



# EFFECTIVENESS OF PREOPERATIVE CARBOHYDRATE LOADING WITH LENGTH OF HOSPITALIZATION IN NON-INVASIVE GYNECOLOGICAL SURGERY PATIENTS: AN EVIDENCE-BASED CASE REPORT

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## Abstract

**Background :** Carbohydrate loading is one of the steps in the preoperative procedure of Enhanced Recovery after Surgery (ERAS). The advantages of the ERAS pathway have positive effects on postoperative outcomes, including a reduction in the length of stay/LOS in hospital.

**Objective:** This study aims to critically analyze the effectiveness of carbohydrate loading on the reduction in the length of hospital stay among patients undergoing non-invasive gynecologic surgical procedure.

**Methods:** A search was conducted to find several literatures from PubMed, Cochrane, and Scopus. This study assesses the relevance and feasibility of the literatures. The search found three selected literatures to further conduct a critical assessment.

**Results:** A critical review was conducted towards three randomized controlled trial literatures. Two literatures showed a significant reduction in the length of stay with preoperative carbohydrate loading ( $p < 0.001$ ), while one literature showed an insignificant finding ( $p = 0.684$ ).

**Conclusions:** Carbohydrate loading as a part of the preoperative management of ERAS could reduce the length of hospital stay among patients undergoing non-invasive gynecologic surgery procedure. Differences in the results of several studies indicate the need for further studies using the similar intervention method.

**Keywords:** enhanced recovery after surgery, gynecologic surgery, carbohydrate loading, length of stay.

## Introduction

The series of nutrition administration in surgery is an important supporting factor in preventing complications and malnutrition among surgical patients. Carbohydrate loading is one of the preoperative steps in the Enhanced Recovery after Surgery (ERAS) protocol. This is an effort to approach perioperative management that aims to reduce surgical stress response and facilitate postoperative recovery.<sup>1</sup> In the ERAS

protocol, prolonged preoperative fasting started from midnight (>6 hours) is not recommended in most patients planned for surgery. Carbohydrate loading in preoperative patients is provided in the form of regular solid food or dextrose/maltodextrin 12.5% as much as 800 ml (100 g of carbohydrates) 6 hours before surgery.<sup>2</sup> At 2 hours before surgery, 400 ml of liquid foods (50 g of carbohydrates) are given.<sup>2,3</sup> Prolonged fasting is associated with



insulin resistance, which increases the risk of hyperglycemia, the risk of surgical infection, negatively affects the length of hospital stay, and increases morbidity.<sup>2,4</sup>

The ERAS protocol is currently accepted as the standard of care for surgery and has shown significant improvements regarding a reduction in the length of stay, improved clinical outcomes, less complications and cost savings.<sup>5</sup> ERAS protocol was initially applied primarily among patients undergoing major surgery such as gastrointestinal tract surgery, so that the main framework of ERAS in gynecological surgery focuses more on invasive gynecological surgery or open surgery.<sup>4,6</sup>

Currently, the implementation of ERAS among patients undergoing minimally invasive gynecological surgery is still low.<sup>7</sup> In various elective surgeries, it has been shown that measures to reduce surgical stress can minimize catabolism and support anabolism during surgical treatment and allow patients to recover much better and faster.<sup>2</sup> The potential advantages of ERAS, especially the preoperative carbohydrate loading step, often overlap with the advantages of minimally invasive surgery itself.<sup>1</sup> Until now, there are still limited data regarding the role of carbohydrate loading in improving the postoperative outcomes of

patients undergoing gynecological surgery, especially minimally invasive surgery.<sup>8</sup>

Based on the background described above, the current critical study aims to evaluate the advantages of carbohydrate loading protocol on length of stay among patients undergoing non-invasive gynecologic surgery procedure

### **Clinical Question**

A 22-year-old woman came to the hospital for a planned surgery to remove an ovarian tumor. Since two months before being admitted to the hospital, the patient had come for a consultation to the obstetrics clinic due to menstrual cycle disorder and lower abdominal pain. After conducting an ultrasound examination, it was found that the patient had a tumor in the ovarian area, and it was recommended a planned surgery to remove the tumor through a minimally invasive method using laparoscopic procedure. The patient then agreed the surgery and was hospitalized at the hospital. At the time of hospitalization, the patient was then consulted with a clinical nutritionist for nutritional preparation before surgery. Before surgery, the patient was not fasted for a long time. In fact, she was given 800 ml of dextrose at midnight or 6 hours before surgery and 400 ml of dextrose 2 hours before surgery. Two hours after the surgery,



the patient was fully conscious and bowel movements were good (the patient had passed gas). The patient then tried to drink followed by soft food. After surgery, the patient had no complaints. There were no complaints of nausea, vomiting, flatulence, fever, and anxiety. The patient was then discharged from the hospital the next day.

In this case scenario, the question proposed is whether preparation for surgery by providing nutrition without fasting for a long time can reduce the length of stay among patients undergoing planned minimally invasive gynecological surgery?

## Methods

Advanced article searching was conducted by combining MeSH Terms and abstracts/titles in the PubMed, Cochrane Library and Scopus databases. The search was conducted on January 31, 2021. The keywords used were "enhance recovery after surgery", "gynecologic surgery", "carbohydrate loading", and "length of stay". After obtaining the appropriate articles, screening was performed by assessing the titles and abstracts, then screening was performed based on inclusion criteria and possible duplication. The flow of the literature search is presented in Figure 1. After obtaining the appropriate articles, a critical assessment was conducted using a

randomized controlled trial (RCT) guidelines published by the University of Oxford Center for Evidence-Based Medicine.

## Research Results

This study obtained 33 literatures derived from PubMed, 99 literatures derived from Cochrane Library and 74 literatures derived from Scopus. The further screening test was conducted by comparing the titles and abstracts to the suitability of the inclusion criteria. Eligibility criteria were articles published in full text, written in English and Indonesian. Limitation regarding the publication of articles in the last 5 years was also applied before the critical review on the articles obtained. After screening duplication and selecting articles according to eligibility criteria, 3 literatures from Ren et al.<sup>1</sup> Yilmaz et al.<sup>8</sup> and Cho et al.<sup>4</sup> were found to be relevant and could be analyzed to answer clinical question

## Discussion

In patients undergoing minimally invasive gynecologic surgical procedure such as those in the study (laparoscopy, hysterectomy), the potential advantages of preoperative carbohydrate loading often overlap with the advantages of minimally invasive surgery itself.<sup>1</sup> Therefore, the results of the current critical review can be useful to describe the advantages of ERAS procedure,



especially carbohydrate loading whenever applied to the type of surgery according to the study.

The ERAS protocol as a method of multimodal perioperative care is associated with shorter hospital stays and faster recovery among postoperative patients.<sup>2,5</sup> This study assigned the intervention group who underwent non-invasive gynecologic surgery procedure using ERAS preoperative measures in the form of carbohydrate loading as well as group of patients who were not treated with carbohydrate loading. A critical review conducted on 2 studies conducted by Ren et al.<sup>1</sup> and Yilmaz et al.<sup>8</sup> showed that the implementation of ERAS in the form of preoperative carbohydrate loading management in which patients were not fasted for a long time, patients were allowed to eat solid food 6 hours before surgery and eat liquids (clear fluid/dextrose) 2 hours before surgery had a significant positive result regarding the length of stay (LOS).

A study conducted by Ren et al.<sup>1</sup> showed that the LOS in the intervention group was significantly shorter than that in the control group. The median postoperative LOS was 1.0 days for the full ERAS group compared to 2.0 days for the restricted ERAS group with  $p=0.002$ . Multivariate regression analysis identified preoperative carbohydrate loading of (5.99; 0.98–36.83; 0.010) as an

independent factor associated with hospital discharge on day 1 or post operation day (POD). Criteria for patient discharge in certain study were adequate pain control using oral analgesics, absence of vomiting or severe nausea, no increase in body temperature of  $\geq 37.5^{\circ}\text{C}$ , tolerance to solid food and ambulatory functional capacity. In addition to a decrease in the length of stay or hospitalization, subjects also experienced a better and faster recovery as indicated by the Quality of Recovery-15 (QoR-15) scale which assesses pain, physical comfort, physical independence, psychological support and emotional state. Differences between the 2 groups were associated with a decrease in pain dimensions and an increase in physical independence found in the ERAS group.<sup>1</sup>

A study conducted by Yilmaz et al.<sup>8</sup> showed that a significantly shorter length of stay in hospital in the group of patients treated with carbohydrate loading when compared to conventional preoperative care without ERAS ( $1.13 \pm 0.4$  days vs.  $1.64 \pm 0.5$  days,  $p<0.001$ ). This study also presented other positive outcomes in the ERAS program, namely subjects were more likely to produce early flatus: 775.0 minutes (563.8–1004.8 minutes) compared to 1022.5 minutes (833.8–1248.8 minutes), with  $p<0.001$ . The implementation of the ERAS



protocol was found to reduce the incidence of postoperative complications by up to 50%. In contrast, the study conducted by Yilmaz et al.<sup>8</sup> found that there was no difference in the incidence of complications. Such finding can be considered as the limitation of the study because the study only assessed non-invasive gynecologic surgery with a low rate of surgical complications.<sup>8</sup> Therefore, a larger number of samples is required to assess the incidence of complications more precisely after the implementation of preoperative carbohydrate loading.

A study conducted by Cho et al.<sup>4</sup> assessed the patient's readiness for discharge based on the QoR-15 score and the time to readiness for discharge (TRD). The TRD component is one method for assessing LOS which includes gastrointestinal movement (time to pass gas), adequate pain control, adequate intake tolerance time and patient mobilization as well as clinical stability assessment.<sup>9</sup> The results regarding the time to readiness for discharge were not significant, namely  $36.8 \pm 12.2$  hours in the non-intervention group and  $37.6 \pm 8$  hours in the carbohydrate loading group ( $p = 0.684$ ). The intervention group also showed insignificant result regarding the QoR-15 value ( $97.7 \pm 23.0$  for the non-intervention group and  $99.6 \pm 22.4$  for the intervention group).<sup>4</sup> Such finding can be due to the limitation of

the study namely no information regarding the baseline QoR-15 values before surgery, so that the researcher could not ascertain the basic psychological characteristics of the patient. The study also involved subjects who were still lean and healthy, so that the possibility of a positive effect of the intervention was also not too significant in the intervention group.<sup>4</sup> Therefore, if there is a large number of subjects are involved, the significant result regarding a reduce in LOS may be obtained.

The advantages of these three studies were that they specifically compared the implementation of ERAS protocol in the form of carbohydrate loading for the intervention group and prolonged fasting in the non-intervention group towards the length of stay in hospital for subjects undergoing non-invasive gynecologic surgery procedure. Until now, there has been no specific critical study that focuses on the assessment of such group of subjects. Carbohydrate loading in major surgery was previously shown to have a positive effect on length of stay, an effect on the reduction in postoperative complications and patient satisfaction.<sup>5,6</sup> The certain mechanism was associated with prevention of catabolic reactions and postoperative insulin resistance.<sup>2,8</sup> Carbohydrate administration 2 hours before surgery was found to provide

more advantages than midnight fasting which could be used as a source of energy, keep the patient in a fed state and reduce the inflammatory response due to decreased insulin resistance so that patients following this protocol could experience an earlier postoperative recovery.<sup>2</sup>

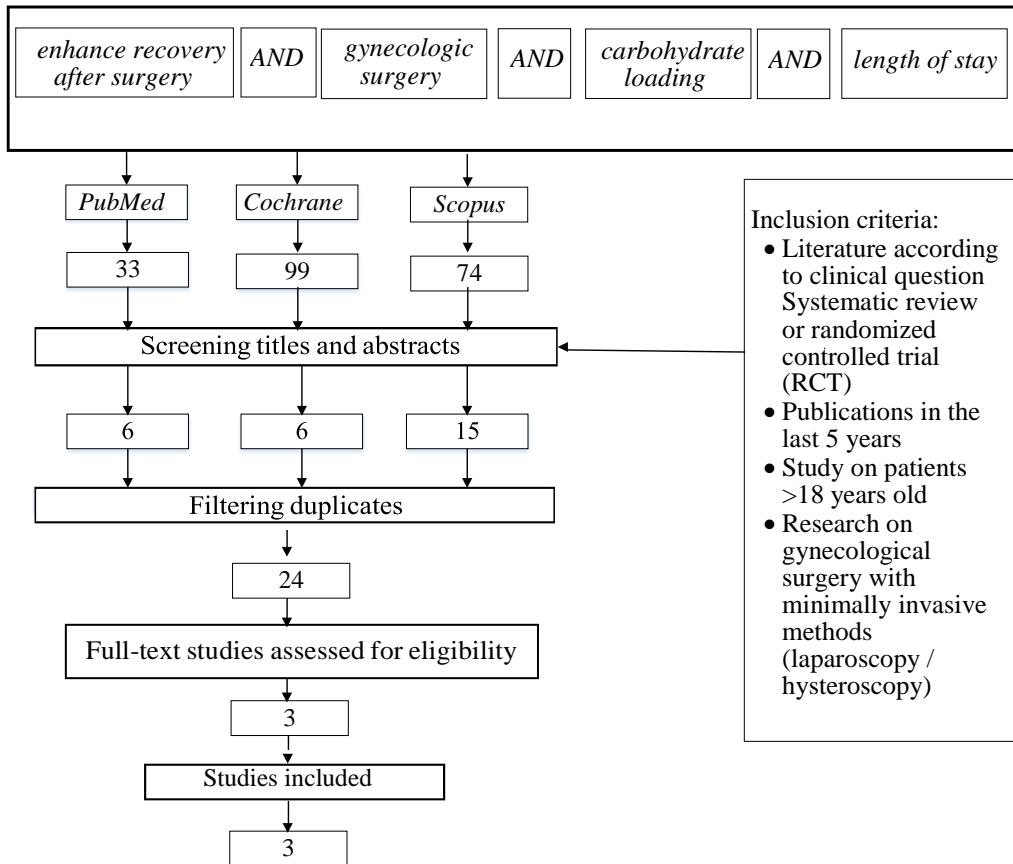
### Conclusions

The implementation of preoperative carbohydrate loading presented a significant result regarding the reduction in the length of hospital stay among patients undergoing planned non-invasive gynecologic surgery procedure. It is expected that further study which involves a larger size of samples can be conducted, so as to provide more accurate findings regarding the advantages of the preoperative carbohydrate loading procedure and the overall ERAS protocol among patients undergoing planned non-invasive gynecologic surgery procedure.

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**Figure 1. Prisma flow diagram on literature searching**



**Table 1. Critical research assessments of randomized control trial**

Parameters	Question	Cho, dkk.	Ren, dkk.	Yilmaz, dkk.
Validity	Was the assignment of patient to treatments randomized?	Yes	Yes	Yes
	And was the randomization list concealed?	Yes	Yes	Yes
	Were the groups similar at the start of the trial?	Yes	Yes	No
	Aside from the allocated treatment, were groups treated equally?	Yes	Yes	Yes
	Were all patients who entered the trial accounted for?	Yes	Yes	Yes
	And were they analyzed in the group to which they were randomized?	Yes	Yes	Yes
	Were measures objective or were the patients and clinicians kept “blind” to which treatment was being received?	No	No	No
Importance	How large was the treatment effect?			
	Post operative length of stay	2 (2-2) p 0,723	1.0 (1.0-1.0) p=0,002	1.13 ± 0,4 p <0.001
Applicability	How precise was the estimate of the treatment effect?	Precise, the 95% CI	Median 1.0-1.0	Precise, the 95% CI
	Is my patient so different to those in the study that the results cannot apply?	No	No	No
	Is the treatment feasible in my setting?	Yes	Yes	Yes
	Will the potential benefit of treatment outweigh the potential harms of treatment for my patient?	Yes	Yes	Yes