ORIGINAL ARTICLE

The Efficacy of Steamed Ginger Extract, Hot Herbal Compress on Breast Milk Flow Rate in Normal First-Time Postpartum Women in the Early Postpartum Period

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Background: Milk deficiency is a common condition after delivery. Thai traditional medicine uses steamed ginger or hot herbal compress to promote milk production.

Objective: To investigate the efficacy and side effects of steamed ginger extract, hot herbal compress, and placebo for promoting milk production in normal first-time postpartum women at Thammasat University Hospital.

Materials and Methods: Standard quality values of the steamed ginger were investigated following the Thai Herbal Pharmacopoeia (THP) protocols. High performance liquid chromatography (HPLC) was used to identify the active constituents, which are 6-gingerol and 6-gingerol. The authors conducted an open, randomized, controlled trial with three groups. Ninety-nine women who had spontaneous vaginal deliveries were divided into three groups. One group received capsules of steamed ginger extract. Another group underwent hot herbal breast compresses, and a third group received capsules of placebo. All three interventions began two hours after delivery. Milk production was assessed using milk flow rates (MFR) before intervention and at 12, 24, 36, and 48 hours postpartum.

Results: Ninety-nine woman were enrolled and 33 were in the steamed ginger group,33 in the hot herbal compress group, and 33 in the placebo group. They had similar baseline demographic, clinical, and laboratory characteristics. The steamed ginger powder used in the present research project passed all parameters according to THP volume II and was safe for the study. Phytochemical markers of steamed ginger extract, which contained 6-gingerol at 77.425±14.57 mg/g and 6-shogaol at 26.19±6.22 mg/g, respectively. Significant differences in MFR were observed between the right and left breasts at 36 and 48 hours after delivery across the steamed ginger, hot herbal compress, and placebo groups. For the right breast, the flow rates at 36 and 48 hours postpartum were 2.67 and 3.18 for the steamed ginger group, 2.0 and 2.36 for the hot herbal compress group, and 1.88 and 2.27 for the placebo group. For the left breast, the flow rates at the same time points were 2.67 and 3.15 for the steamed ginger group, 1.97 and 2.42 for the hot herbal compress group, and 1.82 and 2.27 for the placebo group. These results were statistically significant ($p<0.05$). There was no adverse drug reactions reported in any of the three arms.

Conclusion: Steamed ginger can promote breast milk production 36 and 48 hours after delivery without adverse drug reactions.

Keywords: Steamed ginger extract; Hot herbal compress; Postpartum women

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Inadequate breast milk production is common and affects infants and mothers. Breast milk contains important antibodies and nutrients for newborn infants, and breastfeeding triggers contractions of the uterus for the mothers[1]. However, insufficient milk supply and flow can reduce maternal confidence in breastfeeding, leading to early supplementation with formula and cessation of breastfeeding[2,3]. In a traditional Thai women's health scripture known as Mahachotharat, ginger is used extensively as food and medicine to enhance breast milk production after childbirth. Previous studies of ginger have demonstrated its high total phenolic content[4]. Marker compounds, including 6-gingerol and 6-shogaol, which exhibit antioxidant and anti-inflammatory effects[4-8] and induce vasodilation and hyperthermia modulation[9], have been identified by high-performance liquid chromatography (HPLC)

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in steamed ginger extracts[5]. The vasodilatory effect of ginger may raise peripheral temperature[9] and increase blood supply to lactating breasts, boosting milk production[10]. Previous research had shown how effective it is as pain relief for women who spontaneously have vaginal deliveries. All groups showed a decreasing average perineum and uterus pain scores at 2, 24, 48, and 72 hours after delivery, and there were significant differences between the three groups ($p<0.05$). Specifically, the mean levels of perineum pain score in the steamed ginger extract group were more effective than the paracetamol and placebo groups at 2, 24, 48, and 72 hours after delivery, respectively. The steamed ginger extract exhibited the best activity for reducing perineum pain compared to placebo and paracetamol. There was no adverse drug reaction in the steamed ginger extract group[11].

Herbal compress balls, which are part of the National List of Essential Herbal Medicines, are hot medicinal herbs applied to the breasts after childbirth. These compress balls help increase blood circulation, reduce engorgement, and soften the breast tissue to facilitate breastfeeding. They are commonly used in Thai traditional clinics.

For these reasons, the authors assessed the Milk production of steamed ginger extract for postpartum women and the present study used milk flow rate to evaluate milk production in first-time postpartum women to evaluate the effectiveness of steamed ginger extract, hot herbal compress, and placebo.

Materials and Methods

Raw materials

Fresh ginger rhizomes (*Zingiber officinale* Roscoe) were obtained from plants grown under Good Agricultural Practice (GAP) at Lom Sak District, Phetchabun Province, Thailand. The ginger rhizomes were cleaned, washed, air dried, and steamed with an autoclave at 121°C and 15 psi for 15 minutes, and then grounded to powder. The powder was macerated in 95% ethanol for three days and filtered through Whatman No. 1 filter paper. The filtrate was dried by a rotary evaporator. The 95% ethanol extract of steamed ginger passed the standard of quality tests set by the Thai Herbal Pharmacopoeia (THP), including loss on drying, total ash, acid insoluble ash, extractive value, total aerobic microbial count, and heavy metals.

Standardization by quantitative evaluation of the steamed ginger extract

Standard quality values of the steamed ginger were investigated following THP protocols[12,13] namely, loss on drying, total ash, acid insoluble ash, and extractive value.

Loss on drying:

Loss on drying was determined by an electronic moisture analyzer. About two grams of dried sample was accurately weighed and heated to 105°C until the sample weight was constant. The moisture content by weight was calculated.

Total ash content:

This method investigated the physiological and non-physiological ash or inorganic compounds in the raw material. A crucible dried until the weight of the crucible was stable. Two grams of sample were weighed in the crucible and burned in a muffle furnace at 450°C until the ash turned grey or white and then the crucible was put in a desiccator until cool and then weighed. This process was repeated until the weight was constant. Total ash was calculated compared with the weight before burning.

$$\% \text{ Total ash} = \frac{\text{Stable weight after burning (g)}}{\text{Weight before burning (g)}} \times 100$$

Acid-insoluble ash content:

This method was continued from the total ash method. First, 10% hydrochloric acid (HCl) was prepared, then boiled with ash for five minutes and filtered through Whatman ashless filter paper No. 42. The residue was washed to pH 7 with distilled water. The ashless filter paper was dried and heated to 450°C in the muffle furnace for nine hours, repeated until the weight was stable. The percentage of acid insoluble ash was calculated.

$$\% \text{ Acid insoluble ash} = \frac{\text{Stable weight after burning (g)}}{\text{Weight before burning (g)}} \times 100$$

Extractive value:

The extractive value was used to determine the amount of chemical constituents in the plant. In the present study, the dried sample was extracted with ethanol and water. Methods for determining the ethanol-soluble and water-soluble extractive values were as follows, 1) 5 grams of dried sample were macerated in 100 mL of 95% ethanol in a closed flask for 24 hours. The flask was shaken frequently during the first six hours and allowed to stand for 18 hours. It was filtered rapidly guarding against the loss of ethanol. Twenty mL of the filtrate was evaporated in a tared flat-bottom shallow dish, dried at 105°C and weighed. 2) the water-soluble extractive value followed as per the ethanol-soluble extractive value using chloroform with water, 2.5 to 97.5, v/v, instead of 95% ethanol. The percentage of ethanol- and water-soluble extractive values were calculated.

Heavy metals

Recommended arsenic, cadmium, and lead levels should not exceed 4, 0.3, and 10 ppm, respectively, in the final dosage form of the plant material, when measured by atomic absorption spectrometry.

Limits for microbial contamination

The total aerobic microbial count must not exceed 10^5 per gram, and for yeasts and molds, the limits are 10^3 per gram.

Determination of active constituents (6-gingerol and 6-gingerol) in steamed ginger extracts using HPLC

The study on the chemical fingerprint was carried out by HPLC system (Agilent® 1200) composed of a solvent degasser (G1322A), a quaternary solvent pump (G1311A), an autosampler (G1329A), a column oven (G1316A) and a photodiode array detector (G1315D) with a diode array detector (G1315D), and automatic injector (G1329A). Data was analyzed with Chemstation® software. A reversed-phase column, Phenomenex® Luna C18 (150 mm × 4.6 mm, 5 µm) analytical column connected with a guard column of the same material was used for isolation. The 6-gingerol (Sigma, USA), 6-shogaol (Sigma, USA) were used as standards for quantitative analyses. Using a 40 minutes run time with a flow rate of 1.0 mL/minute, a gradient mobile phase composed of water (A) and acetonitrile (B) were set as follows, 0 to 25 minutes, 40% B to 50% B, 25 to 30 minutes, 50% B to 95% B, 30 to 35 minutes, 95% B to 100% B, 35.1 to 40 minutes, and 40% B. Samples were injected into the HPLC system and detected with a diode array detector using a wavelength of 227 nm. The contents of 6-gingerol and 6-shogaol in the samples were determined by using standard curves, constructed by using seven concentrations by serial dilutions of standard solutions.

Preparation of steamed ginger extract, hot herbal compress, and placebo capsules

Preparation of steamed ginger extract capsules:

The excipient for preparing the steamed ginger extract, packed in capsules and were labelled "0", contained the diluent Avicel® PH 102 (microcrystalline cellulose PH 102). Lubricants included magnesium stearate. AEROSIL® colloidal silicon dioxide was used as a glidant to enhance powder flow. Each capsule contained 100 mg of ginger extract. The ginger extract was blended by gliding Avicel® PH 102 past strainer number 80 and then mixed in a mortar. The mixture was glided again through strainer numbers 80 and then 100 until the powder was uniform. The lubricant was then mixed into the final product before entering the capsule-filling machine. The capsules were prepared in the Center of Excellence in Applied Thai Traditional Medicine Research (CEATMR), Thammasat University, Thailand.

Preparation of hot herbal compress:

The herbal compress comprised 50 grams of Phlai rhizomes, 30 grams of tamarind leaves, 20 grams of kaffir lime skin, 10 grams of turmeric rhizomes, 10 grams of lemongrass stalks, 10 grams of sompoi leaves, 15 grams of table salt, and 30 grams of camphor. All ingredients were cleaned and cut into small pieces, crushed, mixed, and wrapped into compressed of 150 grams.

Preparation of placebo capsules:

Placebo capsules were filled with lactose monohydrate and were labelled "0" for the 500 mg per capsule.

The standard of steamed ginger capsules

Weight variation:

The weight of twenty individual capsules should not deviate more than two capsules from the average weight by more than 10 percent, and no capsule should deviate in weight by more than 20 percent[14].

Disintegration:

The disintegration test for capsules using disintegration apparatus to assess the standard of capsules.

Medication administration, dose calculation

The dose in the present paper was a reference dose (RfD), which was the appropriate dose a person could ingest every day, according to U.S. EPA (United States Environmental Protection Agency) and the U.S. FDA (Food and Drug Administration). It was found by probabilistic multiplication of the no-observed-adverse-effect-level (NOAEL), which was primarily established experimentally with small laboratory mammals and correlated with body weight. Uncertainty factors (UF) of 10, such as tenfold reductions of the NOAEL, were applied to allow for interspecific variability (UFs) and intraspecific variability (UFH) where other animals and individual people differed from each other, respectively[15].

This was then multiplied by the average body weight of pregnant women in the delivery room, which was 63.8 kg[16]. The result indicated a drug dose equal to 638 mg can be taken daily with no

expectation of an adverse drug reaction.

RfD = (NOAEL / UFs × UFH) × Av. weight pregnant woman
= (1,000 mg/kg / 10 × 10) × 63.8 kg
= 638 mg/day

Study design

An open, 1:1 randomized controlled clinical trial was conducted to compare the efficacy of steamed ginger extract, hot herbal compress, and placebo for promoting milk flow rate in first-time normal postpartum women at Thammasat University Hospital. The present study was conducted after receiving approval from the Research Ethics Committee of the university.

Inclusion and exclusion criteria: The population consisted of normal first-time postpartum women who had vaginal deliveries and birth at 37 completed weeks' gestation. The procedure was explained to the participants, and written informed consent was obtained.

The inclusion criteria were women 20 to 40 years of age who had normal first-time labors and were healthy with no history of pregnancy toxemia, no liver or kidney disease, no gastrointestinal bleeding during pregnancy, no postpartum hemorrhage, no smoking or drinking alcohol during pregnancy, no participation in any other research, and gave fully informed, written consent.

The exclusion criteria were allergy to herbal remedies or lactose monohydrate, and not willing to join the present study.

The termination criteria were discontinued from the study if they were found to be allergic to the ginger extract, not following instructions of the researcher, or had an adverse reaction like swelling, nausea, vomiting, and chest discomfort.

Sample sizes

Sample sizes were based on the necessity to demonstrate a significant difference between steamed ginger extract, hot herbal compress, and placebo. The required sample size was calculated based on results of the previous possibility study[11]. A minimum of 30 women per group was calculated, considering a population eta-squared of 0.10 and 0.80 power[17]. Accounting for a 10% dropout rate, the final sample size was adjusted to 33 cases per group.

Randomization, blinding, and interventions

All participants received the same standard treatment designed to promote breastfeeding and the same food. The participants were randomly assigned to three groups. A table chart was created for the experiment by the person responsible for preparing ginger capsules and a placebo. These envelopes were kept with the midwife who opened each envelope when a new participant was recruited at the time of her delivery and monitored compliance throughout the study.

Group 1, an experimental group, received 100 mg capsules of ginger extract after meals, two capsules, as 200 mg total, three times a day for two days, with the first dose starting at two to six hours after her delivery.

Group 2, an experimental group, underwent breast compression with a hot herbal compress for 20 minutes twice a day for two days, starting two to six hours after delivery.

Group 3, the control group, received 500 mg placebo capsules after meals, two capsules three times a day for two days, with the first dose starting at two to six hours after her delivery.

Ethical considerations

The present study was approved by the Ethics Committee of the Faculty of Medicine, Thammasat University, Thailand (number of COA 317/2564) and Thai Clinical Trials Registry (TCTR), TCTR20250305003. All subjects were informed of the study details and were free to leave the study at any time.

Data collection

Demographic, maternal condition, and obstetric data questionnaires were validated by five experts and tested for internal consistency using the Cronbach alpha coefficient. The estimated reliability coefficient obtained was 0.952.

Milk flow rate

The flow of milk ejected from each breast was assessed at 12, 24, 36 and 48 hours postpartum using a milk flow rate form and done by a researcher. Milk is squeezed and discarded one hour before measuring the flow rate and before and after the experiment.

Milk flow rate measurement.

The flow of milk ejected when squeezing a nipple was rated as follows, level 0: no milk came out, level 1: milk seeped out but did not drip, level 2: 1 to 2 drops of milk came out, level 3: more than two drops of milk came out, but it did not gush out, and level 4: milk spurted out.

Table 1. Quality control of steamed ginger extract and capsule

Parameter	Result	Standard values	Summary
Loss on drying (%)	6.03±1.50	≤10	Pass
Percentage total ash (%)			
Total ash	6.99±0.36	≤10	Pass
Acid-insoluble-ash	0.48±0.10	≤1	Pass
Percentages of ethanol and water-soluble extractive values (%)			
Ethanol-soluble extractive values	1.34±0.23	≥5	Pass
Water-soluble extractive values	3.98±0.14	≥13	Pass
Foreign matter (%)	0.00	≤2	Pass
Limits for microbial contamination (CFU/g)			
Bacteria	2×10^1	$<5\times10^5$	Pass
Yeast and fungi	<10	$<5\times10^3$	Pass
Heavy metal contamination (ppm)			
Arsenic	0.005±0.0019	<4	Pass
Cadmium	0.123±0.0013	<0.3	Pass
Lead	0.011±0.0013	<10	Pass

Quality tests of loss on drying, total ash, acid insoluble ash, extractive values, limits for microbial contamination and determination of heavy metals by atomic absorption spectrophotometry according to the standard values set by the Thai Herbal Pharmacopoeia volume II

Table 2. Disintegration time and weight variation

Parameter	Result	Standard values	Summary
Disintegration time (minutes)	5.32	≤30	Pass
Weight variation (mg)	389.7 to 512.3	361.26 to 441.54 (average 401.40)	Pass

Statistical analysis

Demographic data:

The maternal conditions assessed before and two hours after birth include temperature, pulse, systolic blood pressure, diastolic blood pressure, blood loss, uterine contraction, perineum wound, weight of newborn, Apgar score, and gestational age. Data were presented using number, percentage, mean, standard deviation (SD) or median and interquartile range (IQR). Comparison was made between the baseline characteristics and obstetric data for the experimental and the control groups by using One-way ANOVA or Kruskal-Wallis H test for continuous data, and chi-square test for categorical data.

Milk flow rate measurement:

One-way ANOVA was used to compare the flow rates of both left and right breasts between the baseline and at 12, 24, 36, and 48 hours after birth.

Results

Quality control of steamed ginger

Standard values of quality control of steamed ginger and capsule:

The steamed ginger powder used in the present research project passed all parameters according to THP volume II. The results of the quality control of steamed ginger are shown in Table 1. The percentage of loss on drying was 6.03±1.50%, the percentage of total ash was 6.99±0.36%, acid insoluble ash was 0.48±0.10%, the percentages of ethanol and water-soluble extractive values were 1.34±0.23% and 3.98±0.14%, respectively. Heavy metal contamination was arsenic 0.005±0.0019 ppm, cadmium 0.123±0.0013 ppm, and lead 0.011±0.0013 ppm. The foreign matter was 0.00%. Limits for microbial contamination were bacteria 2×10^1 CFU/g, and yeast and mold less than 10 CFU/g.

The steamed ginger extract capsules were tested for disintegration time and weight variation. The disintegration time was 5.32 minutes. The steamed ginger capsules met the standardization criteria for weight variation according to United States Pharmacopeia (USP) 27. The capsules did not exceed 10% of the average weight of 401.40 mg, as shown in Table 2. Therefore, the steamed ginger extract capsules used in this research project passed the standard quality control criteria of THP II and were safety and suitable for the present study.

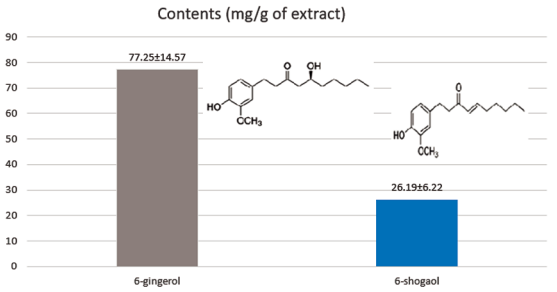

Figure 1. Chemical fingerprint of the 95% ethanol extract of steamed ginger extract by using high performance liquid chromatography.

Phytochemical marker of steamed ginger extract:

The 6-gingerol and 6-shogaol were marker compounds in the 95% ethanol extract of steamed ginger, which contained 6-gingerol at 77.425±14.57 mg/g and 6-shogaol at 26.19±6.22 mg/g, respectively, as shown in Figure 1.

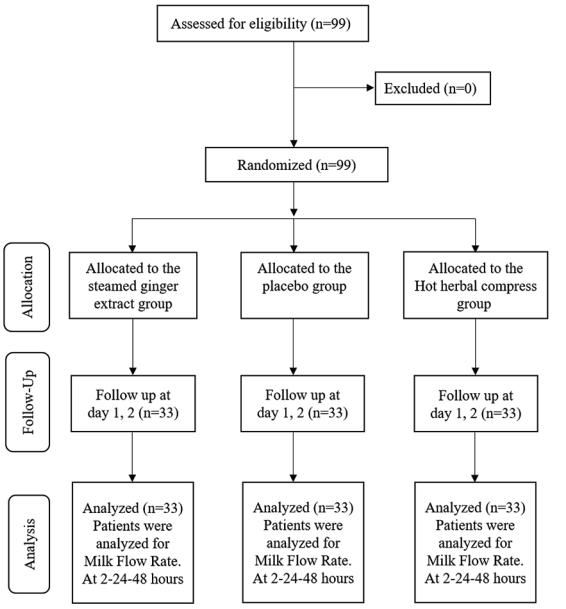

Figure 2. CONSORT flow diagram of participants through the study.

Clinical results

Demographic and obstetric information:

Ninety-nine women who were admitted to the postnatal ward at Thammasat University Hospital were enrolled in the study. The flow of participants in the study is shown in Figure 2. Baseline characteristics were similar between the three arms (Table 3) in terms of demographics, maternal conditions, and obstetric

Table 3. Demographic data, maternal conditions, and postpartum obstetric data

Parameter	Population group			p-value
	Steamed ginger extract (n=33)	Placebo (n=33)	Hot herbal compress (n=33)	
Age (years); mean±SD	24.94±4.31	25.15±5.04	25.85±4.58	0.709
Temperature (°C); mean±SD	37.02±0.55	36.85±0.39	36.92±0.37	0.262
Pulse (bpm); mean±SD	86.36±12.22	84.15±9.85	84.42±11.67	0.649
Systolic blood pressure (mmHg); mean±SD	121±8.95	119.18±9.71	119.70±10.76	0.742
Diastolic blood pressure (mmHg); mean±SD	76.91±7.34	75.39±6.84	76.15±7.18	0.689
Blood loss (mL); median (IQR)	100 (100, 200)	150 (100, 200)	150 (100, 300)	0.160
Uterine contraction; n (%)				0.364
Normal	33 (100)	33 (100)	32 (97.0)	
Not good	0 (0.0)	0 (0.0)	1 (3.0)	
Perineum wound; n (%)				0.629
Normal	27 (81.80)	26 (78.8)	30 (90.90)	
Edema	2 (6.10)	2 (6.10)	1 (3.00)	
Other	4 (12.1)	5 (15.2)	2 (6.10)	
Birthweight (g); mean±SD	3,086±337.49	3,040±367.51	2,967±318.79	0.366
Apgar score; median (IQR)				
1 minute	9 (9, 9)	9 (9, 9)	9 (9, 9)	0.072
5 minutes	10 (10, 10)	10 (10, 10)	10 (10, 10)	0.368
Gestation age; n (%)	38 (0.90)	38 (1.23)	38 (1.08)	0.320

SD=standard deviation; IQR= interquartile range

* Uterine contraction, Normal: After birth, the top of your uterus descends by about 1 or 2 centimeters each day. Not good: After birth, the top of your uterus decreases to less than 1 or 2 centimeters each day.

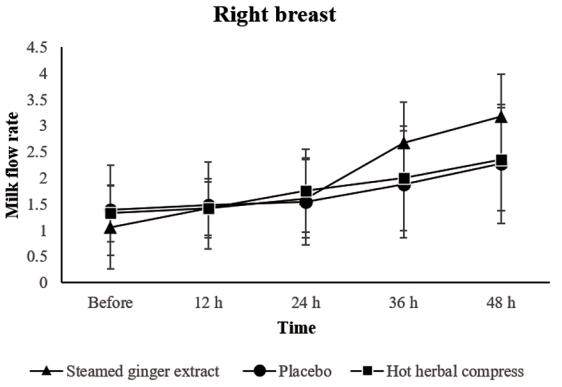

Figure 3. Comparison of milk flow in the right breast.

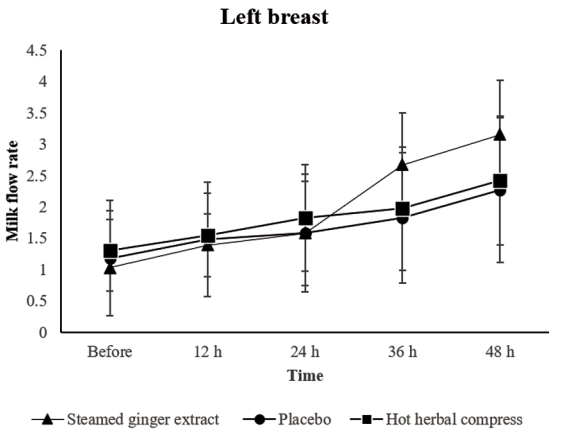

Figure 4. Comparison of milk flow in the left breast.

data after delivery.

Comparison of milk flow between groups

The milk flow rate was derived from the rating score, with a measurement score from 0 to 4 points. The steamed ginger extract group had significantly higher milk flow rate in both breasts compared to the hot herbal compress and placebo groups at two-time points, 36 and 48 hours (Figure 3, 4).

Adverse drug reactions

There were no adverse drug reactions in any of the three groups at any of the four time points measured.

Discussion

In Thai traditional scripture for women's health, ginger (*Zingiber officinale* Roscoe) is widely used for several clinical indications, including postpartum pain, nausea, and vomiting due to motion sickness, and to promote early ambulation and breastfeeding. Thai traditional practitioners always steamed the ginger rhizome before drug preparation.

In the present study, quality tests of loss on drying, total ash, acid insoluble ash, extractive values, limits for microbial contamination and determination of heavy metals passed the standard of the standard values set by the THP, thereby, validating the use of this extract in the present study.

Ninety-nine women who had spontaneous vaginal deliveries were divided into three groups. The present study investigated the efficacy and side effects of steamed ginger extract, hot herbal compress, and placebo for promoting milk production in normal first-time postpartum women.

The authors found that, after 24 hours, the steamed ginger extract, which contained 6-gingerol at 77.425±14.57 mg/g and 6-shogaol at 26.19±6.22 mg/g, had higher milk flow rates than hot herbal compresses and placebo. However, the findings of the study suggested that steamed ginger extract and hot herbal compress increased breast milk volume in the early postpartum period. The authors measured breast milk volume until two days, or at 48 hours, after birth as this is the usual time of stage II lactogenesis[17]. These findings are consistent with a previous study showing that a group of normal postpartum women who consumed ginger had higher milk production than a placebo group[18]. The mechanism by which ginger increases the milk supply is not clear. The authors hypothesized that ginger induces systemic vasodilatation, increasing blood flow to the mammary glands[9,11]. This is based on evidence that it raises the peripheral body temperature in humans[9] and causes vasodilatation in rats[9]. To confirm the findings of the efficacy of steamed ginger extract and hot herbal compress for increasing milk production in postpartum women, further research is needed, with larger groups of participants, more precise measurements of milk volume, and follow up for 7 to 14 days, particularly in later stages of lactation.

Conclusion

Ginger extract can promote breast milk flow rate in the 36 and 48 hours after delivery without adverse drug reactions. However, more rigorous studies with larger sample sizes extending beyond the first 48 hours postpartum are needed before ginger can be recommended for use in clinical practice.

What is already known about this topic?

In Thai traditional scripture for women's health, ginger (*Zingiber officinale* Roscoe) is widely used

for clinical indications, including postpartum pain, nausea, and vomiting due to motion sickness, and to promote early ambulation and breastfeeding. Thai traditional practitioners always steam the ginger rhizome before drug preparation. In addition, the steaming ginger extracts also have a high phenolic content by HPLC analysis, 6-gingerol and 6-shogaol were the main compounds detected in the 95% ethanol extract of steamed ginger, and it has been shown that 6-gingerol and 6-shogaol have antioxidant and anti-inflammatory, previous research has shown the effectiveness of pain relief on women who spontaneously had vaginal deliveries. All groups showed decreasing average perineum and uterus pain scores at 2, 24, 48, and 72 hours after delivery, and there were significant differences between the three groups ($p<0.05$). Specifically, the mean levels of perineum pain score in the steamed ginger extract group were more effective than the paracetamol and placebo groups at 2, 24, 48, and 72 hours after delivery, respectively. The steamed ginger extract exhibited the best activity for reducing perineum pain compared to placebo and paracetamol. There was no adverse drug reaction in the steamed ginger extract group. For these reasons, the authors assessed the milk production of steamed ginger extract for postpartum women.

What does this study add?

The results showed that the steamed ginger powder used in this research project passed all parameters according to THP volume II. Phytochemical marker of raw material of steamed ginger extract, which contained 6-gingerol at 77.425±14.57 mg/g and 6-shogaol at 26.19±6.22 mg/g, respectively. The steamed ginger extract group showed more milk production than the hot herbal compress group and the placebo group, respectively, at two time points 36 and 48 hours after delivery. Specifically, the mean Milk Flow Rate score levels in the steamed ginger extract group were more effective than the hot herbal compress and placebo group at 36 and 48 hours after delivery, respectively. There was no adverse drug reaction in the steamed ginger extract group.

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Conflicts of interest

The authors have no conflict of interest.

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