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The Effect of Bangun-Bangun Leaves and Lemon on Increase in Babies' Weight

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ABSTRACT

Background: Insufficient breast milk production remains a major barrier to successful exclusive breastfeeding and may negatively affect infant weight gain. Therefore, efforts to enhance lactation using natural galactagogues are needed. Bangun-bangun leaves (Plectranthus amboinicus) are traditionally believed to increase breast milk production.
Objective: This study aimed to examine the effect of bangun-bangun leaves combined with lemon on infant weight gain.
Methods: quasi-experimental study with a posttest control group design was conducted among 30 breastfeeding mothers. The intervention group (n = 15) received bangun-bangun leaves combined with lemon in the form of brewed tea (200 ml/day) for 14 days, while the control group (n = 15) received no intervention. Moderating variables reflecting breast milk adequacy and the primary outcome was infant weight change, categorized as weight gain or no weight gain. Data were analyzed using Fisher's exact test due to the categorical data and small sample size..
Result: The analysis showed a statistically significant effect of the intervention on infant weight gain (p = 0.04). All infants (100%) in the intervention group experienced weight gain, whereas 33.3% of infants in the control group showed no weight gain.
Conclusion: The combination of bangun-bangun leaves and lemon may serve as a potential natural galactagogue to support breast milk production and promote infant weight gain. These findings provide preliminary evidence supporting the use of bangun-bangun leaves combined with lemon as a natural and accessible intervention to improve breastfeeding outcomes, although further studies with larger samples and objective measurements are needed.

Keywords: ***Bangun-Bangun Leaves and Lemon; Breast Milk Production; Infant Weight Gain***

INTRODUCTION

According to the health profile data in 2023, the exclusive breastfeeding achievement rate in Indonesia was 73.97% and this figure increased from 2022 which was 72.04%. In Central Java Province, the exclusive breastfeeding rate increased from 78.71% in 2022 to 80.20% in 2023. However, the exclusive breastfeeding rate in Karanganyar District, which is one of the districts in Central Java Province,

decreased from 72.4% in 2022 to 49.3% in 2023.[1,2]

Insufficient breast milk production is one of the main obstacles in achieving exclusive breastfeeding, which can negatively impact infant health. Infants who are not exclusively breastfed are at higher risk of diseases such as diarrhea, respiratory infections, and inadequate weight gain, which may lead to stunting. Babies who do not receive exclusive breastfeeding are reported to have a 4.2 times higher risk of stunting compared to those who are exclusively breastfed.[3,4] One of the factors that influence production is the mother's nutritional intake. The nutritional intake obtained by the mother can affect the quality and quantity of breast milk.[5,6]

One potential local food source is bangun-bangun leaves (*Plectranthus amboinicus (Lour.) Spreng.*), which are traditionally used in Indonesia to enhance breast milk production. Bangun-bangun leaves contain lactogogum as evidenced by the presence of saponin, alkaoid, flavenoid, and polyphenol compounds that stimulate lactation hormones, namely proklatin and oxytocin.[7,8] Bangun-bangun leaves have been widely used by the Batak toba community to increase breast milk production and are usually processed into vegetables or soup.[9] However, outside of Sumatra, this plant is still not widely recognized or utilized by mothers.

In addition, lemon is known to contain vitamin C, antioxidants, and various bioactive compounds that may help improve immunity and support overall health during include breastfeeding period.[10,11] Adequate maternal health and nutritional status are important factors that may indirectly support optimal breast milk production. Therefore, combining bangun-bangun leaves with lemon may provide complementary benefits, both through direct stimulation of lactation hormones and through improved maternal nutritional status.

Based on preliminary studies conducted at the Colomadu 1 Health Center, the results of interviews with 10 breastfeeding mothers were obtained, 4 mothers said that breast milk production was smooth, 3 mothers said that breast milk production was insufficient and required additional formula milk and 3 mothers said that little breast milk production caused the baby not to be given breast milk at all and only given formula milk. And from 10 breastfeeding mothers said that they had never heard and seen bangun-bangun leaves.

From the problems of breastfeeding mothers and also many mothers who have never used the have never used bangun-bangun leaves as a breast milk booster, the researcher is interested in giving bangun-bangun leaves collaborated with lemon with lemon, to find out whether there is an effect of bangun-bangun leaves and lemon given to breastfeeding mothers on infant weight gain at the Colom Health Center. baby's weight gain at the Colomadu 1 Health Center.

METHODS

This study used a quasi-experimental design. The research was conducted in the Colomadu 1 Health Center area from August to September 2024. The study population consisted of all breastfeeding mothers in the Colomadu 1 Health Center area. A total sampling technique was applied, resulting in 30 respondents. The respondents were divided into two groups: 15 mothers in the intervention group and 15 mothers in the control group.

The intervention group received bangun-bangun leaves combined with lemon in the form of a brewed herbal drink at a dose of 200 ml/day for 14 consecutive days.[12,13] The preparation was administered once daily, and adherence was monitored using observation sheets. The control group did

not receive any intervention during the study period.

The variables in this study included respondent characteristics, moderating variables, and the primary outcome. Respondent characteristics consisted of age, parity, education, and employment status. The moderating variables represented the adequacy of breast milk intake and included infant urination frequency, defecation frequency, breastfeeding frequency, infant comfort (appearing calm and comfortable after feeding), and maternal perception of breast condition (breasts feeling soft and empty after breastfeeding). The primary outcome was infant weight, which was assessed before the intervention (pretest) and after the intervention (posttest). Infant weight change was analyzed as a categorical variable and classified into two categories: weight gain and no weight gain (including weight loss or unchanged weight).

Respondent characteristics were analyzed descriptively and categorized. Differences between the intervention and control groups were assessed using the Chi-square test, while Fisher's exact test was applied when the assumptions for the Chi-square test were not met. The moderating variables were also analyzed as categorical variables using the Chi-square test or Fisher's exact test as appropriate. The association between the intervention and infant weight change was analyzed using the Chi-square test or Fisher's exact test as appropriate. All variables were categorical and measured on a nominal scale. Due to the small sample size, Fisher's exact test was used as the primary statistical method, as it is more appropriate than the Chi-square test when expected cell counts are low.[14] A p-value <0.05 was considered statistically significant. This study has been approved by the Ethics Committee of Dr. Moewardi Hospital with Ethical Clearance number 1.875/VII/HREC/2024.

RESULT

Table 1 shows that the majority of respondents were aged 20-35 years as much as 86.7%. The statistical test results obtained a p-value = 0.215, meaning that there was no significant difference in age between the intervention group and the control group. The results showed that the majority of respondents' parity was multigravida as much as 53.3%. The statistical test results obtained a p-value = 1, meaning that there is no significant difference in parity between the intervention and control groups. The results showed that the majority of respondents' education was in the high category as much as 93.3%. Statistical test results obtained p-value = 1 means there is no significant difference in education between the intervention and control groups. The results showed that the majority of respondents did not work, as many as 93.3%. Statistical test results obtained p-value = 0.330 means there is no significant difference in employment between the intervention and control groups.

As presented in Table 2, the adequacy of breast milk intake was evaluated using several key indicators, encompassing both objective measures (infant elimination and breastfeeding frequency) and subjective indicators (infant comfort and maternal perception of breast softness after breastfeeding). Together, these variables provide an indication of nutritional adequacy in breastfed infants.

After 14 days of intervention, 100% of infants in the intervention group had a urination frequency of ≥6 times per day, compared to 86.7% in the control group. However, this difference was not statistically significant (p = 0.483). The proportion of infants who defecated ≤3 times per day was 86.7% in the intervention group and 73.3% in the control group, with no statistically significant difference between the groups (p = 0.651).

Table 1. Maternal Characteristics

Characteristics	Group				*p-value*
	Intervention		Control		
	n	%	n	%	
Age					
< 20 years	0	0	0	0	0.215[a]
20-35 years	9	60	13	86.7	
> 35 years	6	40	2	13.3	
Parity					
Primipara	7	46.7	7	46.7	1[b]
Multipara	8	53.3	8	53.3	
Grandemultipara	0	0	0	0	
Education					
Low	2	13.3	1	6.7	1[a]
High	13	86.7	14	93.3	
Occupation					
Not working	11	73.3	14	93.3	0.330[a]
Working	4	26.7	1	6.7	

Description test: a;*exact fisher,* b; *chi square*

Infants who breastfed less than 8 times per day accounted for 6.7% in the intervention group and 26.7% in the control group. This difference was also not statistically significant (p = 0.330). All infants (100%) in the intervention group appeared calm and comfortable after breastfeeding, compared to 80% in the control group; however, no statistically significant difference was observed (p = 0.598).

In terms of maternal perception, 93.3% of mothers in the intervention group reported that their breasts felt soft and empty after breastfeeding, compared to 88.7% in the control group. This difference was also not statistically significant (p = 1.000).

Table 2. The Effect of Bangun-Bangun Leaves and Lemon on Moderating Variables

Variable	Intervention Group				Control Group				*p-value*
	Yes		No		Yes		No		
	n	%	n	%	n	%	n	%	
Frequency of urination ≥ 6 times/day	15	100	0	0	13	86.7	2	13.3	0.483
Frequency of defecation ≤ 3 times/day	13	86.7	2	13.3	11	73.3	4	26.7	0.651
Breastfeeding frequency (≥8 times/day	14	93.3	1	6.7	11	73.3	4	26.7	0.330
Infant comfort while sleeping (appearing calm and comfortable	15	100	0	0	12	80	2	20	0.598
maternal perception of breast condition (breasts feeling soft after feeding)	14	93.3	1	6.7	13	86.7	2	11.3	1

Table 3 shows that 100% of infants in the intervention group experienced weight gain after receiving bangun-bangun leaves and lemon, whereas in the control group, 33.3% of infants experienced no weight gain (including weight loss or unchanged weight). The results of Fisher's exact test showed a statistically significant association between the intervention and infant weight gain (p = 0.04).

Table 3. The Effect of Bangun-Bangun Leaves and Lemon on Infant Weight Gain

Group	Baby's Weight Gain				Totally		*p-value*
	Weight gain		No Weight gain				
	n	%	n	%	n	%	
Intervention	15	100	0	0	15	100	0.04
Control	10	66.7	5	33.7	15	100	

DISCUSSION

The majority of respondents were aged 20–35 years (86.7%). Statistical analysis indicated no significant difference in age between the intervention and control groups (p = 0.215). Maternal age is a crucial factor influencing a mother's readiness during pregnancy, childbirth, the postpartum period, as well as in parenting and breastfeeding practices. [15–18]

The majority of respondents were multigravida (53.3%), with no statistically significant difference in parity between the intervention and control groups (p = 1.000). Although parity may influence breastfeeding experience, mothers who have given birth more than once are generally better equipped to manage the breastfeeding process, thereby supporting the adequate fulfillment of infant nutritional needs.[17,18] However, parity was not analyzed as a determinant of infant weight gain in this study.

Educational level was categorized into low (elementary and junior high school) and high (senior high school and college), with the majority of respondents (93.3%) classified in the high education group. No statistically significant difference was found between groups (p = 1.000). Higher educational attainment may facilitate better access to information regarding exclusive breastfeeding practices. However, educational level may not be a primary determinant, as several studies have reported that maternal education does not necessarily influence exclusive breastfeeding practices or breast milk volume.[16]

Most respondents were not employed (93.3%), and no significant difference was observed between the intervention and control groups (p = 0.330). Non-working mothers may have more time to breastfeed; however, employment status alone may not be a primary determinant of breastfeeding outcomes, as other factor such as workplace support.[16]

Overall, the comparable distribution of respondent characteristics indicates that both groups were relatively homogeneous at baseline, thereby reducing the potential influence of confounding variables and strengthening the internal validity of the study.

Regarding the moderating variables reflecting the adequacy of breast milk intake, no statistically significant differences were observed between the intervention and control groups across all indicators. After 14 days of intervention, 100% of infants in the intervention group had a urination frequency of ≥6 times/day, compared to 86.7% in the control group (p = 0.483). The proportion of infants with defecation frequency ≤3 times/day was 86.7% in the intervention group and 73.3% in the control group (p = 0.651).

Infants who breastfed less than 8 times/day accounted for 6.7% in the intervention group and 26.7% in the control group (p = 0.330). All infants (100%) in the intervention group appeared calm and comfortable after breastfeeding, compared to 80% in the control group (p = 0.598). In terms of maternal perception, 93.3% of mothers in the intervention group reported that their breasts felt soft and empty after breastfeeding, compared to 88.7% in the control group (p = 1.000).

Although the differences in moderating variables were not statistically significant, these indicators provide important supporting evidence in understanding how the intervention may contribute to improved breastfeeding outcomes, particularly in relation to infant weight gain.

These findings suggest that most respondents in the intervention group tended to demonstrate adequate breast milk intake, as reflected by established clinical indicators. However, these observations should be interpreted cautiously, as no statistically significant differences were found between groups.

The results of the analysis using the chi-square test obtained a p-value of 0.04 smaller than 0.05, meaning that there is an effect of bangun-bangun leaves and lemon on infant weight gain. This is because the intervention group was given bangun-bangun leaves and lemons which were consumed every day for 14 days so that all respondents in the intervention group experienced weight gain while in the control group not given bangun-bangun leaves and lemons there were 33.3% of respondents who experienced no weight gain (including weight loss or unchanged weight).

The findings of this study are consistent with previous research demonstrating that bangun-bangun leaves primarily function as a natural galactagogue by enhancing breast milk production. In the present study, although a direct mechanism linking bangun-bangun leaves to infant weight gain cannot be established, the observed improvement in infant weight in the intervention group may be indirectly explained through increased breast milk production. This is supported by the moderating variables assessed, including infant urination frequency, defecation patterns, breastfeeding frequency, infant comfort, and maternal perception of breast condition, which collectively reflect the adequacy of breast milk intake. These findings suggest that the role of bangun-bangun leaves in promoting infant growth is likely mediated through improved lactation and breastfeeding adequacy rather than a direct effect on weight gain.[7][9][12][13][19][20]

The observed increase in infant weight gain in the intervention group may be explained by the pharmacological properties of bangun-bangun leaves (Plectranthus amboinicus), which contain bioactive compounds such as flavonoids, alkaloids, saponins, and polyphenols. These compounds may enhance lactation by supporting hormonal regulation, particularly through increased prolactin secretion and improved oxytocin-mediated milk ejection. In addition, their antioxidant properties may help maintain maternal physiological balance during lactation. Collectively, these mechanisms may contribute to improved breast milk production and transfer, which may indirectly support infant weight gain.[12][21][22]

In addition to bangun-bangun leaves, the inclusion of lemon in the intervention may also contribute to the observed outcomes. Lemon is known to contain vitamin C and various antioxidant compounds that play a role in reducing oxidative stress and supporting maternal metabolic function. Adequate antioxidant status may help improve hormonal balance during lactation, particularly in supporting the effectiveness of oxytocin in milk ejection. Furthermore, vitamin C may enhance the absorption of certain

nutrients, potentially supporting overall maternal nutritional status during breastfeeding. In addition, lemon may improve the flavor (palatability) of the preparation, making it more acceptable and easier to consume regularly, which may enhance adherence to the intervention. Therefore, the combination of bangun-bangun leaves and lemon may provide complementary effects, not only by stimulating lactation through hormonal pathways but also by supporting maternal physiological conditions and adherence that facilitate optimal breast milk production and transfer.[10][11][23]

However, several limitations should be considered when interpreting these findings. The assessment of breast milk adequacy relied on indirect indicators, such as infant elimination patterns, breastfeeding frequency, infant behavior, and maternal perception of breast condition, which may not fully reflect actual breast milk volume or transfer. Another potential influencing factors, such as maternal dietary intake, stress levels, and breastfeeding techniques, were not controlled. Therefore, the findings should be interpreted with caution, and further studies with larger sample sizes and more objective measurements are recommended.

CONCLUSION

This study concludes that the administration of bangun-bangun leaves combined with lemon has a significant effect on infant weight gain, as evidenced by the statistical analysis showing a p-value of 0.04 (<0.05). Although no statistically significant differences were found in the moderating variables reflecting the adequacy of breast milk intake—such as urination frequency, defecation frequency, breastfeeding frequency, infant comfort, and maternal perception of breast condition—the intervention group consistently demonstrated more favorable patterns. In addition, the comparable distribution of respondent characteristics between the intervention and control groups indicates that both groups were homogeneous at baseline, thereby strengthening the validity of the findings.

Overall, these results suggest that the use of bangun-bangun leaves and lemon may contribute to improved breastfeeding outcomes, particularly in supporting infant weight gain. Furthermore, further studies are needed to explore the individual and combined effects of bangun-bangun leaves and lemon to better understand their specific roles in supporting lactation and infant growth.

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