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The Combined Effects of Endorphin Massage and Blanched Pineapple Consumption on Fundal Height Reduction in Postpartum Women: A Quasi-Experimental Study

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ABSTRACT

Background: Uterine involution is an essential physiological process during the postpartum period. Endorphin massage may promote oxytocin release and uterine contractions, while pineapple contains bromelain, which may support tissue recovery. This study aimed to determine the effect of combining endorphin massage and blanched pineapple consumption on fundal height reduction among postpartum women.
Subjects and Method: A quasi-experimental study was conducted at a private midwifery clinic in Pekanbaru, Indonesia, from January to July 2026. A total of 100 postpartum women were recruited through consecutive sampling and non-randomly allocated into two groups equally. The intervention group received endorphin massage combined with 150 g of blanched pineapple daily for seven days, whereas the control group received endorphin massage alone. Fundal height was measured using an obstetric measuring tape. Data were analyzed using the Wilcoxon signed-rank and Mann–Whitney U tests.
Results: Baseline fundal height was comparable between groups, with a median of 13 cm (IQR 12–13) in both groups (p= 0.770). After seven days, median fundal height was 7 cm (IQR 7–8) in the intervention group and 8 cm (IQR 7–8) in the control group (p<0.001). Both groups showed significant within-group reductions (p < 0.001). Median fundal height reduction (ΔFH) was 5 cm (IQR 5–6) in the intervention group and 5 cm (IQR 4–6) in the control group. The between-group difference in ΔFH was statistically significant (p=0.050), with a higher mean rank in the intervention group (55.88 vs. 45.12).
Conclusion: The combination of endorphin massage and blanched pineapple consumption was associated with a significantly greater reduction in fundal height compared with endorphin massage alone. Further randomized controlled trials are warranted to confirm these findings.

Keywords: endorphin massage, uterine fundal height, uterine involution, postpartum women.

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BACKGROUND

The postpartum period is a physiological transition that begins immediately after childbirth and generally lasts approximately six weeks. During this period, the uterus undergoes a physiological process of involution, characterized by progressive reduction in uterine size and restoration toward the pre-pregnancy state. Uterine involution is an important indicator of postpartum maternal recovery. However, delayed or abnormal involution, or subinvolution, may indicate impaired uterine recovery and is associated with postpartum complications such as prolonged lochia and postpartum hemorrhage. Uterine fundal height (FH) is commonly used as a practical, non-invasive clinical indicator for monitoring uterine involution because it can be measured using simple equipment in various healthcare settings (Engstrom, 1988). Importantly, changes in FH should be interpreted as an indicator of uterine involution rather than as a direct measure of postpartum hemorrhage risk.

Postpartum hemorrhage remains an important cause of maternal morbidity and mortality worldwide. The World Health Organization (WHO) identifies postpartum hemorrhage as a major contributor to maternal deaths, particularly in low- and middle-income countries. In Indonesia, the 2023 Indonesian Health Survey reported a maternal mortality ratio of 189 per 100,000 live births, with postpartum hemorrhage contributing substantially to maternal mortality (Ministry of Health of the Republic of Indonesia, 2023). Prevention and timely management of postpartum hemorrhage therefore remain important components of maternal healthcare. Appropriate uterine contraction during the postpartum period contributes to physiological uterine involution, whereas clinical management of postpartum hemorrhage requires evidence-based interventions according to the severity and underlying cause (WHO, 2022; WHO, 2024).

Uterotonics such as oxytocin are established interventions for the prevention and management of postpartum hemorrhage when clinically indicated (WHO, 2018). Alongside standard clinical care, complementary non-pharmacological approaches have been investigated to support postpartum recovery. These approaches should be considered adjuncts to, rather than substitutes for, evidence-based obstetric management. One such approach is endorphin massage, a gentle massage technique applied to areas such as the back, neck, and shoulders (Angelika et al., 2020). Massage-based interventions have been proposed to promote relaxation and neuroendocrine responses, including oxytocin release, which may contribute to uterine contraction and postpartum recovery (Elisa et al., 2014; Kasiati & Rahayu, 2019). Previous studies have reported reductions in fundal height following postpartum massage interventions (Kasiati & Rahayu, 2019; Contesa, 2023). However, most studies have examined massage-based interventions as individual approaches, and evidence regarding their use in combination with nutritional interventions remains limited.

Nutritional approaches have also been investigated as complementary strategies during postpartum recovery. Pineapple (*Ananas comosus*) contains bromelain, a proteolytic enzyme that has been studied for its anti-inflammatory and tissue-repair-related properties (Maurer, 2001). Experimental research has investigated the effects of bromelain on biological processes related to tissue recovery and myometrial activity; however, evidence from experimental studies should not be interpreted as establishing a clinically proven uterotonic

effect in postpartum women (Apsari et al., 2014). Clinical studies have reported associations between pineapple consumption and reductions in uterine fundal height among postpartum women (Lamdayani et al., 2022; Aryani et al., 2023). These findings provide a rationale for further investigation of pineapple as a complementary nutritional intervention during the postpartum period.

The form in which pineapple is consumed may also be relevant. Fresh pineapple contains organic acids that may affect palatability and gastrointestinal tolerance. Blanching has been investigated as a food-processing approach for modifying the physicochemical characteristics of pineapple while retaining biologically relevant components. A recent study reported that blanched pineapple retained bromelain activity and was associated with a reduction in fundal height among postpartum women (Aryani et al., 2025). However, the biological activity of bromelain may depend on processing conditions, including temperature, duration, and preparation procedures. Therefore, the blanching procedure should be clearly standardized and reported to ensure reproducibility and to support interpretation of the intervention.

Existing evidence suggests that both massage-based interventions and pineapple consumption may be associated with postpartum uterine recovery, but the evidence base remains limited and heterogeneous. Previous studies have generally evaluated massage therapy or pineapple consumption separately (Kasiati and Rahayu, 2019; Contesa, 2023; Lamdayani et al., 2022; Aryani et al., 2023). Importantly, Aryani et al. (2025) subsequently investigated a combination of blanched pineapple and massage therapy in relation to uterine involution and breast milk production. Therefore, the novelty of the present study should not be framed as the first investigation of any combination of pineapple and massage. Rather, the present study focuses specifically on the combination of endorphin massage and a standardized daily intake of 150 g of blanched pineapple for seven consecutive days, with uterine fundal height as the primary indicator of uterine involution among postpartum women receiving care in an independent midwifery practice. This specific intervention regimen and setting provide an opportunity to further examine the association between the combined approach and postpartum uterine recovery.

Although the present study combines two complementary interventions, its quasi-experimental design does not permit determination of whether the interventions have a synergistic effect. Demonstrating synergy would require an experimental design capable of estimating interaction effects, such as a factorial design or separate intervention groups. Therefore, the present study focuses on comparing the outcome of the combined intervention with endorphin massage alone rather than establishing a synergistic interaction between the two interventions.

Accordingly, the objective of this study was to determine whether the combination of endorphin massage and blanched pineapple consumption was associated with a greater reduction in uterine fundal height compared with endorphin massage alone among postpartum women.

SUBJECTS AND METHOD

1. Study Design

This study employed a quasi-experimental pretest–posttest control group design. The study was conducted at a private midwifery practice, Pekanbaru, Riau Province, Indonesia, from January to July 2026. Participants were recruited using consecutive

sampling, in which eligible postpartum women who met the inclusion criteria were enrolled sequentially throughout the study period until the required sample size was achieved. Group allocation was non-random and based on the chronological order of participant recruitment. The first 50 participants recruited during the January–April 2026 period were assigned to the intervention group, while the subsequent 50 participants recruited during the April–July 2026 period were assigned to the control group. The intervention group received endorphin massage combined with 150 g of blanched pineapple daily for seven consecutive days, whereas the control group received endorphin massage alone. Fundal height (FH), as an indicator of uterine involution, was measured before the intervention (pretest) and on the seventh postpartum day after completion of the intervention (posttest).

2. Population and Sample

The target population consisted of postpartum women following spontaneous vaginal delivery. The accessible population included postpartum women on the first day after delivery who received postpartum care at Rosita Independent Midwifery Practice during the study period.

A total of 100 postpartum women were recruited using consecutive sampling, comprising 50 participants in the intervention group and 50 participants in the control group. Eligible participants who met the predefined inclusion and exclusion criteria were enrolled sequentially during the study period until the required sample size was achieved.

The inclusion criteria were postpartum women on the first postpartum day following spontaneous vaginal delivery, who were willing to participate and provided written informed consent. The exclusion criteria were postpartum hemorrhage, puerperal infection, chronic disease, history of pineapple allergy, or any medical condition considered likely to affect uterine involution.

3. Study Variables

The independent variable was the intervention regimen, consisting of a combination of endorphin massage and blanched pineapple consumption in the intervention group and endorphin massage only in the control group. The dependent variable was the reduction in fundal height (FH) as an indicator of uterine involution.

4. Operational Definition of Variables

Endorphin Massage and Blanched Pineapple Consumption was defined as a combination of endorphin massage and blanched pineapple (*Ananas comosus*) consumption administered to the intervention group for seven consecutive days. As this was an experimental study, the intervention was described in detail to ensure reproducibility, including the precise dose, duration, frequency, preparation method, administration procedure, and adherence monitoring. Endorphin massage was administered by trained midwives according to a standardized study protocol for 15 minutes once daily. Participants were positioned comfortably in either a seated, forward-leaning position with adequate support or a lateral position, according to their comfort. Before the massage, participants were instructed to perform slow and regular breathing to promote relaxation. The massage consisted of light, gentle, and rhythmic stroking rather than deep or forceful pressure, beginning with the upper arms, followed by the neck and shoulders, and continuing over the upper back using downward and lateral strokes in an inverted-V pattern from the neck toward the sides of the back. The strokes subsequently continued along both sides of the vertebral column toward the lower back

and lumbar region. The massage covered the neck, shoulders, upper back, and lumbar region continuously and rhythmically for 15 minutes. To standardize the intervention, midwives received instruction on the study protocol before data collection, covering participant positioning, massage areas, sequence of movements, pressure, duration, and frequency. Intervention adherence was monitored using a standardized observation checklist documenting massage duration, anatomical areas, frequency, and completion of each session.

In addition to endorphin massage, participants received 150 g of blanched pineapple daily for seven consecutive days. The pineapple was cleaned, cut into pieces, and blanched by boiling for three minutes. Following blanching, it was weighed into individual portions of 150 g each and packed separately. Each participant received seven packages, with each package containing 150 g of pineapple weighed after blanching, corresponding to one daily serving. The packaged pineapple was stored frozen in a freezer at approximately −5°C. Participants were instructed to consume one 150-g package daily, either directly while still cold or after thawing until it was no longer frozen, according to their comfort and preference.

Endorphin Massage Alone was defined as the administration of endorphin massage without blanched pineapple consumption for seven consecutive days. The massage was administered by trained midwives using the same standardized protocol as the intervention group, including participant positioning, massage sequence, anatomical areas, gentle pressure, duration (15 minutes daily), and frequency. Therefore, the difference between the intervention and control groups was the addition of daily blanched pineapple consumption to the endorphin massage regimen.

Reduction in Fundal Height (ΔFH) was defined as the difference between fundal height measured on the first postpartum day (pretest) and the seventh postpartum day (posttest). Fundal height was measured in centimeters (cm). ΔFH was calculated by subtracting the posttest fundal height from the pretest fundal height. A larger positive ΔFH indicated a greater reduction in fundal height during the seven-day observation period.

5. Study Instruments

Fundal height was measured using a standardized obstetric measuring tape calibrated in centimeters by trained enumerators following standardized measurement procedures. Measurements were obtained twice for all participants: before the intervention on the first postpartum day and after completion of the intervention on the seventh postpartum day.

Intervention adherence was monitored using a standardized observation checklist. For the intervention group, the checklist included massage duration, massage area, participant compliance, blanched pineapple dosage (150 g/day), frequency of consumption, and completeness of intervention procedure. For the control group, the checklist documented adherence to the endorphin massage protocol, including massage duration, massage area, frequency, and completeness of the intervention.

6. Data Analysis

Descriptive statistics were presented as mean ± standard deviation (SD) for continous variables. Baseline characteristics and baseline fundal height were described and compared between the intervention and control groups.

Within-group changes in fundal height from the first to the seventh postpartum day were analyzed using the Wilcoxon signed-rank test. The reduction in

fundal height (ΔFH) was calculated for each participant as the difference between the pretest and posttest measurements. The primary between-group analysis compared ΔFH between the intervention and control groups using the Mann–Whitney U test. All statistical tests were two-tailed, and a p-value <0.05 was considered statistically significant.

7. Research Ethic

This study received ethical approval from the Health Research Ethics Committee of Health Polytechnics, Ministry of Health of Riau, Indonesia (No. LB.02.03/EA/KEPK-PKR/182/2026). Written informed consent was obtained from all participants before enrollment. Participants were informed about the objectives, procedures, potential benefits, and possible risks of the study and were assured that their participation was voluntary. Confidentiality and anonymity of participants were maintained throughout the study by assigning unique identification codes and securely storing all research data. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

RESULTS

1. Sample Characteristics

The baseline characteristics showed generally similar distributions in maternal age and occupation between the intervention and control groups. However, differences were observed in educational attainment and parity. The intervention group had a higher proportion of women with college/university education (22% vs. 6%) and parity 2 (36% vs. 20%), whereas primiparous women were more prevalent in the control group (50% vs. 32%).

Table 1. Characteristics of Study Participants

Characteristics	Intervention		Control n (%)		Total n (%)	
	n	%	n	%	n	%
Maternal age (years)						
<20	1	2%	3	6%	4	4%
20–35	43	86%	44	88%	87	87%
>35	6	12%	3	6%	9	9%
Occupation						
Housewife	44	88%	44	88%	88	88%
Private employee	1	2%	3	6%	4	4%
Teacher	4	8%	2	4%	6	6%
Civil servant	1	2%	1	2%	2	2%
Education level						
Junior high school	4	8%	2	4%	6	6%
Senior high school	35	70%	45	90%	80	80%
College/University	11	22%	3	6%	14	14%
Month of delivery						
January	5	10%	0	0%	5	5%
February	5	10%	8	16%	13	13%
March	13	26%	6	12%	19	19%
April	11	22%	12	24%	23	23%
May	7	14%	13	26%	20	20%
June	8	16%	10	20%	18	18%
July	1	2%	1	2%	2	2%
Parity						
Primiparous (P1)	16	32%	25	50%	41	41%
Parous 2 (P2)	18	36%	10	20%	28	28%

Characteristics	Intervention		Control n (%)		Total n (%)	
	n	%	n	%	n	%
Parous 3 (P3)	9	18%	9	18%	18	18%
Parous 4 (P4)	5	10%	6	12%	11	11%
Parous ≥5	2	4%	0	0%	2	2%

As shown in Table 2, there was no statistically significant difference in baseline FH between the groups (U = 1210.00, Z= −0.30, p = 0.768). Both groups had a median baseline FH of 13 cm (IQR 12–13).

Within-group changes in FH from baseline to day 7 were analyzed using the Wilcoxon signed-rank test. A statistically significant reduction was observed in the intervention group (Z = −6.264, p < 0.001), as well as in the control group (Z = −6.226, p < 0.001).

The reduction in FH (ΔFH) was calculated as baseline FH minus day-7 FH, with higher values indicating a greater reduction. The median ΔFH was 5 cm (IQR 5–6) in the intervention group and 5 cm (IQR 4–6) in the control group. The intervention group had a higher mean rank than the control group (55.88 vs. 45.12), and the between-group difference was statistically significant (U= 981.00, Z= −1.97, p = 0.049).

The post-intervention FH also differed significantly between the groups. The median was 7 cm (IQR 7–8) in the intervention group and 8 cm (IQR 7–8) in the control group (U = 875.50, Z = −2.83, p= 0.005). This posttest comparison was interpreted separately from the ΔFH analysis because the posttest measurement alone does not represent the magnitude of change from baseline.

Table 2. Comparison of Fundal Height and Change in Fundal Height Between the Intervention and Control Groups Using the Mann–Whitney U Test

Variable	Group	n	Mean Rank	Sum of Ranks	Mann–Whitney U	Z	p
Pretest fundal height	Control	50	51.30	2,565.00	1210.00	−0.30	0.770
	Intervention	50	49.70	2,485.00			
Post-test fundal height	Control	50	57.99	2,899.50	875.50	−2.83	0.001
	Intervention	50	43.01	2,150.50			
ΔFH (fundal height reduction)	Control	50	45.12	2,256.00	981.00	−1.97	0.049
	Intervention	50	55.88	2,794.00			

DISCUSSION

This study found no statistically significant difference in baseline fundal height (FH) between the intervention and control groups. The median baseline FH was 13 cm in both groups, indicating comparable baseline FH measurements. This finding provides a useful basis for comparing changes in FH during the seven-day observation period; however, baseline comparability alone does not establish that subsequent between-group differences were caused by the intervention. Other measured or unmeasured factors may have contributed to the observed findings.

After seven days, FH was significantly different between the two groups. The median day-7 FH was 7 cm in the intervention group and 8 cm in the control group. However, because a difference in posttest FH alone does not directly indicate a greater reduction from baseline, ΔFH was analyzed separately. The median ΔFH was 5 cm in the intervention group and 5 cm in

the control group. The between-group comparison of ΔFH showed a statistically significant difference, with a higher mean rank in the intervention group (55.88) than in the control group (45.12). Thus, the findings indicate a difference in the distribution of FH reduction between the two groups during the seven-day observation period. Given the quasi-experimental and non-randomized design, this finding should be interpreted as an association rather than evidence that blanched pineapple consumption caused the greater reduction.

Uterine involution during the early postpartum period involves progressive reduction in uterine size and fundal height. Reduction in FH is commonly used as a clinical indicator for monitoring the progression of uterine involution (Fatimah, 2017; Azizah and Rosyidah, 2021). Both groups in the present study showed statistically significant reductions in FH from baseline to day 7. The intervention group showed a significant within-group reduction, as did the control group. These findings indicate that uterine involution occurred in both groups during the first seven postpartum days.

Previous studies have investigated massage-based interventions in relation to postpartum uterine involution. Elisa et al. (2015) reported an association between uterine massage and reduction in fundal height among postpartum women. Similarly, a study by Contesa (2023) investigated uterine massage as an intervention related to reduction in fundal height. These findings provide contextual support for massage-based approaches to postpartum uterine recovery. However, these interventions should not automatically be considered equivalent to the endorphin massage protocol used in the present study.

Both groups in the present study received endorphin massage. Previous research involving oxytocin massage has reported a reduction in uterine fundal height among postpartum women (Elisa et al., 2014). Kasiati and Rosmalawati (2019) also investigated effleurage and oxytocin massage in relation to acceleration of uterine involution. Although these studies provide relevant evidence concerning postpartum massage, oxytocin massage, uterine massage, and endorphin massage are distinct intervention approaches. Differences in massage technique, anatomical target, duration, and proposed physiological mechanisms should therefore be considered when comparing findings (Alyensi et al., 2023)

The possible physiological effects of endorphin massage may involve relaxation and modulation of neuroendocrine responses. Previous literature has proposed that massage-related relaxation may be associated with physiological processes involved in postpartum recovery (Elisa et al., 2014; Kasiati & Rahayu, 2019). However, oxytocin, endorphin, cortisol, or catecholamine concentrations were not measured in the present study. Therefore, these pathways should be regarded as possible mechanisms rather than mechanisms demonstrated by the present findings.

The additional intervention in the present study was blanched pineapple consumption. Pineapple (*Ananas comosus*) contains bromelain, a group of proteolytic enzymes that has been investigated for several biological effects. Apsari et al. (2014) investigated the effects of young and mature pineapple extracts on uterine contractility using an isolated guinea pig (*Cavia porcellus*) uterus model. This study provides biological evidence concerning the potential relationship between pineapple constituents and uterine contractility; however, findings from an isolated animal

tissue model cannot be directly extrapolated to postpartum women.

Previous postpartum studies have investigated pineapple in different forms, including pineapple juice, fresh pineapple, and blanched pineapple. These preparations should not be considered interchangeable because their preparation methods and intervention protocols differ. Lamdayani et al. (2022) reported that pineapple juice was associated with accelerated reduction in fundal height among postpartum women. In contrast, Aryani et al. (2023) examined fresh and processed pineapple consumption in relation to reduction in fundal height among normal postpartum women. These studies provide relevant evidence regarding pineapple-based postpartum interventions, but they do not directly reproduce the blanched-pineapple protocol used in the present study.

Aryani et al. (2025) also investigated blanched pineapple combined with massage therapy in a quasi-experimental study of postpartum mothers. These studies are particularly relevant because they involve blanched pineapple, but differences in study population, intervention protocol, setting, massage technique, and outcome assessment should be considered when interpreting similarities and differences between studies.

The possible role of bromelain in the observed findings should also be interpreted cautiously. Bromelain-related biological effects and the potential effects of pineapple constituents on uterine contractility have been proposed in previous study (Apsari et al., 2014). Nevertheless, bromelain concentration, inflammatory biomarkers, and uterine contractility were not measured in the present study. The study also did not directly determine whether the blanching procedure preserved bromelain activity. Therefore, bromelain cannot be identified as the demonstrated mechanism underlying the observed difference in ΔFH. Instead, bromelain-related biological activity should be considered a possible mechanism requiring further investigation.

The findings of the present study can therefore be compared with previous study while maintaining distinctions between intervention types. Evidence involving uterine massage (Contesa, 2023), oxytocin massage (Elisa et al., 2014; Kasiati & Rahayu, 2019), pineapple juice (Lamdayani et al., 2022), fresh or processed pineapple (Aryani et al., 2023), and blanched pineapple (Aryani et al., 2025) addresses related but different interventions. The present findings should therefore be interpreted as contributing to the broader evidence on complementary postpartum interventions rather than demonstrating that these different interventions have equivalent effects.

The study by Aryani et al. (2025) is particularly important when considering the novelty of the present study because it also evaluated blanched pineapple combined with massage therapy. Therefore, the novelty of the present study should not be stated as the first investigation of the combination of blanched pineapple and massage therapy. Instead, the contribution of the present study lies in evaluating a specific protocol consisting of endorphin massage combined with 150 g of blanched pineapple consumed once daily for seven consecutive days, using a pretest–posttest quasi-experimental design and assessing the between-group difference in ΔFH during the first seven postpartum days. The study was also conducted in the specific independent midwifery practice setting described in the Methods. These characteristics distinguish the present study from previous studies in terms of intervention

protocol, outcome analysis, population, and setting.

The statistically significant difference in ΔFH should nevertheless be interpreted cautiously. The current study did not include a pineapple-only group. Consequently, the independent contribution of blanched pineapple consumption cannot be determined. Because both groups received endorphin massage, the comparison primarily evaluates whether adding blanched pineapple to the massage protocol was associated with a different change in FH. The study design does not allow determination of whether the observed difference resulted from pineapple consumption alone, the combination of interventions, or other differences between the groups.

From a practical perspective, the intervention may be considered a complementary postpartum intervention within appropriate clinical care. However, adverse events and tolerability were not systematically assessed in the present study. Complementary interventions should also not be interpreted as substitutes for clinically indicated postpartum management or pharmacological treatment when such treatment is required (Pigai and Yanuarti, 2023).

This study has several limitations. First, the study used non-randomized allocation, which limits the ability to establish causal relationships between the intervention and the observed changes in FH. Second, consecutive sampling may have introduced selection bias, and unmeasured differences between participants may have remained despite comparable baseline FH. Third, outcome assessment was not blinded, which may have introduced observer-related bias. Fourth, FH is a clinical measurement that may be affected by measurement technique, participant positioning, bladder status, and assessor-related variation; therefore, measurement bias cannot be excluded. Fifth, potentially relevant confounders, including breastfeeding frequency, maternal nutritional status, early mobilization, body mass index, postpartum hemoglobin level, and other postpartum care practices, were not comprehensively controlled. Sixth, follow-up was limited to the first seven postpartum days, so the findings cannot establish whether the observed difference persisted beyond this period. Seventh, the absence of a pineapple-only group prevents assessment of the independent contribution of blanched pineapple consumption. Finally, because both groups received endorphin massage, the study cannot isolate the independent effects of endorphin massage and blanched pineapple or determine whether their effects interact (Munthe et al., 2026).

Future studies should therefore employ randomized controlled designs with appropriate allocation procedures and blinded outcome assessment where feasible. A multi-arm or factorial design including endorphin massage alone, blanched pineapple alone, the combined intervention, and an appropriate control condition would provide stronger evidence regarding the independent and combined contributions of the interventions. Future research should also consider longer follow-up and standardized assessment of potential confounders. Measurement of physiological or biological variables, such as oxytocin or inflammatory biomarkers, could help determine whether the mechanisms proposed in the present discussion contribute to changes in uterine involution.

Overall, the present study provides preliminary evidence of a statistically significant between-group difference in fundal-height reduction during the first seven postpartum days. The findings suggest an

association between the combination of endorphin massage and blanched pineapple consumption and the observed pattern of FH reduction. However, because the study was non-randomized, had a short follow-up period, did not include a pineapple-only group, and did not measure the proposed biological mechanisms, the findings should be interpreted as preliminary evidence rather than definitive evidence of a causal or synergistic effect.

AUTHOR CONTRIBUTION

All authors made substantial contributions to the conceptual and design draft for study and acquisition of data. I took part in drafting of articles, analysis and interpretation and critically revising and gave it for its final publication and agreed to be accountable of all aspects of the work in this study.

CONFLICT OF INTEREST

There is no conflict of interest.

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