

Predictors of breast-feeding in a developing country: results of a prospective cohort study

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Abstract

Objective: Data on the prevalence and predictors of breast-feeding remain scarce in Lebanon. Moreover, no study has previously addressed the effect of the paediatrician's sex on breast-feeding. The present study aimed to assess the prevalence and predictors of breast-feeding at 1 and 4 months of infant age while exploring the potential role of the sex of the paediatrician.

Design: Prospective cohort study. Predictors of breast-feeding significant at the bivariate level were tested at 1 and 4 months through two stepwise regression models.

Setting: Infants were enrolled through the clinics and dispensaries of 117 paediatricians located in Beirut, Lebanon, and its suburbs.

Subjects: A total of 1320 healthy newborn infants born between August 2001 and February 2002 were prospectively followed during the first year.

Findings: Breast-feeding rates at 1 and 4 months were 56.3% and 24.7%, respectively. Early discharge, high parity and religion were significantly associated with higher breast-feeding rates at 1 and 4 months of age. Maternal age proved significant only at 1 month, while maternal working status and sex of the paediatrician were significant at 4 months. A novel finding of our study was the positive effect of female paediatricians on breast-feeding continuation until 4 months of age (OR = 1.49; 95% CI 1.03, 2.15).

Conclusions: Breast-feeding rates are low at 1 and 4 months of infant age in Beirut. Further research to investigate the interactions between female physicians and lactating mothers in maintaining breast-feeding in other populations is warranted. The results constitute the basis for designing interventions targeting policy makers, health professionals and mothers.

Keywords
Breast-feeding
Physician's sex
Predictors

Breast-feeding is considered internationally as the ideal method of feeding for infants. The WHO⁽¹⁾ and the American Academy of Pediatrics (AAP)⁽²⁾ recommend that infants are exclusively breast-fed for the first 4 or 6 months of life. Exclusive breast-feeding, as defined by WHO, is 'no other food or drink, not even water, except breast milk for at least 4 and if possible 6 months of life, but allows the infant to receive drops and syrups (vitamins, minerals and medicines)'. After the suggested period, mothers can gradually introduce liquids and solids to complement breast-feeding⁽¹⁾. The AAP advises mothers to continue breast-feeding for at least 1 year⁽²⁾, while WHO emphasizes the importance of stretching the duration to the first 2 years of life⁽¹⁾.

It is a well established fact that breast-feeding has price-less advantages for the growth and development of the baby, the health of the mother and the well-being of society⁽²⁾. Despite these essential benefits, breast-feeding rates are low in various regions of the world. According to the WHO global databank on breast-feeding, only 35% of infants in ninety-four countries are exclusively breast-fed under the age of 4 months⁽³⁾. To improve breast-feeding rates, a number of international studies have invested in determining the predictors of successful breast-feeding practices. Such investigations are essential in identifying target groups and modifiable risk factors for effective intervention programmes, such as counselling and educational programmes that have proved to be successful⁽⁴⁻⁷⁾.

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Literature on breast-feeding presents several predictors related to maternal characteristics and psychological state, infant characteristics, cultural customs, sociodemographic status and medical-related factors⁽⁸⁻¹⁶⁾. Although physician support for breast-feeding has been shown to improve breast-feeding rates⁽¹⁷⁾, very few studies have explored physician-related factors as potential breast-feeding determinants. Sex of the paediatrician, for instance, has not been previously researched as a possible predictor, despite the fact that it has been found to be an influential factor for different health outcomes^(18,19).

In Lebanon, data on the prevalence and predictors of breast-feeding remain scarce. Thus the present study aimed to assess the prevalence and predictors of breast-feeding at 1 and 4 months of infant age while exploring the potential role of the sex of the paediatrician, using data from a prospective cohort project conducted by the National Collaborative Neonatal and Perinatal Network (NCPNN) in Beirut, Lebanon.

Experimental methods

Study design and population

The present study used data from the First Year of Life Follow-Up Study. It involved the participation of a close birth cohort of 1320 healthy infants, aged 0-2 months, who were recruited over a period of 7 months (1 August 2001 to 29 February 2002) and followed-up during their first year of life. Infants were enrolled through the clinics and dispensaries of 117 paediatricians located in Beirut and its suburbs (known as the Greater Beirut area) and serving communities of different socio-economic status. The inclusion criteria of the First Year of Life Follow-Up Study were: (i) Lebanese nationality; (ii) single gestation; (iii) birth weight more than 2200 g; (iv) gestational age greater than 35 weeks; (v) absence of major congenital anomalies at birth; (vi) cared for in the hospital of birth and discharged alive within 5 days; (vii) age at first paediatrician visit between 0 and 2 months; and (viii) informed consent from the family.

Data collection

The cohort was followed using a total of seven questionnaires that were completed for each infant. These were: (i) a recruitment form containing basic information about the newborn infant and his/her mother at delivery; (ii) five follow-up questionnaires completed by the paediatricians at five different age intervals corresponding to routine visits at 0-2, 3-4, 5-7, 8-10 and 11-13 months, these included information on anthropometric measurements, vaccination, health-care visits, infectious diseases, injuries, breast-feeding, dental health and others; and (iii) a parental follow-up questionnaire, obtained by telephone call performed by a research assistant six months after the date of birth of the infant, which included

information on parental sociodemographic characteristics, maternal postpartum complications and maternal lifestyle and obstetric characteristics.

In the event that an enrolled baby was lost to its paediatrician, research assistants would track the baby to other paediatricians and/or obtained the needed information from parents through follow-up telephone calls. A baby was considered lost to follow-up if he/she could not be traced through a paediatrician or by telephone.

Analysis

Information on breast-feeding was obtained at each of the five follow-up visits through a question on the current method of milk feeding. The breast-feeding definition adopted in this study was 'full breast-feeding' whereby the infant receives only breast milk without the supplementation of any non-human milk. No consideration about the intake of solid foods was made in our definition.

Based on the literature, the independent variables comprised the following: (i) sociodemographic predictors: religion, parental education and maternal working status; (ii) maternal characteristics: maternal age, parity, smoking during pregnancy, maternal height, pre-pregnancy weight, pregnancy weight gain and weight 6 months after delivery; (iii) infant characteristics: sex of the baby, gestational age and birth weight; and (iv) medical/delivery-related factors: admission status, mode of delivery, length of hospital stay, hospital of delivery and the sex of the paediatrician whom the study participants sought for medical care.

At the bivariate level, differences in the distribution of fully breast-fed babies were assessed among the different levels of each predictor. For continuous predictors, *t* tests with $P < 0.05$ were used, while cross-tabulations and odds ratios with 95% confidence intervals were performed for categorical predictors. Logistic regression using stepwise modelling was computed on the predictors that proved significant at the bivariate level. An adjustment for dependencies within hospitals of delivery (clusters) was undertaken to account for the variations among them. Adjusted odds ratios and 95% confidence intervals are reported for the final model. All analyses were computed in the Statistical Package for the Social Sciences statistical software package version 7.5 (SPSS Inc., Chicago, IL, USA) except for the cluster effect, which was performed using the STATA 6.0 statistical software package (StataCorp LP, College Station, TX, USA).

Ethical considerations

The First Year of Life Follow-Up Study was approved by the university Institutional Review Board at the American University of Beirut. Participation was on voluntary basis. After the full disclosure of the project to the parents, an informed consent was obtained. Information on the participants remained confidential and all analyses performed retained participant anonymity.

Results

A total of 1320 infants were recruited. The 0–2 months age interval questionnaire was completed for all 1320 newborns, while the 3–4, 5–7, 8–10 and 11–13 months follow-up questionnaires were completed for 1171 (88.7%), 1,127 (85.4%), 932 (70.6%) and 1059 (80.2%) infants, respectively. Table 1 presents the prevalence of full breast-feeding at the different age intervals. At the end of the first month of life, the rate of infants receiving full breast-feeding was 56.3%. The rate dropped by more than half (24.7%) at 4 months and reached 18.8% by 6 months of age. At 1 year of life, the intake of breast milk as the only source of milk was minimal (6.7%). Data on full breast-feeding at 1 month were missing in 19.3% of cases. Comparison of sociodemographic, maternal, infant and delivery-related characteristics between those having no information on full breast-feeding status and those having information was performed. No significant difference between the two groups was evident except for maternal age, gestational age and weight gain during pregnancy. Subjects missing information on full breast-feeding at 1 month were mostly of secondary education, higher gestational age and lower pregnancy weight gain. Nevertheless, the difference between the two groups among the different levels of the three variables had no clinical significance.

Tables 2 and 3 present the bivariate results for the categorical and continuous predictors of full breast-feeding, respectively. Significant predictors for full breast-feeding at 1 and 4 months of infant age were all of the sociodemographic indicators, maternal age, parity, maternal height, mode of delivery, early discharge and sex of the paediatrician. Pregnancy weight gain was significant only at 1 month.

Stepwise regression analysis was performed on all variables that proved significant at the bivariate level. Table 4 shows the final regression models for the predictors of breast-feeding at 1 and 4 months of age. Analysis for the clustering effect of the hospital of delivery was performed; yet no differences in the regression estimates were evident. At 1 month, parity, maternal age and early discharge were the most significant predictors of full breast-feeding. Mothers having one child and mothers having more than two children were respectively two and

three times more likely be breast-feeding their newborn than nulliparous mothers. Mothers aged <25 years were 2.5 times more likely than mothers aged >35 years to be breast-feeding their infant at 1 month. Newborns discharged within 48 h of delivery were twice as likely to be breast-fed at 1 month compared with those discharged later than 48 h. Religion had a borderline significance with breast-feeding at 1 month. Although the paediatrician's sex was retained in the final model at 1 month, the association was not statistically significant. In contrast, at 4 months of age, paediatrician's sex was a significant predictor of breast-feeding whereby women seeking health care from female paediatricians rather than male paediatricians were 1.5 times more likely to remain breast-feeding until 4 months. Maternal employment status also emerged as a specific predictor for the model at 4 months. Non-working mothers were more than two times as likely to continue breast-feeding at 4 months compared with working mothers. Among the other covariates, parity, religion and early discharge remained significant at 4 months, while maternal age was no longer significant. However, religion was a stronger predictor of breast-feeding at 4 months, where the odds of breast-feeding among Muslim mothers were about twice those among Christian mothers.

Discussion

In the present study population, the full breast-feeding rate at 1 month of age was low (56.3%). At 4 months it dropped dramatically and remained very low until the end of the first year of life. When addressing the predictors of full breast-feeding at the multivariate level, early discharge, high parity, being Muslim and young maternal age proved significant predictors at 1 month of age. At 4 months, Muslim and non-working mothers, high parity, early discharge and seeking care from female paediatricians were the significant predictors.

The literature on breast-feeding is ample; yet this is one of the rare studies in the Middle Eastern and Arab region that looks into the predictors of breast-feeding using longitudinal data. Previous studies are mainly of cross-sectional nature and focus on the prevalence of breast-feeding^(20–23) and its predictors at the bivariate level^(24–27). In Lebanon, a recent cross-sectional study revealed comparable prevalence rates to those in the present study (52.4% at 1 month and 23.4% at 4 months), whereas the duration of exclusive breast-feeding was longer among rural mothers and those who attained lower education⁽⁹⁾. Particular to our population, maternal age was significantly associated with breast-feeding. Evidence in the literature provides consistent results of a positive association between breast-feeding duration and maternal age^(8,10–14). Thus the present results are not in agreement with the literature as the odds of full breast-feeding at 1 month in our study increased with a decrease in maternal age. However, a study in Germany reported that the odds

Table 1 Prevalence of breast-feeding in Greater Beirut area, Lebanon, 2001–2002, among the healthy cohort at 1, 4, 6 and 12 months of age

Age	Total no. with complete data on breast-feeding	Breast-fed infants	
		<i>n</i>	%
1 month	1065	600	56.3
4 months	1227	303	24.7
6 months	1213	228	18.8
12 months	1161	78	6.7

Table 2 Categorical predictors of breast-feeding at 1 and 4 months of age in Greater Beirut area, Lebanon, 2001–2002

	Full breast-feeding at 1 month						Full breast-feeding at 4 months					
	No		Yes		OR	95% CI	No		Yes		OR	95% CI
	n	%	n	%			n	%	n	%		
Sociodemographic characteristics												
Maternal education												
Intermediate and below	52	31.5	113	68.5	2.4	1.5, 3.8	101	58.0	73	42.0	3.7	2.2, 6.0
Secondary	42	36.2	74	63.8	2.0	1.2, 3.2	112	73.2	41	26.8	1.9	1.1, 3.2
Technical	51	44.3	64	55.7	1.4	0.9, 2.3	101	77.7	29	22.3	1.5	0.8, 2.6
University (undergraduate)	142	54.2	120	45.8	0.9	0.6, 1.4	269	84.9	48	15.1	0.9	0.5, 1.5
University (graduate)	79	52.7	71	47.3	1.0	—*	147	83.5	29	16.5	1.0	—
Paternal education												
Intermediate and below	53	31.9	113	68.1	2.0	1.3, 3.1	116	64.4	64	35.6	2.9	1.8, 4.7
Secondary	42	35.9	75	64.1	1.7	1.0, 2.7	107	71.3	43	28.7	2.1	1.3, 3.5
Technical	55	58.5	39	41.5	0.7	0.4, 1.1	98	82.4	21	17.6	1.1	0.6, 2.1
University (undergraduate)	125	51.4	118	48.6	0.9	0.6, 1.3	226	79.9	57	20.1	1.3	0.8, 2.1
University (graduate)	89	48.1	96	51.9	1.0	—	180	84.1	34	15.9	1.0	—
Religion												
Muslim	153	35.5	278	64.5	2.4	1.8, 3.1	332	66.9	164	33.1	3.5	2.5, 4.8
Christian	210	56.5	162	43.5	1.0	—	392	87.5	56	12.5	1.0	—
Maternal employment status												
Working	168	55.6	134	44.4	1.0	—	323	88.7	41	11.3	1.0	—
Not working	198	39.1	308	60.9	2.0	1.5, 2.6	407	69.5	179	30.5	3.5	2.4, 5.0
Maternal characteristics												
Maternal age (years)												
<25	59	32.6	122	67.4	2.1	1.3, 3.2	130	65.0	70	35.0	1.8	1.2, 2.9
25–35	245	45.9	289	54.1	1.2	0.8, 1.7	502	79.2	132	20.8	0.9	0.6, 1.3
>35	82	50.0	82	50.0	1.0	—	150	77.3	44	22.7	1.0	—
Parity												
0	215	52.6	194	47.4	1.0	—	399	82.6	84	17.4	1.0	—
1	101	40.2	150	59.8	1.6	1.2, 2.3	222	75.0	74	25.0	1.6	1.1, 2.3
≥2	77	33.6	152	66.4	2.2	1.6, 3.1	167	65.0	90	35.0	2.6	1.8, 3.6
Cigarette smoking during pregnancy												
No	330	45.0	403	55.0	1.1	0.7, 1.8	662	77.0	198	23.0	0.9	0.6, 1.5
Yes	36	48.0	39	52.0	1.0	—	68	75.6	22	24.4	1.0	—
Hookah smoking during pregnancy												
No	345	45.3	416	54.7	1.0	0.5, 1.8	684	76.7	208	23.3	1.2	0.6, 2.2
Yes	21	44.7	26	55.3	1.0	—	46	79.3	12	20.7	1.0	—
Medical/delivery-related characteristics												
Admission status												
Normal	380	44.0	484	56.0	1.2	0.6, 2.5	759	75.3	249	24.7	1.5	0.6, 3.6
Intensive care	14	48.3	15	51.7	1.0	—	27	81.8	6	18.2	1.0	—
Mode of delivery												
Vaginal	259	41.1	371	58.9	1.5	1.1, 2.0	542	74.0	190	26.0	1.4	1.0, 1.9
Caesarean section	138	51.1	132	48.9	1.0	—	253	79.8	64	20.2	1.0	—
Early discharge (<48 h)												
No	319	50.4	314	49.6	1.0	—	601	81.0	141	19.0	1.0	—
Yes	61	27.7	159	72.3	2.6	1.9, 3.7	157	62.1	96	37.9	2.6	1.9, 3.6
Sex of paediatrician												
Male	329	47.1	370	52.9	1.0	—	597	76.8	180	23.2	1.0	—
Female	136	37.2	230	62.8	1.5	1.2, 1.9	252	69.4	111	30.6	1.5	1.1, 1.9
Infant characteristics												
Sex of the baby												
Male	236	42.6	318	57.4	1.1	0.9, 1.4	476	74.6	162	25.4	1.1	0.8, 1.4
Female	229	44.8	282	55.2	1.0	—	448	76.1	141	23.9	1.0	—

*95% CI not calculated (reference category).

of breast-feeding for less than 4 months were 3.53 times higher among young mothers (≤ 25 years) than older women⁽¹⁰⁾.

A positive dose–response relationship between parity and breast-feeding rates was present at both time intervals. Association between breast-feeding and parity is not consistent in the literature^(11,14). The relationship ranges from a negative association in some studies^(15,16) to a

positive association in others^(28,29). In agreement with our study, the odds of exclusively breast-feeding at 4 months in Lande *et al.*'s⁽¹¹⁾ study was two times higher among mothers with three or more children than among mothers with one child. Parity might contribute to higher breast-feeding rates because the mother's breast-feeding experiences from previous pregnancies provide her with more knowledge and self-confidence.

Table 3 Continuous predictors of breast-feeding at 1 and 4 months of age in Greater Beirut area, Lebanon, 2001–2002

	Full breast-feeding at 1 month					Full breast-feeding at 4 months				
	No		Yes		P	No		Yes		P
	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
Maternal characteristics										
Maternal height (cm)	163.8	5.6	162.8	5.7	0.015	163.7	5.8	162.5	5.6	0.008
Weight before pregnancy (kg)	60.2	8.4	60.8	10.0	0.421	60.8	9.4	60.5	9.7	0.727
Weight 6 months after delivery (kg)	62.6	9.7	62.8	10.6	0.870	62.6	10.1	62.5	10.3	0.911
Pregnancy weight gain (kg)	13.9	5.2	12.8	4.9	0.002	13.3	5.1	12.6	4.6	0.068
Infant characteristics										
Birth weight (g)	3287	464	3303	431	0.601	3286	459	3310	420	0.450
Gestational age (weeks)	39.0	1.2	39.1	1.1	0.169	39.0	1.1	39.2	1.1	0.138

Table 4 Stepwise regression model of the predictors of full breast-feeding at 1 and 4 months of age in Greater Beirut area, Lebanon, 2001–2002

	Full breast-feeding at 1 month (n 729)		Full breast-feeding at 4 months (n 828)	
	OR	95% CI	OR	95% CI
Sex of paediatrician				
Male	1.00	—*	1.00	—
Female	1.33	0.95, 1.87	1.49	1.03, 2.15
Parity				
0	1.00	—	1.00	—
1	1.96	1.36, 2.82	1.90	1.23, 2.93
≥2	3.18	2.03, 4.97	2.26	1.40, 3.65
Early discharge				
Yes	2.02	1.35, 3.04	1.68	1.14, 2.48
No	1.00	—	1.00	—
Maternal age (years)				
<25	2.52	1.46, 4.37	1.56	0.86, 2.82
25–5	1.42	0.93, 2.15	0.96	0.60, 1.53
>35	1.00	—	1.00	—
Religion				
Muslim	1.44	1.03, 2.01	1.88	1.27, 2.78
Christian	1.00	—	1.00	—
Maternal employment status				
Working	—	—	1.00	—
Not working	—	—	2.38	1.56, 3.63

*95% CI not calculated (reference category).

With reference to early discharge, the odds of breast-feeding increased among women discharged within 48 h of delivery. Early discharge was a significant factor for both the initiation of breast-feeding at 1 month and its continuation until 4 months of age. Although a number of studies suggest the absence of an association^(30–36), Bussolati *et al.*⁽³⁷⁾ and Margolis and Schwartz⁽³⁸⁾ reported results similar to the present study. This can be attributed to the absence of rooming-in systems in the hospitals, unsupportive practices of health-care staff and the unmonitored promotion of formula milk by sales representatives⁽²⁴⁾.

While religion had borderline significance at 1 month, it was a stronger predictor of breast-feeding at 4 months of age. Religion thus played a significant role in the continuation of breast-feeding until 4 months of age, with Muslim mothers twice as likely to breast-feed compared with Christian women. Similarly, a study noted that Muslim mothers in Kenya breast-feed for the longest durations⁽³⁹⁾. This result can be explained by Islam's encouragement of breast-feeding^(20,25): it is stated in

the Holy Qur'an that 'a mother shall breast-feed her child for two years' (Holy Qur'an 31:14). It is worth mentioning that religiosity, the degree to which a person practices his/her religion, might add further insight to the current data.

Concerning maternal employment status, non-working mothers were significantly more likely to breast-feed until 4 months (OR = 2.38) compared with working mothers. Likewise, housewives in Egypt (1981) breast-fed for longer durations than working mothers⁽²⁴⁾. In Malaysia (1995) as well, higher odds of breast-feeding at 6 weeks were evident among non-working mothers (OR = 1.48)⁽⁴⁰⁾. Evidently, non-working mothers have more time to breast-feed their children than their employed counterparts. This is exacerbated by the short maternity leave in Lebanon (range from 40 days to 2 months). Working mothers usually try to terminate breast-feeding before the end of their maternity leave, especially with the lack of facilities allowing expressing of breast milk at the work place.

A novel finding of the present study was the positive effect of female paediatricians on breast-feeding continuation until 4 months of age. At 1 month of age, the sex of the paediatrician was not significant in the multivariate model after controlling for other variables. However, its significance was evident in the 4 month model, whereby babies visiting female paediatricians had higher breast-feeding rates. Therefore, the sex of paediatrician has no effect on the initiation of breast-feeding but plays an important role in the continuation of breast-feeding. Although no literature is available on the effect of the sex of the physician on breast-feeding, some studies have examined its effect on other outcomes. Similar to our study trend, Lurie *et al.*⁽¹⁸⁾ showed that women consulting female physicians are more likely to have a Pap smear performed and mammography screening tests. They also reported getting more counselling on the use of condoms as a preventive method for sexually transmitted diseases and undesired pregnancies⁽¹⁹⁾. According to a recent review article⁽⁴¹⁾, female doctors are described to 'engage in more active partnership behaviors, positive talk, psychosocial counseling, psychosocial question asking, and emotionally focused talk'. Female physicians also might encourage and support breast-feeding by reflecting on their personal breast-feeding experiences.

The present study has several strengths. Being a prospective cohort study, it was not exposed to recall bias and information on breast-feeding status was available as of the first months of life. The study also accounted for a considerable number of covariates that serve as potential predictors for breast-feeding. The confounding effect of many predictors was thus well contained. The sample size was large (n 1320) and relatively representative of the Greater Beirut area, as the cohort was recruited from the clinics and dispensaries of 117 paediatricians serving communities of different socio-economic status and of different geographic areas in Beirut. The heterogeneity of the sample, as a result of proper recruitment, allows for generalizability of the results to the Greater Beirut area. Moreover, according to the Central Administration for Statistics of the Lebanese Republic, there were 7096 births in total in the Greater Beirut area during the recruitment period (1 August 2001 to 29 February 2002). Since the present study recruited 1320 babies, it was able to capture 18.6% of the total births during that period⁽⁴²⁾.

A limitation of the study was the inability to incorporate solid food intake in the definition of breast-feeding as per the WHO description of 'exclusive breastfeeding'. There was also no measure of breast-feeding status at the hospital of delivery. The breast-feeding status before discharge aids in assessing hospital practices and its effect on future breast-feeding status. Besides the sex of the paediatrician, information on the training, knowledge, duration or experience and qualification of paediatricians would have provided a clearer understanding of the paediatrician's role on breast-feeding.

Conclusions

In Beirut, Lebanon, low breast-feeding rates at 1 and 4 months of infant age have been explained by early discharge, young maternal age and high parity. Breast-feeding continuation up to 4 months of age has been further explained by religion, maternal working status and sex of the paediatrician. Additional research is warranted to investigate the interactions between female physicians and lactating mothers in maintaining breast-feeding in other populations. Our results also constitute the basis for designing interventions targeting policy makers, health professionals, mothers and researchers.

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