

HJOG 2024, 23 (4), 242-252 | DOI: 10.33574/HJOG.0572

Mode of birth and clinical factors associated with exclusive breastfeeding at hospital discharge: a retrospective cross-sectional study of women and full-term infants in Greece

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Abstract

World Health Organization recommends exclusive breastfeeding for six months. Despite its well-documented benefits, breastfeeding rates worldwide do not meet the recommended goals.

The aim of this study was to identify factors that could influence exclusive breastfeeding at hospital discharge. All live, singleton, term births in a private hospital of Athens, Greece between January and December 2019 were included with a final study sample of 7336 women and newborns.

Our study identifies several factors associated with nonexclusive breastfeeding at hospital discharge: nullipara women compared to multipara (OR 0.73; 95% CI 0.66, 0.82), cesarean delivery compared to vaginal delivery (OR 1.83; 95% CI 1.65, 2.03), smoking during pregnancy (OR 1.28; 95% CI 1.15, 1.44), gestational age at 37+0- 38+6 weeks compared to 39+0- 41+6 weeks (OR 0.70; 95% CI 0.62, 0.78), birthweight <2500g (OR 0.38; 95% CI 0.22, 0.35), and admission to neonatal intensive unit (NICU) after delivery (OR 8.19; 95% CI 6.65, 10.08).

No association was observed for maternal age, pregnancy after assisted reproductive technology, gestational diabetes, obstetric complication, and sex of the newborn. It is expected that our results will allow future comparisons between different hospitals in the same country, as well as comparison of practices with other countries. Several perinatal factors related to nonexclusive breastfeeding at hospital discharge, most noteworthy were caesarean section and admission to NICU.

Key words: exclusive breastfeeding, discharge, risk factors, caesarean section, neonatal intensive unit

Introduction

All around the world we have seen that every year, improved breastfeeding practices can have a life-saving impact on the lives of more than 823,000 children under 5 years of age¹. The World Health Organization recommends exclusive breastfeeding for the first six months of a child's life, that is no other liquid or solid food except breast milk and any necessary vitamins or medication, and continuation of breastfeeding up to the age of two years old or more². The short and long-term benefits of breastfeeding for the child, the mother, the society and the environment have been widely proven, with breastfeeding being one of the most important foundations for the promotion of public health and an investment for the health of future generations². Several studies have been performed during the last years aiming to investigate the true benefits for the infants and their mothers of exclusive breastfeeding with mother's milk for the first six months of their life and the continuation of breastfeeding beyond that age. For the mothers, the long-term benefits include lower risk of breast cancer, ovarian cancer and type II diabetes^{3,4}. In children, breastfeeding has protective qualities against gastrointestinal and respiratory infections in the ages under 5 years old². In fact, the protection is dose-dependent^{1,5}. Furthermore, it lowers the risk of obesity both in childhood and in adult life¹. Moreover, as breastfeeding is a safe and natural method of feeding and has no environmental risks, it can increase both family and national resources³. However, the rates of breastfeeding on a worldwide basis, especially exclusive breastfeeding, are nowhere near the global public health recommendations and nutrition goals that have been set by the World Health Organization (WHO). The WHO has set a goal at least 50% of the six-month-old infants to breastfeed exclusively by 2025⁶. Europe has the lowest breastfeeding rates compared to other continents. Specifically, between 2006-2012, only

25% of infants were exclusively breastfed at 6 months of age while in the WHO South – East Asia Region a rate of 43% was recorded^{7,8}. In Greece, data from the most recent national study performed in 2017, showed that the percentages of breastfeeding at the end of 1st, 4th, and 6th month were 80%, 56% and 45% respectively. However, less than 1% of infants were breastfeeding exclusively by the end of 6th month [9]. Many factors affect breastfeeding. Which can be obstetric, maternal or neonatal in nature and are often linked to each other. Previous studies associate the breastfeeding initiation and duration with factors such as caesarean section^{9,10}, smoking during pregnancy^{10,11}, lower maternal education and socioeconomic status, overweight and obesity, epidural analgesia¹². Moreover, non-clinical factor such as hospital practices (not providing rooming-in, prescription of infant formula), cultural context of the country and attitude of relevant health professionals and mothers have also been suggested as negative barriers of breastfeeding initiation and duration^{9,11}. Pinpointing the factors that can negatively influence initiation and duration of breastfeeding is extremely important for the successful development and implementation of both national policies for infant nutrition and for the courses of action for the protection, promotion and support of breastfeeding in local and national level. Based on the above, the aim of this study was to identify factors that may be associated with exclusive breastfeeding using data of term newborns at hospital discharge in Greek population.

Material and methods

This was a retrospective cross-sectional study conducted in a private hospital of Athens, Greece. In the study hospital more than 10.000 deliveries are performed annually including a neonatal intensive care

unit (NICU). The source population was women who had live births of term neonates (born between gestational age 37+0 and 41+6 weeks) between January 1, 2019 and December 31, 2019 (n=7963). Because this study looks at term newborns only, all preterm and post-term births were excluded (n=609). Additionally, women with stillborn fetuses/newborns (n=73) were excluded from the sample. A small percentage (n=36) of women were not included in the study because their medical records were not accessible.

The outcome variable of interest was exclusive breastfeeding at hospital discharge which defined as the neonate receiving only breast milk in the last feedings before hospital discharge. Nonexclusive breastfeeding included neonates which had formula feeding, mixed feeding or parental feeding in the last feedings before hospital discharge. In the study hospital, newborn discharge normally occurred between in three days for vaginal delivery and four days for caesarean section. The data were compiled from medical records and birth registrations. An experienced midwife and an epidemiologist with experience in study design and analysis using medical records and birth certification databases scrutinized and assessed whether the measurements of each variable appeared to be a good standard to achieve face validity of the data. Maternal variables from women's medical records were: age, smoking status during pregnancy, assisted reproductive technology, parity, gestational age (weeks), mode of delivery (vaginal delivery, caesarean section), and obstetric complications. The data we retrieved from newborn medical records were: newborn sex (boy, girl), birth weight, and admission to neonatal intensive care unit (NICU). For data retrieval, collection and analysis, ethical approval was obtained from the scientific board of hospital 96 (1146/24-09-20). They were not required to obtain a signed consent form from the women whose medical records were retrieved, as these women had already signed a GDPR form.

The qualitative variables were presented by the fre-

quencies (n) and percentages (%). Unifactorial analysis were made using the Chi-square test or Fisher exact test to analyze the relation between the type of feeding and all qualitative demographic and clinical variables. All variables in the unifactorial analysis were further assessed in multifactorial binary logistic regression model using the enter method to identify independent demographic and clinical predictors of type of feeding. ORs and 95% CIs were reported for all variables in the multifactorial model. All tests are two-sided, statistical significance was set at $p < 0,05$. All analyses were carried out using the statistical package SPSS vr 21.00 (IBM Corporation, Somers, NY, USA).

Results

From the 7336 neonatal in the study sample, a total of 3463 (47.2%) were exclusive breastfed at hospital discharge whereas 3873 (52.8%) were not. Table 1 presents the distribution of maternal, delivery and neonatal characteristic of study sample. Of these, the majority of women were nullipara and aged ≥ 35 years old (45.4%). A high percentage of the studied population (54.1%) gave birth between 37+0- 38+6 weeks of gestation, and 45.9% between 39+0- 41+6 weeks. A 56.8% of the sample had a caesarean section and 43.2% had a vaginal delivery. Overall, 5.2% of women reported obstetric complication during pregnancy (3.3% due to maternal reason and 1.8% due to fetal reason). A total of 27.1 of women were smokers during pregnancy and 9.4% had used assisted reproductive technologies. Additionally, 13.3% of women had gestational diabetes. Regarding the newborns, 51.3% were males and the majority of them had a birth weight between 3000 and 3999 g (71.4%). During the study period, 14.2% of full-term neonates admitted to Neonatal Intensive Unit (NICU). Maternal, delivery and neonatal characteristics differed by breastfeeding status at hospital discharge are shown in table 2. More specifically, for

Table 1. Maternal, delivery and neonatal characteristics (N=7336)

	Characteristics	Frequency (n)	Percentage (%)
Maternal age	20- 29	1246	17.0
	30-34	2763	37.7
	≥35	3327	45.4
Parity	Nullipara	4130	56.3
	Multipara	3206	43.7
Smoking status during pregnancy	No	5346	72.9
	Yes	1990	27.1
Assisted reproductive technology	No	6646	90.6
	Yes	690	9.4
Obstetric complication (maternal)	No	7092	96.7
	Yes	244	3.3
Obstetric complication (fetus)	No	7205	98.2
	Yes	131	1.8
Gestational Diabetes	No	6357	86.7
	Yes	979	13.3
Gestational age	37+0- 38+6	3970	54.1
	39+0- 41+6	3366	45.9
Mode of birth	Vaginal birth	3170	43.2
	Caesarean section	4166	56.8
Sex of neonatal	Male	3761	51.3
	Female	3575	48.7
Birth weight (g)	<2500	158	2.2
	2500- 2999	1680	22.9
	3000- 3999	5240	71.4
	≥ 4000	258	3.5
Type of feeding	Exclusive breastfeeding at discharge	3463	47.2
	Nonexclusive breastfeeding at discharge	3873	52.8
Admission to NICU	No	6297	85.8
	Yes	1042	14.2

nonexclusive breastfed neonates at discharge, 59.3% of mothers were nullipara and the majority of them (66.5%) gave birth by caesarean section. Additionally, 61.5% of neonates not being exclusive breastfed were delivered between 37+0- 38+6 weeks of gestation. Significant associations were found across breastfeeding status at hospital discharge compared to maternal age ($p<0.035$), parity ($p<0.001$), smoking during pregnancy ($p<0.001$), assisted reproductive technology ($p<0.001$), fetus obstetric complication ($p<0.001$), gestational age ($p<0.001$), gestational diabetes ($p<0.001$), mode of birth ($p<0.001$) and birth

weight ($p<0.001$).

Multiple logistic regression of breastfeeding at discharge are presented in table 3. Parity, mode of birth, gestational age at delivery, smoking status during pregnancy, birthweight, and admission to NICU were identified as factors significantly statistically associated with nonexclusive breastfeeding at hospital discharge. More specific, multipara women were 27% less likely to be nonexclusive breastfeeding at hospital discharge compared to nullipara women (OR 0.73; 95% CI 0.66, 0.82). Newborns who were delivered by caesarean sec-

Table 2. Maternal, delivery and neonatal characteristics according to breastfeeding status at hospital discharge

Characteristics		Exclusive breastfeeding) at discharge (N= 3463		Nonexclusive breastfeeding at discharge (N=3876)		p- value
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	
Maternal age	20- 29	587	17.0	659	17.0	<0.035
	30-34	1355	39.1	1408	36.4	
	≥35	1521	43.9	1806	46.6	
Parity	Nullipara	1833	52.9	2297	59.3	<0.001
	Multipara	1630	47.1	1576	40.7	
Smoking status during pregnancy	No	2647	76.4	2699	69.7	<0.001
	Yes	816	23.6	1174	30.3	
Assisted reproductive technology	No	3214	92.8	3432	88.6	<0.001
	Yes	249	7.2	441	11.4	
Obstetric complication (maternal)	No	3360	97.0	3732	96.4	0.118
	Yes	103	3.0	141	3.6	
Obstetric complication (fetus)	No	3431	99.1	3774	97.4	<0.001
	Yes	32	0.9	99	2.6	
Gestational Diabetes	No	3092	89.3	3265	84.3	<0.001
	Yes	371	10.7	608	15.7	
Gestational age	37+0- 38+6	1589	45.9	2381	61.5	<0.001
	39+0- 41+6	1874	54.1	1492	38.5	
Mode of birth	Vaginal birth	1873	54.1	1297	33.5	<0.001
	Caesarean section	1590	45.9	2576	66.5	
Sex of neonatal	Male	1760	50.8	2001	51.7	0.483
	Female	1703	49.2	1872	48.3	
Birth weight (g)	<2500	26	0.8	132	3.4	<0.001
	2500- 2999	724	20.9	956	24.7	
	3000- 3999	2605	75.2	2635	68.0	
	≥ 4000	108	3.1	150	3.9	
Admission to NICU	No	3350	96.7	2944	76	<0.001
	Yes	113	3.3	929	24	

tion were 83% more likely to not being exclusive breastfed at hospital discharge in comparison to those born with vaginal delivery (OR 1.83; 95% CI 1.65, 2.03). Moreover, neonates of women smoking during pregnancy were 28% more likely to be nonexclusively breastfed at hospital discharge compared to those born by women who did not smoke during pregnancy (OR 1.28; 95% CI 1.15, 1.44). Neonatal born at 39+0- 41+6 weeks of pregnancy were 30% less likely to be nonexclusively breastfed at hospital discharge compared to those born at 37+0- 38+6 weeks of pregnancy (OR 0.70; 95% CI

0.62, 0.78). A negative correlation was detected between the birthweight of neonates and the exclusive feeding at discharge; thus, the biggest weight, the lower the percentage of nonexclusive feeding at discharge. More specific, neonates with birthweight >2500g had 61% lower likelihood of receiving nonexclusively breastfeeding at hospital discharge compared to those weighting <2500g (OR 0.38; 95% CI 0.22, 0.35). In addition, neonates admitted to NICU were 8.19 times more likely to not being exclusive breastfed in comparison to infants not admitted to NICU (OR 8.19; 95% CI 6.65, 10.08). No

Table 3. Multiple logistic regression of breastfeeding at discharge (enter method)

	OR	95%CI		p-value
Maternal age				
20-29	1.00			0.479
30-39	0.92	0.80	1.06	0.260
≥ 35	0.97	0.83	1.12	0.641
Parity				
Nullipara	1.00			<0.001
Multipara	0.73	0.66	0.82	
Mode of birth				
Vaginal birth	1.00			<0.001
Caesarean section	1.83	1.65	2.03	
Gestational age				
37+0- 38+6	1.00			<0.001
39+0- 41+6	0.70	0.62	0.78	
Smoking status during pregnancy				
No	1.00			<0.001
Yes	1.28	1.15	1.44	
Assisted reproductive technology				
No	1.00			0.551
Yes	1.06	0.88	1.28	
Gestational Diabetes				
No	1.00			0.314
Yes	0.92	0.79	1.08	
Obstetric complication (maternal)				
No	1.00			0.309
Yes	0.86	0.64	1.15	
Obstetric complication (fetus)				
No	1.00			0.119
Yes	1.42	0.91	2.22	
Sex of neonatal				
Male	1.00			0.777
Female	1.00	0.89	1.09	
Birth weight (g)				
<2500	1.00			<0.001
2500- 2999	0.39	0.25	0.62	<0.001
3000- 3999	0.35	0.22	0.55	<0.001
≥ 4000	0.44	0.26	0.74	<0.002
Admission to NICU				
No	1.00			<0.001
Yes	8.19	6.65	10.08	

association was observed for maternal age, pregnancy after assisted reproductive technology, gestational diabetes, obstetric complication, and sex of neonate.

Discussion

Despite the fact that the decision to breastfeed is a highly personal one, there are many factors that

can influence both initiation and duration. Previous studies have shown that baby formula feeding during the first three days after birth can lead to increased ensuing infant formula feeding and premature breastfeeding termination [13]. Consequently, studies that identify, detect and predict factors pertinent to exclusive breastfeeding upon discharge from the hospital, are of great importance for public health, because thus we can investigate low rates of exclusive breastfeeding. Our study identified several factors associated with non-exclusive breastfeeding at hospital discharge: nullipara compared to multipara, caesarean section compared to vaginal delivery, gestational age <39 weeks, smoking during pregnancy, birth weight <2500g compared to 2500-2999g and 3000-3999g and admission to NICU.

Neonatal born by CS (planned or not) were less likely to be exclusively breastfed at hospital discharge compared to newborns born by vaginal delivery. Our finding is in accordance with previous studies¹⁴⁻¹⁶. Moreover, recent studies in Greece have shown CS rate over 60%¹⁷ compared to the mean (26%) in European countries during the period 2015-2019¹⁸. To ensure the success of exclusive breastfeeding, it is apt to consider the “Ten steps to Successful Breastfeeding in the Baby Friendly Hospital Initiative” and especially the immediate skin-to-skin contact between the mother and the newborn for early initiation of breastfeeding. Previous studies have confirmed the above claim showing that women gave birth by CS was less likely to be exposed to skin-to-skin contact and as a result delay in initiation of breastfeeding, problems in effectively latch and lactogenesis and as a result, lower rates of exclusively breastfeeding rates and/or early breastfeeding cessation¹⁹. Furthermore, maternal post-operational pain and use of high doses of analgesics and anti-inflammatory drugs affect women’s consciousness and may be a risk factor for lower percentages of exclusive breastfeeding²⁰. Previous sys-

tematic review showed that adequate breastfeeding support during the first hours and days after CS, can improve the rates of exclusive breastfeeding at hospital discharge and beyond¹⁹

In our study primipara was a negative factor for exclusive breastfeeding in hospital discharge. Previous studies have shown that previous experience of breastfeeding is a positive factor for breastfeeding initiation²¹. As a result, multiparous women have a tendency to exclusively breastfeed much more successfully and for a longer duration. However, other authors claim that higher birth order was associated with lower odds of breastfeeding, due to non-clinical reasons, such as family obligations and/or increased needs of the older children^{22,23}. A 27.2% of the women participating in the study reported that they smoked during pregnancy, a particularly high percentage, when according to other studies 15-20% of women will continue to smoke during pregnancy²⁴. In previous studies conducted in Greece, lower percentages of pregnant women who smoked during pregnancy were noted, with a percentage of around 17.0%²⁵. Smoking is considered one of the most negative factors for breastfeeding initiation and duration. Previous studies have shown that smoking mothers are 3 times more likely to either not breastfeed at all or to breastfeed for a short period of time^{26,27}. Previous study by McDonald et al. showed that non-smoker mothers were more likely to exclusively breastfeed at hospital discharge compared to smokers²⁸. Neonates weighing <2500g were less likely to be exclusive breastfed at hospital discharge compared to neonates with birth weight >2500g, a finding which is in accordance with previous studies²⁹. According to WHO guidelines, all infants, including preterm small and/or sick should be fed with human milk which is more beneficial for the health of low birth weight compared to normal weight³⁰.

Neonatal admission to NICU had a negative association

on exclusive breastfeeding at hospital discharge. NICU admission has been associated with lower odds of exclusive breastfeeding in previous studies as well^{31,32}. It is important to mention that although we excluded multiple and preterm pregnancies from our study, the association between NICU admission and exclusive breastfeeding at hospital discharge was very high. A step to establish breastfeeding in neonatal units is the adoption of baby-friendly hospital initiation for neonatal wards, where rooming-in of mother and newborn in the NICU is recommended³³. Although rooming-in is not possible in all settings, mother and neonate should have the chance to stay close to each other the NICU.

Additionally, our study did not reveal any association between maternal age, assisted reproductive technology, gestational diabetes or other obstetric complication and exclusive breastfeeding at hospital discharge. Previous studies had shown negative association between assisted reproductive technology and obstetric or pregnancy complications and exclusive breastfeeding at hospital discharge²⁸.

Strength and limitations

Our work presents some strengths and limitations. First of all, the sample size we used in our study was large enough to be regarded as an annual typical sample of breastfeeding rate in Greece, and is also considered representative of the Greek population. The hospital that approved this study is the largest private obstetrical clinic in Greece and consequently, serves as a referral hospital as it offers a full range of services, including obstetrics, neonatology and intensive care units, therefore amplifying the representativeness of our sample. It is expected that our results will allow future comparisons between different hospitals in the same country, as well as comparison of practices with other countries. We are aware, though, that our research had some limitations as well. The main limitations of our study were its retrospective nature

and the fact that it was conducted in a single hospital. Additionally, the fact that we did not have data on factors such as: education level, body mass index and nonmaternal and neonatal factors influencing exclusive breastfeeding at hospital discharge. Moreover, previous studies have shown differences in breastfeeding initiation between emergency and elective caesarean section. Unfortunately, in our study, these subgroups were not included due to possible misclassification in emergency caesarean section.

Conclusion

In summary, we found that significant perinatal factors and mode of birth are related to exclusive breastfeeding on hospital discharge. Future studies should explore more elaborately each of the factors related to the prevalence of exclusive breastfeeding at hospital discharge. Potential steps to increase rates of exclusive breastfeeding could be the adaptation of the Baby-Friendly Hospital initiative as well as reducing the high caesarean delivery rates in Greece. Finally, these findings will be valuable for National Health Authorities and highlighted the need for hospital policies that promote rooming in, skin-to-skin contact, and lactation evaluation by midwives before discharge from the hospital. Also we have seen that community-based initiatives that promote information, education and counseling can have a positive effect on improving breastfeeding rates.

Disclosure

The authors report no conflict of interest.

Funding

None to disclose for all authors.

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Received 2-9-2024

Revised 12-9-2024

Accepted 24-9-2024