ORIGINAL ARTICLE

Effect of a 50 mg Caffeine Coffee Intake on Bowel Function Recovery in Postoperative Cesarean Delivery Patients: A Randomized Controlled Trial

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Objective: To study the effect of a 50 mg caffeine coffee consumption on bowel function recovery after cesarean delivery.

Materials and Methods: A randomized controlled trial was conducted. One hundred sixty-two post-cesarean delivery patients were enrolled and allocated to one of the two groups, Group 1, which included 81 volunteers, with a cup of 50 mg caffeine coffee and Group 2, which also included 81 volunteers, with a cup of warm water at postpartum ward, two hours after the operation. The primary outcome was to compare the time to first flatus after surgery between patients of each group. The secondary outcome was to compare the time to first defecation, time to tolerate a solid diet, and the incidence of postoperative ileus between groups.

Results: The mean time to first flatus and standard deviation was 28.93±20.20 and 30.52±16.27 hours, time to first defecation was 62.45±28.00 and 63.45±25.53 hours, and the incidence of postoperative ileus was 17.28% and 19.75%. All results in both groups were not significantly different in the 50 mg caffeine coffee group and the warm water group.

Conclusion: Drinking coffee with a cup of 50 mg caffeine coffee after cesarean delivery did not significantly improve the bowel function recovery. The higher dosage of caffeine coffee needs further studies.

Keywords: Coffee; Ileus; Cesarean delivery; Postoperative

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Cesarean delivery is one of the most common operations around the world, accounting for more than 30% of delivery[1]. In some countries, the incidence of cesarean birth is close to 60%[2]. Complications can occur after cesarean operation and postoperative ileus (POI) is a common one. POI is defined as a temporary cessation of coordinated bowel motility that causes the obstruction and intolerance of oral intake following non-abdominal or abdominal surgery[3]. The incidence of POI in cesarean patients is 10% to 20%[4]. In most cases, POI is usually mild and self-resolve however, it can be severe and impair the ability to take care of themselves and their babies, prolonged hospital stays, and other serious postoperative complications[4,5].

Methods have been used to restore bowel function after cesarean delivery such as the early ambulation[6], multimodal analgesia[7], other non-pharmacological methods, chewing gum[8], and natural herbs such as ginger[9] and coffee. Coffee has caffeine, which is Methylated xanthine derivative (1,3,7-trimethylxanthine), and has multiple systemic effects on the neuropsychiatric[10], cardiovascular[11], and gastrointestinal system[12]. Coffee is a common drink even in the pregnancy and postpartum women. For lactating mothers, The American College of obstetricians and Gynecologists advise that caffeine intake in moderate amounts, such as of 200 mg per day, is most likely safe for the baby. However, in the first few days of newborn and preterm infant, less dosage is recommended[13].

Studies have shown the beneficial effects of caffeinated coffee consumption on POI[14-19]. In cesarean delivery, studies found a benefit of coffee on the bowel function after operation, however, they

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used a high dosage of caffeine, at 300 mg of caffeine per day. This is extremely high when compared with the normal daily coffee intake, which is 27 to 173 mg of caffeine per drink. Therefore, the authors conducted the present research to study the effects of caffeine dose using an instant coffee with 50 mg caffeine, as a welcome drink at postpartum ward on bowel function recovery to determine its effectiveness and safety for improving intestinal function and reducing POI after cesarean delivery.

Materials and Methods

The present study was a randomized controlled trial study, conducted in the Department of Obstetrics and Gynecology, Udonthani Hospital, Udon Thani and Ang Thong Hospital, Ang Thong, Thailand, between January and December 2022. The study protocol was approved by Udonthani Hospital Research Ethics Committee (number 90/2564) and Ang Thong Hospital Ethical Committee on human research (number ATGEC 09/2565). The present study was registered in Thai Clinical Trials Registry, TCTR20231002014.

The inclusion criteria were the patients aged 18 or older who underwent cesarean delivery. The exclusion criteria were allergy or hypersensitivity to caffeine, cardiac arrhythmia, thyrotoxicosis, chronic liver or kidney disease, irritable bowel syndrome, chronic constipation as defined as defecation of two times per week or less, previous bowel surgery, need for intensive care for more than 24 hours postoperatively, and need for nasogastric tube drainage postoperative.

The study details were explained to all participants and written informed consent was obtained prior to their participation in the present study. The randomization was performed when the patients came to the labor ward. Eligible patients were randomly assigned to one of two groups by the investigators who consecutively opened sequentially numbered opaque and sealed envelopes. The randomization was performed using computer generated numbers with a blocked randomization protocol. Group A drank a cup of caffeinated coffee in 100 mL of hot water, which contained 50 mg caffeine, while Group B drank a 100 mL cup of warm water at postpartum ward. Both groups drank their drink two hours after surgery under the supervision of a nurse. The coffee package was prepared using the commercial coffee, Nescafe® red cup.

A standard protocol for pre-operation was implemented for all participants. All cesarean deliveries were performed by the Obstetricians. During the postoperative period, non-steroidal analgesia and antiemetic agents were provided according to the patients' request. Early ambulation was encouraged. Postoperative feeding regimen was standardized, water and liquid diet were begun on the first postoperative day and stepped up to a regular diet in 24 to 48 hours as the individual patients could tolerate.

The primary outcome measurement was the time to first pass of flatus after surgery. The secondary outcomes were the time to first defecation, time to tolerate solid diet, POI symptoms, side effects of postoperative coffee intake, and the length of hospital stay.

The time of first flatus and defecation were recorded based on the patient's own statements. The time to tolerate solid diet was defined as the patient's tolerance to intake solid food without nausea or vomiting within four hours after meal. POI symptoms and signs were evaluated twice daily. Serious side effects, such as palpitation and tachycardia, were monitored. The hospital discharge criteria were stable vital signs for at least 24 hours, ability to ambulate, ability to tolerate a solid diet without nausea and vomiting, normal urination, and the absence of any complication after surgery. All data were collected by investigators who were blinded to the study allocation.

Sample size calculation

The number of samples was calculated based on a Bozkurt Koseoglu et al. study[19]. The formula of randomized trial study by N4studies application was used. The mean time of the first flatus was 11.30 hours in the water group with a standard deviation of 7.50. The mean time in the caffeine group was 8.60 hours with a standard deviation of 3.30. Considering the power of 80% with an α level 0.01. The calculated sample size was 73 patients in each group. Assuming a 10% dropout rate, 81 patients per group were included.

Statistical analysis

Statistical analyses were performed using Stata, version 13 (StataCorp LP, College Station, TX, USA). Continuous data were reported as the mean and standard deviation. Categorical data shown as the number and percentage. A t-test for comparison of continuous data, and Pearson chi-square test for categorical data. A p-value less than 0.05 was considered statistically significant.

Table 1. Baseline characteristics of the patients

	Coffee group (n=81)	Control group (n=81)	p-value
Age (year); mean±SD	30.06±4.88	29.96±5.66	0.906
Body mass index (kg/m^2); mean±SD	29.93±5.17	30.07±5.92	0.873
Primigravida; n (%)	18 (22.22)	28 (34.57)	0.081
Nullipara; n (%)	22 (27.16)	32 (39.51)	0.096
Hypertension; n (%)	4 (4.94)	8 (9.88)	0.230
Diabetes mellitus; n (%)	10 (12.35)	10 (12.35)	1.000
Indication for cesarean delivery; n (%)			
Previous cesarean delivery	84 (51.85)	38 (46.91)	0.259
Cephalopelvic disproportion	10 (12.35)	14 (17.28)	0.376
Abnormal presentation	8 (9.88)	6 (7.41)	0.576
Previous abdominal surgery; n (%)	7 (8.64)	4 (4.94)	0.225
Appendectomy	4 (4.94)	2 (2.47)	
Salpingectomy or cystectomy	1 (1.23)	2 (2.47)	
Others	2 (2.47)	0 (0.00)	
Coffee intake during pregnancy; n (%)	58 (71.60)	45 (55.56)	0.034*

SD=standard deviation

Continuous variables were compare by Student t-test, categorial variables were compare by chi-square test or Fisher's exact test, * Statistically significance, $p<0.05$

Table 2. Surgical characteristics of the patients

	Coffee group (n=81)	Control group (n=81)	p-value
Skin incision; n (%)			0.199
Pfannelstiel	71 (87.65)	65 (80.25)	
Low midline	10 (12.35)	16 (19.75)	
Anesthesia; n (%)			0.059
Spinal	68 (83.95)	58 (71.60)	
General	13 (16.05)	23 (28.40)	
Anesthesic time (minute); mean±SD	47.25±12.47	44.89±10.57	0.199
Tubal resection; n (%)	51 (62.96)	40 (49.38)	0.082
Lysis adhesion; n (%)	3 (3.70)	6 (7.41)	0.495
Other procedure; n (%)	3 (3.70)	5 (6.17)	0.720
Operative time (minute); mean±SD	34.49±11.16	33.70±8.26	0.613
Estimated blood loss (mL); mean±SD	260.00±89.44	220.00±44.72	0.397
Birth weight (g); mean±SD	3,150.09±457.35	3,060.35±475.77	0.226

SD=standard deviation

Continuous variables are compare by Student t-test, categorial variables are compare by chi-square test or Fisher's exact test

Results

In the present study, 162 patients were enrolled with 81 patients randomly assigned to the 50 mg caffeine coffee group and 81 patients randomly assigned to the control group. The demographic characteristics of the subjects are presented in Table 1. There was no statistically significant difference in age, BMI, gravida, hypertension, diabetes mellitus, indication for cesarean delivery, and previous surgery. The surgical characteristics of both groups are shown in Table 2. The type of skin incision, anesthetic type, operative and anesthetic time, blood loss, other surgical procedures, and neonatal birth weight showed no significant differences.

The primary and secondary outcomes of the present study are shown in Table 3. The mean time to first flatus, the time to first defecation in both groups were all insignificantly shorter in the 50 mg caffeine group at 28.93 versus 30.52 hours (p=0.58) and 62.45 versus 63.45 hours (p=0.84) respectively. The mean time to tolerate a solid diet and the length of hospital stay in the 50 mg caffeine group were not significantly shorter than in the control group. The POI was insignificantly lower in the 50 mg caffeine group than the control group. No serious side effects, such as palpitation or tachycardia, were found in the

Table 3. Study outcomes

	Coffee group (n=81)	Control group (n=81)	Mean diff. (95% CI)	p-value
Mean time of first flatus (hour), mean±SD	28.93±20.20	30.52±16.27	−1.59 (−7.28 to 4.10)	0.581
Mean time of first defecation (hour); mean±SD	62.45±28.00	63.45±25.53	−0.86 (−9.42 to 7.69)	0.842
Postoperative ileus; n (%)	14 (17.28)	16 (19.75)		0.686
Time to tolerate diet (day); mean±SD	2.08±2.00	1.88±0.62	0.20 (−0.26 to 0.66)	0.400
Length of hospital stay (day), mean±SD	3.32±1.92	3.30 ±1.40	0.02 (−0.50 to 0.54)	0.937

SD=standard deviation; CI=confidence interval
Continuous variables are compare by Student t-test, categorial variables are compare by chi-square test

present study.

There was no postpartum hemorrhage in both groups. Narcotic drugs were used for pain after surgery in all cases. There was one case of post cesarean febrile morbidity in the control group. No other important complication occurred.

Discussion

The data from the present study showed that the commercial instant coffee with 50 mg caffeine as a welcome drink in the postpartum unit after cesarean delivery made a shorter mean time to first flatus, mean time to first defecation, and lower POI than patients who drank warm water after surgery, but this was not significantly different. All POI in the present study were mild symptoms.

Coffee affects bowel function by increasing the gastrin hormone, which stimulates the involuntary muscle contractions of stomach and colon[14]. The effect of caffeine on postoperative bowel function recovery was demonstrated in previous studies[15-18]. A systematic review by Gkegkes et al.[16] that included four randomized studies, showed that postoperative caffeine consumption improved bowel function recovery and decreased POI. However, most studies were conducted in colorectal surgery with one study in gynecological surgery.

A previous study by Bozkurt Koseoglu et al.[19] randomly assigned 108 post cesarean delivery women to drink either 100 mg caffein coffee three time a day, thus, 300 mg per day, group, and no intervention group. The mean postoperative bowel function recovery time was significantly shorter in the coffee group, however the recommended dosage of caffeine coffee in pregnancy is less than 200 mg per day, and it was advised to have even less than that in the early lactating women[13].

The regular commercial instant coffee has about 27 to 173 mg of caffeine. Jirawongprapa et al. study reported the comparison of 50 mg with the 100 mg caffeine coffee three times daily, thus, 150 versus 300 mg daily, had similar effect on bowel function recovery in the postoperative gynecological cancer surgery[20]. However, the result from this study showed that the single cup of commercial instant coffee with the 50 mg caffeine could not significantly improve the postoperative bowel function recovery when compared with the result of higher caffeine dosage coffee from the former study. The authors suggested that the appropriate dosage of caffeinated coffee that has a benefit for postoperative cesarean patients should be studied.

The strength of the present study was prospective randomized trial with the adequate sample size. The participants were also randomly assigned by computer generated numbers for allocation of groups and both groups had similar demographic profiles. The limitations of the present study were the time of flatus and defecation were retrieved from patients and might, in some cases, be inaccurate. The caffeine dosage in the regular commercial instant coffee can be varied due to the coffee bean and preparation process.

Conclusion

Drinking coffee with a cup of 50 mg caffeine coffee after cesarean delivery did not significantly improve the bowel function recovery. The higher dosage of caffeine coffee needs further studies.

What is already known on this topic?

Coffee consumption improves bowel function recovery after surgery, however the caffeine dosage that was effective in the previous studies is a high dose.

What does this study add?

The commercial 50 mg caffeine coffee did not significantly improve the recovery of bowel function after cesarean delivery.

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Authors' contributions

MS, CC, and YJ conceived of the research idea. MS, SS, CC, and YJ developed the proposal and collected the research data. MS and US performed the analytical methods. All authors discussed the results and contributed to the final manuscript.

Data availability statement

The data that support the findings of the present study is available on request from the corresponding author within five years after publication.

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Conflicts of interest

The authors report no conflict of interest.

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