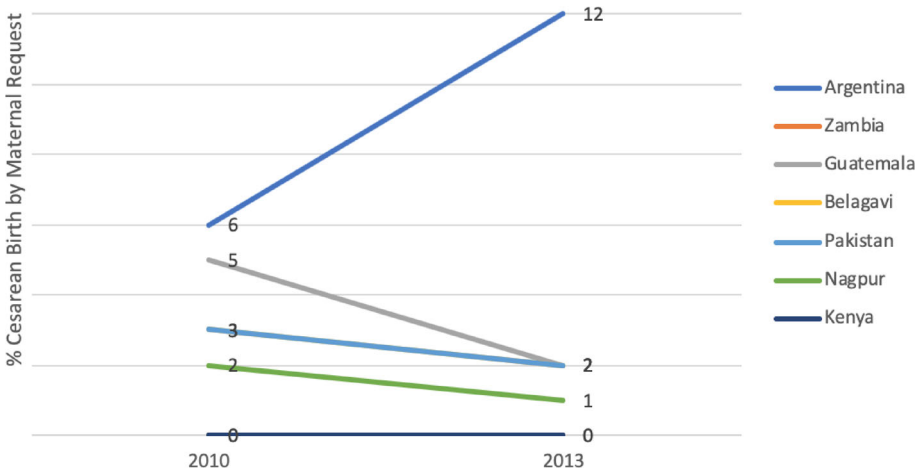

Figure 2. Rates in caesarean delivery by maternal request within the Global Network sites, 2010–2013.
*Note: Zambia not visible behind Kenya line (both went from 0% in 2010 to 0% in 2013) and Belagavi not visible behind Pakistan line (both went from 3% in 2010 to 2% in 2013).

Table 2. Univariate comparison of characteristics of women who underwent caesarean birth for a maternal indication compared with those who underwent CBMR at Global Network sites, 2010–2013

Variables	Medical indication[a,b] (N = 28 096)	CMBR (N = 655)	*P*-value LR/site/cluster[c]
Maternal age (years), n (%)			<0.001
<20	2566 (9)	56 (9)	
20–35	24 569 (88)	532 (81)	
>35	913 (3)	67 (10)	
	n = 27 973	n = 651	
Maternal education, n (%)			0.005
No formal schooling	4192 (15)	91 (14)	
Primary school	8089 (29)	217 (33)	
Secondary school	11,306 (40)	234 (36)	
University or higher	4386 (16)	109 (17)	
	n = 27 986	n = 649	
Parity, n (%)			0.3
0	13 204 (47)	321 (50)	
1–2	11 674 (42)	176 (27)	
≥3	3108 (11)	152 (23)	
	n = 28 096	n = 655	
BMI, n (%)			0.3
Underweight	4763 (17)	79 (12)	
Normal	14 232 (51)	271 (41)	
Overweight	4007 (14)	114 (18)	
Obese	5094 (18)	191 (29)	
	n = 28 080	n = 655	
Singleton gestation, n (%)			0.01
Yes	27 251 (97)	630 (96)	
No	829 (3)	25 (4)	
	n = 28 017	n = 653	
Hypertension, n (%)			<0.001
Yes	2413 (9)	27 (4)	
No	25 604 (91)	626 (96)	

[a]Women with 'no indication' for caesarean birth not included in the analysis.
[b]Medical indication includes the first six indications in Table 1.
[c]Multilevel mixed effects regression adjusting for site and cluster.
LR, logistic regression.

multifoetal gestation and hypertension all increasing the risk of CBMR about twofold ($P < 0.01$).

Table 4 illustrates the distribution of outcomes by the key exposure: indication for caesarean birth. In bivariate multilevel mixed effects comparisons adjusted for site and cluster of women who underwent CBMR compared with those who underwent caesarean birth for a medical indication, the only outcome that was more prevalent among women who had CBMR was breastfeeding initiation rates within the first hour of delivery ($P < 0.001$). When this result was tested in multivariate models, the odds of breastfeeding within 1 h among women undergoing CBMR were increased twofold in both unadjusted (site and cluster) and adjusted (for age, education, multifoetal gestation, hypertension, site and cluster) models (unadjusted and adjusted odds ratio 2.0 [95% confidence interval 1.6 to 2.5], $P < 0.001$) (Table 5).

Discussion

While caesarean birth rates within the Global Network for Women's and Children's Health Research have been found to be increasing, trends in rates of CBMR are less clear.[2] The only site with a rising rate of CBMR over the study timeframe was Argentina (it increased from 6 to 12%). The Guatemalan and Southeast Asian sites had an unclear trend, and no CBMR existed at all in Zambia and Kenya. Our analysis found that older and more educated women, as well as those with multifoetal gestation and hypertension were more likely to undergo CBMR than women who underwent caesarean birth for a medical indication. We also found that in the context of CBMR, breastfeeding initiation rates were higher than those among women who had a caesarean birth for a medical indication.

One interesting finding of our analysis is the increasing trend of CBMR in Argentina. Argentina was actually not renewed within

Table 3. Multivariate analysis of characteristics associated with CBMR within Global Network sites, 2010–2013

Odds of CBMR[a]	UOR	LLCI	ULCI	*P*-value[b]	AOR	LLCI	ULCI	*P*-value[b]
Maternal age (years)								
<20	0.7	0.5	0.9	0.02	0.8	0.6	1.0	0.06
20–35	1	1.8	3.2	<0.001	1 (ref)	1.9	3.4	<0.001
>35	2.4				**2.5**			
Maternal education								
No formal schooling	1.1	0.9	1.5	0.4	1.1	0.8	1.4	0.7
Primary school	0.9	0.8	1.1	0.4	0.9	0.7	1.1	0.3
Secondary school	1 (ref)	1.4	2.2	<0.001	1 (ref)	1.3	2.2	<0.001
University or higher	1.7				**1.7**			
Multifoetal gestation	1.8	1.2	2.7	0.007	**1.8**	1.2	2.8	0.005
Hypertension	2.3	1.6	3.5	<0.001	**2.4**	1.6	3.5	<0.001

[a]Women with 'no indication' for caesarean birth not included in analysis.
[b]Multilevel mixed effects regression adjusting for site and cluster.
UOR, unadjusted odds ratio; LLCI, lower limit confidence interval; ULCI, upper limit confidence interval; AOR, adjusted odds ratio.

the Global Network after 2013 because of its increased human development index. This raises the hypothesis that as countries advance in their development, CBMR may become more prevalent, which deserves further exploration and has been suggested by other analyses.[10] Accordingly, we intend to closely watch the trend in the Guatemala site, as caesarean birth rates at study sites are around 57%. We added indication for caesarean birth back into the registry as of 2020. Also of note was the fact that the sub-Saharan African sites had zero caesarean births attributed to CBMR. A possible explanation for this is that coders did not understand the indication, but more likely, given the fact that the caesarean birth rates at these sites were <2% over the study timeframe, CBMR may not have existed because overall proper access to and utilization of caesarean birth did not exist in these settings. This also supports the hypothesis that regions with low human development have low rates of CBMR and as wealth and development increases, so does CBMR.

Other studies have found that older women and those with more education are more likely to undergo caesarean birth.[11] While age and education level may not be a modifiable risk factors, providers or facilities who wish to reduce their CBMR rate can change by discussing the risks and benefits of vaginal birth for a multifoetal gestation. Prior research on vaginal birth in the setting of multifoetal gestation has found vaginal birth may be a safe delivery option for properly selected women.[12] Increasing patient and provider education regarding the likelihood of good pregnancy outcomes for twin gestation delivered vaginally might be a point of intervention for quality improvement. Similarly, hypertension in itself should not be an indication for caesarean birth, and certainly women requesting CBMR for hypertensive disease should be counselled on the evidence.[13,14] More rigorous hypertensive management in the prenatal and antepartum setting might reduce CBMR for this indication if it gives women more time to undergo induction and to understand their condition more fully.

Regarding outcomes after CBMR as compared with those resulting from a caesarean birth for a medical indication, we found that breastfeeding within 1 h of delivery was more common after CBMR than after caesarean for a medical indication. Prior research is consistent with this finding.[15] A possible explanation for this is that CBMR is an elective procedure, not performed in an emergent setting. As such, after CBMR mothers and babies are likely to have a more stable environment in which to initiate breastfeeding. While emergent caesarean births may require stabilization of the mother and baby prior to breastfeeding attempts, the fact that it is happening more successfully after CBMR suggests that whenever possible, breastfeeding immediately post-partum should be encouraged, even in more acute environments, which is also supported by the literature.[16]

This study is limited by the fact that the data are almost a decade old and that many variables were unable to be included in the analysis due to missing data. For example, regarding antepartum care, we hypothesized that antenatal care visits, history of a prior live birth and anaemic status might have been associated with CBMR. Similarly, regarding outcomes, we were unable to include the 7-d neonatal mortality rate, post-partum haemorrhage, use of oxytocics, administration of blood products and performance of a post-procedure dilation and curettage due to missing data. Additionally, data on maternal death were not included in the dataset from DASH and were unable to be obtained despite follow-up requests. The strengths of the analysis include the large (initial) sample size and the representativeness of the data from multiple LMICs in various world regions.

In conclusion, data from 2010 to 2013 in the Global Network's MNHR does not provide definitive proof of any trend in CBMR in LMICs. However, based on this analysis, entities wishing to reduce CBMR rates might observe rates in their institutions among women with multiple gestations and those with hypertensive disease. Breastfeeding was found to be more common in women following CBMR than in those who underwent caesarean birth for another primary indication. More evidence on the rates, trends

Table 4. Univariate comparison of outcomes of women who underwent caesarean birth for a maternal indication compared with those who underwent CBMR at Global Network sites, 2010–2013

Variables	Medical indication[a,b] (N = 28 096)	CMBR (N = 655)	*P*-value[c] LR/site/cluster
Gestational age, n (%)			0.2
Preterm	7626 (27)	219 (33)	
Term	20 470 (73)	436 (67)	
	n = 28 094	n = 655	
Live birth, n (%)			0.6
Yes	27 655 (98)	648 (99)	
No	439 (2)	7 (1)	
	n = 27 870	n = 652	
Post-partum haemorrhage, n (%)			0.3
Yes	403 (1)	11 (2)	
No	27 467 (99)	641 (98)	
	n = 26 942	n = 610	
Maternal blood transfusion, n (%)			0.1
Yes	2311 (9)	33 (5)	
No	24 631 (91)	577 (95)	
	n = 27 523	n = 649	
Baby received bag-mask resuscitation, n (%)			0.1
Yes	2007 (7)	35 (5)	
No	25 516 (93)	614 (95)	
	n = 27 357	n = 641	
Baby breastfed within 1 h, n (%)			<0.001
Yes	12 025 (44)	3433 (68)	
No	15 332 (56)	208 (32)	

[a]Women with 'no indication' for caesarean birth not included in analysis.
[b]Medical indication includes the first six indications in Table 1.
[c]Multilevel mixed effects regression adjusting for site and cluster.
LR, logistic regression.

Table 5. Multivariate analysis of associated of CBMR with breastfeeding within 1 h of delivery in Global Network sites, 2010–2013

Odds of outcome after CBMR[a]	UOR	LLCI	ULCI	*P*-value[b]	AOR	LLCI	ULCI	*P*-value[b]
Breastfeeding within 1 hour	2.0	1.6	2.5	<0.001	**2.0**	1.6	2.5	<0.001

[a]Women with 'no indication' for caesarean birth not included in analysis.
[b]Multilevel mixed effects regression adjusting for age, education, number of gestations, hypertensive disease, site and cluster.
UOR, unadjusted odds ratio; LLCI, lower limit confidence interval; ULCI, upper limit confidence interval; AOR, adjusted odds ratio; LR, logistic regression.

and outcomes of CBMR in LMICs are needed, especially if along with increasing national development comes increasing CBMR rates in these settings.

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References

1 Betran AP, Ye J, Moller AB, et al. The increasing trend in caesarean section rates: global, regional and national estimates: 1990–2014. PLoS One. 2016;11(2):e0148343.

2 Harrison MS, Pasha O, Saleem S, et al. A prospective study of maternal, fetal and neonatal outcomes in the setting of cesarean section in low- and middle-income countries. Acta Obstet Gynecol Scand. 2017;96(4):410–20.

3 Betran AP, Temmerman M, Kingdon C, et al. Interventions to reduce unnecessary caesarean sections in healthy women and babies. Lancet. 2018;392(10155):1358–68.

4 Mylonas I, Friese K. Indications for and risks of elective cesarean section. Dtsch Arztebl Int. 2015;112(29–30):489–95.

5 Betran AP, Torloni MR, Zhang JJ, et al. WHO statement on caesarean section rates. BJOG. 2016;123(5):667–70.

6 ACOG Committee opinion no. 761: cesarean delivery on maternal request. Obstet Gynecol. 2019;133(1):e73–7.

7 Jenabi E, Khazaei S, Bashirian S, et al. Reasons for elective cesarean section on maternal request: a systematic review. J Matern Fetal Neonatal Med. 2019:1–6. doi: 10.1080/14767058.2019.1587407.

8 Bose CL, Bauserman M, Goldenberg RL, et al. The Global Network Maternal Newborn Health Registry: a multi-national, community-based registry of pregnancy outcomes. Reprod Health. 2015;12(Suppl 2):S1.

9 Liu X, Landon MB, Cheng W, et al. Cesarean delivery on maternal request in China: what are the risks and benefits? Am J Obstet Gynecol. 2015;212(6):817.e1–9.

10 Guilmoto CZ, Dumont A. Trends, regional variations, and socioeconomic disparities in cesarean births in India, 2010–2016. JAMA Netw Open. 2019;2(3):e190526.

11 Boatin AA, Schlotheuber A, Betran AP, et al. Within country inequalities in caesarean section rates: observational study of 72 low and middle income countries. BMJ. 2018;360:k55.

12 Barrett JFR, Hannah ME, Hutton EK, et al. A randomized trial of planned cesarean or vaginal delivery for twin pregnancy. N Engl J Med. 2013;369(14):1295–305.

13 ACOG practice bulletin no. 202: gestational hypertension and preeclampsia. Obstet Gynecol. 2019;133(1):e1–25.

14 Abalos E, Cuesta C, Carroli G, et al. Pre-eclampsia, eclampsia and adverse maternal and perinatal outcomes: a secondary analysis of the World Health Organization Multicountry Survey on Maternal and Newborn Health. BJOG. 2014;121(Suppl 1):14–24.

15 İsik Y, Dag ZO, Tulmac OB, et al. Early postpartum lactation effects of cesarean and vaginal birth. Ginekol Pol. 2016;87(6):426–30.

16 Chen C, Yan Y, Gao X, et al. Influences of cesarean delivery on breastfeeding practices and duration: a prospective cohort study. J Hum Lact. 2018;34(3):526–34.