

A Randomized Controlled Trial of a Regular Diet as the First Meal Compared with Traditional Feeding in Patients Undergoing Cesarean Section

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Objective: To compare adverse gastrointestinal (GI) effects of early post-operative regular diet versus traditional feeding for patients undergoing cesarean section (CS).

Materials and Methods: Participants randomly assigned to the early regular diet or traditional diet groups. The early regular diet group received regular diet within 6 to 12 hours post-operative CS. The traditional feeding group was given nothing orally on the day of CS, sips of water, liquid, and soft diet, respectively on day 1 post CS, and regular diet on day 2. Outcomes of interest were GI symptoms and function, as well as post CS care.

Results: The demographic, obstetrics, and operative characteristics were not significantly different between the 453 participants in the early regular diet group and the 447 participants in the traditional feeding group. The early regular diet group and the traditional feeding group received regular diet at 8.1±2.1 versus 39.1±10.8 hours post CS, respectively. The incidences of ileus symptoms and post-operative complications were similar in both groups. The early regular diet group had earlier bowel movement (13.3±8.7 versus 18.6±12.0 hours, p<0.001), less time interval to flatus (26.4±13.5 versus 33.3±16.7 hours, p<0.001), and earlier defecation (38.7±15.4 versus 47.4±16.3 hours, p<0.001). The early regular diet groups also needed less after care and short hospital stays (2.3±0.3 versus 3.0±0.4 days, p<0.001).

Conclusion: Early regular diet after CS does not increase post-operative GI symptom. It also causes earlier resumption of GI function and less post-operative care.

Keywords: Cesarean section, Bowel function, Regular diet, Traditional feeding

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The rate of cesarean section (CS) is increasing around the world⁽¹⁾. Recently its rate in Thailand was about 34.1%⁽²⁾. In the upper North of Thailand, the CS rate increased from 27.9% in 2009 to 32.3% in 2015⁽³⁾. CS involves bowel manipulation and frequently causes post-operative temporarily impaired bowel motility, abdominal discomfort, and delayed recovery. Women delivered by a CS, therefore, needed more care after the operation than those who gave birth vaginally.

CS involves several steps of fasting and nutrition. All pregnant women must receive nothing per oral at least 6 to 12 hours before CS. Due to this fasting and blood loss during surgery, nutrition is an issue of concern for post-operative CS mothers. For traditional feeding regimen, post-operative CS mothers usually receive a series of nutrition care as follows, (i) 12 to 24 hour fasting, (ii) water, liquid, and soft diet, respectively, on day 1, and (iii) regular diet on day 2. This practice is widely applied to lessen the gastrointestinal (GI) complications in surgical patients⁽⁴⁻⁶⁾.

Early diet within the first 24 hours after CS may benefit the patients. The studies so far have found no complication, e.g., flatulence⁽⁷⁻¹¹⁾. In contrast, it may lead to early wound healing compared with those

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receiving traditional diet regimen⁽¹²⁾. Several studies reported that early diet enhanced the recovery of GI function, resulting in good nutritional status, rapid wound healing, early ambulation, and an early return to normal daily life activities⁽¹³⁻¹⁷⁾.

To investigate the early feeding post CS, most studies focused on the risks and benefits of liquid and soft diet. These studies found that feeding liquid or soft diet within the first 24 hours post CS was beneficial and had no complication such as flatulence⁽⁷⁻¹⁰⁾.

To the authors knowledge, only four studies have been carried out to determine the risks and benefits of early regular (solid) diet post CS^(14,18-20). However, the sample sizes of most studies appeared to be too small to be certain^(14,20). In the present study, the authors proposed to compare the risks and benefits between early regular diet and the traditional feeding regimen in patients underwent CS.

Materials and Methods

This prospective multicenter randomized controlled trial was conducted in the Departments of Obstetrics and Gynecology of three tertiary care hospitals in three provinces locating in Northern Thailand, including Lamphun, Nan and Chiang Rai. The study was carried out between February 1, 2016 and January 31, 2017.

Participants

Participants were women with term singleton pregnancy receiving a planned or uncomplicated CS. Exclusion criteria included (i) history of surgery in GI tract, (ii) severe medical complications, (iii) obstetric complications, such as preeclampsia and diabetes mellitus, twin pregnancies, hydramnios, abruptio placenta, (iv) fasting less than 6 hours prior to the CS, and (v) additional appendectomy. The research protocol was reviewed and approved by the Ethics Committees for Research Involving Human Subjects of the three hospitals. The present study was registered at the Thai Clinical Trials Registry (TCTR 20160122002). All participants gave written informed consents before participating in the present study. The present research has been carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Procedure

Time at surgery was designated as zero hour. The first day of surgery was considered as first 24 hours, the second post-operative day was 24 to 48 hours after surgery, and the third post-operative day included 48

to 72 hours after surgery. The duration of surgery was defined as the time from the surgery started to the completion of skin closure.

The demographic characteristics, indications for CS, operative and outcome characteristics of the CS were recorded. Demographic information included age, gravidity, gestational age, body mass index, preoperative NPO time, duration of surgery, birthweight, and estimated intraoperative blood loss.

Patients were randomly assigned to “early regular diet” group or “traditional feeding” group. The randomization was accomplished by a computer-generated list of random numbers. The group name was placed inside consecutively numbered opaque envelopes. Both the obstetricians and the primary investigators were blinded to the group assignment. The post-operative patients were evaluated by an obstetric intern and nurses serving in the postpartum wards. Each participant was given the feeding regimen as group assignment.

In the “early regular diet” group, the patients were offered regular diet (solid food) as soon as they gained normal consciousness within 6 to 12 hours after surgery. In the “traditional feeding” group, the patients were post-operatively treated as currently practiced in most of the hospitals. Patients were given nothing by mouth after surgery, then, sips of water were offered to the patients in the morning of the first day, followed by liquid and soft diet respectively. On the next day, regular diet (solid food) was offered to the patients. Thai solid food usually contains steam rice. Other Thai common dishes are boiled or fried meat and vegetables.

Outcomes

An independent research nurse reviewed and assessed the patient’s condition twice daily. Primary outcomes included the signs and symptoms of ileus, nausea, or vomiting. Mild ileus symptoms included anorexia, abdominal cramping, or non-persistent nausea or vomiting. A severe ileus symptom was defined as abdominal distention, greater than three episodes of emesis in a 24-hour period, inability to tolerate oral liquids, and required nasogastric tube or abdominal radiographs⁽¹⁴⁾.

Secondary outcomes were the signs and symptoms of GI function resumed after the CS, including first time of bowel movement, time interval to flatus, and time interval to defecation. The authors also collected post-operative care outcomes, including time to first ambulation, duration of intravenous fluid administration, amount of intravenous fluid

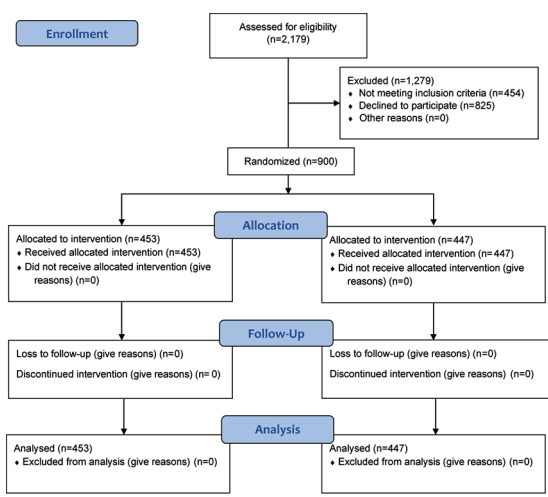


Figure 1. Trial diagram of 453 participants randomly assigned to receive early regular diet and 447 participants randomly assigned to receive traditional feeding regimen.

administration, and overall length of hospital stays. The length of hospital stay was defined as the time interval between surgery to hospital discharge.

Statistical analysis

The study needed a sample size of at least 438 per group to gain power of 80% at 95% confidence interval, based on the incidence of abdominal ileus of 13% for the traditional feeding group and 20% lower rate in the early regular diet group⁽¹⁰⁾.

The comparisons of categorical data were analyzed using the chi-square test or Fisher's exact probability tests. Based on the distribution of data, the continuous data were compared using a two-tailed Student t-test or Mann-Whitney U test. Normally distributed data were reported as means and standard deviations.

Results

Nine hundred cesarean delivery women were enrolled and randomly allocated into early regular diet group (453 patients) and traditional feeding group (447 patients) (Figure 1). The demographic, obstetrics, operative characteristics, type of surgery, incision, anesthesia, and indications for CS were not significantly different between groups (Table 1). Compared with those receiving traditional feeding regimen, early regular diet group started receiving solid food earlier after CS (8.1±2.1 hours versus 39.1±10.8 hours, $p<0.001$).

There was a trend that nausea was less common

in the early regular diet group than those receiving traditional feeding regimen. The frequencies of vomiting, mild ileus symptoms, and severe ileus symptoms were not significantly different between groups (Table 2).

Comparison with the traditional feeding group, the early regular diet group also had earlier resumption of GI function, including earlier bowel movement (13.3±8.7 hours versus 18.6±12.0 hours, $p<0.001$), earlier flatus (26.4±13.5 hours versus 33.3±16.7 hours, $p<0.001$), and earlier defecation (38.7±15.4 hours versus 47.4±16.3 hours, $p<0.001$).

In the respects of post-operative care, the early regular diet group also had earlier ambulation (11.8±5.4 hours versus 16.9±8.7 hours, $p<0.001$), shorter duration of intravenous fluid administration (17.3±5.7 hours versus 25.0±7.7 hours, $p<0.001$), less amount of intravenous fluid (2,007.2±574.6 cc versus 3,034.3±1,017.0 cc, $p<0.001$), and shorter length of hospital stays (2.3±0.3 days versus 3.0±0.4 days, $p<0.001$) (Table 2).

Discussion

After undergoing uncomplicated CS, the participants assigned to the early regular diet group in this rater-blind, randomized controlled trial received solid food approximately 31 hours earlier than those receiving traditional feeding regimen. The earlier feeding of solid food did not increase the incidence of GI symptoms, including nausea, vomiting, and mild or severe ileus symptoms in patients. In addition, the earlier regular diet also led to the earlier resumption of GI function, as observed by earlier bowel movement, earlier flatus, earlier defecation. This earlier feeding was also beneficial on the post-operative care, including earlier ambulation, shorter duration of intravenous fluid administration, less amount of intravenous fluid, and shorter length of hospital stays.

Similar to previous finding^(14,18-20), the early oral feeding after undergoing uncomplicated CS is safe. Although clear liquid diet is accepted as the standard first post-operative meal, reports have suggested that a regular diet as the first post-operative meal is safer and well tolerated⁽²¹⁾. These findings may be because liquid diet is more easily aspirated through their rapid transit through the oropharynx.

Previous studies in patients who had intra-abdominal surgery, cesarean, and benign gynecologic surgery showed that initiation of a regular diet immediately after surgery were not associated with increased GI complaints compared with the initiation of clear liquids^(14,18-22). In other studies, incidence of

Table 1. Demographic, obstetrics, and operative characteristics by groups

	Early regular diet group (n=453)	Traditional feeding group (n=447)	p-value
	Mean±SD	Mean±SD	
Maternal age (year)	28.4±6.2	27.8±5.9	0.173
Gestational age at delivery (week)	38.4±1.3	38.1±2.1	0.779
Body mass index	28.3±4.7	28.1±4.4	0.564
Preoperative NPO time (minute)	614.3±204.8	616.7±191.6	0.858
Duration of surgery (minute)	34.2±11.0	35.3±11.8	0.135
Birthweight (gram)	3128.9±438.1	3139.8±444.4	0.713
Estimated intraoperative blood loss (ml)	457.8±118.1	449.9±116.6	0.310
Time interval to solid food (hour)	8.1±2.1	39.1±10.8	<0.001
Gravidity, n (%)			
1	262 (57.8)	244 (54.6)	0.354
2	149 (32.9)	154 (34.5)	
>3	42 (9.3)	49 (10.9)	
Type of cesarean section, n (%)			
Elective	148 (32.7)	149 (33.3)	0.887
Emergency	305 (67.3)	298 (66.7)	
Type of incision, n (%)			
Midline incision	202 (44.6)	193 (43.2)	0.687
Pfannenstiel incision	251 (55.4)	254 (56.8)	
Type of anesthesia, n (%)			
General	315 (69.5)	305 (68.2)	0.802
Regional	57 (12.6)	63 (14.1)	
Regional with morphine	81 (17.9)	79 (17.7)	
Indication for cesarean section, n (%)			
Previous cesarean section	110 (24.3)	130 (29.1)	0.552
Cephalopelvic disproportion	222 (49.0)	202 (45.2)	
Abnormal position & lie	32 (7.0)	37 (8.3)	
Fetal distress	19 (4.2)	19 (4.2)	
Placenta previa	3 (0.7)	3 (0.7)	
Others	67 (14.8)	56 (12.5)	

SD=standard deviation; NPO=nothing per oral

mild ileus symptom varied from 0% to 31.7% and 0% to 26.7% and severe ileus symptom varied from 0% and 0% to 1.7% in regular diet and traditional feeding group, respectively^(14,18-20). Low incidence of mild and severe ileus symptom was also reported in other studies^(11,15,26). The findings of the present study were in concordance with those previous reports. The incidence rates of mild and severe ileus symptom in the present early regular diet group were 0.4% and 0.4%, respectively. These figures were comparable to the rates of 1.3% and 0.7%, respectively, in the present

traditional feeding group.

Shorter time to development of bowel sounds, time of first flatus, and time to defecation are consistent with previous reports^(14,18-20). Based on a systematic review and meta-analysis⁽²³⁾, the introduction of liquids and solids within six to eight hours after cesarean delivery improves the return of GI function without the increase of GI complications such as post-operative ileus. Moreover, many studies found that early resumption of diet after surgery can reduce the incidence of post-operative ileus^(8,24,25). The present

Table 2. Postoperative gastrointestinal symptoms, gastrointestinal function, and clinical care in early regular diet and traditional feedings groups

	Early regular diet group (n=453) n (%)	Traditional feeding group (n=447) n (%)	p-value
Gastrointestinal symptoms			
Nausea	4 (0.9)	12 (2.7)	0.053
Vomiting	7 (1.5)	7 (1.6)	1.000
Mild ileus symptom	2 (0.4)	6 (1.3)	0.177
Severe ileus symptom	2 (0.4)	3 (0.7)	0.811
Gastrointestinal function, Mean±SD			
Time interval to bowel movement (hour)	13.3±8.7	18.6±12.0	<0.001
Time interval to flatus (hour)	26.4 ±13.5	33.3±16.7	<0.001
Time interval to defecation (hour)	38.7±15.4	47.4±16.3	<0.001
Clinical care, Mean±SD			
Duration of intravenous fluid administration (hour)	17.3±5.7	25.0±7.7	<0.001
Amount of intravenous fluid administration (cc)	2,007.2 ±574.6	3,034.3±1,017.0	<0.001
Time interval to ambulation (hour)	11.8±5.7	16.9±8.7	<0.001
Length of hospital stays (day)	2.3±0.3	3.0±0.4	<0.001

SD=standard deviation

finding of shorter stays in the hospital have been reported in another study^(14,27). In a large randomized-controlled trial, women in the experimental group were given early feeding of liquid such as 200 to 250 mL of water, tea, milk, juice in packs, two hours after surgery⁽²⁷⁾. If the liquid diet was well tolerated, solid diet was then started four hours after surgery. Compared with those receiving traditional feeding similar to the present trial, the GI complications were not significantly different between groups. However, a meta-analysis found that the introduction of liquid and solid within six to eight hours after cesarean delivery improved the return of GI function but not increased the GI complications⁽²³⁾.

The benefits of early regular diet after CS found in the present study are understandable. Post-operative consumption of food might stimulate bowel peristalsis and earlier return of bowel function, explaining the decreased nausea in the early feeding group⁽²²⁾. The length of hospital stay was found to be significantly shorter in the early regular diet group since the patients had more rapid recovery of bowel function, early ability to ambulate, and received regular diet sooner than the traditional feeding group.

The present findings may close the gap of knowledge on early feeding after CS. In the present study, patient that underwent CS tolerated stream

rice, as well as boiled or fried meat and vegetables. The findings suggest that not only early liquid or soft diet but also early regular (solid) diet can be given to patients that underwent CS. In addition, not only western regular diet but also Asian regular diet can be given as early regular diet.

The strength of the present study was its multicenter study design with an adequate sample size. The results showed not only the comparable GI symptoms and earlier resumption of GI function found in the early regular diet group, but also the benefits on post-operative care. A limitation of the study was the clinical staff who were non-blinded on the feeding regimens. The bias on the post-operative care, therefore, could not be ruled out. In addition, the operation techniques used were diverse, such as anesthetic techniques and incisions.

In conclusions, for a woman who has undergone an uncomplicated CS, a start of regular diet as early as 6 to 12 hours after the operation is safe and well tolerated. Early regular diet after CS helps earlier resumption of GI function resulting in early post-operative recovery, less post-operative care, and early hospital discharges. Obstetricians should consider a regimen of early regular diet in women receiving uncomplicated CS. Future studies on early regular diet in complicated CS would be helpful to determine its

use in all mothers who have undergone CS.

What is already known on this topic?

Traditional feeding regimen after CS includes 12 to 24 hours of fasting, water, liquid, and soft diet, respectively, on day 1, and regular diet on day 2. Recent findings suggested that feeding liquid or soft diet within the first 24 hours after CS was possible.

What this study adds?

Early regular diet, within 6 to 12 hours after CS, is safe and well tolerated. In addition, mothers receiving this practice need less care and shorter hospital stay.

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Conflicts of interest

All investigators declared no personal or professional conflicts of interest regarding any aspect of this study.

References

1. Betran AP, Ye J, Moller AB, Zhang J, Gulmezoglu AM, Torloni MR. The increasing trend in caesarean section rates: Global, Regional and National Estimates: 1990-2014. *PLoS One* 2016;11:e0148343.
2. Lumbiganon P, Laopaiboon M, Gulmezoglu AM, Souza JP, Taneepanichskul S, Ruyan P, et al. Method of delivery and pregnancy outcomes in Asia: the WHO global survey on maternal and perinatal health 2007-08. *Lancet* 2010;375:490-9.
3. Maternal and Child Health Committee, Health Region 1, Thailand. Maternal and child health annual statistics report 2009-20015. Chiang Mai: Health Region 1, Thailand; 2016.
4. Bisgaard T, Kehlet H. Early oral feeding after elective abdominal surgery--what are the issues? *Nutrition* 2002;18:944-8.
5. Horowitz IR, Rock JA. Postanesthesia and postoperative care. In: Thompson JD, Rock JA, editors. *TeLinde's operative gynecology*. 8th ed. Philadelphia: JB Lippincott; 1997. p. 142-63.
6. Cunningham FG, MacDonald PC, Gant NF, Leveno KJ, Gilstrap LC 3rd, Hankins GDV, et al. Cesarean delivery and cesarean hysterectomy. In: *Williams obstetrics*. 20th ed. Norwalk, CT: Appleton and Lange; 1998. p. 509-31.
7. Kovavisarath E, Atthakorn M. Early versus delayed oral feeding after cesarean delivery. *Int J Gynaecol Obstet* 2005;90:31-4.
8. Chantarasorn V, Tannirandorn Y. A comparative study of early postoperative feeding versus conventional feeding for patients undergoing cesarean section; a randomized controlled trial. *J Med Assoc Thai* 2006; 89 Suppl 4:S11-6.
9. Bar G, Sheiner E, Lezerovitz A, Lazer T, Hallak M. Early maternal feeding following caesarean delivery: a prospective randomised study. *Acta Obstet Gynecol Scand* 2008;87:68-71.
10. Orji EO, Olabode TO, Kuti O, Ogunniyi SO. A randomised controlled trial of early initiation of oral feeding after cesarean section. *J Matern Fetal Neonatal Med* 2009;22:65-71.
11. Göçmen A, Göçmen M, Saraoğlu M. Early post-operative feeding after caesarean delivery. *J Int Med Res* 2002;30:506-11.
12. Schroeder D, Gillanders L, Mahr K, Hill GL. Effects of immediate postoperative enteral nutrition on body composition, muscle function, and wound healing. *JPEN J Parenter Enteral Nutr* 1991;15:376-83.
13. Adupa D, Wandabwa J, Kiondo P. A randomised controlled trial of early initiation of oral feeding after caesarean delivery in Mulago Hospital. *East Afr Med J* 2003;80:345-50.
14. Patolia DS, Hilliard RL, Toy EC, Baker B. Early feeding after cesarean: randomized trial. *Obstet Gynecol* 2001;98:113-6.
15. Teoh WH, Shah MK, Mah CL. A randomised controlled trial on beneficial effects of early feeding post-Caesarean delivery under regional anaesthesia. *Singapore Med J* 2007;48:152-7.
16. Varadhan KK, Neal KR, Dejong CH, Fearon KC, Ljungqvist O, Lobo DN. The enhanced recovery after surgery (ERAS) pathway for patients undergoing major elective open colorectal surgery: a meta-analysis of randomized controlled trials. *Clin Nutr* 2010;29:434-40.
17. Wind J, Polle SW, Fung Kon Jin PH, Dejong CH, von Meyenfeldt MF, Ubbink DT, et al. Systematic review of enhanced recovery programmes in colonic surgery. *Br J Surg* 2006;93:800-9.
18. Burrows WR, Gingo AJ Jr., Rose SM, Zwick SI, Kosty DL, Dierker LJ Jr, et al. Safety and efficacy of early postoperative solid food consumption after cesarean section. *J Reprod Med* 1995;40:463-7.
19. Izbizky GH, Minig L, Sebastiani MA, Otano L. The effect of early versus delayed postcaesarean feeding on women's satisfaction: a randomised controlled trial. *BJOG* 2008;115:332-8.
20. Kramer RL, Van Someren JK, Qualls CR, Curet LB. Postoperative management of cesarean patients: the effect of immediate feeding on the incidence of ileus. *Obstet Gynecol* 1996;88:29-32.
21. Jeffery KM, Harkins B, Cresci GA, Martindale RG. The clear liquid diet is no longer a necessity in the routine postoperative management of surgical patients. *Am Surg* 1996;62:167-70.
22. MacMillan SL, Kammerer-Doak D, Rogers RG, Parker KM. Early feeding and the incidence of gastrointestinal symptoms after major gynecologic surgery. *Obstet*

- Gynecol 2000;96:604-8.
23. Hsu YY, Hung HY, Chang SC, Chang YJ. Early oral intake and gastrointestinal function after cesarean delivery: a systematic review and meta-analysis. *Obstet Gynecol* 2013;121:1327-34.
 24. Venara A, Neunlist M, Slim K, Barbicux J, Colas PA, Hamy A, et al. Postoperative ileus: Pathophysiology, incidence, and prevention. *J Visc Surg* 2016;153:439-46.
 25. Lubawski J, Saclarides T. Postoperative ileus: strategies for reduction. *Ther Clin Risk Manag* 2008;4:913-7.
 26. Guo J, Long S, Li H, Luo J, Han D, He T. Early versus delayed oral feeding for patients after cesarean. *Int J Gynaecol Obstet* 2015;128:100-5.
 27. Masood SN, Masood Y, Naim U, Masood MF. A randomized comparative trial of early initiation of oral maternal feeding versus conventional oral feeding after cesarean delivery. *Int J Gynaecol Obstet* 2014;126:115-9.