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Predictors and consequences of in-hospital formula supplementation for healthy breastfeeding newborns in Hong Kong public hospitals

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Well Established

The health benefits of breastfeeding to both the infant and the mother are dose dependent with a longer duration of exclusive breastfeeding conferring greater benefits. The use of breast milk substitutes is widespread around the world and in-hospital formula supplementation of healthy breastfeeding newborns is detrimental to exclusive breastfeeding.

Newly Expressed

In Hong Kong, hospital practices such as delivery interventions and late initiation of breastfeeding were associated with in-hospital supplementation. Infant formula is introduced soon after birth to many healthy breastfeeding newborns and is unlikely to be medically necessary. Infant formula while in hospital is strongly associated with a shorter duration of breastfeeding but we were unable to demonstrate a dose-response relationship between the amount of infant formula given in hospital and breastfeeding duration.

Abstract

Background: Although exclusive breastfeeding is recommended for the first six months, use of breast milk substitutes is widespread around the world.

Objectives. To describe the patterns of infant formula supplementation among healthy breastfeeding newborns, to identify factors contributing to in-hospital formula supplementation and to assess the dose-response relationship between the amount of in-hospital formula supplementation and the duration of any breastfeeding.

Methods: A sample of 1,246 breastfeeding mother-infant pairs was recruited from four public hospitals in Hong Kong and followed prospectively for 12 months or until weaned. Multiple logistic regression analysis was used to examine factors associated with in-hospital supplementation. Cox regression analysis was used to explore the impact of in-hospital supplementation on breastfeeding duration.

Results: 82.5% of newborns were supplemented in the hospital with one-half receiving formula within 5 hours of birth. Assisted vaginal delivery (OR=2.06, 95% CI 1.03, 4.15), cesarean section (OR=3.45, 95% CI 1.75, 6.80) and higher birth weight (OR=1.56, CI 1.12, 2.18) were positively associated with in-hospital formula supplementation while initiating breastfeeding in the delivery room (OR=0.55, 95% CI 0.33, 0.89) was associated with decreased likelihood of in-hospital supplementation. Any infant formula in the first 48-hours was associated with a shorter duration of breastfeeding (HR=1.51, 95% CI 1.27, 1.80) but there was no dose-response effect.

Conclusions: In-hospital formula supplementation is common in Hong Kong hospitals and appears to be detrimental to breastfeeding duration. Continued efforts should be made to

avoid the provision of infant formula to breastfeeding babies while in hospital unless medically indicated.

Background

Exclusive breastfeeding for the first six months of life and continued breastfeeding for up to two years and beyond have been widely accepted as the gold standard of infant nutrition in both developed and developing countries.[1, 2] Beyond the nutritional benefits of breast milk, the profound immunological benefits are becoming increasingly apparent, as is the influence of breastfeeding on psychosocial outcomes in early childhood.[3-6] Still, the use of breast milk substitutes is widespread around the world, and Hong Kong is no exception.[7-10]

A wide range of factors associated with early weaning have been identified, including socio-demographic characteristics of the mother and her household; pregnancy- and childbirth-related factors; and obstacles to breastfeeding such as early return to work and lack of support for breastfeeding from family, peers and healthcare professionals.[11] Many factors associated with breastfeeding initiation, duration and exclusivity have been identified in Hong Kong, including socioeconomic and sociocultural variables,[12-17] early supplementation[7, 8, 12] and maternal breastfeeding intention.[16, 18, 19] While early formula supplementation has been identified in a number of studies as an independent risk factor for early breastfeeding cessation,[8, 20, 21] surprisingly less is known about the factors underlying the introduction of infant formula to breastfeeding babies in the hospital. Of the few studies that have been done, Kurinji and Shiono[22] found that having a vaginal delivery, early breastfeeding initiation, on-demand feeding, and rooming-in were associated with lower rates of formula supplementation. Gagnon et al.[9] found that intention to exclusively breastfeed, planning to breastfeed for > 3 months, childbirth education, and breastfeeding in the delivery room were also associated with lower rates of supplementation, while giving birth from 7pm to 9am was associated with a higher rate of supplementation. A

more recent study by Biro et al.[23] found that neonates born to primaparous mothers by operative vaginal or cesarean deliveries, and with low or high birth weight had higher rates of formula supplementation. In these studies, rates of formula supplementation of healthy breastfeeding newborns ranged from 23% to 78%.[9, 10, 22, 23] Most of these studies were retrospective studies conducted in North America and none were from Asia. Given the continuing efforts in Hong Kong and elsewhere to improve breastfeeding outcomes, it is important to further describe in-hospital infant feeding patterns and to identify factors associated with supplementation of breastfeeding newborns. Therefore, the objectives of this study were three-fold: to describe the patterns of infant formula supplementation in a prospective cohort of healthy breastfeeding newborns in Hong Kong; to identify factors that contribute to the introduction of infant formula during the post-partum hospital period, and to assess if there is any dose-response relationship between the amount of in-hospital formula supplementation and the duration of breastfeeding.

Methods

Data were collected as part of a multi-center longitudinal prospective cohort study of breastfeeding mothers in Hong Kong.[6]

Participants

In 2006-07, 1,417 mother-infant pairs who gave birth at obstetric units at one of four public hospitals were recruited immediately post-partum. All the mothers were Cantonese-speaking and had lived in Hong Kong for more than a year. They had singleton pregnancies with no major obstetrical or other medical complications and expressed their intention to

breastfeed. Only infants that were at least 37 weeks' gestation were included in the cohort. To meet the inclusion criteria, they had to have a five-minute Apgar score of at least 8, weigh at least 2500 gms and have no severe medical complications or congenital abnormalities. None of the newborns were admitted to the neonatal intensive care unit or spent more than 48 hours in the special care nursery after delivery. In addition, none of the study hospitals were certified as baby-friendly.

Data Collection

Data were extracted from the medical records of both the mother and child, which included detailed information on labor, birth and infant feeding practices, including frequency of breastfeeding and formula supplementation. The mothers also self-completed a questionnaire which elicited not only socio-demographic information, but also information about the mother's previous breastfeeding experience (if applicable), breastfeeding intentions and their husband's infant feeding choice. Follow-up questionnaires were administered by telephone at one, two, three, six, nine and 12 months or until the baby was weaned, at which point the mother completed a weaning questionnaire and was no longer followed up. Participants who were still breastfeeding at 12 months did not complete a weaning questionnaire.

Study Variables

Breastfeeding was defined as exclusive if the infant received only breastmilk and no breastmilk substitutes (with the exception of vitamins or medications) in accordance with the World Health Organization definition.[24] The time of the first breastfeed and the time of

first supplementation were recorded for all participants. Detailed in-hospital infant feeding data were collected for all infants for the first 24 hours. Thereafter, infant feeding data were collected up until the time of hospital discharge or 48 hours postpartum, whichever came first. Therefore, if the infant was discharged before 48 hours but had not received any infant formula or other liquids up to that point, they were defined as exclusively breastfed. In the study hospitals, the usual length of stay for a vaginal delivery is 48 hours and for a cesarean delivery is 72 hours.

In the first 24 hours, infants who were non-exclusively breastfeeding were categorized according to the number of breastfeeds as a proportion of total feeds received: high partial (>80% to <100% breastmilk), medium partial (>20 to ≤80% breastmilk), low partial (>0% to ≤20% breastmilk) and full formula feeding (0% breastmilk).[25, 26] In the second 24 hours, infants were categorized as exclusively breastfed, partially breastfed, or not breastfed. Finally, for the first 48 hours of their hospital stay, infants were categorized as either having been exclusively breastfed or non-exclusively breastfed. Duration of breastfeeding was defined as the total duration in weeks that the infant received any breastmilk.

Data Analysis

Descriptive statistics were used to describe the participants' socio-demographic profile, breastfeeding and supplementation practices in the first 24 and 48 hours of life and total duration of any breastfeeding. Logistic regression was used to compute the crude odds ratios (ORs) of the association between demographic and perinatal variables and formula supplementation in the first 48 hours after birth. Variables with a significance of <.05 in the

bivariable analysis were entered into a multivariable model to determine the independent impact of the various demographic and perinatal variables on formula supplementation

To examine the time to cessation of any breastfeeding among participants receiving different amounts of infant formula in the first 24 and 48 hours, we constructed Kaplan-Meier survival curves and compared them using the log-rank test.[27] To examine the independent association between any in-hospital formula supplementation and the duration of breastfeeding, we performed a multivariable Cox regression. In the multivariable model we adjusted for key sociodemographic variables (maternal age, education, family income, previous breastfeeding experience, planning to exclusively breastfeed, husband's feeding preference and returning to work postpartum) that have been shown in previous studies to significantly affect breastfeeding duration in this population.[7, 12]

All data analysis was conducted using Stata version 11.2 statistical software (Stata Corp, College Station, Tx)[28] and the 0.05 level of significance was used throughout the statistical analysis. Ethical approval for the data collection was obtained from the Institutional Review Board of the Li Ka Shing Faculty of Medicine, University of Hong Kong and from the four hospitals where the data collection was conducted. All participants gave informed written consent.

Results

Of the original cohort of 1417 mother-infant pairs, 1246 were included in this analysis. After initial recruitment, 97 participants (6.8%) were excluded, including 87 completely lost to follow-up after discharge, eight with exclusion criteria and two lacking demographic

data. A further 74 (5.2%) participants were excluded due to missing data relevant to this analysis.

The in-hospital proportion of breastfeeding in the first 24 and 48 hours of life is shown in Figure 1. Of those infants non-exclusively breastfed in the first 24 hours, 22.1%, 67.2%, and 9.8% were classified as high, medium and low partial breastfeeding, respectively. By 48 hours after birth, 82.5% of healthy breastfeeding newborns had been supplemented with infant formula. The time to first supplementation is presented in Figure 2. By five hours post-partum, one-half of the infants had been supplemented. In addition, only 28.7% (n=357) of the infants were breastfed within the first hour after birth; it took three hours for one-half of the infants to be breastfed for the first time.

The unadjusted associations between sociodemographic and perinatal variables and formula supplementation are presented in Table 1. Higher maternal education, previous breastfeeding experience, intention to exclusively breastfeed, early breastfeeding initiation in the delivery room, and rooming-in were all inversely associated with infant formula supplementation. The father's preference for formula or mixed feeding, higher birth weight (≥3250 grams) and intrapartum interventions such as induction of labor, epidural administration, instrumental vaginal delivery and cesarean section and were all strongly and positively associated with in-hospital formula supplementation. Over 95% of infants born by cesarean section (239 out of 250) received formula supplements (χ^2 =43.8, p<0.001) by 48 hours postpartum.

In the multivariable model, instrumental vaginal delivery (OR=2.06; 95% CI 1.12, 4.15), cesarean section (OR=3.45; 95% CI 1.75, 6.80), and birth weight ≥3250 grams (OR=1.56; 95% CI 1.12, 2.18) remained strongly associated with formula supplementation

while initiating breastfeeding in the delivery room (OR=0.55; 95% CI 0.33, 0.89), was associated with lower odds of supplementation. In addition, higher maternal education, previous breastfeeding experience, and planning to exclusively breastfeed were associated with lower odds of the infant receiving formula.

Figure 3 shows the dose-response effect of the amount of formula supplementation in the first 24 hours (measured inversely by the amount of breastfeeding) on the duration of breastfeeding. Participants who were exclusively breastfed in the first 24 hours of life had an overall longer duration of breastfeeding than those whose infants received any amount of infant formula (p<.001). However, there were no statistically significant differences in the duration of breastfeeding among the four non-exclusively breastfed groups (p=.78). The risk of breastfeeding cessation was significantly higher among those who received any amount of infant formula in the first 48 hours of life (HR=1.67; 95% CI 1.42, 1.98) (Figure 4). Even after controlling for key sociodemographic variables, infants who were supplemented while in hospital were more likely to wean than those who left hospital exclusively breastfeeding (HR=1.51, 95% CI 1.27, 1.80).

Discussion

To our knowledge, this is the first prospective study to report on both the predictors and consequences of in-hospital infant formula supplementation of breastfeeding newborns. We found very high rates of formula supplementation with 82.5% of newborns receiving formula within the first 48 hours of life. Assisted vaginal and cesarean deliveries and higher birth weight were strongly associated with supplementation. The introduction of infant

formula during the postpartum stay was also significantly associated with a shorter duration of breastfeeding.

The rate of formula supplementation of newborns reported here is substantially higher than those reported in other studies[9, 10, 22, 23] and the time to the introduction of infant formula strongly suggests that most infant formula was introduced for non-medical reasons. At the same time, only a small proportion of infants were breastfed within one hour of birth, despite the fact that early initiation of breastfeeding is a well-recognized step to support the successful establishment of breastfeeding.[29] By the 24-hour mark, more than 12.9% of breastfeeding newborns still had not been breastfed at all. In Hong Kong, there is a high prevalence of infant formula supplementation of breastfed babies across the first year of life with less than one-half of all breastfeeding mothers doing so exclusively.[7] Supplementation with infant formula before 1 month of age has been shown to be a strong predictor of breastfeeding cessation.[7, 30] Delayed initiation of breastfeeding along with the early and frequent introduction of infant formula appears to set new mothers on a path of continued supplementation and early weaning.

In this study a number of different factors were associated with formula supplementation, suggesting different avenues for intervening to reduce unnecessary and non-medically indicated formula supplementation of healthy breastfeeding newborns. Hospital practices and delivery factors were strongly associated with the introduction of infant formula. After controlling for other variables, cesarean section and assisted vaginal delivery remained significantly associated with formula supplementation. Participants in this study who underwent cesarean section (either scheduled or emergency) had more than a three-fold increase in the odds of formula supplementation and only a small number

of infants who were born by cesarean section did not receive infant formula. Studies have repeatedly shown that delivery complications, in particular cesarean section, are associated with an increased risk of infant formula supplementation by delaying the initiation of breastfeeding and increasing the separation of the mother and infant in the immediate postpartum period.[31-34] Pain medications used during surgery, intravenous catheters, and abdominal incisions all make finding a comfortable breastfeeding position more difficult.[35] There may also be a perception by nursing staff that mothers need to rest after surgery, and infants born by cesarean section may be separated from their mothers for more intensive observation than their vaginal-born counterparts, making it more difficult to establish early skin-to-skin contact.

Conversely, baby-friendly hospital practices such as early initiation of breastfeeding in the delivery room and rooming-in were associated with lower odds of formula supplementation. Participants who initiated breastfeeding in the delivery room were almost half as likely to receive infant formula compared with those who did not breastfeed in the delivery room. Unfortunately, the timely initiation of breastfeeding within the first hour after delivery occurred for only a minority of the infants in the cohort. Studies show a clear association between baby-friendly hospital practices and both in-hospital breastfeeding rates[36-38] and longer-term breastfeeding outcomes.[8, 39-41] Unfortunately, none of the study hospitals and no hospital in Hong Kong have yet received the Baby-friendly designation. Furthermore, data for this study were collected when public hospitals in Hong Kong were still receiving free infant formula from the formula manufacturers. Infant formula was provided to the study hospitals by formula manufacturers in ready-to-serve containers for easy distribution to mothers and infants during the hospital period. The

infant formula policy was changed in April 2010 and all public hospitals in Hong Kong now pay market price for infant formula in accordance with World Health Organization guidelines.[42]

Study data also show that maternal characteristics such as higher maternal education, previous breastfeeding experience and intention to exclusively breastfeed were all associated with lower rates of in-hospital formula supplementation. Antenatal education has contributed to the substantial increase in breastfeeding initiation in Hong Kong over the past two decades. Initiation rates have increased from a low of 5% in 1984 to over 80% in 2011.[43, 44] Because study results suggest that the mother's intent to exclusively breastfed has a strong inverse association with in-hospital formula supplementation, the focus of antenatal education should also include the promotion of exclusive breastfeeding. The benefits of breastfeeding to both the mother and child are highly dose-dependent with longer period of exclusive breastfeeding conferring greater benefits.[45] Study results also suggest that it is important to include the husband in breastfeeding education in both the antenatal and early postpartum period, as the husband's infant feeding preference was also associated with in-hospital formula supplementation.

All mothers in this study intended to breastfeed with most intending to do so exclusively. Breastfeeding, however, is often perceived as a "deluxe" or "premium" infant feeding method and infant formula is often viewed as the "normal" method.[46] Thus, when problems arise, mothers may feel some guilt over not being able to breastfeed[47] but largely do not perceive that they are harming their babies by providing infant formula. In addition, health professionals are reluctant to inform new mothers about the risks associated with infant formula feeding for fear of making mothers feel guilty. Infant formula, however, does

carry health risks for infants and new mothers need to be more fully informed of these risks.[1]

Data analysis showed that supplemented infants are substantially less likely at any time point to be breastfed vs. their exclusively breastfed counterparts. The lack of a dose-response effect between the amounts of infant formula received early in the post-partum period and the duration of breastfeeding suggests that there isn't any threshold below which formula supplementation can be considered safe and just one bottle of infant formula while in hospital is enough to irreparably interfere with the course of breastfeeding. Thus, protecting infants from exposure to formula in hospital could go a long way towards improving early breastfeeding success and subsequent breastfeeding duration, a finding that has been observed in earlier studies.[48-50] While some researchers had suggested early infant formula supplementation to be a marker of poor breastfeeding rather than the cause,[51] the findings that formula was introduced to some infants as early as 30 minutes after birth and that over one-half of the babies had received formula by 5 hours post-partum, strongly suggests that it is being given more liberally than can be justified by medical or breastfeeding problems.

This is the first study to examine factors associated with in-hospital supplementation in a large cohort of Hong Kong infants and one of the first prospective longitudinal studies on this topic. Participant dropout was low, and breastfeeding follow-up data were gathered on 87.9 percent of the sample. In addition, data on infant formula supplementation were collected directly from the client record, thus minimizing maternal recall bias. Direct recording of infant formula feedings has been shown to be more accurate than other

methods of recording in-hospital formula supplementation.[52]

Although the locations of the four study sites were geographically widespread, the cohort was not a population-based sample. Participation in the study was voluntary so it is possible that mothers more positively pre-disposed towards breastfeeding were more likely to agree to participate, which may indicate that the actual problem is even worse that what is suggested by our findings. However, the breastfeeding duration and exclusive breastfeeding duration rates of the cohort are similar to those reported by the Department of Health at the time the data were collected.[53] Also, since the participants were recruited exclusively from public hospitals, they may not be representative of the community as a whole. Rooming-in and breastfeeding on-demand are not standard practice in most private hospitals in Hong Kong and the cesarean section rate is substantially higher in private hospitals.[54] In addition, we only collected in-hospital infant feeding data for the first 48 hours of the hospital stay. For participants whose hospital stay was longer than 48 hours, in particular those participants who underwent cesarean section, our data may not reflect all of the infant formula that was received while in the hospital. All of these factors may indicate an under-reporting the problem of in-hospital infant formula supplementation in Hong Kong and may be why we were unable to demonstrate a dose-response effect between the amount of infant formula received and the duration of breastfeeding.

Furthermore, follow-up data collection relied on maternal recall, which may or may not accurately reflect actual infant feeding patterns. However, other research has shown that maternal recall of breastfeeding duration is accurate up to three years after birth in other studies.[55] Finally, we were not able to accurately assess the reasons for formula supplementation and did not assess the breastfeeding problems experienced by the

participants while in the hospital. Thus, we cannot say for certainty that infant formula was introduced for non-medical reasons. However, the timing of the introduction of infant formula among a cohort of healthy full-term infants strongly suggests that the majority of infant formula was introduced as a routine practice rather than medically indicated.

Conclusion

Despite the fact that breastfeeding initiation rates have steadily improved in Hong Kong, the exclusivity and duration of breastfeeding is suboptimal and is likely severely hampered by widespread in-hospital formula supplementation of healthy breastfeeding newborns. Further research is necessary to clarify reasons for infant formula supplementation of healthy breastfeeding newborns and to develop effective interventions to minimize the amount of formula that is provided by hospital staff. The lack of timely initiation of breastfeeding also leaves new mothers vulnerable to difficulties with breastfeeding initiation and the successful establishment of breastfeeding. Early in-hospital formula supplementation disrupts the normal course of establishing breastfeeding, and as a result the majority of infants are already on a pathway toward mixed feeding and early weaning by the time they are discharged from hospital.

Conflict of Interest

The authors declare that no conflicts of interest exist.

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Table 1. Unadjusted ORs for in-hospital infant formula supplementation by mother-infant and perinatal characteristics

Characteristic	Total N=1,246 N (%)	Formula Supplementation in First 48 hours	
		OR	(95% CI)
Age of mother (years)			
18–24	85 (6.7)	1.31	(0.66, 2.58)
25–29	285 (22.9)	1.21	(0.78, 1.88)
30–34	571 (45.8)	0.91	(0.64, 1.31)
≥35	305 (24.5)	1	--
Highest level of maternal education			
Compulsory secondary[a]	294 (23.6)	1.19	(0.79, 1.80)
Upper secondary	469 (37.6)	1	--
University degree or above	483 (38.8)	0.68	(0.49, 0.95)
Monthly family income (HKD)[b]			
<$15,000	277 (22.2)	0.98	(0.64, 1.49)
$15,000–$29,999	419 (33.6)	1	--
≥$30,000	550 (44.1)	0.71	(0.50, 1.00)
Previous breastfeeding experience			
No	829 (66.5)	1	--
Yes	417 (33.5)	0.59	(0.44, 0.80)
Mother planning to exclusively breastfeed			
No	448 (36.0)	1	--
Yes	798 (64.0)	0.37	(0.26, 0.52)
Husband feeding preference			
Breastfeeding	774 (62.1)	1	
Infant formula or mixed	239 (19.2)	2.17	(1.39, 3.38)
No preference	233 (18.7)	1.79	(1.18, 2.73)
Induction of labour			
No	806 (64.7)	1	--
Yes	440 (35.3)	1.72	(1.24, 2.40)
Epidural during labour			
No	1,105 (88.7)	1	--
Yes	141 (11.3)	2.24	(1.24, 4.05)
Delivery type			
Spontaneous vaginal delivery	899 (72.2)	1	--
Assisted vaginal delivery	97 (7.8)	2.17	(1.14, 4.16)
Planned cesarean section	109 (8.8)	5.80	(2.33, 14.4)
Emergency cesarean section	141 (11.3)	6.27	(2.72, 14.4)
Delivery time (hours)[c]			
0000–0759	330 (26.6)	0.76	(0.53, 1.09)
0800–1559	509 (41.0)	1	--
1600–2359	404 (32.5)	1.01	(0.71, 1.44)
Birth weight (grams)			
<2750	114 (9.2)	1.26	(0.75, 2.12)
2750 – <3250	596 (47.8)	1	--

Table 1. Unadjusted ORs for in-hospital infant formula supplementation by mother-infant and perinatal characteristics

Characteristic	Total N=1,246 N (%)	Formula Supplementation in First 48 hours	
		OR	(95% CI)
3250 – <3750	441 (35.4)	1.61	(1.15, 2.24)
≥3750	95 (7.6)	2.56	(1.25, 5.23)
Breastfed within 1 hour			
No	889 (71.4)	1	
Yes	357 (28.7)	0.27	(0.20, 0.36)
Breastfed in delivery room			
No	832 (66.8)	1	
Yes	414 (33.2)	0.25	(0.19, 0.34)
Baby rooming-in			
No	431 (34.6)	1	--
Yes	815 (65.4)	0.54	(0.38, 0.75)
Breastfeeding on demand			
No	298 (23.9)	1	--
Yes	948 (76.1)	0.72	(0.50, 1.04)

[a] Compulsory secondary education is to Form 3 or Grade 9.
[b] 1 USD = 7.78 HKD
[c] Some missing values

Table 2. Adjusted odds ratios for factors associated with in-hospital formula supplementation

	Formula Supplementation in First 48 hours	
Charactyeristic	aOR	(95% CI)
Mother had university degree		
No	1	
Yes	0.71	(0.51, 0.98)
Previous breastfeeding experience		
No	1	
Yes	0.69	(0.50, 0.97)
Planning to exclusively breastfeed		
No	1	
Yes	0.41	(0.27, 0.62)
Husband's feeding preference		
Breastfeeding	1	
Infant formula or mixed	1.35	(0.82, 2.25)
No preference	1.41	(0.89, 2.23)
Induction of labor		
No	1	
Yes	1.22	(0.84, 1.77)
Epidural during labor		
No	1	
Yes	1.50	(0.77, 2.90)
Mode of delivery		
Assisted vaginal	2.06	(1.03, 4.15)
Cesarean	3.45	(1.75, 6.80)
Birth weight ≥3250 grams		
No	1	
Yes	1.56	(1.12, 2.18)
Breastfed ≤1 hour of birth		
No	1	
Yes	0.63	(0.40, 1.01)
Breastfed in delivery room		
No	1	
Yes	0.55	(0.33, 0.89)
Newborn rooming-in		
No	1	
Yes	0.69	(0.47, 1.01)

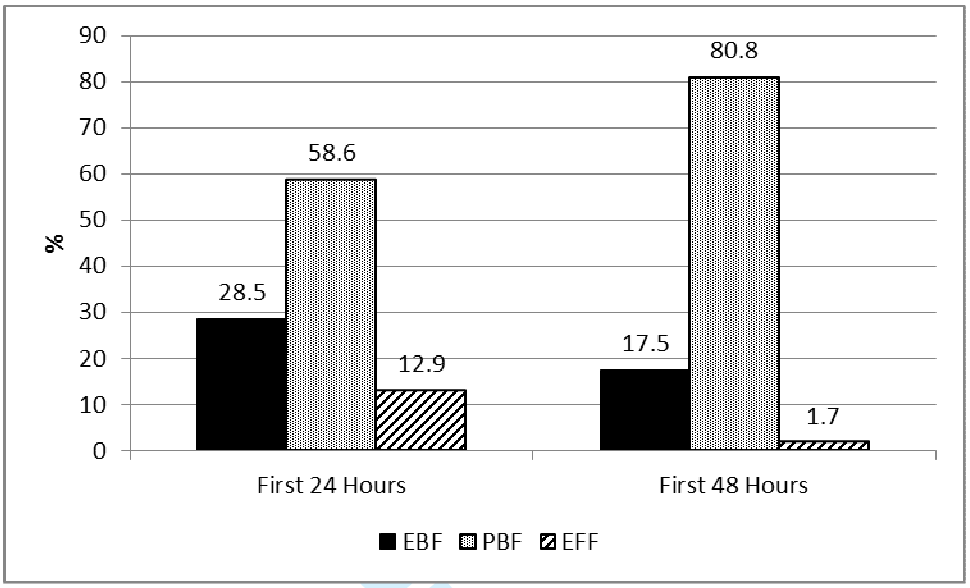

Figure 1. In-hospital proportion of breastfeeding in the first 24 and 48 hours of life

EBF, exclusive breastfeeding; PBF, partial breastfeeding; EFF, exclusive formula feeding

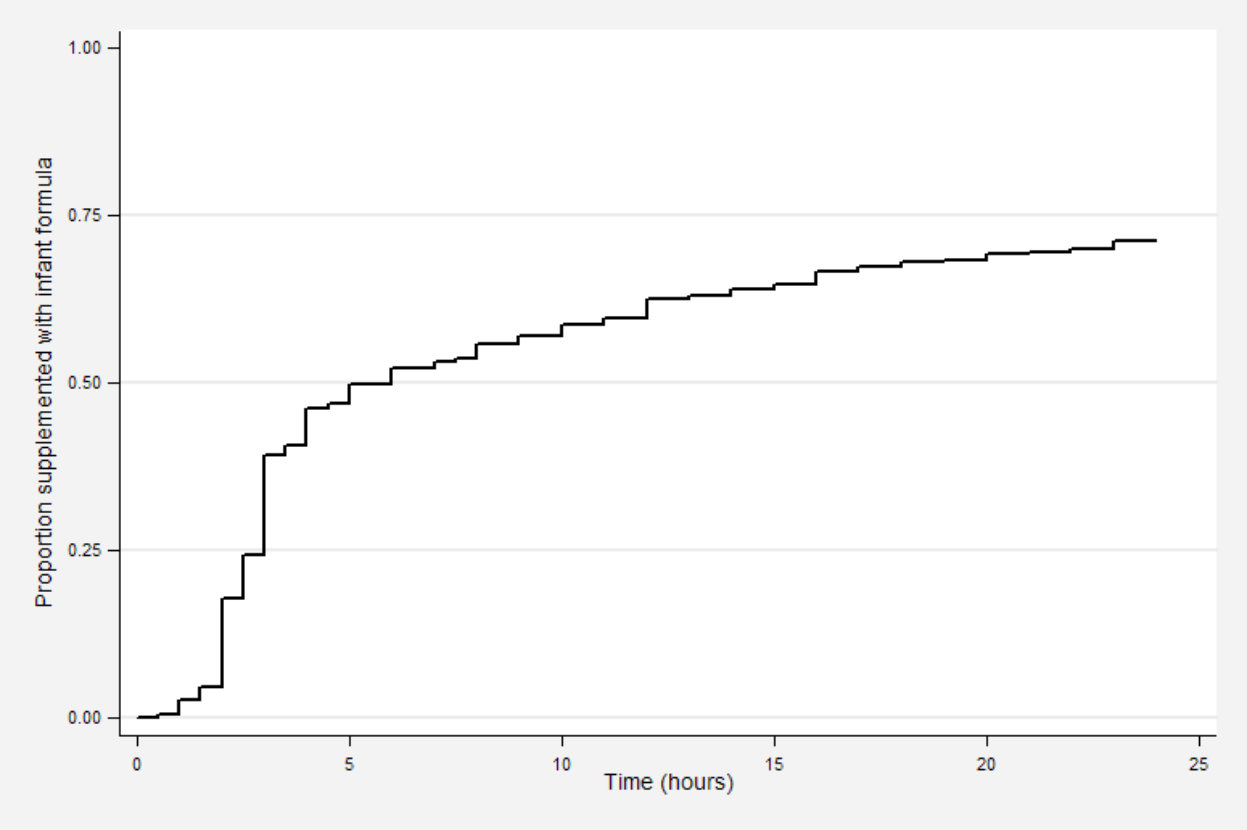

Figure 2. Time to first infant formula supplementation

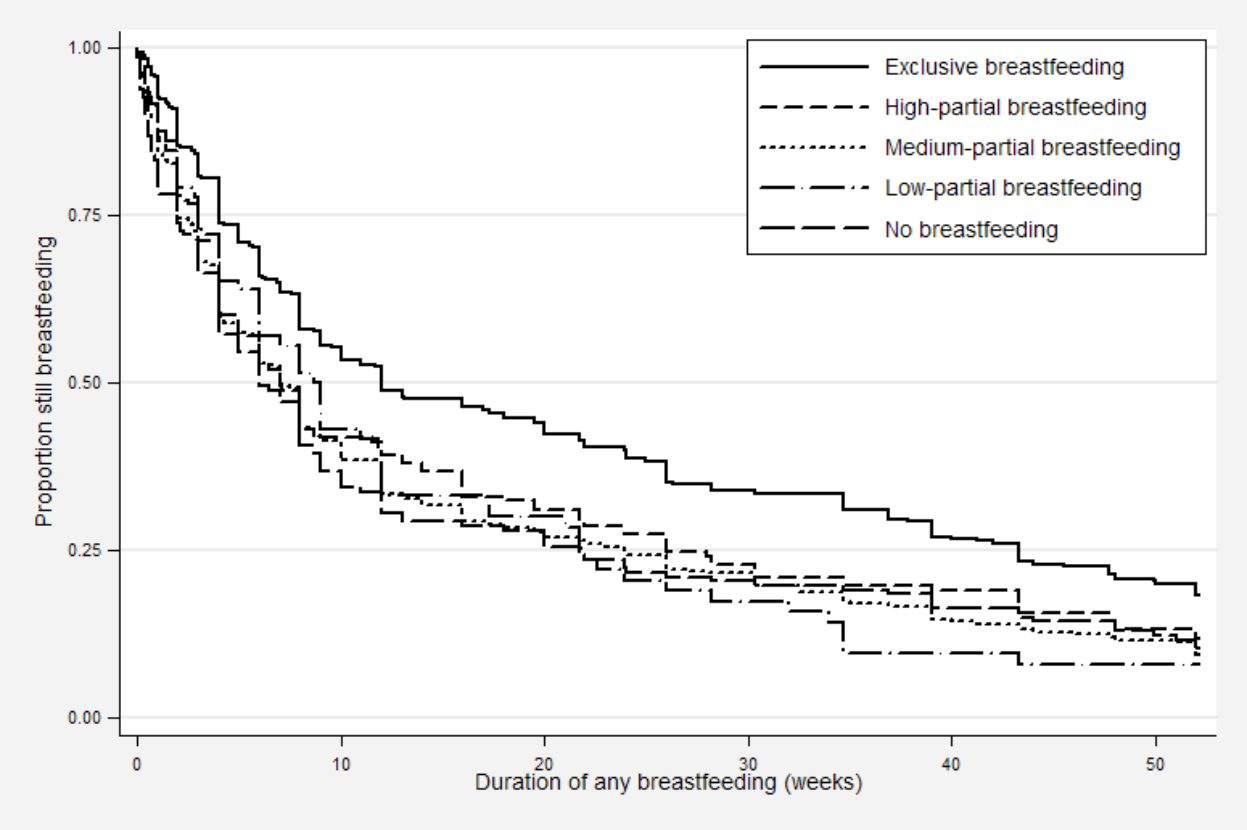

Figure 3. Duration of any breastfeeding by amount of in-hospital breastfeeding and formula supplementation in first 24 hours of life

Exclusive breastfeeding (%100 breast milk); high partial breastfeeding (>80% to <100% breastmilk); medium partial breastfeeding (>20 to ≤80% breastmilk); low partial breastfeeding (>0% to ≤20% breastmilk); and no breastfeeding (0% breastmilk).

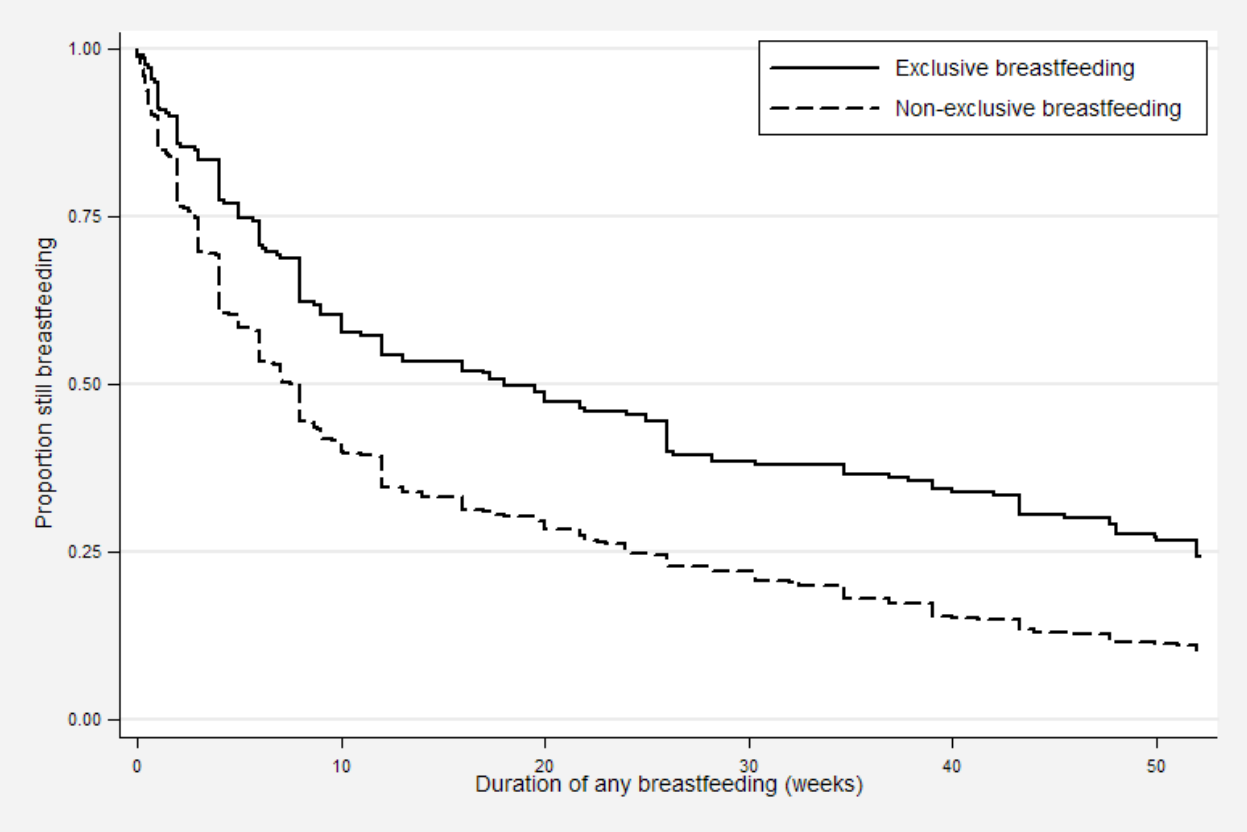

Figure 4. Duration of any breastfeeding of infants who were and were not exclusively breastfed in the first 48 hours of life.