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## OBSTETRICS

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# Effect of Egg and Milk Supplement on Breast Milk Volume at 48 and 72 Hours Postpartum: A Randomized-Controlled Trial

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### ABSTRACT

**Objective:** To determine whether egg and milk supplement with regular diet can increase breast milk volume at 48 and 72 hours postpartum.

**Materials and Methods:** A randomized-controlled trial was conducted at Chiangrai Prachanukroh Hospital between January 2013 and December 2013. One hundred and twenty term pregnant women with spontaneous vaginal delivery were randomized into four groups to receive (1) regular postpartum diet, (2) regular diet with milk supplement, (3) regular diet with egg supplement, or (4) regular diet with egg and milk supplement three meals a day. Breast milk volume was measured using an electric breast pump for 15 minutes for each breast at 48 and 72 hours postpartum. The differences in breast milk volume at 48 and 72 hours postpartum between groups were assessed using an analysis of covariance adjusted for the variables significantly different between groups at the time of delivery.

**Results:** Age of postpartum mothers ( $p=0.039$ ) and experience of breastfeeding ( $p=0.045$ ) were significantly different between groups, but not body mass index, gestational age at delivery and infant birth weight. In the analysis of covariance adjusted for maternal age and breastfeeding experience, postpartum mothers who received a regular diet with egg and milk supplement had a significantly higher volume of breast milk at 48 and 72 hours compared to mothers who received a regular diet ( $p<0.001$ ).

**Conclusion:** A diet with both egg and milk supplement three meals a day significantly increased breast milk volume in lactating women.

**Keywords:** Milk and egg supplement, breast milk volume, postpartum

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## Introduction

Breast milk is the ideal food for newborns and infants. It gives infants all the nutrients they need for healthy development, is safe and contains antibodies

that help protect infants from common illness such as diarrhea and pneumonia, which are the two primary causes of child mortality worldwide<sup>(1)</sup>. Breastfeeding also benefits mothers because it reduces the risk of

breast and ovarian cancer later in life and increases maternal-infants bonding<sup>(2)</sup>. The World Health Organization (WHO) recommends exclusive breastfeeding during the first six months of life and provides ten recommendations for a successful breastfeeding<sup>(3)</sup>. The amount of breast milk volume needed depends mainly on how often and how effectively the baby sucks on the breast. Many problems may lead to breastfeeding failure, such as inadequate breast milk volume, maternal stress, sick newborn, food intake or low birth weight<sup>(4)</sup>. With breastfeeding, the number of calories and the quantity of oral protein consumption during pregnancy and lactation is likely to increase<sup>(5)</sup>. The caloric intake during lactation for women should be more than 1,500 kilocalories (kcal)/day<sup>(6)</sup>. Egg and milk contain many nutrients and proteins, can increase lactating women's energy, are inexpensive and can be bought anywhere. This study was conducted to determine whether egg and milk supplement can increase breast milk volume at 48 and 72 hours postpartum as compared to a regular postpartum diet.

## **Materials and Methods**

### **Study Design and Participants**

This randomized-controlled trial study was conducted in the Department of Obstetric and Gynaecology, Chiangrai Prachanukroh Hospital between January 2013 and December 2013. One hundred and twenty term pregnant women without complication and with spontaneous vaginal delivery of a baby weighting more than 2,500 grams at birth were recruited. The present study was approved by the Internal Chiangrai Prachanukroh Hospital's Ethics Committee.

### **Randomization and Blinding**

After obtaining their consent, eligible women were randomly assigned to one of four equally sized groups of 30 women using blocked randomization. Between delivery and 72 hours postpartum, the women either received (1) regular postpartum diet (control group), (2) regular diet with 200-mL milk supplement three meals a day, (3) regular diet with one medium hard-

boiled egg supplement three meals a day, or (4) regular diet with both egg and milk supplement three meals a day. The study nurse was blinded to the intervention.

### **Study Procedures**

Every lactating women had unrestricted skin to skin contact with the baby immediately post-delivery. Breastfeeding was initiated within the first hour of life and then provided as often as the child wanted (day and night). Apart from the diet provided by the hospital, the mothers did not consume any other food within 72 hours postpartum. The breast milk volume was measured at 48 hours and 72 hours postpartum by electric breast pumps (Spectra 2) for 15 minutes for each breast.

### **Statistical Analysis**

We estimated that a sample size of 30 patients in each group would have 90% power to detect a difference in effect size of 0.35 between at least two of the four groups using one-way analysis of variance test with a 5% one-sided type I error.

The following variables were collected as part of this study: (1) at delivery: age, body mass index, gestational age, birth weight and previous experience of breastfeeding; (2) at 48 and 72 hours postpartum: breast milk volume, number of breastfeeds, number of maternal meals and amount of water consumed by the mother between delivery and 48 hours postpartum and between delivery and 72 hours postpartum. These characteristics were compared across the four groups using one-way analysis of variance test or exact probability test as appropriate. The primary endpoints were the differences in breast milk volume at 48 and 72 hours postpartum between groups and were assessed by analysis of covariance adjusted for the characteristics significantly different between groups at the time of delivery. P-values <0.05 were considered statistically significant.

## **Results**

At the time of delivery, age of postpartum mothers ( $p=0.039$ ) and previous experience of breastfeeding ( $p=0.045$ ) were significantly different between groups,

but not body mass index, gestational age at delivery and infant birth weight (Table 1). The number of breastfeeds, number of maternal meals and amount of water consumed by the mother between delivery and 48 hours postpartum and between delivery and 72 hours postpartum were not different between groups (Table 2).

The mean breast milk volume in mothers receiving a regular diet was 5.2 mL (standard deviation

(SD): 6.7 mL) at 48 hours and 19.6 mL (SD: 18.7 mL) at 72 hours, which was lower than that in women receiving at least one supplement. Only women receiving both egg and milk supplement had a significantly higher breast milk volume than women receiving a regular diet at 48 hours (+14.6 mean difference,  $p=0.008$ ) and 72 hours postpartum (+41.1 mean difference,  $p<0.001$ ) (Table 3).

**Table 1.** Maternal characteristics at delivery.

	<b>Regular diet (n=30)</b>	<b>Egg supplement (n=30)</b>	<b>Milk supplement (n=30)</b>	<b>Egg and milk supplement (n=30)</b>	<b>P</b>
	(Mean±SD)	(Mean±SD)	(Mean±SD)	(Mean±SD)	
Age (years)	26.0±5.2	29.1±6.6	25.2±5.4	28.0±5.7	0.039
BMI (kg/m <sup>2</sup> )	26.4±3.4	27.9±4.1	26.1±3.9	26.9±3.9	0.301
Gestational age (weeks)	38.5±1.2	39.1±1.4	38.9±1.2	38.5±1.1	0.156
Birth weight (g)	3069.8±321.4	3099.7±430.8	3051.3±336.4	3124.7±372.5	0.874
Previous experience of breastfeeding	25	25	27	12.9	0.115
Yes	12 (40.0)	19 (63.3)	14 (46.7)	21 (70.0)	0.045
No	18 (60.0)	11 (36.7)	16 (53.3)	9 (30.0)	

**Table 2.** Maternal and infant feeding after delivery

	<b>Regular diet (n=30)</b>	<b>Egg supplement (n=30)</b>	<b>Milk supplement (n=30)</b>	<b>Egg and milk supplement (n=30)</b>	<b>P</b>
Number of infant breastfeeds					
0-48 hours	17.7±5.3	18.3±3.6	19.9±3.7	19.1±3.7	0.184
0-72 hours	32.2±5.3	31.0±3.9	30.0±7.4	31.9±4.5	0.414
Number of maternal meals					
0-48 hours	5.5±0.9	5.5±0.9	5.7±0.5	5.5±1.0	0.729
0-72 hours	9.3±4.1	8.4±0.9	8.7±0.6	8.4±1.0	0.360
Amount of water consumed (mL)					
0-48 hours	2906.9±1127.0	3193.5±1307.5	2973.3±896.2	3346.0±1101.2	0.392
0-72 hours	5348.9±1363.2	5632.3±1702.9	5431.7±1603.7	5596.0±1539.6	0.881

**Table 3.** Assessment of differences in breast milk volume at 48 and 72 hours postpartum between groups using an analysis of covariance adjusted for maternal age and previous experience of breastfeeding.

	<b>Breast milk volume at 48 hours postpartum (mL)</b>	<b>95% CI</b>	<b>P</b>	<b>Breast milk volume at 72 hours postpartum (mL)</b>	<b>95% CI</b>	<b>P</b>
Regular diet (mean±SD)	5.2±6.7			19.6±18.7		
Egg supplement (mean difference)	+3.8	-6.8, 14.5	0.477	+19.6	-2.5, 41.7	0.082
Milk supplement (mean difference)	+7.5	-3.1, 18.1	0.163	+4.1	-17.9, 26.0	0.715
Egg and milk supplement (mean difference)	+14.6	3.8, 25.4	0.008	+41.1	18.8, 63.5	<0.001

## Discussion

Although much has been learned about dietary requirements for lactation from women from different cultures and with various nutritional levels, conflicting results have been reported. A high intake of protein nutrients and calories is usually recommended to ensure that the mother provides good milk to her infant during breastfeeding<sup>(7,8)</sup>.

The present study found that postpartum mothers who received a regular diet with egg and milk supplement had a significantly higher volume of breast milk at 48 and 72 hours postpartum compared to mothers who received a regular diet ( $p < 0.001$ ). Mothers who received a regular diet with only one supplement (either egg or milk) also had higher volume of breast milk than mothers who received a regular diet, but the differences were not significant. A study in 50 well-nourished lactating mothers found that only egg supplement significantly increased breast milk production at 48 hours postpartum<sup>(12)</sup>.

Egg and milk can increase energy and protein in lactating women. One medium egg contains 78 calories, 6.29 grams of protein, carbohydrate, fat, cholesterol and vitamins, while 200 mL of milk contain 134 calories, 3 grams of protein, 7.2 grams of fat and 14.4 grams of lactose<sup>(13)</sup>. Nursing mothers consume an

average of 2,460 kcal daily to produce milk, as compared to 1,880 kcal in non-nursing mothers<sup>(14)</sup>. The United States Institute of Medicine Committee on Nutritional Status During Pregnancy and Lactation does not recommend diet intake below 1,500 kcal/day at any time during lactation<sup>(6)</sup>. It has been reported that mothers who consume less than 1,500 kcal/day during lactation had a decreased breast milk volume<sup>(6,15)</sup>, while a study in Japanese women found that lactating women on a low-caloric diet for three days postpartum had a lower breast milk volume compared to lactating women on a regular postpartum diet<sup>(16)</sup>.

A regular postpartum diet provided by the hospital has an average energy of 2,000 kcal/day. A regular diet with 200-ml milk supplement and one boiled egg supplement three meals a day can increase the energy by 834 kcal/day and therefore increase breast milk volume. Based on the results of the present study, we suggest to provide nursing mothers with milk and egg supplement along with their regular diet in order to increase breast milk volume and caloric intake.

One limitation of our study is that, despite the use of blocked randomization, some of the maternal characteristics at delivery were different across the four groups. The analysis of covariance had to be adjusted for the variables significantly different across the groups

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In conclusion, the present study demonstrated that supplementing lactating women's regular diet with egg and milk within 72 hours postpartum significantly increased breast milk volume. These findings can help achieve the goal of exclusive breastfeeding.

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## Potential conflicts of interest

None.

## References

1. American Academy of Pediatrics, American College of obstetricians and Gynecologists: Guidelines for Perinatal Care, 6th ed. American Academy of Pediatrics, Elk Grove Village, IL: American College of Obstetricians and Gynecologists, Washington, DC, 2007; PP 171,242.
2. Gartner LM, Morton J, Lawrence RA, Naylor AJ, O'Hare D, Schanler RJ, et al: American Academy of Pediatrics Section on Breastfeeding. Breastfeeding and the use of human milk. *Pediatrics* 2005;115:496–506.
3. World Health Organization. Ten steps to successful breastfeeding. Geneva: WHO, 1998.
4. Dewey KG. Maternal and fetal steps are associated with impaired lactogenesis in human. *J Nutr* 2001;131: 30125-55.
5. Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Gilstrap III LC, Wenstrom KD, editor. *Williams Obstetrics* 22<sup>nd</sup> ed. USA: McGraw-Hill; 2005.p.695-710.
6. The United States Institute of Medicine Committee on Nutritional Status During Pregnancy and Lactation: Nutrition during lactation. Washington, DC: National

- Academy Press, 1991.
7. Fomon ST: Breastfeeding and evolution. J Am Diet Assoc 1986;86:317.
  8. Jelliffe EFP: Maternal Nutrition and lactation, Ciba Foundation Symposium, No 45. Breastfeeding and the Mother. Amsterdam: Elsevier Science, 1976.
  9. Dusdieker LB, Hemingway DL, Stumbo PJ. Is milk production impaired by dieting during lactation? AJCN. 1994;59:833-40.
  10. Morse JM, Ewing G, Gamble D, Donahue P. The effect of maternal fluid intake on breast milk supply: a pilot study. Eurasian Journal of Public Health. 1992 May – Jan 83(3):213-6.
  11. Gonzalez-Cossio T, Habicht JP, Rasmussen KM, and Delgado HL. Impact of food supplementation during lactation on infant breast-milk intake and on the proportion of infants exclusively breast-fed. J Nutr 1998;128:1692-702.
  12. Laosirirat T. Effect of egg supplementation for breast milk production at 48 hour postpartum. Thai J Obstet Gynecol 2011;19:45-9.
  13. Holland B, Unwin ID, and Buss DH. Mc Cance and Widdowson's The Composition of Foods, 6th Summary Edition. Cambridge: Royal Society of Chemistry; 2002. Available at: [http://www.nutritionandeggs.co.uk/page/nutritional\\_val](http://www.nutritionandeggs.co.uk/page/nutritional_val). Accessed February 6, 2011.
  14. English RM, Hitchcock NE: Nutrient intakes during pregnancy, lactation and after the cessation of lactation in a group of Australian women. Br J Nutr 1968;22:615.
  15. Prentice AM, Prentice A: Energy costs of lactation. Annu Rev Nut. 1988;8:63.
  16. Okanura T, Takeuchi T, Nishi O, Yagurunma T, Kawana T. Effects of low-caloric diet in puerperium on prolactin, TSH, estradiol and milk secretion. Acta Obst Gynaec Jpn 1987;39(11):2059-5.

## ผลของการรับประทานนมและไข่เสริมในมารดาต่อปริมาณน้ำนมมารดาที่ 48 ชั่วโมงและ 72 ชั่วโมง หลังคลอด

### จุลพงศ์ อจลพงศ์

**วัตถุประสงค์:** เพื่อศึกษาการให้ไข่และนมเสริมในอาหารปกติแก่มารดาหลังคลอดสามารถเพิ่มปริมาณน้ำนมที่ 48 และ 72 ชั่วโมงได้หรือไม่

**วัสดุและวิธีการ:** ศึกษาในมารดาหลังคลอดบุตรปกติทางช่องคลอดที่คลอดที่โรงพยาบาลเชียงใหม่ระหว่างเดือน มกราคม 2549 ถึงเดือนธันวาคม 2549 จำนวน 120 คน โดยแบ่งเป็น 4 กลุ่มๆ ละ 30 คน เพื่อได้รับอาหารปกติ, อาหารปกติเสริมไข่, อาหารปกติเสริมนม, อาหารปกติเสริมไข่และนมวันละ 3 มื้อ เปรียบเทียบปริมาณน้ำนมในมารดา โดยการใช้เครื่องปั๊มไฟฟ้าเป็นเวลา 15 นาที ที่ 48 และ 72 ชั่วโมงหลังคลอด ระหว่างวันที่ 1 มกราคม 2556 – 31 ธันวาคม 2556

**ผลการศึกษา:** อายุมารดา ( $P=0.039$ ) และประสบการณ์การเลี้ยงลูกด้วยนมมารดา ( $P=0.045$ ) แตกต่างกันแต่ดัชนีมวลกาย, อายุครรภ์ที่คลอด และน้ำหนักทารกแรกคลอดไม่แตกต่างกัน เมื่อวิเคราะห์โดยปรับความแตกต่างอายุมารดา และประสบการณ์การเลี้ยงลูกด้วยนมมารดา พบว่ามารดาที่ได้รับอาหารปกติเสริมนมและไข่มีปริมาณน้ำนมเพิ่มขึ้นเมื่อเทียบกับมารดาที่ได้รับอาหารปกติที่ 48 และ 72 ชั่วโมงหลังคลอด อย่างมีนัยสำคัญทางสถิติ ( $P<0.001$ )

**สรุป:** อาหารปกติเสริมไข่และนมช่วยให้มารดาหลังคลอด มีปริมาณน้ำนมมากกว่ากลุ่มที่ได้รับอาหารปกติ, อาหารปกติเสริมไข่และกลุ่มที่ได้รับอาหารปกติเสริมนม จึงควรเสริมนมและไข่ให้มารดาหลังคลอด เพื่อเพิ่มปริมาณน้ำนม