

Factors affecting exclusive breastfeeding in term infants

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Abstract

Background Exclusive breastfeeding by healthy mothers to their healthy, term babies who underwent vaginal birth, should be readily accomplished. However, exclusive breastfeeding by Indonesian mothers has declined.

Objective To assess the monthly success rate prevalences for exclusive breastfeeding for the first 6 months of life, as well as factors that affect exclusive breastfeeding.

Methods A prospective cohort study was conducted in 243 healthy mothers with healthy term babies who underwent normal births at Cipto Mangunkusumo Hospital (CMH), Jakarta, Indonesia. Guided interviews were conducted monthly for six months. Bivariate and multivariate analyses were performed on the factors potentially affecting breastfeeding with equal subject numbers.

Results Exclusive breastfeeding prevalences were 64.8% (first month), 53.7% (second month), 43% (third month), 30.7% (fourth month), 23.5% (fifth month), and 22.3% (sixth month). Multivariate analysis revealed that the mother's confidence in breast milk production, as well as husband or family support, affected the success of exclusive breastfeeding for each month. Maternal not working/studying outside the home affected the success of exclusive breastfeeding in the third (RR 3.38; 95%CI 1.21 to 9.43) and fourth months (RR 6.56; 95%CI 1.39 to 30.99).

Conclusion Exclusive breastfeeding prevalences in Cipto Mangunkusumo Hospital decrease in a monthly fashion up to the sixth month. Several factors affect the success rate for each month in the six month period, including maternal confidence in breast milk production and family support. [Paediatr Indones. 2018;58:25-35; doi: <http://dx.doi.org/10.14238/pi58.1.2018.25-35>].

Keywords: exclusive breastfeeding; prevalence

Breast milk is the most suitable nutritional source for an infant's needs up to the first 6 months of life. The benefits of breastfeeding are well known and include optimized infant growth and reduced death rates.^{1,2} Healthy mothers and their healthy term babies who underwent vaginal births should not encounter many problems in exclusive breastfeeding. However, exclusive breastfeeding in Indonesia, according to the *Survei Demografi dan Kesehatan Indonesia (SDKI)* or *Demographic Survey and Indonesian Health Data* in 2007, was reported to be 43.9% in the first hour of life, 40.6% in infants up to four months old, and 32.4% in babies up to 6 months old.³ The *Data Riset Kesehatan Dasar (RISKESDAS)* or *Basic Health Research Data* in 2010 by the Ministry of Health noted decreases to 29.3% in exclusive breastfeeding in the first hour of life, to 25.2% in infants up to 4 months old, and to 15.3% in infants up to 6 months old.⁴ The decline in exclusive breastfeeding may be due to many factors,

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as reported by previous studies in developed and developing countries, such as care in the hospital or at home.⁵⁻⁹ Studies on the success of exclusive breastfeeding have shown inconsistent results on the factors that affect breastfeeding in developed and developing countries.

In Indonesia, there have been few studies with a prospective design and monthly monitoring for 6 months on the factors that affect exclusive breastfeeding. As such, we aimed to assess the incidence rate and the factors affecting the success of exclusive breastfeeding monthly for 6 months, in healthy babies who underwent normal births at Cipto Mangunkusumo Hospital, the main referral hospital in Indonesia's health care system.

Methods

This study was a prospective, analytical, cohort study with an internal comparison group to evaluate the potential risk factors contributing to successful exclusive breastfeeding monthly for the first 6 months of life. The factors assessed were maternal educational level, early initiation, rooming-in care, education on breastfeeding techniques and benefits, avoiding early usage of feeding bottles, maternal psychological factors (confidence in breast milk production, husband/family support, as well as not having stress, confusion, fear, or post-natal depression), maternal work or studying outside the home, maternal physical factors (not sick or tired, not using contraceptives, not having an anatomical breast problem, breast engorgement, or cracked nipples), and indifference to formula milk promotions.

Subjects were recruited from the delivery ward of the Department of Obstetrics and Gynecology, Cipto Mangunkusumo Hospital, at the University of Indonesia Medical School, from December 2010 until June 2011 by consecutive sampling. The subjects were healthy mothers who gave normal per vaginam birth to term infants in Cipto Mangunkusumo Hospital. Their infants were considered to be healthy. We excluded infants with congenital malformations which prevented them from breastfeeding well, such as labiopalatognathosis, as well as infants with congenital heart disease, metabolic disease (as they were unable to receive breast milk, such

as galactosemia, maple syrup urine disease, and phenylketonuria), twin infants, and mothers with human immunodeficiency virus (HIV).

Early subject samplings were conducted at the CMH rooming-in ward. Data acquisition then was conducted at the Growth and Development Clinic, Department of Child Health, University of Indonesia Medical School/Cipto Mangunkusumo Hospital, by phone calls and monthly house visits, using guided interviews with a research questionnaire. The questionnaire had been tested previously in Child Health Department CMH.

Exclusive breastfeeding was defined as the feeding of breast milk only, without other liquids such as formula, orange juice, tea, honey, or plain water, as well as without additional food, such as banana, biscuits, or porridge, though administration of vitamins, minerals, and medicines were allowed.¹ Early initiation was defined as the opportunity given to newborns to find the mother's breast and breastfeed. Early initiation was done as soon as possible after the birth. The infant was placed on the mother's chest with skin-to-skin contact. Early feeding may have included the use of nipples or milk bottles to administer breast milk or formula after the birth prior to 72 hours after the birth. Maternal working or attending school was defined as working or studying outside the home for more than 6 hours per day. Prevalences of infants who received exclusive breastfeeding every month were calculated based on subjects who stayed in the study until the end of that month. Subjects who dropped out were not included in the calculation for that month.

Variable analysis was done monthly for 6 months. Variables were analyzed using Chi-square hypothetical test to obtain P values, RR, and 95%CI for each month in the 6 months. Based on RR value, we calculated the population attributable risk (PAR) to evaluate the effect on the population if a certain factor was dismissed. For variables with insufficient sample sizes, results are given in a descriptive manner with text and tables.

The second analysis was multivariate logistic regression test. This analysis was used to assess factors that most affected the success of exclusive breastfeeding in each month for 6 months. The study protocol was approved by the Medical Research Ethics Committee of the University of Indonesia.

Results

The subjects' characteristics at the beginning of the study are shown in **Table 1**. The mean age of maternal subjects was 29.25 (SD 6.04) years, with the youngest and oldest aged 15 and 46 years, respectively. The mean infant birth weight was 3,041 (SD 3,520) grams.

Table 1. Subjects' characteristics

Characteristics	N=243
Maternal educational level, n (%)	
Low	75 (31)
High	168 (69)
Working mothers, n (%)	70 (29)
Infant gender, n (%)	126 (52)
Male	
Parity, n (%)	
Primipara	108 (44)
Multipara	135 (56)
Number of children, n (%)	
1	108 (44)
2	82 (34)
3	34 (14)
>4	19 (8)
Early initiation of breastfeeding, n (%)	97 (40)
Rooming-in, n (%)	241 (99)
Breastfeeding education, n (%)	136 (56)
Bottle use at hospital	6 (3)

The number of babies who received consistent, exclusive breastfeeding decreased in a monthly fashion for the 6 months studied. The largest decline occurred between the third and fourth months (29%). This declining trend is shown in **Figure 1**.

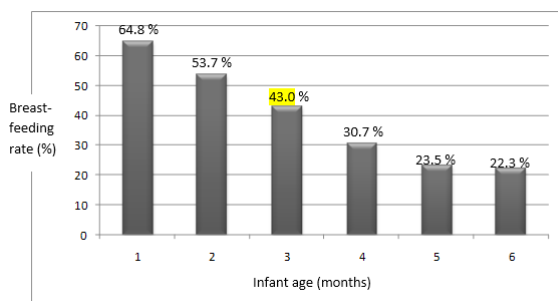


Figure 1. Prevalences of exclusive breastfeeding in months 1 - 6

Analysis of the factors potentially affecting the success of exclusive breastfeeding was done longitudinally for 6 months, revealing statistical and clinical differences. Complete explanations are presented in **Tables 2** and **Table 3**. Confidence in breast milk production and support from husband or family affecting the success of exclusive breastfeeding until 6 months. In population, if mothers was not confidence with her breast milk production and there was not support from her husband or family, exclusive breastfeeding will not accomplished 73-98%. Early initiation and stressed correlated with exclusive breastfeeding for 2 and 3 months, respectively. Not working or studying outside the home had affected the success of exclusive breastfeeding since 3rd months. A description of factors which affected the success of exclusive breastfeeding are shown in **Table 4**. More than 50% subjects were giving exclusive breastfeeding until 2nd months who were rooming in, avoided using milk bottle at hospital, not working/studying outside the home, not sicked/tired, not having inverted/flat nipple, and not interested in formula company promotion.

Multivariate analysis was conducted as a logistic binary regression with backward LR method. The analyses were done monthly for 6 months on factors which had P values <0.25, based on the bivariate analysis. Multivariate analysis results for the six months are shown in **Table 5**.

Discussion

The advantage of this study is that the "exclusive breastfeeding" and "non-exclusive breastfeeding" groups are from the same population and received similar observations with similar procedures. The observation on the success of exclusive breastfeeding and its influencing factors was performed monthly for 6 months, in order to limit recall bias. The questionnaire had been tested prior to the study, with the hope of increasing the reliability and validity of the study. Studies on factors affecting exclusive breastfeeding in term infants have been limited. Furthermore, there has never been such a study undertaken in Indonesia.

The main obstacle in our study was the difficulty of subject recruitment related to the ongoing renovation process at Cipto Mangunkusumo Hospital

Table 2. Statistical analysis results of factors affecting the success of exclusive breastfeeding

Variables	First month (n=239)			Second month (n=227)			Third month (n=216)		
	n (%)	PAR (%)	P value	n (%)	PAR (%)	P value	n (%)	PAR (%)	P value
High educational level	119 (67)	26	0.193	91 (55)	8	0.707	67 (42)	NA	0.750
Early initiation	74 (76)	37	0.002	57 (63)	25	0.028	39 (46)	39	0.499
Breastfeeding education	83 (62)	NA	0.287	65 (51)	NA	0.309	48 (40)	NA	0.257
Not working/ studying outside the home	-	-	-	-	-	-	87 (51)	81	0.001
Confidence in breast milk production	143 (82)	93	0.001	120 (70)	98	0.001	89 (60)	94	0.001
Support from husband or family	111 (82)	73	0.001	94 (75)	79	0.001	73 (60)	72	0.001
Not Stressed	136 (72)	71	0.001	110 (75)	67	0.001	85 (49)	70	0.001
Not using contraceptives	109 (63)	NA	0.442	42 (50)	NA	0.386	30 (45)	3	0.723
No cracked nipple/breast engorgement	89 (66)	8.7	0.567						

Variables	Fourth month (n=208)			Fifth month (n=204)			Sixth month (n=201)		
	n (%)	PAR (%)	P value	n (%)	PAR (%)	P value	n (%)	PAR (%)	P value
High educational level	47 (31)	4.4	0.856	36 (24)	9.4	0.726	33 (23)	3.5	1.000
Early initiation	28 (35)	11.5	0.343	21(27)	11	1.31	20 (26)	12	0.378
Breastfeeding education	34 (29)	NA	0.484	26 (22)	NA	0.610	25 (22)	NA	0.858
Not working/ studying outside the home	62 (39)	91	0.001	46 (30)	87	0.001	43 (28)	86	0.001
Confidence in breast milk production	63 (46)	98	0.001	47 (36)	96	0.001	44 (36)	96	0.001
Support from husband or family	58 (48)	87	0.001	45 (38)	90.3	0.001	44 (37)	97	0.001
Not Stressed	-	-	-	-	-	-	-	-	-
Not using contraceptives	15 (25)	NA	0.251	11 (19)	NA	0.69	10 (18)	NA	0.338
No cracked nipple/breast engorgement	-	-	-	-	-	-	-	-	-

NA=not available; (-)=descriptive analysis; PAR=population at risk

Table 3. Bivariate analysis result of factors which affect the success of exclusive breastfeeding

Variables	Fisrt month		Second month		Third month	
	RR	95%CI	RR	95%CI	RR	95%CI
High educational level	1.48	0.82 to 2.68	1.12	0.62 to 2.02	0.91	0.50 to 1.66
Early initiation	2.42	1.37 to 4.30	1.83	1.07 to 3.15	1.21	0.7 to 2.10
Breastfeeding education	0.75	0.44 to 1.28	0.76	0.45 to 1.29	0.73	0.42 to 1.26
Not working/ studying outside the home	-	-	-	-	6.48	2.61 to 16.13
Confidence in breast milk production	19.37	9.28 to 40.40	63.53	14.92 to 270.53	23.36	8.08 to 67.59
Support from husband or family	5.95	3.32 to 10.67	7.66	4.24 to 13.85	5.51	2.99 to 10.17
Not Stressed	3.98	2.07 to 7.66	3.50	1.68 to 7.28	3.90	1.70 to 8.91
Not using contraceptives	0.79	0.43 to 1.44	0.79	0.46 to 1.35	1.11	0.62 to 1.98
No cracked nipple/breast engorgement	1.17	0.69 to 1.99	-	-	-	-

Table 3. Bivariate analysis result of factors which affect the success of exclusive breastfeeding (continued)

Variables	Fourth month		Fifth month		Sixth month	
	RR	95%CI	RR	95%CI	RR	95%CI
High educational level	1.06	0.55 to 2.07	1.14	0.54 to 2.40	1.05	0.50 to 2.21
Early initiation	1.34	0.73 to 2.43	1.31	0.68 to 2.53	1.35	0.69 to 2.65
Breastfeeding education	0.81	0.45 to 1.46	0.84	0.44 to 1.62	0.94	0.48 to 1.84
Not working/ studying outside the home	14.09	3.3 to 60.16	9.92	2.31 to 42.55	8.99	2.09 to 38.67
Confidence in breast milk production	61.27	8.27 to 453.79	42.42	5.71 to 315.13	41.80	5.62 to 310.98
Support from husband or family	12.79	5.13 to 31.52	17.06	5.08 to 57.21	48.76	6.55 to 362.75
Not Stressed	-	-	-	-	-	-
Not using contraceptives	0.67	0.34 to 1.33	0.69	0.32 to 1.47	0.68	0.31 to 1.49
No cracked nipple/breast engorgement	-	-	-	-	-	-

NA=not available; (-)=descriptive analysis

Table 4. Descriptive factors which affects the success of exclusive breastfeeding

Variables	First month n (%)	Second month n (%)	Third month n (%)	Fourth month n (%)	Fifth month n (%)	Sixth month n (%)
Rooming-in care	154 (65)	121 (54)	92 (43)	64 (31)	48 (24)	45 (23)
Avoided using milk bottle at hospital	153 (66)	120 (54)	92 (44)	63 (31)	48 (24)	45 (23)
Not working/studying outside the home	155 (65)	119 (56)	*	*	*	*
Not sick/tired	154 (66)	121 (55)	93 (44)	64 (31)	48(24)	45 (22)
No inverted/flat nipple	152 (67)	120 (56)	92 (45)	63 (32)	47 (24)	44 (23)
No cracked nipple/breast engorgement	*	121 (55)	92 (43)	63 (30)	47 (24)	44 (22)
Not interested in formula company promotions	151 (67)	118 (55)	93 (46)	64 (33)	48 (25)	45 (24)
Not stressed	*	*	*	59 (33)	45 (25)	43 (25)

*=bivariate analysis

Table 5. Multivariate analysis of factors affecting the success of exclusive breastfeeding

Month	Variables	RR	95%CI	Probability (%)	P value
1	Husband/family support	4.06	2.06 to 8.03	89	0.001
	Confidence in breast milk production	14.85	6.90 to 31.94		0.001
2	Husband/family support	4.93	2.50 to 9.73	81	0.001
	Confidence in breast milk production	44.26	10.16 to 192.75		0.001
3	Not working mothers	3.38	1.21 to 9.43	69	0.020
	Husband/family support	2.35	1.15 to 4.81		0.019
	Confidence in breast milk production	14.62	4.88 to 43.83		0.001
4	Not working mothers	6.56	1.39 to 30.99	61	0.018
	Husband/family support	5.44	2.03 to 14.59		0.001
	Confidence in breast milk production	32.28	4.23 to 246.37		0.001
5	Husband/family support	6.49	1.77 to 23.75	21	0.005
	Confidence in breast milk production	19.85	2.573 to 153.16		0.004
6	Husband/family support	24.43	3.20 to 186.42	45	0.002
	Confidence in breast milk production	19.02	2.47 to 146.31		0.005

building. Other limitations were the possibility that the sample size of the control group was not equal to the risk factor-exposed group, due to its natural sampling formation. A large number of subjects (17%) dropped out of this study, probably due to its protracted duration. Factors expected to affect exclusive breastfeeding were attraction to formula milk promotions and maternal psychological state, such as confidence in breast milk production sufficiency, husband/family support, or not under stress. These factors being evaluated are subjective, time-dependent, and dynamic in nature.

In our study, 56% of mothers were multiparous, with an average of 2-3 children. Infant gender was almost evenly split between boys (52%) and girls (48%). The data obtained in this study was in accordance with the 2007 SDKI data, which showed that more Indonesian women gave birth in their mid-20 to 30 years of age, and on average gave birth to 2.6 children in their lifetime. The gender distribution of Indonesia's population (49.6% males and 50.4% females) was also similar to that of our subjects.³ A cross-sectional, community-based study in Tanzania reported that as many as 76% of mothers were multiparous with 2 as the median number of children. As many as 47% were males.¹⁰ Similarly, a Malaysian cross-sectional study in 2009 reported 48.2% male infants and 51.8% female infants.⁸

In our study, the exclusive breastfeeding incidence in the 4th month was only 31%. This incidence was lower than the 2007 SDKI data (40%), but higher than the 2002 SDKI data (25%) or RISKESDAS 2010 (26%). In the 6th month, only 22% were exclusively breastfeeding, lower than the SDKI data in 2002 (24%) and 2007 (32%), yet higher than RISKESDAS 2010 (15%) for the same month.^{3,4,11}

Other studies on exclusive breastfeeding for 6 months from several other developing countries in 2009 found higher percentages than our study. Studies from Malaysia, India, and Brazil showed 32.8%, 61.5%, and 31%, respectively, of infants received exclusive breastfeeding for 6 consecutive months.^{7,8,12} These three studies used the same exclusive breastfeeding definition as our study, but different study methods.

The lower incidence of exclusive breastfeeding for 6 months in our study compared to the SDKI data and studies from other countries may be related to factors such as nutritional status of pregnant and

lactating mothers, infant micronutrient status (iron, zinc, and vitamin A), and routine primary infant healthcare (growth evaluation and clinical signs of micronutrient deficiency).¹³

Seventy percent of the subjects had a high educational level, of senior high school or higher, yet educational level did not significantly affect exclusive breastfeeding. The median breastfeeding durations for mothers with high or low educational level did not differ (both at 2 months). This result was similar to that of other developing countries such as Ethiopia, although as much as 78% of subjects in their study stated that they had never attended school. Their multivariate analysis revealed no significant correlation between maternal educational level and the success of 6-month, exclusive breastfeeding ($P > 0.05$).¹⁴

In contrast to studies from developing countries, those from developed countries found that educational level correlated to longer exclusive breastfeeding duration. For example, a Swiss study found that more than 60% of subjects had a high educational level (high school graduate minimum). This retrospective cohort study concluded that there was a significant correlation between level of education and the success of exclusive breastfeeding up to 6 months ($P < 0.0001$). The median breastfeeding duration was 12 weeks for mothers with a high educational level and 7 weeks for mothers with a low educational level. The difference in median duration between the Swiss study and our study was due to a longer evaluation time conducted in our study.⁹ We had hoped that increased knowledge and understanding about breastfeeding would result from a higher level of education. However, such did not appear to be the case. Nonetheless, we did not evaluate the level of knowledge and understanding on breastfeeding in our maternal subjects.

Early breastfeeding initiation in our study was only done in 99 subjects (40.7%), with 20 of these mothers succeeding in exclusive breastfeeding until the 6th month. This breastfeeding initiation percentage was lower than that of the 2007 SDKI data (43.9%), yet higher than the RISKESDAS 2010 data (29.3%).^{3,4} World Health Organization data from 2007 also reported Indonesia's early breastfeeding initiation percentage at an almost similar rate of 39%. Compared to other Asian countries, we found a lower percentage than in Sri Lanka (75%) and the

Philippines (54%), but higher than in Nepal (31%) and India (24.5%).¹⁵

Cipto Mangunkusumo Hospital issued a policy stating that early breastfeeding initiation should be performed in the case of every healthy birth without contraindications. Therefore, the percentage should theoretically be 100%. Previous data for early breastfeeding in CMH was not available. The low percentage in our study may be caused by the fact that most initiations are not done according to procedure. For example, breastfeeding was not done directly after the birth, there was no skin-to-skin contact, and it was not up to the infant to decide when to breastfeed for the first time. The inadequate early initiation procedure may be due to limited human resources, lack of health officers' knowledge on correct initiation procedures or resistant behaviours.

In our study, early breastfeeding initiation affected the success of exclusive breastfeeding in the first two months of life. The lack of early initiation lowered the percentage of exclusive breastfeeding in the population 11-39% every month up to the 6th month, based on PAR calculations. Many studies in developing and developed countries also showed a greater impact of early initiation on breastfeeding success. Studies in India and Switzerland concluded that there was a significant correlation between early breastfeeding initiation and the success of exclusive breastfeeding (P value < 0.0001).^{6,16} The probability of infants who did not do early initiation to fail exclusive breastfeeding reached 55% (RR 1.2; 95%CI 1.08 to 1.34).⁶ The different effect in our study compared to previous ones may be caused by different operational definitions.

Most mothers (241 subjects or 99%) opted for continuous rooming-in care. The other two subjects (1%) received rooming-in, post-natal care for only 12 hours, due to the lack of human resources to initially deliver the infant to the mother. Continuous rooming-in care is a CMH policy for mothers and infants who did not have contraindications. There is no time limit for initiation of rooming-in, so there were also infants who started rooming in at > 12 hours after birth. The longer the infant is separated from the mother, the greater the chance of the infant receiving formula milk. A Polish study concluded that infants who are separated for more than 1 hour from the mother within the first 24 hours of hospital care had a 3 times higher

probability of receiving formula milk (OR 3.37; 95%CI 3.07 to 3.69).⁵

The percentage of exclusive breastfeeding success was higher in mothers with rooming-in care compared to non-rooming-in mothers for every month during the 6 months. From the 3rd month on, more mothers with rooming-in care failed to breastfeed exclusively. This observation indicates that rooming-in care played a role in the success for the first 2 months. Several obstacles which might cause mothers to refuse rooming-in care were an ill or tired condition, no family available to assist the mother, or the lack of healthcare personnel to help.

Studies in developing and developed countries have reported a correlation between rooming-in care and successful exclusive breastfeeding. A study in Brazil found that mothers with rooming-in care had a 35-times higher probability to successfully exclusively breastfeed up to the sixth month ($P=0.0297$).¹² In addition, a Swiss study concluded that 55% (OR 1.21; 95%CI 1.09 to 1.33) of mothers who did not have rooming-in care failed to exclusively breastfeed up to the sixth month.⁶

In our study, 136 subjects (56%) received education on breastfeeding techniques and benefits. However, we found that education did not correlate with successful exclusive breastfeeding monthly for 6 months. The PAR for each month in the 6 months for this factor could not be calculated due to RR values being less than 1.

A prospective, random, clinical trial in Singapore concluded that a one-time, structured and personal session on breastfeeding with a lactation counselor increased the success of exclusive breastfeeding until the 3rd month ($P < 0.0001$), but not at the 6th month ($P > 0.05$).¹⁷

In our study, breastfeeding education was given by nurses or nursing students. Subjects received verbal information on breastfeeding techniques and benefits, without display exhibits. Sessions lasted for 10-15 minutes, were performed post-birth in the ward room and consisted of 6 mothers and 2 educators. The lack of correlation between education and successful, exclusive breastfeeding may be due to inadequate methodology, duration, consistency, or persistency of the educational session.

In our study, 3% of infants used bottles while at the hospital. The bottle was intended for giving

either expressed milk (2 subjects) or formula milk (4 subjects). A Swiss, retrospective, cohort study reported that 58% of infants who used a bottle in the first week failed to receive exclusive breastfeeding ($P < 0.0001$; OR 1.38; 95%CI 1.25 to 1.52).¹⁸ A Brazilian, epidemiological study reported that bottle usage in the first week was 56% and increased to 74% in the first month. Also, bottle usage in the first week of life was a risk factor for failure to exclusively breastfeed (OR 4.01; 95%CI 2.07 to 7.78).¹⁹

Bottle usage at CMH is not advised unless there is a condition for which the mother cannot breastfeed directly. As such, expressed breast milk may be given by cup feeding. The effect of bottle usage can cause nipple confusion and indolence due to the different shape and contour of bottle nipple from the mother's nipple. The first days of an infant's experience play an important role, hence, earlier bottle usage may lead to shorter duration of exclusive breastfeeding.^{18,19}

Psychological factors, including maternal confidence in sufficient breastmilk production and support from husband/family had a statistically significant correlation with successful exclusive breastfeeding monthly for the first 6 months ($P = 0.001$). Mothers who firmly believed that their breastmilk production was sufficient had a 19-66 times higher probability of successful exclusive breastfeeding monthly compared to mothers who lacked that confidence. In the population, the lack of belief in sufficient breastmilk production reduced the success of exclusive breastfeeding by 93-98% per month.

A prospective cohort study in California and Connecticut, USA, showed similar findings as our study. The California study reported that mothers who were not sure of their breast milk production were 2.8 times more likely to fail to exclusively breastfeed in the second month (95%CI 1.02 to 7.6) and 1.2 times in the third month (95%CI 0.84 to 1.7) compared to mothers who were confident of their breast milk production.⁹ The Connecticut study reported that 28% of mothers felt unsure of their breast milk production in the second week after birth. The unsure mothers had a 3 times higher chance of failing to exclusively breastfeed in the second week (95%CI 1.64 to 4.79; $P < 0.0001$), and 12 times higher in the second month (95%CI 1.79 to 76.5; $P < 0.001$) compared to mothers with a firm belief in their breast milk production.²⁰

In our study, mothers with support from their husbands or families had a 6-49 times higher likelihood to successfully breastfeed exclusively for every month in the 6 months compared to mothers with no support. In our patient population, lack of husband/family support reduced exclusive breastfeeding success as much as 73% in the first month, 79% in the second month, 72% in the third month, 87% in the fourth month, 90% in the fifth month, and 97% in the sixth month.

Similarly, a California study reported that a husband's support affected the success of exclusive breastfeeding in the second week, while mothers without spousal support were twice as likely to fail. A difference in their study was their smaller OR compared to ours, as only 77% of their subjects were married, while 100% of our subjects were married.⁹

Another psychological factor analyzed in our study was maternal feelings, which did not significantly correlate to the success of exclusive breastfeeding until the third month ($P = 0.001$). Mothers who did not feel stressed, confused, worried, afraid, or depressed had a 4 times higher likelihood to succeed in exclusively breastfeeding to 3 months (RR 3.50 to 3.98). This was the most influential factor for the success of the first month of breastfeeding (RR 3.98; 95%CI 2.07 to 7.66). The PAR results showed that in our patient population, mothers who felt stressed, confused, worried, afraid, and depressed had reduced success in exclusively breastfeeding to 71% in the first month, 67% in the second month, and 70% in the third month.

In terms of depression, a California study showed similar effects to ours, that depression is one of the factor. They evaluated 239 mothers (24%) with post-birth depression based on the *Center for Epidemiologic Studies Depression Scale* (CES-D). Mothers with high CES-D scores (> 16) in the first 2 weeks had a 1.2 times higher likelihood of failing to exclusively breastfeed until 3 months ($P = 0.01$), compared to mothers who were not depressed.⁹ The difference between the California study with this study was in the method to evaluate depression. Another US study concluded that only 9.7% of mothers with emotional dysfunction could breastfeed exclusively for 6 months (OR 0.53; 95%CI 0.31 to 0.92).²¹

Four physical maternal factors were evaluated: cracked nipple or breast engorgement, maternal illness

or fatigue, breast anatomical problems, and hormonal contraceptive usage. The percentage of exclusive breastfeeding success in the first month was higher in mothers who did not experience cracked nipples or breast engorgement, but it was not statistically significant. In our subjects, cracked nipple or breast engorgement caused a decrease in breastfeeding success of 9% in the first month. No analyses were performed for the 2nd to 6th months, due to the small number of mothers who experienced cracked nipples or breast engorgement compared to the sample size calculation. In the 2nd month, mothers without cracked nipples or breast engorgement were more successful in exclusive breastfeeding (56%), but not in the 3rd to 6th months. In the 6th month, there were two mothers with cracked nipples or breast engorgement caused by incorrect latching on by their infants. The percentage of exclusive breastfeeding success was higher in mothers who did not feel ill or tired, with 66% in the 1st month and 55% in the 2nd month. In the 4th to 6th months, we did not find mothers who felt ill or tired.

Similarly, Taveras *et al.* reported that maternal physical condition, such as cracked nipples, breast engorgement, illness, or fatigue affected the success of exclusive breastfeeding in the 2nd week ($P=0.001$) and in the 3rd month ($P=0.03$). However, their multivariate analysis determined that maternal physical condition only affected exclusive breastfeeding success significantly in the 2nd week (OR 1.5; 95%CI 1.1 to 1.97), but not in the 3rd month (OR 1.2; 95%CI 0.94 to 1.6).⁹

Mothers without inverted or flat nipples in our study were more successful in exclusively breastfeeding than with inverted/flat nipples in the 1st month (152 subjects) and 2nd month (120 subjects). Three subjects with inverted or flat nipples successfully breastfed exclusively in the 1st month using nipple connectors. At the end of observation, there was 1 subject with a flat nipple who succeeded in breastfeeding exclusively for 6 months.

A cross-sectional study in Tanzania reported a significant correlation between mothers without anatomical nipple disorders and the success of exclusive breastfeeding for 6 months ($P<0.0001$). Their multivariate analysis showed that mothers without anatomical nipple problems had a 7 times higher likelihood of successful exclusive breastfeeding

for 6 months compared to mothers with an anatomical disorder (OR 6.6; 95%CI 3.2 to 13.6).¹⁰

Maternal contraceptive usage did not significantly correlate to exclusive breastfeeding monthly for the 6 months of our study. Most subjects used contraceptives by the 40th to 60th day after birth. In the 2nd month after birth, all subjects who failed to breastfeed exclusively were also using hormonal contraceptives (56%). Similarly, a prospective cohort study in Germany concluded that there was no statistically significant difference in exclusive breastfeeding between with and without contraceptive groups. However, 25% of mothers in the hormonal contraceptive group failed to breastfeed exclusively with the excuse of diminished milk production, while only 13% of mothers in the non-hormonal contraceptive group failed to breastfeed exclusively.²²

In our study, 72% of mothers did not work outside the home. Not working significantly affected the success of exclusively breastfeeding in the 3rd month and did so consistently until the 6th month. ($P=0.001-0.022$). Non-working or schooling mothers had a 6-14 times higher likelihood of exclusively breastfeeding in the 3rd to 6th months, compared to working or schooling mothers. The possibility of success fluctuated monthly with the highest relative risk in the 4th month (RR 14.09; 95%CI 3.3 to 60.16). In population, maternal working/studying outside the home caused failure to exclusively breastfeed by as much as 82% in the 3rd month, 91% in the 4th month, 87% in the 5th month, and 86% in the 6th month (PAR).

Several studies found a correlation between maternal working and successful exclusive breastfeeding. A cross-sectional study in Klang, Malaysia, concluded that working mothers had an almost 4 times higher likelihood of failing to breastfeed exclusively for 6 months compared to non-working mothers (OR 3.75; 95%CI 1.64 to 8.55).⁸ A similar study on nursing behavior and exclusive breastfeeding in Singapore concluded that working status affected the success of exclusive breastfeeding (HR 1.27; 95%CI 1.14 to 1.41).²³ A study from another developed country, USA, also found that mothers who returned to work or study had an almost 3 times higher possibility to fail to exclusively breastfeed compared to non-working mothers (RR 2.4; 95%CI 1.75 to 3.3).⁹

In our study, most working mothers returned to work or study after their 2 month maternity leave, but a small number returned after only 1 month of leave. Based on the Indonesian human resources law no. 13, article 82 verse 1 (2003), the length of maternity leave is at least 1.5 months before birth and 1.5 months after birth, based on doctor's or midwife's calculated due date.²⁴ Mothers who returned to work or study typically started supplementing with formula beginning in the second month as preparation for returning to work. In our study, mother's working status significantly affected the success of exclusive breastfeeding starting from the third month. Going back to work was the most common reason for mothers to stop exclusive breastfeeding. Most subjects were unaware of how to express milk and store it. Lack of support and commitment at the workplace or school also caused failure to breastfeed exclusively.

Exclusive breastfeeding success for 6 months was higher in mothers who were not interested in formula company promotions. More mothers who were not interested in formula promotions successfully breastfed exclusively in the 1st month (151 subjects) and the 2nd month (118 subjects). However, the number of mothers not interested in formula promotions declined consistently with time.

A multicenter study in Ethiopia on 1,142 mothers with 6-month-old infants reported that 44.1% of subjects admitted being interested in formula milk promotions on television, radio, and newspapers, but there was no significant correlation with failure to exclusively breastfeed ($P > 0.05$).¹⁴

In our study, the effect of formula promotion was observed after the 2nd month post-partum, along with improved maternal physical and psychological well-being. In addition, maternal indifference to formula promotion may also be affected by socioeconomic factors.

Logistic regression analysis, which included all factors, showed that the success of exclusively breastfeeding by month was influenced by many factors. The probability of success by month may be estimated from data relating to factors contributing to the success of exclusive breastfeeding in a multivariate manner.

Healthy mothers with healthy, term infants, confidence in breast milk production and who received support from husbands/families, had probabilities of

89% and 81% in the 1st and 2nd months, respectively, for successful exclusive breastfeeding. The probability for successful exclusive breastfeeding in the 3rd and 4th months were 69% and 61%, respectively, for mothers with confidence in their breast milk production, had husband/family support, and did not work or study outside the home. The probability of successful exclusive breastfeeding in the 5th and 6th months were 21% and 45%, respectively, for mothers with confidence in their breast milk production and husband/family support.

In conclusion, prevalences of exclusive breastfeeding in healthy term babies who had normal births in CMH decrease in a monthly fashion. After eliminating bias, maternal confidence in breast milk production and husband/family support are found to most influence the success of 6 months exclusive breastfeeding. Not working/studying outside the home also influence the success rates for the 3rd and 4th months.

Conflict of Interest

None declared.

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