Wahyuningsih D, et al. Belitung Nursing Journal. 2017 June;3(3):174-182
Accepted: 18 February 2017
http://belitungraya.org/BRP/index.php/bnj/

ORIGINAL RESEARCH **ISSN: 2477-4073**

EFFECT OF *MUSA BALBISIANA COLLA* EXTRACT ON BREAST MILK PRODUCTION IN BREASTFEEDING MOTHERS

Diyan Wahyuningsih[1*], Syarief Taufik Hidayat[2], Nur Khafidhoh[3], Ari Suwondo[4], Diyah Fatmasari[1], Kun Aristiati Susiloretni[1]

[1]Magister Applied Midwifery, Health Polytechnic of Semarang, Semarang, Indonesia
[2]Medical Staff Group of Obstetry Gynecology Departement, Dr. Kariadi Hospital, Semarang, Indonesia
[3]Midwifery Department, Health Ministry Polytechnic of Semarang, Semarang, Indonesia
[4]Health and Work Safety Department, Faculty of Public Health, Diponegoro University, Semarang, Indonesia

***Corresponding author:**
Diyan Wahyuningsih, MTr.Keb
Magister Applied Midwifery, Health Ministry Polytechnic Semarang
Jl. Tirto Agung, Pedalangan, Banyumanik, Kota Semarang, Jawa Tengah, Indonesia (50268)
E-mail: wahyuningsihdiyana@gmail.com

ABSTRACT

Background: *Musa balbisiana Colla*, known as Jantung Pisang Klutuk or Pisang Batu, is considered as a traditional food that can increase breast milk production. Little is known about its benefit in Indonesia. Thus, to examine the impact of *Musa balbisiana Colla* on the production of breast milk is needed.

Objective: This study aims to examine the effect of the extract of banana flower (*Musa balbisiana Colla*) to increase milk production of breastfeeding mothers.

Methods: This was a quasi-experimental study with pretest-posttest control group design. This study was conducted in the working area of the Health Center (Puskesmas) of Pesantren II in January – February 2017. There were 16 respondents were selected by accidental sampling, divided into intervention group (8 respondents) and control group (8 respondents). Randomization was performed to select the respondent in each group. The quantity of milk production was measured based on the volume of milk production, while the quality of milk production was based on the levels of prolactin in early (pre) and late (post) using Electro Chemi-Luminescence Immunoassay (ECLIA) method. Independent t-test was used to analyze the data.

Results: Findings showed that the mean of the volume of the breast milk production in the experiment group was 470.681 ml and in the control group was 364.650 ml with SD 113.502. The mean of prolactin levels in the experiment group was 35.337 nanogram and in the control group was -38.381 nanogram. There was a significant effect of consuming *Musa balbisiana Colla* extract on the volume of breast milk production (p-value 0.003) and prolactin levels (p-value 0.001) (<0.05).

Conclusion: There was a significant effect of banana flower (*Musa balbisiana Colla*) extract on breast milk production and prolactin level in breastfeeding mothers. The findings of this study could be used to be alternative daily menu for postpartum mothers and a solution for midwives to deal with those who have inadequate production of breast milk and low prolactin levels.

Keywords: banana flower, *Musa balbisiana Colla*, milk production, prolactin, breastfeeding

Editor's Note: This article has been updated on 17 June 2020 in terms of minor changes in the reference format. The update is according to BNJ Policy on article correction.

INTRODUCTION

Breast milk is the best food to be given to babies, because it contains almost all the nutrients needed by the baby.[1] Exclusive breastfeeding for the baby during the first 6 months will reduce the risk of allergies, diarrhea, and obesity.[1] The contains of breast milk are the nutrient such as proteins (linoleic acid and folacin) that play a role in the formation of brain cells that ultimately affect brain development, and immunoglobulin contained in colostrum which provide protection or antibodies to fight infection until the infant immune system began to function.[2]

Inadequate breastfeeding is a threat to the development of the children.[3] Barriers to exclusive breastfeeding among breastfeeding mothers are due to the need to return to work outside the home and health related problems,[4] lack of family support,[4] the perception that babies continued to be hungry after breastfeeding,[5] maternal health problems,[5] fear of babies becoming addicted to breast milk pains in the breast,[5] low education,[6] low income,[6] and insufficient breast milk.[7]

Based on the data obtained from Riskesdas 2013,[8] exclusive breastfeeding coverage for infants aged 0-6 months in Indonesia was 38%.[8] According to the data from the Lancet Series Breastfeeding series 2016 indicated that the coverage of exclusive breastfeeding in Indonesia was increased to 65%.[9] However, the scope of exclusive breastfeeding in the setting of this study, Kediri East Java, decreased from 67% in 2012 to 64.5% in 2015.[10] Thus it indicated that the scope of exclusive breastfeeding in Kediri has not achieved the target of 80% yet. Scope of the lowest exclusive breastfeeding in Kediri was in the area of the Health Center (Puskesmas) of Pesantren II amounted to 57.4%.[10]

Based on a preliminary study conducted by researchers by interviewing 10 mothers in the area of Puskesmas Pesantren II showed that only four mothers (40%) breastfed exclusively and remaining six mothers (60%) did not breastfeed exclusively with reasons that their milk came out only slightly and insufficient for the baby.

In response to the inadequate breastfeeding, the Health Center of Pesantren II provided great efforts such as to provide breast care among breastfeeding mothers in the purpose that breastmilk can produce smoothly, and to give vitamin and facilitate breastfeeding and counseling about the importance of balance nutrition. However, these efforts had not been fully effective. So, another intervention is needed to deal with these problems, particularly to increase breastmilk production among breastfeeding mothers. Otherwise, if the babies do not have enough nutrient from their mother's milk, it can be a problem for the baby's development.[3] Some of mothers use complementary feeding for their babies which might have risks of diarrhea due to indigestion of baby who has not been able to digest food other than breast milk.[11] In addition, it has the possibility of bacterial contamination because of unsterile equipment, and other disadvantages such as the lack of adequate infant nutrition, and allergies.

Therefore, midwives play roles to deal with this issue and make an effort to increase the production of breast milk of mothers. There are some of traditional foods are recommended to increase milk production, such as katuk leaves,[12] leaves of papaya,[13] leaves of bangun-bangun,[14] and banana flower.[15] These foods are known by several previous studies that have laktogogum properties, which are able to enhance the secretion and production of milk due to a high flavonoid content that increase the production of the hormone of prolactin and oxytocin to increase the volume of milk.[12-15] The other ingredients are calories, protein, calcium

and other nutrients, which are very good for the milk glands in the breast milk secretion process. However, in this study, the researchers did not use all these traditional foods to be examined, but only using banana flower (*Musa balbisiana Colla*), or called as kluthuk banana flower in Indonesian term.

Banana flower is very cheap and easy to obtain and often processed into a wide variety of popular traditional cuisine in the public in Indonesia. This banana heart is generally considered to have a delicious, sweet and soft flavor. However, the benefits of this food have not been known by the society in Indonesia, especially to increase the breast milk.

According to the literature, the content of banana flower of kluthuk includes: energy (31 kcal), protein (1.26 g), fat (0.35 g), carbohydrates (7.1 g), calcium (30 mg), phosphorus (50 mg), vitamin A (170 IU), vitamin B1 (0.05 mg), vitamin C (10 mg), flavonoids (0.4 g).[16] Additionally, the high flavonoid in this banana blossom has laktogogum that help in producing breast milk. However, there is no study that has been conducted in the working area of the Health Center of Pesantren II. Therefore, this study aims to examine the effect of banana flower of kluthuk to increase breast milk production.

METHODS

Design

This study was a quasi-experimental study with pretest-posttest control group design, conducted in the working area of the Health Center (Puskesmas) of Pesantren II in January – February 2017.

Target Population and Sample

The target population in this study was the postpartum mothers in the working area of Puskesmas Pesantren II. There were 16 respondents were recruited by accidental sampling, divided into intervention group (8 respondents) and control group (8 respondents). Randomization was performed to select the respondent in each group. The inclusion criteria of the sample were 1) mothers who did not take supplements for breast milk, 2) no abstain from food, and 3) willing to be a respondent. The exclusion criteria were 1) postpartum mothers who had severe anemia and bleeding, 2) mothers with a history of having low body weight infants that should be treated in an incubator and require special handling, 3) having infants with labiopalatoskiziz, and 4) having infants with a short frenulum.

Instrument

The quantity of milk production was measured based on the volume of milk production, while the quality of milk production was based on the levels of prolactin in early (pre) and late (post) of prolactin levels using the method of electro chemiluminescence immunoassay (ECLIA). ECLIA is considered as a promising method for analyzing hormones. In this study, the volume of milk production was noted by each respondent in the observation sheet started from the 5th day until 12th day of postpartum, which was based on the duration of breastfeeding per day. The assumption used was the average amount of breast milk is 600 ml per day (24 hours or equal to 1,440 minutes) in the first year.[17] The level of prolactin was obtained using blood sampling of each respondent in the intervention group, which were taken before and after intervention. The blood samples were sent to the Prodia Laboratory, and the results were also noted in the observation sheet. The observation sheet contained a table about the duration of breastfeeding, respondents wrote the time to start feeding, breastfeeding and finished breastfeeding (within minutes).

Intervention

In this study, *Musa balbisiana Colla* was used in the form of extract capsule. The researchers distributed 14 extract capsules to each respondent in the intervention group. Each of them was asked to take 2 capsules per night in 7 days, which started from the 5th day until 12th day of postpartum. There was no intervention for the control group, which they could had daily food as they usually did.

Ethical Consideration

Ethical permission for this study was obtained from the ethical board of the Health Ministry Polytechnic Semarang number: DM.02.04 / IV.2 / 8.5 / 2017. In this study, researcher also got the permission from STiKes Ganesha Husada Kediri and the Health Center of Pesantren II before data collection. Informed consent was performed by the researchers, and each respondent was asked to read and sign the written consent form.

Data Analysis

Data were analyzed using Independent t-test to determine significant differences between the two groups. Shapiro Wilk and Levene's test were performed to examine the normality and homogeneity of the data.

RESULTS

Based on Table 1, the characteristics of the respondents in the intervention and control group were mostly 21-30 years old, had senior high school background, worked as housewife, and had two and three children. There was no significant difference of the characteristics of the respondents between both groups.

Table 1 Characteristics of the respondents (n=16 respondents)

Characteristic	Intervention Group		Control Group		*p-value* Exact Fisher
	Quantity	%	Quantity	%	
Age					
≤ 20 years	1	6.300	1	6.300	0.590*
21 - 30 years	8	50.000	10	62.500	
> 30 years	7	43.800	5	31.300	
Mother's Education					
Senior High School	14	87.500	16	100.000	0.564*
University	2	12.500	0	0.000	
Mother's Job					
Housewife	11	68.800	13	81.300	0.564*
Private employee	5	31.300	3	18.800	
Parity					
1 child	4	25.000	2	12.500	1.000*
2 children	6	37.500	10	62.500	
3 children	6	37.500	4	25.000	

*)*No difference > 0.05*

Table 2 Breastfeeding duration per day (the 5th day to 12th day of postpartum)

Groups	Mean of Breastfeeding duration per day (Min)
Experiment group	235.300
Control group	182.300

Table 2 shows that the mean of breastfeeding duration per day since the 5th day to 12th day of postpartum was 235.300 minutes in the experiment group and 182.300 minutes in the control group. It could be seen that the average of breastfeeding duration in the experiment group was longer than it in the control group.

Table 3 Mean of the volume of breast milk production after given intervention

Groups	Mean of the volume of breast milk production (ml)	Standard Deviation
Experiment group	470.681	65.637
Control group	364.650	113.502

Table 3 shows that the mean of the volume of the breast milk production in the experiment group was 470.681 ml with SD 65.637, while in the control group was 364.650 ml with SD 113.502. This number showed that the mean of the volume of breast milk production in the experiment group was higher and more heterogeneous than the mean of the volume of breast milk production in the control group.

Table 4 Mean of the increase of the prolactin level after given intervention

Groups	Mean of the increase of the prolactin level (nanogram)	Standard Deviation
Experiment group	35.337	40.714
Control group	-38.381	60.853

The quality of breast milk production was measured based on the level of the prolactin level between the 5th day (pre) to 13th day (post). Table 4 shows that the mean of prolactin level in the experiment group was 35.337 nanogram, and in the control group was -38.381 nanogram. It was indicated that the mean of prolactin level in the experiment group was higher than the mean in the control group. But the range of data between two groups was similar.

Table 5 Normality test for breast milk volume and prolactin level using Shapiro Wilk

Variable	Groups	*p-value*
Volume of breast milk production	Experiment	0.671*
	Control	0.081*
Prolactin level	Experiment	0.814*
	Control	0.064*

**)Normal distribution > 0.05*

Table 5 shows the result of Shapiro Wilk, which indicated that the volume of breast milk production and prolactin level in the intervention and control group were in normal distribution with p-value > 0.05.

Table 6 Homogeneity test using Levene's test

Variable	*p-value Levene's Test*
Volume of breast milk production	0.056*
Prolactin level	0.057*

**)Homogenous > 0.05*

The Levene's test as shown in the Table 6 indicated that the volume of breast milk production and prolactin level in the intervention and control group were homogenous with p-value >0.05.

Table 7 Comparison test of confounding variables on breast milk production volume and prolactin levels

Confounding variables	Volume of Breast milk production		Prolactin level	
	Contingency Coefficient	*p-value*	*Contingency Coefficient*	*p-value*
Age	0.812	0.412	0.816	0.406
Education	0.707	0.368	0.707	0.417
Job	0.707	0.368	0.707	0.417
Parity	0.811	0.426	0.816	0.406

**)Significant level <0.05*

All confounding variables as shown in the table 7 had no effect on the volume of breast milk production and prolactin level with p-value >0.05.

Table 8 The effect of musa balbisiana colla on the volume of breast milk production and prolactin level (*Independent t- Test)*

Variable	*T*	*df*	*p-value*	*Mean Difference*	*Interval*	
					Lower	*Upper*
Volume of breast milk production	3.914	14	0.003*	106.031	39.088	172.974
Prolactin level	4.261	14	0.001*	73.718	36.336	111.101

**)Significant level <0.05*

Table 8 shows that there was a significant effect of consuming *Musa balbisiana Colla* extract on the volume of breast milk production with p-value 0.003 (<0.05), and the mean difference between intervention and control groups was 106.031, ranged between 39.088 (lower) to 172.974 (upper). The data also showed that there was a significant impact of *Musa balbisiana Colla* extract on the prolactin level with p-value 0.001 (<0.05). The mean difference of prolactin level between both groups was 73.718, which ranged between 36.336 (lower) to 111.101 (upper).

DISCUSSION

The findings of this study revealed that the mean of breastfeeding duration since the 5th day to 12th day of intervention in postpartum period was 235.300 minutes in the experiment group and 182.300 minutes in the control group. It could be seen that the average of breastfeeding duration in the experiment group was longer than it in the control group. This finding was in line with the previous study of Wahyuni,[15] stated that an increase in the duration of breastfeeding significantly affected by consuming banana blossom for 7 days in a row. In this case, she assumed that the more a mother breast-feeding, the higher the volume of milk produced in the body.[15] However, the calculation of milk production volume in this study was more accurate than in the previous study, because the researchers consider the average duration of breastfeeding per day. In this study, a Soetjiningsih's formula[17] to measure the volume of an average milk production per day in units of milliliters, assuming that

normal milk production in quantity on average is about 600 ml per day in the first year.

The results of this study also showed that there was a significant effect of consuming *Musa balbisiana Colla* extract on the volume of breast milk production with p-value 0.002 (<0.05). This finding was consistent with the previous study revealed that there was an effect of banana blossom on the increase of breast milk production.[15]

According to Sulistyawati, foods during breastfeeding will affect the quality or quantity of milk produced.[18] To breastfeeding exclusively, mothers should receive additional food. If the mother's diet constantly does not meet adequate nutrition, the breastmilk gland will not work effectively. So, the finding of this study was really useful, which banana flowers easily to find, and have several compounds that can increase the production and quality of milk. According to Mamuaja, in 100 grams of banana blossom of kluthuk has 31 kcal calories and 30 mg calcium, 1.26 g protein, 170 IU of vitamin A, vitamin C 10 mg, 50 mg phosphorus and 0.4g flavonoids.[16] Flavonoid in the banana flower is an anti-progesterone in the mammary gland, thus increasing the action of prolactin in stimulating milk production.[19] Reflex of prolactin hormone to produce milk is working when a baby sucks mother's nipple in which there is a neurohormonal stimulation ron the nipple and areola of the mother. This impulse is forwarded to the pituitary through nervosvagus, then to the anterior lobe. These lobes will secrete the hormone prolactin, enter the bloodstream and to the glands of breast milk maker. These glands will be stimulated to produce breastmilk.[18]

On the other hand, the finding of this study also revealed that there was a significant impact of consuming *Musa balbisiana Colla* extract on the prolactin level with with p-value 0.001 (<0.05). The mean difference of prolactin level between both groups was 73.718, which ranged between 36.336 (lower) to 111.101 (upper). This proved that the flavonoid in *Musa balbisiana Colla* has an influence towards hormone prolactin, like the study said that the higher level of the prolactin, the better process of breast milk production.[15] In addition, flavonoid in musa balbisiana colla is high enough, namely 0.4 gram per 100 gram. This study proved that mean of prolactin level in the experiment group was 35.337 nanogram and in the control group was -38.381 nanogram. It described that the mean of prolactin level in the experiment group was higher than it in the control group.

Limitation of the study

This study provides the insight of knowledge regarding the effect of musa balbisiana colla on breast milk production in breastfeeding mothers. However, further study is needed to have bigger sample size to generalize the finding of this study.

CONCLUSION

From this study, it can be concluded that there was a significant effect of banana blossom (*Musa balbisiana Colla*) extract on breast milk production and prolactin level in breastfeeding mothers. The findings of this study could be used to be alternative daily menu for postpartum mothers and a solution for midwives to deal with those who have inadequate production of breast milk.

Declaration of Conflicting Interest

None declared.

Acknowledgement

This study has been supported by Health Ministry Polytechnic Semarang, Indonesia.

Authorship Contribution

Authors have equal contribution on this study

References

1. Leung AKC, Sauve RS. Breast is best for babies. *Journal of the National Medical Association.* 2005;97(7):1010.
2. Martin CR, Ling P-R, Blackburn GL. Review of infant feeding: key features of breast milk and infant formula. *Nutrients.* 2016;8(5):279.
3. World Health Organization. *The optimal duration of exclusive breastfeeding. A systematic review.* Geneva: World Health Organization. 2001.
4. Thet MM, Khaing EE, Diamond-Smith N, Sudhinaraset M, Oo S, Aung T. Barriers to exclusive breastfeeding in the Ayeyarwaddy Region in Myanmar: Qualitative findings from mothers, grandmothers, and husbands. *Appetite.* 2016;96:62-69.
5. Agunbiade OM, Ogunleye OV. Constraints to exclusive breastfeeding practice among breastfeeding mothers in Southwest Nigeria: implications for scaling up. *International Breastfeeding Journal.* 2012;7(1):5.
6. Muchacha M, Mtetwa E. Social and economic barriers to exclusive breast feeding in Rural Zimbabwe. *International Journal of MCH and AIDS.* 2015;3(1):16.
7. Thomas JV. *Barriers to exclusive breastfeeding among mothers during the first four weeks postpartum*. Minnesota: College of Health Science, Walden University; 2016.
8. Ministry of Health. *Basic health research 2013*. Jakarta: Ministry of Health of Indonesia; 2013.
9. Hajeebhoy N. *The lancet breastfeeding series*. Geneva: World Health Organization; 2016.
10. Department of Health of East Java Indonesia. *Health profile of Kediri City.* East Java: Department of Health of East Java Indonesia; 2016.
11. Munir M. Infantile diarrhoea: breast and bottle feeding compared with special reference to their clinical role. *Paediatrica Indonesiana.* 1985;25(5-6):100-106.
12. Nindiyaningrum RA. Pengaruh pemberian ekstrak daun katuk terhadap produksi ASI pada ibu post partum [Effect of katuk leaves extract on breastmilk production in postpartum mothers]. *Jurnal Ilmu Keperawatan dan Kebidanan.* 2014;1(6).
13. Turlina L, Wijayanti L. Pengaruh pemberian serbuk daun pepaya terhadap kelancaran asi pada ibu nifas di Bpm Ny. Hanik Dasiyem, Amd. Keb di Kedungpring Kabupaten Lamongan [Effect of papaya leaf powder on breastmilk production in postpartum mothers at Bpm Ny. Hanik Dasiyem, Amd. Keb in Kedungpring Kabupaten Lamongan]. *Jurnal Media Komunikasi Ilmu Kesehatan.* 2015;7:01.
14. Syarief H, Damanik RM, Sinaga T, Doloksaribu TH. Pemanfaatan daun bangun-bangun dalam pengembangan produk makanan tambahan fungsional untuk ibu menyusui [Utilization of bangun-bangun leaves in developing functional supplementary food products for breastfeeding mothers]. *Jurnal Ilmu Pertanian Indonesia.* 2014;19(1):38-42.
15. Wahyuni E, Sumiati S, Nurliani N. Pengaruh konsumsi jantung pisang batu terhadap peningkatan produksi asi di wilayah Puskesmas Srikuncoro, Kecamatan Pondok Kelapa, Bengkulu Tengah tahun 2012 [Effect of consuming stone heart banana on the increase of breatmilk in the working area of Puskesmas Srikuncoro, Kecamatan Pondok Kelapa, Bengkulu Tengah in 2012]. *Buletin Penelitian Sistem Kesehatan.* 2013;15(4).
16. Mamuaja CF, Aida Y. Karakteristik gizi abon jantung pisang (musa paradisiaca) dengan penambahan ikan layang (Decapterus sp) [Nutritional characteristics abon of banana inflorescence (musa paradisiaca) with addition of scad fish (decapterus sp)]. *Jurnal Ilmu dan Teknologi Pangan.* 2014;2(2):28.
17. Soetjiningsih D. A*SI: Petunjuk untuk tenaga kesehatan [Breastmilk: Guideline for health workers]*. Jakarta: EGC; 1997.

18. Sulistyawati A. *Buku ajar asuhan kebidanan pada ibu nifas [Teaching book of midwifery care for postpartum mothers]*. Yogyakarta: Andi Offset; 2009.
19. Kumar KPS, Bhowmik D. Traditional and medicinal uses of banana. *Journal of Pharmacognosy and Phytochemistry.* 2012;1(3).

Cite this article as: Wahyuningsih D, Syarief Taufik H TS, Khafidhoh N. Effect of musa balbisiana colla extract on breast milk production in breastfeeding mothers. *Belitung Nursing Journal*. 2017;3(3):174-182. https://doi.org/10.33546/bnj.103