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ORIGINAL RESEARCH

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## EFFECT OF MORINGA OLEIFERA ON LEVEL OF PROLACTIN AND BREAST MILK PRODUCTION IN POSTPARTUM MOTHERS

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### ABSTRACT

**Background:** Breastfeeding among postpartum mothers has been a problem due to low milk supply. As a result, mothers often decide to give formula milk or other additional foods, which may affect infant's growth and development.

**Objective:** This study aims to investigate the effect of moringa oliefera on the levels of prolactin and breast milk production (baby's weight and sleep duration) in postpartum mothers.

**Methods:** Quasi-Experimental study with non-equivalent control group design. There were 30 respondents recruited by purposive sampling, consisted of 15 respondents in intervention group and 15 respondents in the control group. This study was conducted from November until December 2016 in Four Midwives Independent Practice (BPM) in the working area of the Health Center of Tlogosari Wetan Semarang. Data were analyzed using Independent t-test.

**Results:** Findings showed that there was a mean difference of prolactin level in the intervention group (231.72 ng / ml) and the control group (152.75 ng / ml), and a significant effect on increasing the levels of prolactin ( $p = 0.002$ ). The mean of baby's weight in the intervention group was 3783.33 grams and in the control group was 3599.00 grams. However, there was no significant effect of moringa oleifera on baby's weight ( $p = 0.313 > 0.05$ ), while the mean difference on sleep duration was 128.20 minutes in the intervention group and 108.80 minutes in the control group. There was a significant effect on baby's sleep duration ( $p = 0.000$ ).

**Conclusion:** There were significant effects of moringa oleifera on mother's prolactin and sleep duration of the baby. However, there was no significant effect on baby's weight. Thus, it can be suggested that moringa oleifera can be used as an alternative treatment to increase breast milk production and prolactin hormones. Midwives should promote the benefits of moringa leaves as one of alternative supplements.

**Keywords:** breast milk production, postpartum, prolactin, moringa oleifera

## INTRODUCTION

As a global public health recommendation, infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health.<sup>1</sup> Breast milk has proved having immunological factors and bioavailability, and increases intelligence if compared to milk formula.<sup>2</sup> Various studies show that breastfeeding is beneficial in terms of health and socioeconomic, increases cognitive development, and improves infant survival, including to reduce the rate of infant morbidity and mortality caused by tract infections. For the benefits of mother, breastfeeding lowers the risk of postpartum hemorrhage and breast cancer, and delays pregnant.<sup>3,4</sup>

Breast milk as the best food for infants is not in doubt. But in fact, low rates of breastfeeding have been identified in Indonesia due to low milk supply or production in mothers.<sup>5</sup> As a result, mothers decided to give formula milk or other additional foods, which may have an effect to the growth of the baby.

There are several factors influencing breast milk production according to the literature, such as breast anatomical and physiological factors, psychological factors, baby sucking factors, nutritional factors, and drugs or ingredients from plants.<sup>6</sup> Additionally, prolactin and oxytocin hormones also play role in increasing milk production, which prolactin affects the amount of milk production, while oxytocin affects the secretion process.<sup>7</sup>

In line with this, medical intervention that is usually given to mothers to help breast milk production is by giving metoclopramide (reglan) in long-term use and oxytocin nasal. However, these may have side effects, for instance, metoclopramide can cause depression in mothers, and a spray of oxytocin nasal (syntocinon, one spray in each nostril, two minutes before feeding)

make mothers feel headache. Therefore, in regards to those side effects, alternative intervention is needed.<sup>8</sup>

Indonesia is one country that is rich in various types of medicinal plants that have been proven scientifically. Some of them that can increase the breast milk production are *katuk* or star gooseberry, *lampes*, *adas manis*, *bayam duri*, *bidara upas*, *blustru*, *dadap ayam*, *jinten hitam pait*, *nangka*, *patikan kebo*, *pulai*, ginger, *turi*, papaya and moringa.<sup>9</sup> However, this study only focuses on moringa oleifera.

Moringa plants in Indonesia is a local grocery that has the potential to be developed into a culinary of breastfeeding mothers, compounds contain phytosterols (included in the steroid classification), which works to improve and expedite the production of milk (laktogogum effect).<sup>10</sup> Its effect on breast milk production has been proven in previous studies.<sup>11,12</sup> However, little is known about its effect in the setting of this study, in the working area of the Health Center of Tlogosari Wetan. The effort of midwives to deal with low breast milk production, according to our preliminary study, was just limited to the health education. Therefore, this study aims to examine the effect of moringa oleifera on breastmilk production and prolactin level in postpartum mothers.

## METHODS

### *Design*

This study was quasi-experimental study with pretest posttest with control group.

### *Setting*

This study was conducted from November until December 2016 in the Four Midwives Independent Practice (BPM) in the working area of the Health Center (Puskesmas) of Tlogosari Wetan Semarang. Two BPMs for the intervention group and the other two BPMs for the control group. These 4 BPMs were in

different area to avoid reaction effect from respondents.

#### *Target Population and Sample*

Target population in this study was normal postpartum mothers who gave birth in BPM in Puskesmas Tlogosari Wetan Semarang, Indonesia. There were 30 respondents recruited by purposive sampling, which consisted of 15 respondents in intervention group and 15 respondents in the control group. The inclusion criteria of the samples were postpartum mothers in the 1<sup>st</sup> day until the 15<sup>th</sup> day, willing to breastfeed exclusively, not taking herbs or any breastfeeding supplements, and willing to be respondents, aged 20-35 years old. In addition, the baby's weight ranged from 2500-4000 grams. The exclusion criteria included postpartum mother with abnormal breast nipple, chronic energy deficiency (upper arm circumference <23.5 cm), babies with abnormalities (cleft lip), and postpartum mothers with complications (bleeding, infection).

#### *Intervention*

The intervention group was given moringa oleifera leaves in the form of capsule, which consisted of 28 capsules for each respondent. This capsule was taken two times per day at 7.30 am and 4 pm. There were no side effects if taken outside these hours, but just to facilitate respondents in a given time consumption of the capsules and facilitate monitoring of infant sleep duration after feeding. The dose of each capsule was 250 mg and was taken 30 minutes before breastfeeding. This capsule was given since the first day of postpartum until the 14<sup>th</sup> day. The control group was just given the midwifery care based on standard, namely health education about breast care and newborn care, and given vitamin and Fe tablet.

#### *Instruments*

The researchers conducted blood sampling as much as 3cc on the first day after delivery in the control and the treatment group before the intervention, then separated between plasma and serum using centrifuges by lab personnel of GAKI UNDIP, and the second blood sampling was conducted on 15<sup>th</sup> day of postpartum in the intervention and control group after intervention. Prolactin hormone level measurement was performed in the laboratory of GAKI UNDIP using microplate reader. In this study, the weight of infant was also measured to see the successful of breastfeeding of the mothers giving their milk to the babies. It was performed three times, namely the 1<sup>st</sup> day, 7<sup>th</sup> day, and 14<sup>th</sup> day, using digital scales that had previously been calibrated with number ARN-EBSD-01. In addition, the duration of baby's sleep was also observed after feeding as another indicator of breast milk production, and noted in the observation sheet in the morning and evening for 14 days.

#### *Ethical consideration*

This experiment received a study permission from the Health Research Ethics Committee of the Health Ministry Polytechnic Semarang with number: 174 / KEPK / polytechnic-smg / EC / 2016.

#### *Data Analysis*

Data were analyzed using univariate and bivariate analysis. Independent t-test was performed for this study.

## **RESULTS**

Table 1 showed that there were changes in prolactin level, baby's weight and sleep duration. It could be seen from the result of posttest of prolactin level, which was 231.72 % in the intervention group and 152.39 % in the control group. The

increase in baby's weight also occurred in the intervention group (3783.33) compared with it (3599.00) in the control group. Sleep duration in the intervention

group (128.20) was longer than the baby's sleep duration in the control group (108.80).

**Table 1** Prolactin hormone and breast milk production (baby's weight and sleep duration) before and after intervention in the intervention and control group

Variable	n	Mean	SD	Min	Max
<b>Prolactin Level</b>					
Intervention (Pre)	15	92.11	460.47	34.91	167.05
Control (pre)	15	97.82	596.14	38.46	208.73
Intervention (post)	15	231.72	604.45	127.88	312.59
Control (post)	15	152.39	678.67	63.67	284.98
<b>Breast Milk Production</b>					
Weight (1st day)					
Intervention	15	3256.67	399.05	2500	4100
Control	15	3366.67	343.03	2700	4300
Weight (7th day)					
Intervention	15	3503.33	469.98	2700	4200
Control	15	3383.33	521.22	2700	4300
Weight (15th day)					
Intervention	15	3783.33	460.07	3100	4500
Control	15	3599.00	520.19	2950	4500
Sleep duration					
Intervention	15	128.20	5.467	114	135
Control	15	108.80	6.742	98	119

**Table 2** Effect of moringa oleifera on changes in prolactin hormone and breast milk production after intervention in the intervention and control groups

Variable	n	Mean	SD	SE	p-value
<b>Prolactin level</b>					
Intervention	15	231.72	60.45	15.61	0.002
Control	15	152.75	66.99	17.29	
<b>Breast milk production</b>					
Weight (15 <sup>th</sup> day)					0.313
Intervention	15	3783.33	460.07	118.79	
Control	15	3599.00	520.19	134.32	
Sleep duration					0.000
Intervention	15	128.20	5.47	1.41	
Control	15	108.80	6.74	1.74	

The results of independent t-test in the table 2 show that the mean of prolactin level in the intervention group was 231.72 ng/ml with a standard deviation of 60.45 ng/ml, and the mean in the control group was 152.75 ng/ml with a standard deviation of 66.99. The result showed that there was a significant effect on increasing the levels of prolactin with

significant value of  $p = 0.002 < 0.05$  with  $\alpha = 5\%$ .

The result also shows that the mean of baby's weight in the intervention group was 3783.33 grams with a standard deviation of 460.07 grams, and in the control group was 3599.00 grams with a standard deviation of 520.19 grams. However, there was no significant effect of moringa oleifera on baby's weight with

significant value of  $p = 0.313 > 0.05$  with  $\alpha = 5\%$ .

The average of sleep duration in the intervention group was 128.20 minutes with a standard deviation of 5.467 minutes, and the control group had the mean of sleep duration of 108.80 minutes with a standard deviation of 6.742 minutes. The mean difference between the intervention and control groups was 19.4 minutes. The statistical result showed the p-value of 0.000, which indicated that there was a significant effect of *moringa oleifera* on baby's sleep duration.

## DISCUSSION

### *Effect of moringa oleifera on prolactin level*

An amount of breast milk in the early postpartum is correlated with the amount of prolactin released during breastfeeding after birth.<sup>13</sup> The main stimulus that maintains prolactin secretion is sucking, which milk production will continue as long as the baby continues to suck breast milk.<sup>13</sup> When mothers breastfeed their babies, nerve signals from the nipple to the hypothalamus will cause a surge of prolactin secretion about 10 to 20 times for approximately 1 hour. Prolactin is working on the breast to keep the glands of mammals that secrete milk into the alveoli to the next lactation production.<sup>14</sup>

This is supported by research that prolactin levels are different in each period. The results of research conducted in sixteen breastfeeding mothers found that the serum levels of prolactin were different between groups of breastfeeding mothers at the first week, fourth weeks, and eighth weeks of postpartum, at the first menstrual period after birth and after the babies done weaning.<sup>15</sup> It showed that the prolactin levels in the fourth weeks of postpartum were higher compared with the others.<sup>15</sup>

In this study, findings showed that the levels of prolactin in the intervention

group was higher than them in the control group. It is because the capsules of moringa leaves contain chemical compounds of phytosterol (polyphenol and sterols), which the compound plays a role to increase prolactin levels.<sup>10</sup> High prolactin levels have a function to improve, accelerate, and facilitate milk production.<sup>16</sup>

In addition, phytosterols and steroids contained in moringa leaves have the power effect of lactagogue, which can occur by stimulating directly the activities of protoplasm of cells secretory of mammary gland, stimulating the secretory nerve endings in the milk glands so that secretion milk increased, or stimulating the hormone prolactin, which is working on alveolar epithelial cells.<sup>10,17</sup>

Prolactin or luteotropin (LTH) is a lactagogue hormone and proliferative against the mammary gland. Effects of prolactin in humans or mammals is the stimulation of lactation.<sup>18</sup> Additionally, lactagogue function can also improve glucose metabolism for lactose synthesis that increases milk production.<sup>18</sup>

The finding of this study was also in line with the research results indicated that the galactagogue of *moringa oleifera* has been an induction of prolactin production in the anterior pituitary gland. Study reported that patients with the *Moringa* has a higher level of prolactin level with an average of a statistically significant increase of  $19.5 \cdot 10^2$  mIU / L.<sup>10</sup>

### *Effect of moringa oleifera on breast milk production*

Based on literature review, indicators of an assessment of the breast milk production could use some criteria as a reference to determine the secretion of breast milk and the amount sufficient for the baby, such as an increase in infant weight, frequency and urine color, frequency and characteristics of

defecation, sleep duration or baby calmness after feeding.<sup>14</sup>

In this study, breast milk production was measured based on the indicator of baby's weight and sleep duration. The findings of this study indicated that there were mean differences of baby's weights between the intervention and control groups in the 1<sup>st</sup> day, 7<sup>th</sup> day, and 15<sup>th</sup> day of treatments. However, there was no significant difference of moringa oleifera on baby's weight with significant value of  $p = 0.313 > 0.05$  with  $\alpha = 5\%$ . It was because the slight difference of mean of baby's weight between two groups. Yet, it could be explained that the number of breast milk production by the mothers might not be sufficient for the baby. This finding was in line with research conducted by orphan y who examined the influence of extract of Moringa leaves on birth weight and length birth weight of babies in pregnant women for 3 months, and it showed that no significant difference in mean birth weight ( $p = 0.168$ ) and the length of infant birth weight ( $p = 0.612$ ).<sup>19</sup> Thus, it could be said that the process of breast milk production is not that easy, which is influenced by two hormones, namely prolactin and oxytocin hormones.

Breast milk production is influenced by the hormone prolactin, which is continuously secreted into alveoli of the breast, but the milk does not flow easily from the alveoli into the duct system so that the milk does not drip continuously in the nipple. To drain the milk from the alveoli into the duct requires a process of merging neurologic and hormonal reflex involving the posterior pituitary hormone, namely oxytocin. If this hormone does not work then the baby will not get enough breast milk.<sup>14,20,21</sup>

Oxytocin reflex is more complicated than prolactin reflex. Thoughts, feelings and sensations mother will greatly affect this reflex. Maternal feelings can increase

and inhibit oxytocin. If stress happens, then the hormone reflex will be blocked from Let-Down reflex.<sup>14</sup> It is due to the release of adrenaline epinephrine which causes vasoconstriction of blood vessels of alveoli, so that the oxytocin hormone cannot reach the target organ, namely myoepithelium.<sup>14</sup> As a result of incomplete Let-Down reflex, there will be a buildup of milk in alveoli, and baby will not get enough milk, while the amount of the volume of milk can affect the baby's weight.<sup>14</sup> In addition, the speed of the baby's body fluid exchange is 7 times greater than in adults.<sup>14</sup>

On the other hand, breast milk flow is not in the same time. The content of breast milk flow in the first minute and the last minute of baby sucking is quite different. Protein and fat are much higher in the last minutes of breastfeeding than in the first few minutes; or it could be said as 'foremilk', the milk which is first drawn during a feeding. It is generally thin and lower in fat content, satisfying the baby's thirst and liquid needs; and also 'hindmilk', the milk which follows foremilk during a feeding. It is richer in fat content and is high in calories. The high fat and calorie content of this milk is important for your baby's health and continuing growth.<sup>22</sup>

The findings of this study also revealed that there was a significant effect of moringa oleifera on baby's sleep duration. The mean of sleep duration in the intervention group was 128.20 minutes with a standard deviation of 5.467 minutes, and the control group had the mean of sleep duration of 108.80 minutes with a standard deviation of 6.742 minutes. The mean difference between the intervention and control groups was 19.4 minutes. This result could be assumed that the babies in the intervention group had all of the benefits of breast milk. However, although the results showed the significant effect, it cannot be mentioned

that the breast milk production was good enough, because it should have 4 of 7 indicators that should be observed. In addition, sleep duration of each baby might not be the same because each individual is unique.

### LIMITATION OF THIS STUDY

The limitation of this study included that psychological changes in mothers were not observed by the researchers in detail. Although the researchers had tried to control this factor by asking and providing support to the respondents during the research process, but it could not be denied if the respondents still felt worried and did not tell the researchers.

### CONCLUSION

Based on the results of this study, it could be concluded that there were significant effects of moringa oleifera on mother's prolactin and sleep duration of the baby. However, there was no significant effect on baby's weight. Thus, it can be suggested that the capsules of moringa oleifera can be used as an alternative treatment to help mothers in breast milk production and increase their prolactin hormones. Midwives should promote the benefits of moringa leaves as one of alternative supplements. Further study is needed to observe all indicators of breast milk production, not just limited to the baby's weight and sleep duration.

### Declaration of Conflict of Interest

None declared.

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### Authorship Contribution

The authors equally contributed in this study.

### References

1. World Health Organization. The World Health Organization's infant feeding recommendation. 2001; [http://www.who.int/nutrition/topics/infantfeeding\\_recommendation/en/](http://www.who.int/nutrition/topics/infantfeeding_recommendation/en/). Accessed 12 March, 2017.
2. Hacker NF, Gambone JC, Hobel CJ. *Hacker and Moore's essentials of obstetrics and gynecology*: Philadelphia: Elsevier Health Sciences; 2015.
3. Kramer MS, Aboud F, Mironova E, et al. Breastfeeding and child cognitive development: new evidence from a large randomized trial. *Archives of General Psychiatry*. 2008;65(5):578-584.
4. Fewtrell MS, Morgan JB, Duggan C, et al. Optimal duration of exclusive breastfeeding: what is the evidence to support current recommendations? *American Journal of Clinical Nutrition*. 2007;85(2):635S-638S.
5. Shetty P. Indonesia's breastfeeding challenge is echoed the world over. *Bulletin of the World Health Organization*. 2014;92(4):234.
6. Ladewig PW. *Buku saku asuhan ibu dan bayi baru lahir [Mother and newborn handbook]*. Jakarta: EGC; 2006.
7. Gabbe SG, Niebyl JR, Simpson JL, et al. *Obstetrics: normal and problem pregnancies*. Philadelphia: Elsevier Health Sciences; 2016.
8. Constance S. *A midwife's handbook*. Philadelphia: Saunders; 2003.
9. Batugal PA, Kanniah J, Sy L, Oliver JT. *Medicinal plants research in Asia-Volume I: The framework and project workplans*. Italy: Bioversity International; 2004.
10. Raguindin PFN, Dans LF, King JF. Moringa oleifera as a galactagogue. *Breastfeeding Medicine*. 2014; 9(6):323-324.
11. Kiranawati TM, Nurjanah N. Improvement of noodles recipe for increasing breastmilk: Design of the moringa noodles. *American Journal of*

- Food Science and Technology*. 2014;2(3):88-92.
12. Titi MK, Harijono ET, Endang SW. Effect lactagogue moringa leaves (*Moringa oleifera* Lam) powder in rats white female wistar. *Journal of Basic and Applied Scientific Research*. 2013;3(4):430-434.
  13. Uvnäs-Moberg K, Widström A-M, Werner S, Matthiesen A-S, Winberg J. Oxytocin and prolactin levels in breast-feeding women. correlation with milk yield and duration of breast-feeding. *Acta Obstetrica et Gynecologica Scandinavica*. 1990;69(4):301-306.
  14. Guyton AC. *Human physiology and mechanisms of disease*. Philadelphia: WB Saunders Co; 1992.
  15. Tay CC, Glasier AF, McNeilly AS. Twenty-four hour patterns of prolactin secretion during lactation and the relationship to suckling and the resumption of fertility in breast-feeding women. *Human Reproduction (Oxford, England)*. 1996;11(5):950-955.
  16. Farah Rizki SG. *The miracle of vegetables*. Jakarta: AgroMedia; 2013.
  17. Kumalasari R, Arimbi D, Ismunandar A. Pemberian jamu uyup uyup terhadap kelancaran pengeluaran air susu ibu (asi) pada ibu nifas [Consumption of herb uyup uyup on smoot hexpenditure of breastmilk in postpartum mothers]. Paper presented at Seminar Nasional & Internasional, Semarang, Indonesia; 2014.
  18. Sari IP. Daya laktagogum jamu uyup-uyup dan ekstrak daun katu (*sauropus androgynus merr.*) pada glandula ingluvica merpati [Lactagogue effect of uyup-uyup (traditional medicine) and *Sauropus androgynus Merr* extract on pigeon inglu]. *Majalah Farmasi Indonesia*. 2003;14(2003).
  19. Yatim Y, Hadju V, Indriasari R. *Influence of moringga leaf extract on the born baby's weight and length from the informal sector working pregnant women*. Makassar: Bagian Gizi, fakultas Kesehatan Masyarakat, Universitas Hasanuddin.
  20. Biancuzzo M. Breastfeeding the Newborn: Clinical strategies for nurses. *Journal of Perinatal & Neonatal Nursing*. 1999;13(1):92-93.
  21. Marshall JE, Raynor MD. *Myles' Textbook for midwives*. Philadelphia: Elsevier Health Sciences; 2014.
  22. Jay E. Where does fore-milk end and hind-milk begin (and does it actually matter?). 2009; <https://thetruthaboutbreastfeeding.com/2009/03/03/where-does-fore-milk-end-and-hind-milk-begin-and-does-it-actually-matter/>. Accessed 13 March, 2017.

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