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ORIGINAL RESEARCH

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## THE IMPACT OF CONSUMING AMARANTHUS SPINOSUS L EXTRACT ON PROLACTIN LEVEL AND BREAST MILK PRODUCTION IN POSTPARTUM MOTHERS

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### ABSTRACT

**Background:** Breast milk is the best natural nutrient for the baby. However, some mothers have problems with breastfeeding due to lack of breast milk production. Spinach leaf (*Amaranthus Spinousus L*) is considered as one of the plants that have the effect of non-synthesis lactagogues to increase milk production.

**Objective:** To analysis the effect of spinach leaf (*Amaranthus Spinousus L*) extract on prolactin and breast milk production in postpartum mothers.

**Methods:** This was a quasi-experimental study with pretest posttest with control group design conducted in the Community Health Center of Wonogiri II Indonesia from December 2016 to January 2017. There were 30 participants were selected using purposive sampling, with 15 participants assigned in an experiment group and a control group. Data were analyzed using independent and paired t-test.

**Results:** The results showed significant differences in prolactin levels ( $p = 0.000$ ), breast milk production ( $p = 0.000$ ), and infant weight ( $p = 0.000$ ) ( $<0.05$ ) after given spinach leaf (*Amaranthus Spinousus L*) extract.

**Conclusion:** Spinach leaf (*Amaranthus Spinousus L*) extract had a significant effect in increasing the prolactin levels and breast milk production in postpartum mothers.

**Keywords:** spinach leaf, *Amaranthus Spinousus L*, prolactin, breast milk, postpartum

### INTRODUCTION

Baby is the most beautiful gift given by the Creator to humans. Baby care does not require special skills; it just needs a little

basic knowledge, logical thinking, and willingness to seek help and advice.<sup>1</sup> One way to take care of a baby is to breastfeed.

Breastfeeding is the feeding of babies and young children with milk from a woman's breast.<sup>1</sup> Health professionals recommend that breastfeeding begin within the first hour of a baby's life and continue as often and as much as the baby wants to get the immune system naturally, or called as exclusive breastfeeding, is to provide only breast milk to babies during the first six months of baby's life without providing food or other fluids, except for vitamins, minerals, and medicines that have been permitted. Exclusive breastfeeding is the most nutritious food for baby needs, protecting infants from various diseases such as diarrhea and acute respiratory tract infection.<sup>2</sup>

However, breastfeeding or lactation is a complex physiological process of milk production and secretion, involving physical, emotional and hormonal factors such as estrogen, progesterone, oxytocin, prolactin, growth hormone, glucocorticoid, and insulin.<sup>3</sup> Breast milk production can be influenced by several factors, one of which is a hormonal factor. Prolactin is one of the hormones that play a role in lactation. In fact, mothers sometimes are having problems with breastfeeding, which is the main problem is that breast milk is not produced smoothly.<sup>4</sup>

In 2015, Millennium Development Goals (MDG's) Indonesia was targeting a decrease of 23 for infant and under-five mortality for the period 2009-2015. Therefore, Indonesia has a commitment to reduce infant mortality rate from 68 / 1,000 live births to 23 / 1,000 live births and under-five mortality rate from 97 / 1,000 live births to 32/ 1,000 live births.<sup>5</sup> One of the frameworks for lowering infant mortality rate can be done with exclusive breastfeeding.

Department of Health of Central Java showed the coverage of exclusive breastfeeding in Central Java was 52.99% in 2013.<sup>6</sup> In 2014 exclusive breastfeeding coverage in Wonogiri sub-district was 46.06%, especially in the area of the community health center of Wonogiri II with 48.31% of coverage and 46.6% in 2015.<sup>7</sup> Thus, it can be said that the total coverage of exclusive breastfeeding in the area of the community health center of Wonogiri II decreased and considered less when compared with the Ministry of Health Strategic Plan target of 80% infants aged 0-6 months get exclusive breastfeeding.<sup>8</sup>

Surveys in Indonesia reported that 38% of mothers stopped breastfeeding because of lack of breast milk production.<sup>6</sup> It is also in line with Cox's research that little milk production in the first postpartum days becomes an obstacle to early breastfeeding. Inadequate exclusive breastfeeding may cause nutritional problems in infants.<sup>9</sup> Attempts to overcome them are, among other things, by increasing the quantity and quality of breast milk. One of the factors affecting milk production is food, and spinach (*Amaranthus Spinosus*) is a plant that has a non-synthesis lactagogue effect to increase the production of breast milk.

Majority of people in Indonesia eat katuk leaves to increase milk production, however, it is not easily to find. Thus, spinach is proposed as an alternative and more easily to find as the community commonly consumes it. Spinach grows wild and is found in many gardens or rice fields. The use of spinach as lactagogum was also supported by previous study indicated that 10% of spinach infusion could increase milk production of mice.<sup>10</sup> Therefore, this study aimed to examine

the effect of Spinach (*Amaranthus Spinosus*) in increasing breast milk production and prolactin levels in postpartum mothers.

## METHODS

### *Design*

This research was a quasi-experiment with pretest posttest with control group design. This study was conducted in the Community Health Center of Wonogiri II Indonesia from December 2016 to January 2017.

### *Population and Sample*

The target population in this study was all postpartum mothers in the working area of the Community Health Center of Wonogiri II. There were 30 participants were selected using purposive sampling, with 15 participants assigned in the experiment and control group. The inclusion criteria to choose the sample were: a postpartum mother from day 1 to 14, normal delivery, aged 20-35 years, baby weight 2500-4000 grams and normal breasts. The exclusion criteria were: postpartum mothers who had complications during pregnancy, childbirth and postpartum; taking breast milk and herbal supplements, consuming cigarettes and alcohol, infants with congenital abnormalities and postpartum mothers experiencing chronic energy deficiency (upper arm circumference <23.5 cm).

### *Intervention*

The intervention given was spinach leaf extract in the form of capsule (extracted in the Food Technology Laboratory of UNDIP). The capsule dose was 1400 mg per day, consuming three times per day (morning, afternoon and night). While the

control group was only treated with normal childbirth care (consuming Fe and Vitamin A tablets).

### *Instrument*

Prolactin levels and breast milk production were measured before and after given intervention. Prolactin levels were measured using vidas (Immunology Analyzer which works automatically by using Enzyme-Linked Fluorescence Immune-Assay (ELFA)) in the laboratory of RS UNS Surakarta. Blood sampling (3 cc) was performed in each participant. Breast milk production was measured using electric breast pumps and digital scales for weighing the baby.

### *Ethical Consideration*

The ethical approval of this study was obtained from the Ethics Committee of Poltekkes Kemenkes Semarang with number: 254/KEPK/Poltekkes-SMG/EC/2016. Informed consent was performed and signed by each participant.

### *Data Analysis*

Data were in a normal distribution. Independent t-test and paired t-test were performed for data analyses.

## RESULTS

Table 1 shows that the majority of the respondents aged 26-29 years, multipara, elementary-senior high school background, and not working. A half of them had the nutritional intake based on diet, a good sleep pattern and breastfeeding duration. Homogeneity test showed p-value >0.05 in all variables, which indicated that there were no significant differences of the characteristics of the respondents between experiment and control group.

**Table 1** Frequency distribution of respondents based on age, parity, educational level, working status, nutritional intake, sleep pattern, and breastfeeding duration in the experiment and control group

Characteristics	Group		P-value
	Experiment	Control	
<b>Mother's age (year)</b>			
Mean $\pm$ SD	26.93 $\pm$ 4.920	29.87 $\pm$ 3.543	0.117
Min $\pm$ max	20 $\pm$ 35	25 $\pm$ 35	
<b>Parity</b>			
Primipara	33.3%	33.3%	1.000
Multipara	66.7%	66.7%	
<b>Education</b>			
D1, D4, S1	40.0%	33.3%	1.000
Elementary, Junior high, Senior high	60.0%	66.7%	
<b>Working status</b>			
Working	46.7%	26.7%	0.449
Not working	53.3%	73.3%	
<b>Nutritional intake</b>			
According to diet	53.3%	60.0%	1.000
Not according to diet	46.7%	40.0%	
<b>Sleep pattern</b>			
Mean $\pm$ SD	7.20 $\pm$ 1.656	7.53 $\pm$ 1.642	0.948
Min $\pm$ max	5 $\pm$ 10	5 $\pm$ 10	
<b>Breastfeeding duration</b>			
Mean $\pm$ SD	16.67 $\pm$ 4.880	16.33 $\pm$ 5.164	0.783
Min $\pm$ max	10 $\pm$ 25	10 $\pm$ 25	

**Table 2** Breast milk production and prolactin hormone before and after intervention in the experiment and control group

Variable	Value	Group		P-value
		Experiment	Control	
Prolactin hormone				
Pretest	Mean±SD	254.399±76.699	198.988±61.806	0.184
	Min±max	157.32±388.86	97.28±320.67	
Posttest	Mean±SD	279.276±73.303	206.897±58.937	0.047
	Min±max	178.23±399.97	123.65±327.41	
Breast milk production (ml)				
Pretest	Mean±SD	19.33±7.761	19.67 ±9.904	0.919
	Min±max	5±30	5±35	
Posttest	Mean±SD	140±36.839	112.33±26.784	0.026
	Min±max	95±200	75±170	
Baby’s weight (gram)				
Pretest	Mean±SD	3150.67±344.580	3110.00±378.965	0.761
	Min±max	2500±3800	2580±3700	
Posttest	Mean±SD	3590.67±470.918	3205.33±388.033	0.021
	Min±max	3040±4800	2590±3750	

Table 1 shows that prolactin levels before intervention in the experiment group had an average value of 254.399 ng/dL with a

lowest value of 157.32 ng/ml and a highest value of 388.86 ng/ml, while in the control group the mean of prolactin

level was 198.988 ng/ml with the lowest value of 123.65 ng/ml and the highest of 327.41ng/ml. Independent t-test results showed p-value of pretest was 0.184 ( $>0.05$ ), which indicated that there was no difference of prolactin level between the experiment and control group before intervention. However, after intervention, independent t-test showed p-value 0.047 ( $<0.05$ ), which indicated that there was a statistically significant difference of prolactin level between the experiment and control group.

For breast milk production, before treatment in the experiment group had an average value of 19.33 ml with the lowest value of 5 ml and the highest of 30 ml, while in the control group the average of milk production was 19.67 ml with the lowest value of 5 ml and the highest of 35 ml. The result of independent t-test showed p-value 0.919 ( $>0.05$ ), which indicated there was no difference of milk production between the treatment group and control group before given intervention. Whereas p-value after given intervention was 0.026 ( $> 0.05$ ), which indicated that there was a statistically significant difference in the production of breast milk between the treatment group and the control group after given spinach (*Amaranthus Spinosus L*) extract.

For the infant weight, the treatment group during pretest had an average value of 3150.67 grams with the lowest value of 2500 gr and the highest of 3800 gr, while in the control group the average of infant weight was 3110 gr with the lowest value of 2580 gr and the highest value of 3700 gr. Independent t-test showed p-value 0.761 ( $>0.05$ ) meaning that there was no difference of infant weight between treatment group and control group before given intervention. While after given

intervention p-value was 0.021 ( $>0.05$ ), which means there was a statistically significant difference in infant weight between treatment group and control group after intervention.

## DISCUSSION

The result of this study revealed that there was a significant effect of spinach (*Amaranthus Spinosus L*) extract on prolactin level and the amount of milk production with p-value 0.000 ( $<0.05$ ). This suggests that giving spinach (*Amaranthus Spinosus L*) extract can increase the level of prolactin and milk production in postpartum mothers.

After childbirth, milk production increases rapidly, and then slowly decreases until the child is weaned. At lactation, a mother needs extra energy for the production of breast milk;<sup>11</sup> therefore, the lactation process is strongly influenced by the mother's intake, the availability of substrates/precursors in the blood plasma, the absorption of substrates by the udder gland, enzyme activity, and the cooperation of various steroid hormones.<sup>12</sup>

One of the factors affecting milk production is food.<sup>13</sup> Indonesia is rich in traditional plants that have lactagogous effects. Lactagogum is a substance that can increase milk production. Many sources of quality food are believed by the community as well as proven scientific tests in improving the quality and quantity of breast milk.

Usually people know more about "katuk leaf" as food that can increase milk production.<sup>14</sup> But nowadays katuk leaf is not easy to find. In contrast, spinach is everywhere in Indonesia, usually growing in the tropics and become an important

vegetable for community. Spinach is a perennial plant, fast growing and easily planted in gardens or fields. Previous research has shown that spinach (*Amaranthus Spinosus L*) can increase milk production.<sup>12</sup> Indri D research revealed that infusion of 10% spinach could increase milk production of mice.<sup>10</sup>

However, spinach (*Amaranthus Spinosus L*) contains alkaloids, flavonoids, glycosides, phenolic acids, steroids, amino acids, terpenoids, lipids, saponins, betalaine, b-sitosterol, stigmasterol, linoleic acid, routine, catechuic tannins and carotenoids.<sup>15</sup> Steroids and polyphenols play a role in the reflexes of prolactin, the reflex that stimulates the alveoli to produce milk.

In addition, polyphenols are a group of chemicals found in plants. This character has a distinctive sign that it has a phenol group in its molecule. Polyphenols play a role in the color of a plant, such as leaf color in autumn. The content of polyphenols plays a role in increasing prolactin levels. High levels of prolactin function are to improve the production of breast milk.<sup>14</sup>

On the other hand, the assessment of breast milk production is not only seen from the amount of milk volume alone, but there are several criteria as a reference to know the release of breast milk and the amount is sufficient, such as the value of baby weight. This study revealed that there was a significant increase of baby's weight after given intervention. This suggests that the spinach (*Amaranthus Spinosus L*) extract intervention may increase the levels of prolactin hormone and milk production seen from the increment of infant BB values.

This study provided the evidence that prolactin levels and breast milk production could be increased by consuming the spinach leaf (*Amaranthus Spinosus L*). However, other contents beside polyphenols and steroids in spinach need to be explored.

## CONCLUSION

Provision of spinach leaf extract (*Amaranthus Spinosus L*) for 14 days was proven to increase levels of prolactin hormone and milk production seen from breast milk volume and infant weight. It could be said that spinach leaf extract (*Amaranthus Spinosus L*) has potential as a supplement that can increase the level of prolactin and milk production. It is expected that postpartum women who have the problem in breastfeeding can consume spinach in their diet.

## Declaration of Conflicting Interest

None declared.

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## Authorship Contribution

All authors have equal contribution in this study.

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