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# Research Article
# Mother's Milk Supplementation and 6-Months Exclusive Breastfeeding in Cipayung Sub-District, Depok City, Indonesia: A Quasi-Experimental Study

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## Abstract

**Background and Objective:** Calorie intake during lactation is not being paid sufficient attention despite its importance to support the success of 6-months exclusive breastfeeding (EBF). In Indonesia, lactating mother's calorie intake is low. The objective of this study was to determine the effect of calorie supplementation on the success of 6-month EBF. **Materials and Methods:** Four groups of lactating mothers in Cipayung Sub-district, Depok City, Indonesia were purposively selected and followed up for 6 months. The first group received calorie supplementation in the form of one glass of milk per day (140 kcal per day) five days a week for 3 months. Cadres provided milk supplementation and ensured complete consumption. The second group received reminder message from cadres, the third group received EBF short message service and the fourth group was a control group. All groups were observed and measured on the status of breastfeeding, anthropometry and food consumption monthly. **Results:** The calorie intake of those who were successful in EBF was significantly higher than those who failed. Milk supplementation is the dominant factor for the success of 6-months EBF. The milk supplementation group had the highest percentage of mothers who were successful in providing 6-months EBF. **Conclusion:** The study has proven significant role of milk supplementation to support EBF. Provision of one glass of milk five times a week for 3 months could increase EBF prevalence to 90%, compared to 60% among other groups. Milk supplementation for lactating mothers must be considered as one strategy to increase the prevalence of 6 months EBF in Indonesia.

Key words: Breastfeeding intervention, energy consumption, exclusive breastfeeding, lactating mothers, maternal intake, milk supplementation

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Data Availability: All relevant data are within the paper and its supporting information files.

## INTRODUCTION

Breast milk is the best food for newborns. The World Health Organization (WHO) recommended that the optimal duration for exclusive breastfeeding (EBF) is 6 months. EBF for 6 months can meet the nutritional needs of most infants and has other advantages, such as optimizing cognitive development and strengthening mother-infant bond[1]. The Indonesian government through the 1000 Days Movement seeks to accomplish the global target of Sustainable Development Goals (SDGs) related to ending all forms of malnutrition[2]. One of the indicators of the movement is an increasing percentage of (at least 50%) mothers who provide 6 months of exclusive breastfeeding by 2025.

Exclusive breastfeeding for infants for 6 months has been recommended since 2003 but to date the prevalence of exclusive breastfeeding for 6 months in Indonesia is still low, i.e. 30.2% in 2013 and 37.3% in 2018[3,4]. The target prevalence of exclusive breastfeeding (50%) looks difficult to achieve. Number of mothers who initiated breastfeeding increased but many did not meet the recommendations of exclusive breastfeeding for 6 months[5].

Studies have shown that maternal nutritional status plays an important role for infant growth during the first 1000 days of life (1000 HPK)[6-8]. The nutrients contained in breast milk originated entirely from maternal nutritional intake and maternal fat reserves. Maternal nutritional requirements increase during pregnancy and lactation. In Indonesia, the prevalence of pregnant women with poor nutritional status is relatively high (24.2% in 2013 and 17.3% in 2018)[3,4]. This is due to low nutritional intake before and during pregnancy and the increase of nutrient requirement during pregnancy and breastfeeding[9-11]. Recent studies have shown that calorie intake in Indonesian lactating mothers is below recommendation[12-15].

Various studies have shown a significant relationship between the amount of energy consumed by mothers during lactation and the success of 6-months EBF[16-18]. Furthermore, studies have consistently shown that maternal nutritional supplementation during the postnatal period can increase maternal breast milk production[16,19,20].

MOH-RI recommends a higher energy intake during lactation (2580 kcal per day) compared to pregnancy (2550 kcal per day)[11]. However, education and promotion on the importance of energy intake for lactating mother in Indonesia are still lacking. Thus, as a result, the average energy intake of lactating mothers in Indonesia continues to decline over time and even becomes lower than the intake during pregnancy[13,14,21]. With age, infant's nutritional needs are increased due to the increase in body size and activity. This would add difficulty in achieving 6 months EBF especially when the mother's milk production decreases.

West Java Province has 6-months EBF prevalence below the national average. Based on Indonesia's Health Profile in 2015, the percentage of EBF for infants aged 0-6 months in West Java is 35.3% and this is the third lowest nationally and the lowest on the island of Java[22]. Previously, a 6-month longitudinal study conducted in Beji Sub-District, Depok City, West Java, Indonesia showed that lactating mothers who managed to exclusively breastfeed for 6 months had a significantly higher energy intake than those who did not[20]. The study also showed that the energy intake of lactating mothers was a dominant factor of 6-month EBF.

This study aimed to follow up the above study and to determine the appropriate type of intervention to support the success of 6-month EBF. The intervention was in the form of food supplementation or through a reminder system (reminded by cadres or reminded through short message service). The null hypothesis of this study is that there is no difference in the prevalence of coverage of lactating mothers who receive calorie supplementation and who receive reminder. If the null hypothesis is accepted, the intervention through reminder will be more efficient because no additional funding is needed for supplementation. However, if the null hypothesis is rejected, mother who received the supplementation is more successful in giving EBF for 6 months, then the supplementation of lactating mothers may be an option to increase the coverage of 6-months EBF prevalence.

## MATERIALS AND METHODS

This quasi-experimental study was conducted in Cipayung Sub-district, Depok City, West Java Indonesia. Subject was mother-infant pair that was purposively selected based on pregnant women data obtained from Community Health Centre (*Puskesmas*) and the local Integrated Health Post (*Posyandu*). All mothers-infants who met the inclusion criteria (intending to give EBF for 6 months, give birth at >37 weeks, birth weight >2500 g, normal-born infants/not disabled, single-born infants, mothers do not suffer from chronic diseases) were asked for their consent to participate in the study.

Subjects were divided into four groups and followed longitudinally for 6 months. The first group was given food supplements in the form of milk (140 kcal of extra energy) every day, the second group was reminded by cadres every week about EBF, the third group was reminded through Short Message Service (SMS) about EBF and the fourth group was a

control group. At the beginning of the study, all groups received nutritional education on maternal lactation nutrition and the benefits of EBF. All treatments were carried out for 3 months considering cost efficiency and assuming that intervention (supplementation and information) during 3 months were sufficient to show effects.

The first group involved health cadres to give milk to the lactating mothers for five days a week with the frequency of one drink of milk per day since birth until 3 months. Milk is chosen as calorie supplement because of its practicality. Cadres also ensure that mothers take the milk supplements. In the second group, respondents were contacted by cadres once per week and were reminded to continue giving EBF for up to 6 months. Respondents in the third group (SMS group) received an SMS once per week from the researcher containing information about the benefits of breastfeeding and the motivation to continue giving EBF for up to 6 months. All groups of mothers were monitored for EBF and their body weight and height were measured monthly for 6 months.

Data on food intake was obtained through a 24 h food recall conducted monthly and data were analyzed to get energy and other macro-nutrients data. Cadres were employed to collect data on exclusive breastfeeding duration every week and exact date on when mother stopped exclusive breastfeeding could be confirmed. The definition of exclusive breastfeeding in this study is in accordance to WHO[1] definition that the infant only receives breastmilk without any additional food or beverages except drops of medicine or vitamin during the first six months of life[1].

Anthropometry data (mother and infant) were collected since 6-7 days after birth (at home setting) and until mother stop providing exclusive breastfeeding. Mother's height was measured using standard microtoise; infant length was measured using locally made wood length board with attached microtoise measuring band (0.1-cm precision) and weight (for both mother and infant) was measured using a calibrated weighing scale. One-way ANOVA analysis with Bonferonni's post-hoc test was conducted to compare differences between groups. Multivariate analysis was performed using multiple logistic regression analysis methods.

This study was approved by the Commission of Research Expert and Research Ethics of Faculty of Public Health University of Indonesia (Letter of Approval No.313/UN2.F10/PPM.00.02/2016/date October 27, 2016). Written informed consent was obtained from all subjects/ respondents.

## RESULTS

The total number of initial respondents was 197 mothers-infants in the Cipayung Sub-district, Depok City but as many as 28 mothers-infants failed at the beginning of the study due to moving (9 people), premature infants (10 people), LBW (7 people), infants born with congenital disability (1 person) and adopted baby (1 person) (Fig. 1). A total of 169 mothers-infants were included in the study by dividing the number per group as follows: milk

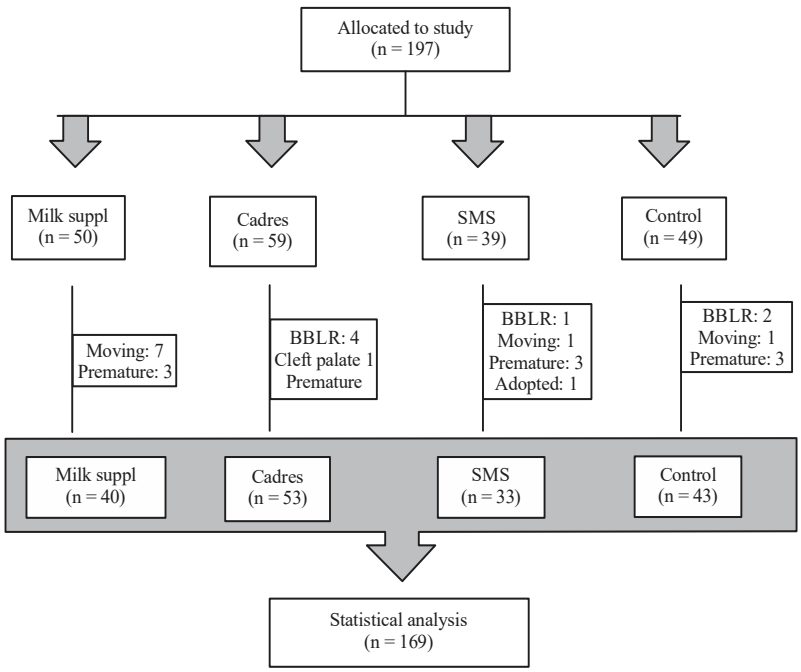


Fig. 1: Flowchart of the study

supplementation group (n = 40), cadre monitoring group (n = 53), SMS reminder group (n = 33) and control group (n = 43). Each group was in different village (*kelurahan*). There were no significant differences in subject characteristics (nutritional status and socio-demographic factors) between those who stopped and those who continued the study in each treatment group.

The characteristics of the respondents in each intervention group were relatively the same. There were no significant differences in maternal age, maternal education level, maternal employment status, maternal parity, knowledge of maternal nutrition and maternal attitudes between the milk supplementation group, cadre monitoring group, SMS reminder group and control group (Table 1).

Table 2 shows information on the duration of EBF, the success rate of EBF and the average calorie intake in each treatment group. The longest duration of EBF was in the milk supplementation group, with an average duration of 171 days. By using the one-way ANOVA analysis with Bonferonni's post-hoc test, it is found that only milk supplementation group was significantly different compared to the control group ($p<0.05$). Mothers who received milk supplementation were 4.3 times more likely to succeed in giving EBF for 6 months compared to mothers in the control group.

In this study, a total of 72.2% of mothers managed to give EBF for 6 months. Based on the distribution of the respondents according to the treatment group, it was observed that the most successful 6 months EBF was found in the group of women who received milk supplementation that reached 90%. Prevalence of EBF in the other three groups were 67.9, 63.6 and 67.4% for the monitoring group, group received text messages and control group, respectively.

Table 2 also shows the difference in average energy intake in mothers who managed EBF for 6 months and who were not successful in each treatment group. In each group, mothers who succeeded in EBF for 6 months had a higher energy intake than those who did not. Overall, the difference in calorie intake is significant. The average number of energy consumed by mothers who succeeded in EBF was higher (2016.8 kcal per day) than those who did not succeed (1819.1 kcal per day).

Table 1: Distribution of maternal characteristics of the treatment and control groups (%)

| Characteristics | Milk supplement (n = 40) | Cadres monitoring (n = 53) | SMS reminder (n = 33) | Control (n = 43) | Total (N = 169) | p- value* |
|---|---|---|---|---|---|---|
| Age | | | | | | |
| High risk | 17.14 | 31.43 | 25.71 | 25.71 | 35 | 0.646 |
| Low risk | 25.37 | 31.34 | 17.91 | 25.37 | 134 | |
| Mother's level of education | | | | | | |
| Low | 28.38 | 27.03 | 21.62 | 22.97 | 74 | 0.452 |
| High | 20.00 | 34.74 | 17.89 | 27.37 | 95 | |
| Mother's employment status | | | | | | |
| Employed | 13.64 | 40.91 | 31.82 | 13.64 | 22 | 0.161 |
| Unemployed | 25.17 | 29.93 | 17.69 | 27.21 | 147 | |
| Parity | | | | | | |
| Primipara | 27.27 | 33.33 | 21.21 | 18.18 | 33 | 0.756 |
| Multipara | 22.79 | 30.88 | 19.12 | 27.21 | 136 | |
| Mother's knowledge of nutrition | | | | | | |
| Poor | 25.61 | 35.37 | 17.07 | 21.95 | 82 | 0.508 |
| Good | 21.84 | 27.59 | 21.84 | 28.74 | 87 | |
| Mother's attitude | | | | | | |
| Negative | 22.81 | 33.33 | 19.30 | 24.56 | 57 | 0.983 |
| Positive | 24.11 | 30.36 | 19.64 | 25.89 | 112 | |

*p<0.05 chi-square test

Table 2: Status description of EBF and calorie intake according to the treatment group

| | | | Successful 6-months EBF | | Unsuccessful 6-months EBF | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Treatments | Average duration of EBF (day) | Percentage | Calorie intake (kcal) | Percentage | Calorie intake (kcal) | OR* | CI | ANOVA p-value** | t-test p-value*** |
| Milk supplementation (n = 40) | 171 | 90.0 | 2210.1 | 10.0 | 2039.3 | 4.3 | 1.3-14.6 | 0.013 | 0.407 |
| Cadres monitoring (n = 53) | 141 | 67.9 | 1941.4 | 32.1 | 1789.0 | 1.0 | 0.4-2.4 | 0.960 | 0.139 |
| SMS (n = 33) | 143 | 63.6 | 2028.5 | 36.4 | 1782.0 | 0.8 | 0.3-2.2 | 0.729 | 0.023 |
| Control (n = 43) | 134 | 67.4 | 1861.8 | 32.6 | 1824.4 | 1.0 | - | - | 0.704 |
| Total (n = 169) | 147 | 72.2 | 2016.8 | 27.8 | 1819.1 | - | - | - | 0.001 |

*Treatment of the success of EBF for 6 months, **One-way ANOVA test with post-hoc Bonferroni successful EBF for 6 months, ***t-test calorie intake

Table 3: Multivariate analysis result

| Variables | OR | CI | p-value |
|---|---|---|---|
| Mother's education | 1.4 | - | 0.457 |
| Mother's employment status | 3.7 | 1.2-11.4 | 0.022* |
| Mother's knowledge | 4.6 | 2.0-10.4 | 0.000* |
| History of EI | 7.0 | - | 0.084 |
| Family support | 1.8 | - | 0.203 |
| Supplementation status | 5.5 | 1.5-20.2 | 0.011* |
| Carbohydrate intake | 3.7 | 1.5-9.3 | 0.005* |

*Significant at a = 0.05

The first model of multivariate analysis began with thirteen variables including maternal age, maternal education, maternal working status, parity, maternal knowledge, maternal attitudes, history of early initiation of breastfeeding (EI), family support, milk supplementation, maternal calorie intake, maternal carbohydrate intake, maternal protein intake and maternal fat intake. After excluding variables with a p>0.05, the variables included in the final model were maternal education, maternal working status, maternal knowledge, EI, family support, supplementation status and carbohydrate intake. Milk supplementation is the dominant variable, after being controlled by maternal working status, maternal knowledge and carbohydrate intake with OR 5.5 (CI 1.486-20.189).

Based on these results, mothers who received milk supplementation had a 5.5 times greater chance of succeeding in giving their infants EBF for 6 months compared to those who did not receive milk supplementation. The data for the final model is shown in the Table 3.

## DISCUSSION

In this study, 90% of the respondents in the milk supplementation treatment group managed to give EBF for 6 months, with an average duration of 171 days of EBF. This percentage is significantly higher compared to other groups that only varied by 60% (67.9% in the cadre monitoring group, 63.6% in the SMS reminder and 67.4% in the control group) with an average duration of approximately 140 days. Mothers in the milk supplementation group were 4 times more likely to give EBF compared to other groups that did not receive supplementation.

This result is in line with the research of Fikawati *at el.*,[20] who found that calorie supplementation was a significant factor in the success of EBF for 6 months. Mothers with high energy intake are 5.6 times more likely to succeed in giving EBF for 6 months. It was found that mothers who were successful in 6 months EBF were more in the group of women who received milk supplementation (82.7%) and milk and egg supplementation (81.6%) than in the control group (<60%). In this study, milk supplementation was considered to be more efficient than milk and egg supplementation, because, with bigger effort and cost (adding eggs), it turned out that the prevalence of achievement was almost the same at around 80%.

The same was reported by Huynh *et al.*[16] in a longitudinal study of 228 mothers in Vietnam, who were followed from the last trimester of pregnancy until the first 12 weeks postpartum. It was found that milk supplementation for lactating mothers can increase the birth weight of infants, increase the duration of EBF and increase breast milk production. In terms of the duration of EBF, the intervention group was twice as likely to breastfeed exclusively for 6 months as the control group.

Providing milk supplements to lactating mothers is an important factor in determining the success of 6-months EBF. Maternal calorie intake during breastfeeding influences the duration of EBF. The Ministry of Health of the Republic of Indonesia has issued Regulation of the Minister of Health No. 75 of 2013 regarding the Recommended Dietary Allowance (RDA), which states that lactating mothers need to increase the normal energy requirements (non-pregnant and breastfeeding) by 330 kcal per day in the first 6 months of breastfeeding and this number is higher than the recommended calorie intake in pregnant women. However, studies in Indonesia reported that energy intake during lactation is lower than during pregnancy[13,14,21]. The prevalence of pregnant women with chronic energy deficiency (CED) and anemia in Indonesia is high. Ministry of Health showed that the prevalence of pregnant women with CED was 24.2% and that of women with anemia was 37.1%[3]. Worthington-Roberts and Williams[23] claimed that the impact of malnutrition on pregnant women would affect the first maternal fat reserve, which will be reduced and will impair breast milk production and then affect the infant's weight. In a situation where the malnutrition of pregnant women is high and the low birth weight prevails (such as in Indonesia, where maternal CED is around 25% and low birth weight is around 10%), it is almost a certainty that maternal fat reserves is low and breast milk production will be impaired. Lactating mothers with low fat reserves need a higher energy intake to support breast milk production. The results of this study confirm that, in all groups, mothers who managed to give EBF for 6 months had a higher energy intake than mothers who did not succeed.

This is in line with the study of Fikawati and Syafiq[24] on three studies on perceived insufficient milk (PIM) in the Karawang Regency of West Java, Tanjung Priok of North

Jakarta and Cilandak subdistrict of South Jakarta. All three studies consistently showed a significant relationship between maternal nutritional status with PIM. Gatti[25] reported that the main reason for the failure of EBF in the world is because the PIM mother feels her milk is not enough to meet the baby's needs. About one-third of mothers who provide additional food to infants before six months of age are due to experiencing PIM.

The study by Prabasiwi *et al.*[26] found a significant relationship between the calorie intake of lactating mothers and the PIM. This is similar to the research of Safon *et al.*[27] in Nicaragua, which reported that 76.2% of 21 respondents experienced PIM. Although, the study believes that maternal nutritional status does not affect the success of breastfeeding, some of the respondents expressed their belief in the importance of adequate maternal nutritional needs, so that they could successfully breastfeed for 6 months[27].

A significant relationship was found between maternal working status and the success of 6-months EBF. Working mothers have an almost 4 times greater risk not to provide exclusive 6-months breastfeeding than mothers who do not work. This result is in line with Ghana's findings on 225 lactating mothers, which have a significant relationship between the status of working mothers and the success of EBF[28].

There is a significant relationship between the knowledge of mothers with EBF. This study found that less knowledgeable mothers were 4.2 times higher risk not to provide EBF compared to knowledgeable mothers. This is similar to a study conducted in Ghana with 190 mothers who found that mothers with good breastfeeding knowledge had 5.9 times the opportunity to give EBF compared to those who had low knowledge[29]. Mother's low knowledge of breastfeeding meant that the mother did not know the importance of EBF, so she did not feel the need to give EBF for 6 months.

The study also found a significant relationship between carbohydrate intake and EBF. Mothers with low carbohydrate intake have a 3.7 times higher risk not to provide EBF compared to mothers with adequate carbohydrate intake. Carbohydrate demand in lactating mothers have increased; that is, the addition of 45 g per day during the first 6 months and 55 g per day during the second 6 months of breastfeeding are necessary[11]. Lactating mothers need additional carbohydrates to replace the glucose used to produce lactose in breast milk, which is the second main component after water, thus consumption of carbohydrates during breastfeeding can determine the volume of milk produced[30].

This study rejects the hypothesis that there is no difference between milk supplementation and reminder interventions. There is a significant difference on percentage of 6 months EBF in the group that received supplementation (90%) and the reminder including control group (around 60%). The study also shows the importance of the nutritional intake of lactating mothers in supporting the success of EBF. Variables significantly associated to the success of EBF are milk supplementation and carbohydrate intake. Both variables are reflection of the dimension of maternal nutritional intake during lactation, especially energy intake. Carbohydrates are the main source of energy for the human body. On the other hand, milk supplementation can ensure adequate energy intake, especially if the carbohydrate intake from daily meal is below the recommendations. Providing milk as supplement for breastfeeding mothers may be an option to guard the success of 6-months EBF.

This study implies the importance of energy intake during lactation and milk supplementation program would be recommended as application of the study results. It should be noted, however, that this study is limited in the specific context of the study area. Thus, the application in form of supplementation program should always consider situational analysis on specific location.

## CONCLUSION

The study has proven significant role of milk supplementation during lactation to support the success of 6 months EBF. Provision of one glass of milk five times a week for 3 months could increase 6 months EBF prevalence to 90%, compared to 60% among control.

## SIGNIFICANCE STATEMENT

This study discovered the role of milk supplementation for lactating mothers that significantly improve the success of 6 months exclusive breastfeeding. This study proved that milk supplementation intervention could increase the prevalence of 6 months exclusive breastfeeding as compared to control group. Thus, milk supplementation as energy consumption for lactating mothers must be considered as one strategy to increase the prevalence of 6 months exclusive breastfeeding in Indonesia and other countries with similar setting.

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