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Original Research Article

Spatial prevalence and its contextual determinants of early initiation of breastfeeding in cases of C-section deliveries in India: a study based on National Family Health Survey-4, 2015-2016

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ABSTRACT

Background: Delayed early initiation of breastfeeding (EIBF) between 2 to 23 hours has increased 1.3 times risk of neonatal and it goes up double when it crosses more than 24 hours. Babies who were born through caesarean section (C-section) were less likely to initiate early breastfeeding as compared to normal vaginal delivery.
Methods: The present study has utilized 14774 weighted samples of C-section delivered women from National Family Health Survey-4 (NFHS-4) (2015-2016). Spatial analysis software i.e. ArcGIS 10.8 and STATA 14 including logistics regression has been utilized to show the spatial prevalence and contextual determinants of EIBF on C-section birth babies in India.
Results: In India, around 31.8% of C-section mothers breastfeed their children within one hour of delivery. The prevalence of EIBF is highest in Goa and lowest in Rajasthan. The central part of India mostly from the empowered action group (EAG) states practices a very low level of EIBF practices whereas, the north-east region represents the highest prevalence for the same. The odds of logistic regression shows that mother's higher education (OR: 1.38), everyday mass media exposure (OR: 1.66), and initiation of postnatal care (PNC) within one hour (OR: 1.79) help to increase the practices of EIBF. On the other hand, delivery in the private hospital (OR: 0.61).
Conclusions: The study shows remarkable geographical variations in EIBF and its correlates in the country. It recommends that the public health programmes need to target the states with less practice of EIBF (i.e. EAG state or central part of India) F among C-section delivery mothers. By increasing the level of mothers' education status, mass media exposure and early PNC care can improve the EIBF practices among C-section mothers in India.

Keywords: Early initiation of breastfeeding, Caesarean section, Spatial prevalence, Empowered action group

INTRODUCTION

The World Health Organization (WHO) has defined early initiation of breastfeeding (EIBF) as the initiation of breastfeeding within 1 hour after delivery.[1] WHO baby-friendly initiative (BFI) states that keeping mother and baby together for at least the first hour after birth leads to improved initiation and duration of breastfeeding.[2,3,6] As per United Nations International Children's Emergency Fund (UNICEF) (2017) estimation around 5.6 million children died before reaching their fifth birthday and out of these 2.6 million (46%) died in the first 30 days of life.[4] Around 75% of maternal death occurred due to pregnancy complications, mostly in the developing countries, which can be averted by a surgical intervention called cesarean section (C-section).[5] The international healthcare community estimated the "ideal rate" for C-section delivery to be between 10% to 15% in 1985 and the trend has been increasing in developed and developing countries.[6] Babies who were born through C-section were

less likely to initiate early breastfeeding as compared to normal vaginal delivery.[7,8] If initiation of breastfeeding is delayed between 2 to 23 hour the risk of neonatal death increases 1.3 times and it goes up double when it crosses more than 24 hour.[9,10] Early initiation of breastfeeding reduces the risk of neonatal mortality.[11] Breastfeeding just within the first hour after delivery has been cited as an important predictor of continued breastfeeding.[12,13] Moreover, it also reduces the risk of diarrhoea and respiratory infections among newborn.[11,14] A study based on National Family Health Survey-3 (NFHS-3) (2005-2006) shows that initiation of breastfeeding is beneficial for child survival within the first 28 days of birth, including all causes of mortality.[10] Early initiation of breastfeeding confers lifelong benefits to children such as fewer childhood illnesses, lower blood pressure/hypertension and cholesterol levels, lower prevalence of obesity, and improved intelligence as adults.[15,16] Delays in breastfeeding initiation accompanying C-section delivery are associated with maternal/infant separation, reduced suckling ability, decreased infant receptivity, and insufficient milk supply, which are predictive of shortened breastfeeding duration.[17,18] C-sections are associated with poor maternal and infant health outcomes, such as higher incidences of maternal infection and uterine hemorrhage, and infant respiratory distress and hypoglycemia.[18-20] Some studies have shown that women who deliver by C-section delivery are less likely to breastfeed, or delay takes place in breastfeeding initiation.[7,17]

The rate of C- section is higher in India and then the normal delivery while on the other hand EIBF reduces the risk of neonatal death.[10,15,16,18,19] C-section is less likely to have skin-to-skin contact immediately after birth and more likely not to have attempted breastfeeding within the first 24 hours post-delivery.[20] C-sections are associated with more breastfeeding difficulties, greater use of resources, and shorter breastfeeding duration compared to vaginal deliveries.[21]

The present literature shows some studies have observed the health outcomes and socioeconomic consequences for C-section delivery while others have also focused on determinants of breastfeeding.[5,22-24]

The prevalence of EIBF in India is 42%.[25] 63% of countries across the globe have cesarean rate more than 20%.[6] The ideal rate for C-sections is to be between 10-15% but in 2015-16 India C-section rate was 17.2% which was higher than the ideal rate.[6] Between 1992-93 to 1998-1999 C-section rate had increased from 2.9 percent to 7.1 percent and it further raised to 8.5 percent in 2005-06 and a steady rise to 17.2 percent in 2015-16. It means almost in 10 years the C-section rate has doubled up in India.

In India, there is a need to provide region-specific studies and the interventions that target mothers in their local communities, as well as the involvement of family members and community leaders in order to improve EIBF practice. The present study attempted to examine the regional prevalence of EIBF along with determinants in the case of C-section in the states/UTs including the different regions in India. Detailed understanding of determinants of EIBF in case of C-section will help to design targeted intervention to improve EIBF in case of C-section in India. Such targeted intervention will also help to reduce the risk of neonatal and maternal health or achieve the 3rd sustainable development goal (SDG).

METHODS

Data

The NFHS-4 (2015-2016) data were used to do this study. NFHS is also known as the India demographic and health survey (DHS) and this survey was conducted by the International Institute for Population Sciences (IIPS), Mumbai through the Ministry of Health and Family Welfare (MoHFW), Government of India. To obtain the sample of mothers who initiated breastfeeding within the first hour of birth in the case of C-section, we restricted our analyses to the youngest living children aged <24 months, who were living with respondents (women aged 15–49 years). A total of 14,774 samples have been taken for the final analysis.

Methodos

The study used a total of 14774 weighted samples of NFHS-4 (2015-2016). The study has used Arc-GIS (10.8) software to represent a state wise map of EIBF prevalence in India. Descriptive analysis was done to describe the prevalence of EIBF with background (like socio economic, maternal and health service factors) of the mothers. Logistic regression model has been used to examine factors associated with EIBF for C-section delivery mothers in India.

Dependent and independent variable

Dependent variable

The dependent variable for study is 'early initiation of breastfeeding, EIBF'. In this study we strictly followed EIBF definition of WHO and UNICEF i.e. initiation of breastfeeding within one hour of birth. In analysis, early initiation of breastfeeding was taken as the dependent variable and coded as "0" for not breastfeeding within one hour of birth and "1" for breastfeeding within one hour of birth.

Independent variable

We selected 3 groups of determinants i.e. socio-economic, maternal characteristics and individual and health service in present study. Socio-economic determinants included place of residence (urban/rural), sex of the child (male/female), religion (Hindu/non-Hindu), caste (SC/ST/OBC/Others), household wealth index (poor/middle/rich), regions of India as per NFHS-4

division (i.e. North, East, North-East, South, West and central). In the maternal factors includes mother's educational level (no educated/primary/secondary and above), and mass media exposure (never/sometime/everyday); maternal age in years (15-24/25-34/34 and above) birth order (first/second/three and more) of the child. The health service included the number of antenatal visit factors (no ANC/one/two/three/four and above); postnatal care received (no PNC/with 1 hour/more than 1 hour/ more than 1 day), the place of delivery (public/private), type of delivery assistance and health status of child (health professionals/non-health professionals). Other non-health professionals included relatives, friends, no one and others, while health professionals included doctors, auxiliary nurse midwives, nurses, midwives, and female health visitors.

RESULTS

Prevalence of early initiation of breastfeeding (EIBF) in the states and UTs in India

Table 1 portrays the prevalence of early initiation of breastfeeding in the case of C-section among children aged 0-23 months in states and UTs of India in 2015-16. Results show that in India, around 33.81% C-section delivery mothers breastfeed their babies within one hour of time. The prevalence of EIBF is reported highest in Goa (72.4 percent) followed by Sikkim (60.89 percent) Odisha (58.05 percent) Mizoram (57.27 percent), Manipur (53.60 percent) and Assam (53.54 percent). On the other hand, states/UTs like Rajasthan (10.4 percent), Uttar Pradesh (12.6 percent), Uttarakhand (12.7 percent), Chandigarh (14.7 percent), and Jharkhand (17.7 percent) reported the low prevalence of EIBF among C-section mothers. In short, only 32 percent states and UTs have more than fifty percent prevalence of EIBF.

Prevalence of EIBF in the C-section mother is highest in North East India (50.6 percent) followed by West (41.27 percent) and South (40.54 percent) zone and lowest in Central Zone (16.08 percent) of India in the year 2015-2016.

Geographical variation of EIBF among C-section delivered mothers in the states/UTs in India

Figure illustrates that EIBF prevalence among C-section mothers ranges in between 10.4 percent in Rajasthan to 72.4 percent in Goa. Overall, 10 states and UTs (i.e. Goa, Sikkim, Odisha, Mizoram, Manipur, Assam, Puducherry, Karnataka, Kerala and Meghalaya) have more than fifty percent of EIBF and 9 states/UTs (i.e. Rajasthan, Uttar Pradesh, Uttarakhand, Chandigarh, Jharkhand, Panjab, Andaman and Nicobar Iceland, Madhya Pradesh and Bihar) have less than twenty-eight percent level of EIBF among the C-section delivered mother in India. Remaining other 17 states and UTs belong to the range between twenty-eight to fifty percent level of EIBF. The states from the central part of India practices a very low level of EIBF among C-section mothers.

Prevalence of EIBF in the case of C-section with background characteristics in India 2015-2016

The prevalence of early initiation breastfeeding among mothers delivered in C-section was 33.81% in India in the year 2015-16 (Table 2). The EIBF reported higher in urban (33.87%) as compared to rural (33.74%) area. Prevalence of EIBF practices among male children (35.44%) is higher as compared to female children (31.98%). In this case social group ST population (40.65%) reported a high prevalence of EIBF. Hindu (34.19%) religious groups practiced higher EIBF as compared to non-Hindu. The prevalence of early initiation of breastfeeding was found higher among the mother from middle wealth quintile (36.19%) followed by rich (33.25%) and poor (32.68%) respectively. There was a higher prevalence of early initiation of breastfeeding mothers with secondary and higher (34.83%) education levels. Mothers exposed to mass media every day (35.67%) shows higher prevalence of EIBF as compared to mothers who are never exposed (28.33%) of mass media. Mothers who received four and more ANC treatments show maximum prevalence of early initiation of breastfeeding. Similarly, those who received post-natal care treatment within 1 hour show maximum prevalence (49.5%) and minimum prevalence found in mothers who didn't receive post-natal care treatment (33.9%). Delivery in public health facilities (38.82%) shows more IEBF as compared to private health facilities. Mothers who received delivery assistance from health professionals (34.45%) reported high prevalence of early initiation of breastfeeding as compared to those who were assisted by other non-professional (29.11%) staff (Table 2).

Determinants of EIBF among C-section mothers

In socio-economic factors, mothers in SC (OR: 0.69; CI: 0.60-0.79), OBC (OR: 0.68; CI: 0.60-0.77) and others (OR:0.65; CI:0.57-0.74) were less likely to EIBF as compared to ST. Mothers belonging to rich households (OR: 0.87; CI: 0.78-0.98) were less likely to start breastfeeding within 1 hour as compared to poor quantiles. Mothers with secondary and higher education (OR: 1.38, CI: 1.21-1.58) were substantially more likely to start breastfeeding early than non-educated mothers. EIBF was highly associated with mothers who were exposed to mass media every day (OR: 1.66; 95% CI: 1.39-1.97) and sometimes (OR: 1.28; 95% CI: 1.11-1.49) as compared to mothers who are never exposed the media. Second birth order of child (OR: 1.08; CI: 0.64-1.16) makes the EIBF more likely as compared to first birth order. The mother who received two ANC visits (OR: 0.79; 95% CI: 0.64-0.98) was less likely to practice EIBF compared to those who didn't receive any ANC visits. Similarly, those mothers who obtained post-natal treatment within 1 hour (OR: 1.79, CI: 1.55-2.07) are more likely to EIBF compared to those who had received post-natal care after

more than one hour (OR 0.77; 95% CI: 0.68-0.88). Similarly, those who gave birth in a private health facility (OR: 0.62; 95% CI: 0.57-0.67) were less likely to practice EIBF as compared to those birthed at a public facility. Mothers who were assisted by non-health professional (OR: 0.80; 95% CI: 0.72-0.90) were less likely to practice EIBF compared to those who received assistance from health professionals (Table 3).

Table 1: Prevalence of early initiation of breastfeeding (EIBF) within one hour in the case of C-section across the states and UTs in India, NFHS-4 (2015-16).

State/UTs	Early initiation of breastfeeding (EIBF)		
	No (%)	Yes (%)	Sample
North zone	77.45	22.55	3,093
Uttarakhand	87.28	12.72	327
Delhi	70.92	29.08	155
Haryana	69.67	30.33	396
Himachal Pradesh	70.78	29.22	193
Jammu and Kashmir	63.22	36.78	922
Chandigarh	85.26	14.74	16
Punjab	81.45	18.55	499
Rajasthan	89.62	10.38	582
Central zone	83.92	16.08	2,816
Uttar Pradesh	87.41	12.59	1,612
Madhya Pradesh	78.76	21.24	845
Chhattisgarh	71.87	28.13	359
East zone	67.02	32.96	2,345
Odisha	41.95	58.05	660
Bihar	77.28	22.72	698
Jharkhand	82.33	17.67	502
West Bengal	66.61	33.39	485
North East zone	49.34	50.66	1,802
Arunachal Pradesh	59.27	40.73	154
Assam	46.46	53.54	586
Manipur	46.4	53.6	423
Meghalaya	49.69	50.31	127
Mizoram	42.73	57.27	190
Nagaland	69.99	30.01	112
Tripura	69.36	30.64	105
Sikkim	39.11	60.89	105
West zone	58.73	41.27	1,310
Goa	27.59	72.41	56
Gujarat	56.93	43.07	494
Maharashtra	60.21	39.79	694
Dadra and Nagar Haveli	61.94	38.06	23
Daman and Diu	50.34	49.66	43
South zone	59.46	40.54	3,411
Karnataka	48.71	51.29	732
Kerala	49.52	50.48	340
Lakshadweep	59.5	40.5	46
Andaman and Nicobar Iceland	81.31	18.69	42
Andhra Pradesh	69.14	30.86	487
Puducherry	47.82	52.18	170
Tamil Nadu	54.48	45.52	1,080
Telangana	67.43	32.57	514
India	66.19	33.81	14,774

Source: NFHS-4 (2015-2016).

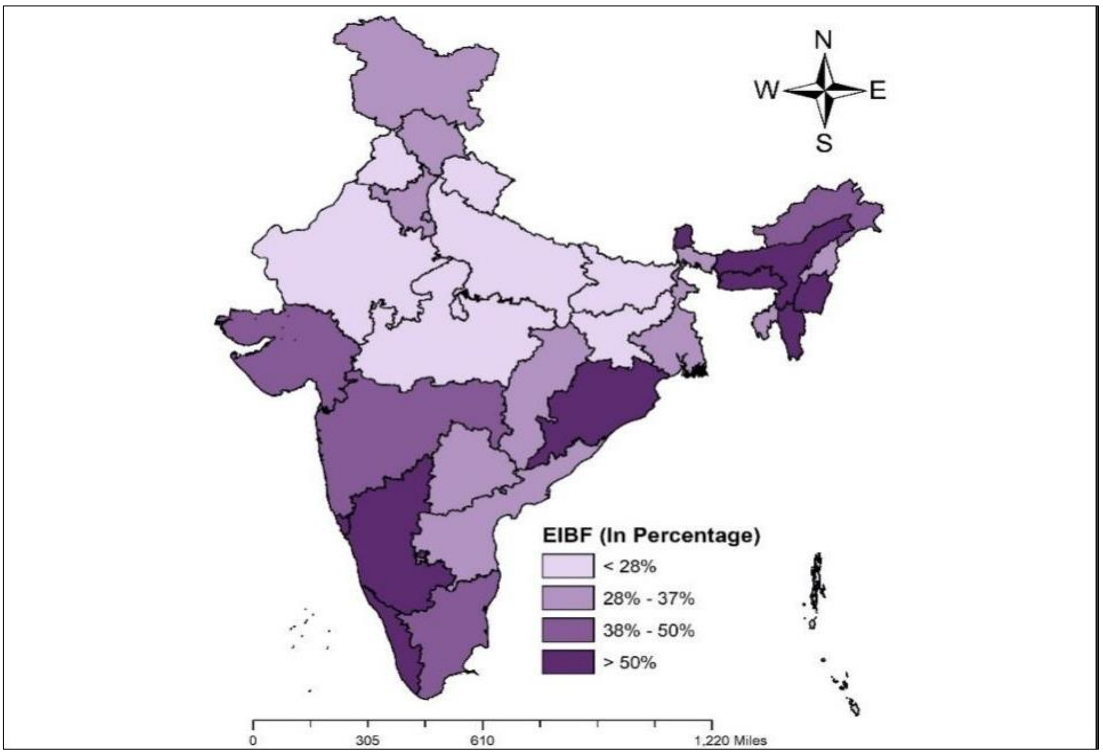

Figure 1: Spatial prevalence of EIBF within one hour in the case of C-section in the states and UTs in India, NFHS-4 (2015-2016).

Table 2: Prevalence of EIBF in the case of C-section by study factors in India, NFHS-4 (2015–2016).

Variables	N	Prevalence (%)	Chi-square P value
Early initiation of breastfeeding			
Yes	4,995	33.81	
No	9,779	66.19	NA
Socio-economic variable			
Place of residence			
Rural	2,224	33.74	
Urban	2,771	33.87	0.19
Sex of the child			
Male	2,767	35.44	
Female	2,228	31.98	0.29
Caste group			
ST	317	40.65	<0.001
SC	919	33.48	
OBC	2256	34.20	
Others	1503	32.29	
Religious group			
Non-Hindu	973	32.30	<0.001
Hindu	4022	34.19	
Wealth index			
Poor	937	32.68	<0.007
Middle	1218	36.19	
Rich	2840	33.25	
Mother's age in years			
15-24	2184	33.21	<0.001
25-34	2595	34.66	
35 and above	216	30.32	

Continued.

Variables	N	Prevalence (%)	Chi-square P value
Mother's education			
No education	364	25.79	<0.001
Primary	428	33.00	
Secondary and higher	4202	34.83	
Mass media exposure			
Never	330	28.33	<0.001
Sometimes	4042	34.07	
Everyday	623	35.67	
Birth order			
One	2,509	33.02	0.145
Two	1,922	35.13	
Three and above	564	33.05	
Health care variable			
ANC care			
No ANC	225	30.63	0.001
One	151	30.24	
Two	273	28.15	
Three	450	29.43	
Four and above	3834	35.2	
PNC care			
No	418	32.23	0.001
<1 hour	1507	49.5	
Within or >1 hour	2503	28.93	
After one day	491	31.71	
Place of delivery			
Public	2,147	38.82	0.001
Private	2,847	30.81	
Assistance of health professional			
Health personal	4,479	34.45	0.001
Non-health personal	516	29.11	

Source: NFHS-4 (2015-16); p<0.05=significant.

Table 3: Determinants of EIBF of mothers in the case of C-section in India, NFHS-4 (2015–2016).

Variables	Odds ratio (OR)	[95% confidence interval]	P value
Socio economic factors			
Place of residence			
Urban ®	1.0		
Rural	1.01	(0.93-1.09)	0.894
Sex of child			
Male ®			
Female	0.95	(0.89-1.03)	0.204
Caste group			
ST ®	1.0		
SC	0.69	(0.60-0.79) ***	0.000
OBC	0.68	(0.60-0.77) ***	0.000
Others	0.65	(0.57-0.74) ***	0.000
Religious group			
Hindu ®	1.0		
Non-Hindu	0.99	(0.91-1.08)	0.785
Wealth index			
Poor ®	1.0		
Middle	0.99	(0.88-1.11)	0.884
Rich	0.87	(0.78-0.98) **	0.017
Mother's age in years			

Continued.

Variables	Odds ratio (OR)	[95% confidence interval]	P value
15-24 ®	1.0		
25-34	1.13	(1.04-1.22) ***	0.003
35 and above	1.22	(1.04-1.43) **	0.015
Mother's education			
No education ®	1.0		
Primary	1.17	(0.98-1.38)	0.082
Secondary and higher	1.38	(1.21-1.58) ***	0.000
Mass media exposure			
Never ®	1.0		
Sometimes	1.28	(1.11-1.49) ***	0.001
Everyday	1.66	(1.39-1.97) ***	0.000
Birth order			
One ®	1.0		
Two	1.04	(0.96-1.13)	0.058
Three and above	0.96	(0.91-1.14)	0.722
Health service factors			
ANC visit			
No ANC visit ®	1.0		
One	1.19	(0.92-1.54)	0.202
Two	0.80	(0.65-0.99) **	0.030
Three	0.97	(0.80-1.18)	0.759
Four and above	1.14	(0.97-1.34)	0.121
PNC care			
No ®	1		
<1 hour	1.79	(1.55-2.07) ***	0.000
Within or >1 hour	0.77	(0.68-0.88) ***	0.000
After one day	0.90	(0.77-1.06)	0.221
Place of delivery			
Public ®			
Private	0.61	(0.57-0.66) ***	0.000
Assistance of health professional			
Health personal®	1		
Other personal	0.80	(0.71-0.90) ***	0.000

***P<0.01, **p<0.05, *p<0.10, ®reference category.

DISCUSSION

In India, EIBF is around 31.8 percent among C-section delivery mothers as per NFHS-4 data. Among the states and UTs the prevalence of EIBF is highest in Goa and lowest in Rajasthan. In India 10 states and UTs have fifty percent level of EIBF and 9 states and UTs have less than twenty-eight percent level of EIBF among the C-section delivered mothers. The central part of India mostly from EAG states (i.e. Rajasthan, Uttar Pradesh, Uttarakhand, Jharkhand, Madhya Pradesh and Bihar) practice a very low level of EIBF practices. On the other hand, the states from the north-east region represent the highest EIBF practices from India in 2015-2016. The reasons for the regional variations in early initiation of breastfeeding practice have not been found from existing literature. However, possible reasons may be due to the local cultural attitudes such as the negative perceptions towards the use of the colostrum (first milk) advice from mothers-in-law that does not promote optimal breastfeeding and the mother's prenatal intention not to breastfeed.[26-28]

The prevalence of EIBF is more in urban area compared to rural area among C-section delivery mothers. The prevalence of EIBF among C-section mothers is high among mothers who passed secondary and higher education. Households with middle and rich quantile practice a high level of EIBF. Mothers who are exposed to mass media every day reported higher breast-feeding practices within one hour of time after C-section delivery as compared to those who were never exposed to mass media. PNC including assisted delivery from health professionals found to be conducive breastfeeding practices.

The present study also finds the interesting contextual determinants of early initiation of breastfeeding within one-hour in the case of C-section delivery mothers. It has been found that early initiation of breastfeeding within one hour of birth is significantly associated with mother's education.[29,30] Consistent with findings from others studies based on South Asia, India, Pakistan, Bangladesh and Nepal, our study also indicated for the same, that higher

educational attainment among mothers in the total population was associated with EIBF compared to those with no schooling.[31-34,37] Mass media exposure also played a significant role to increase the early initiation of breastfeeding.[35]

Mothers who have been exposed to mass media sometime and every day increase the EIBF 1.27 times and 1.65 times higher as compared to mothers who have never been exposed to media. Similarly, PNC care within one hour of birth increases the EIBF practices.[8,36] The C-section delivery mothers who received delivery assistance from health professionals also reported a higher proportion of EIBF compared to mothers who were assisted by non-health professionals in India.[23]

Some evidence suggests that in the case of C-section delivery the practice of EIBF is higher if health professionals are well-trained to provide the necessary support and guidance to the mother.[37,38] It has been found that an initiative can increase breastfeeding practices through the training of health professionals and establishment of 'baby friendly' health facilities to appropriately support mothers to breastfeed within the first hour of birth.[39] The public health facility is more likely to EIBF practices as compared to private health facilities in India.

The present study does not only contribute to providing remarkable geographical and regional variations in EIBF practices in the case of C-section delivery but also examines the contextual factors affecting this. The study found that one-third of Indian mothers who deliver through C-section, have initiated breastfeeding within one hour of delivery (33.8%).

The present study also found that the prevalence of early initiation of breastfeeding was highest in the North-East, followed by western, and southern part of India, whereas the north-east region practices the highest EIBF from India in the year of 2015-2016. Mother's education, and PNC care within one hour mass media exposure, delivery assisted by health professionals and public health facility were associated with EIBF in the case of C-section delivery. Based on these findings, the study recommends the public health programmers to target low prevalence regions in India, to improve the early initiation of breastfeeding by increasing mother's education, and PNC care within one hour including a mass media exposure.

CONCLUSION

The study shows remarkable geographical variations in EIBF and its correlates in the country. It recommends that the public health programmes need to target the states with less practice of EIBF (i.e. EAG state or central part of India) F among C-Section delivery mothers. By increasing the level of mothers' education status, mass media exposure and early PNC care can improve the EIBF practices among C-section mothers in India.

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