Section: General Surgery

Original Research Article

THE PROSPECTIVE STUDY ON IMPACT OF PREOPERATIVE ORAL CARBOHYDRATE LOADING ON POSTOPERATIVE RECOVERY ACCORDING TO ENHANCED RECOVERY AFTER SURGERY [ERAS] PROTOCOL AMONG TYPE 2 DIABETES MELLITUS PATIENTS ADMITTED AT CHENGALPATTU MEDICAL COLLEGE

P. Sankarlingam [1], V. Balaji[2], M. Thiruvikkaraman[3], A. Divya Kalyani[4], C. Manoj Priyan[4], K. Rajeshwari[5]

[1]Associate Professor, Department of General Surgery, Government Chengalpattu Medical College, Tamilnadu, India.
[2]Assistant Professor, Department of General Surgery, Government Chengalpattu Medical College, Tamilnadu, India
[3]Assistant Professor, Department of General Surgery, Government Chengalpattu Medical College, Tamilnadu, India
[4]Assistant Surgeon, Department of General Surgery, Government Hospital-Tirunelveli, Tamilnadu, India
[5]Assistant Surgeon, Department of General Surgery, Government Hospital-Vandavasi, Tamilnadu, India

Received : 03/12/2023
Received in revised form : 24/01/2024
Accepted : 12/02/2024

Keywords:
Insulin, Resistance, Diabetes, Loading

Corresponding Author:
Dr Divya Kalyani. A,
Email: drsurumd@gmail.com

DOI: 10.47009/jamp.2024.6.1.365

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (1); 1844-1847

Abstract

Background: Insulin resistance is a central metabolic change during surgical stress that is directly proportional to the magnitude of the operation. Insulin resistance has been shown to be an independent factor influencing length of stay in hospital postoperatively. Hence the role of preoperative carbohydrate loading in patients undergoing surgery has been undertaken as part of Enchanced Recovery after Surgery protocol. Aims and Objective is to study the impact of pre-operative oral Carbohydrates loading in type 2 diabetes mellitus patients in Enhanced Recovery after Surgery protocol. To study on incidence of aspiration within 24hrs immediate postop period affecting the post-operative mortality. To study on post-operative infections due to observed fluctuations in blood sugar in type 2 diabetics following surgery. **Materials and Methods:** A prospective interventional study done at chengalpattu medical college among 50 type 2 diabetes mellitus patients with of oral preoperative carbohydrate loading and following up with preop, intraop and postop sugar levels with insulin titration and its effects on postoperative recovery for period between April 2021-May 2022. **Result:** ? **Conclusion:** In conclusion, this study indicates that patients with DM-II well tolerate preoperative CHO-loading without increasing glucose levels, insulin requirements, the incidence of complications, or hospitalization durations. In ERAS protocols, patients with DMII may reap the same physiological benefits of this beverage as patients without DM-II. Further randomized studies are necessary to confirm our findings and investigate protocols for carbohydrate loading in type 2 diabetes patients.

INTRODUCTION

During the perioperative period, the stress of surgery and the subsequent inflammation contribute to increased glucose mobilisation but a decreased uptake of glucose. The decreased insulin sensitivity that results from this might sometimes last for several days or even weeks after surgery.[1] Even in healthy patients, perioperative hyperglycemia is quite common. According to,[2] it occurs in thirty percent of surgical patients who have never been diagnosed with diabetes mellitus (DM).

The Enhanced Recovery after Surgery (ERAS®) Society, the European Society for Clinical Nutrition and Metabolism, and the American Society for Enhanced Recovery and Perioperative Quality Initiative (ASER/POQI) all recommend nutrition strategies such as shortened fasting periods and preoperative carbohydrate administration, also known as "carbohydrate loading," in order to

improve postoperative insulin resistance in patients who do not have diabetes.[3]

Carbohydrate loading regimens can vary from institution to institution, but they typically consist of taking an oral dose of 100 g of a complex carbohydrate that is at least 12% (such as maltodextrin) the evening before surgery, followed by another dose of 50 g that is given 2–3 hours before anaesthesia.

According to the findings of four meta-analyses that included researchers from a variety of surgical specialties, preoperative carbohydrate loading is associated with significantly improved postoperative insulin resistance, primarily in patients who do not have DM.[4] Carbohydrate loading, when provided as part of an enhanced recovery protocol, has been shown in two of these studies to result in a modest but statistically significant reduction in length of stay (0.7–1.1 days) for patients undergoing major surgeries.[5,6] This reduction in length of stay was observed in patients who had undergone the surgery. However, the applicability of the purported benefits of carbohydrate loading to diabetic surgical patients is still a matter of some debate.

Patients who have had surgery have a diabetes prevalence that ranges from 20 to 40 percent, with some of the highest rates being documented by bariatric cohorts.[7] A increased risk of post-operative complications, an extended period of hospital stay, and mortality is connected with diabetes. Although the correlation between the two has not been proven, it is possible that a number of different mechanisms, including but not limited to glycemic unpredictability and hyperglycemia, are to blame for the unfavourable results.[7]

Aim and Objectives of the Study

1 To assess the necessity and safety of preoperative oral Carbohydrates loading in type 2 diabetes mellitus patients in Enhanced Recovery after Surgery protocol.
2 To study on incidence of aspiration affecting the post-operative mortality

To study on post-operative infections due to observed fluctuations in blood sugar in type 2 diabetics following surgery.

MATERIALS AND METHODS

Study Design: Prospective Interventional study
Study Period: APRIL 2022-MAY 2022
Inclusion criteria

1 Patients diagnosed with type 2 diabetes mellitus on insulin Or oral hypoglycemic drug under glycemic control Of FBS- 100 to 140, PPBS-140 to 180,Hba1c –less than 6.5 or 7,planned for elective surgery are included in the study
2 Newly diagnosed diabetes mellitus with FBS->126, PPBS->200,RBS->200.

Exclusion Criteria

Patients diagnosed with type 1 diabetes mellitus.
Patients with type 2 Diabetes mellitus undergoing emergency surgical procedures.
Patients with uncontrolled Diabetes mellitus and diagnosed with Diabetic Ketoacidosis.
Patients not willing for surgery
Patients not willing to give a written informed consent.

Methodology (Materials & Methods)

Patients diagnosed with type 2 Diabetes mellitus who are admitted for elective surgical procedure are taken into the study after written informed consent. Pre operatively given 400 ml of 12.5 percent of carbohydrate containing50 grams of glucose before 2 hrs of surgery. These patients would be followed up for length of hospital stay and post op complications rate as primary outcomes with aspiration pnemonitis, fatigue, post-op nausea, vomiting within 24 hrs, fatigue and post op infections as secondary outcomes .The blood sugar estimation would be done at appropriate intervals and the results would analysed using suitable software.

Sample Size: 50

Sample Size Estimation: The formula for sample size determination was determined as follows:

$n = z^2\frac{pq}{d^2}$

Where,
n = Sample size
Z = Standard Normal Deviate [z value] for a given level of confidence
p = prevalence or proportion
q = 1-p
d = absolute allowable error
[Prevalance -9%;d-8 ; Z-3.84]

RESULTS

Data was entered in spread sheet of Microsoft excel version 2021. Analysis was done in SPSS (trial version 23) software. To address the first objective descriptive statistics like frequency, percentages, and graphs and to analyse for association between various variables and healthcare seeking behaviour Chi-square test for proportion was used and wherever applicable Fischer's exact test was used. A 'p-value' of less than 0.05 was decided as the cut-off for deciding the significance of association and its strength.

Percentage, Proportion: The two basic columns of frequency distribution table are proportion and percentage. Proportion measures the fraction of the total group that is associated with each score. Proportions can be expressed as fractions; they commonly appear as decimals. Find the proportion and then multiply by 100 to get the percentage.

Level of significance or Alpha level: To find the boundaries that separate the high-probability samples from the Low-probability samples, we must define exactly what is meant by "low" probability and "high" probability. This is accomplished by selecting a specific probability value, known as

ISSN (O): 2687-5365; ISSN (P): 2753-6556

level of significance or the alpha level. The alpha value of 0.05 separates the most unlikely 5% of the sample (extreme values) 70 from the most likely 95% of the samples. This is also the value used for determining the p-value.

P-value: P-value must be lesser than 0.05 to be considered statistically significant. It is the probability that the result would occur if H0 were true. It is a Type I error.

Chi Square Test: Chi-square, a non-parametric test to evaluate hypothesis about proportions; or to study the relationships that exists within populations. It is also applied as a test of "goodness of fit", to determine if actual numbers are similar to the expected or theoretical numbers-goodness of fit to a theory.

Table 1: Distribution of glucose level (mg/dl) among the study participants (N=50)

			Std. Error	95% Confidence Interval		p
				Lower Bound	Upper Bound	
			10.18	175.59	216.50	NA
Operative room	195.26	63.87	9.03	177.11	213.41	0.66
1st postoperative	201.44	56.95	8.05	185.26	217.62	0.01
Postop day 0	236.50	72.96	10.32	215.77	257.24	0.81
Post op day 1	192.80	53.76	7.60	177.52	208.08	0.01
Post op day 2	168.64	43.92	6.21	156.16	181.12	0.00
Post op day 3	152.92	41.89	5.92	141.02	164.83	0.00
Post op day 4	154.78	33.80	4.78	145.17	164.39	0.00
Post op day 5	140.68	32.61	4.61	131.41	149.95	0.00

Table 2: Distribution of insulin unit given among the study participants (N=50)

Time line	Mean	Std. Deviation	Std. Error	95% Confidence Interval		p
				Lower Bound	Upper Bound	
Postop day 0	9.96	6.47	0.92	8.12	11.80	NA
Post op day 1	40.96	22.38	3.17	34.60	47.32	<0.001
Post op day 2	40.68	22.68	3.21	34.23	47.13	<0.001
Post op day 3	23.12	10.44	1.48	20.15	26.09	<0.001
Post op day 4	28.20	15.56	2.20	23.78	32.62	<0.001
Post op day 5	14.84	8.56	1.21	12.41	17.27	<0.001

DISCUSSION

In our study, 155 children who were diagnosed with Globally diabetes is present in about 7.2 to 11.4% of the population and those with diabetics are more likely to require operations. In fact, about 10-15% of patients undergoing operations have type 2 diabetes mellitus.[1] Diabetic patients have higher rates of complications, utilize more medical resources, and experience longer lengths of hospital stay than do patients without diabetes.[1,2]

In this study sample size of 50 was used to know the impact of preoperative Oral carbohydrates loading on patients with type 2 Diabetes Mellitus in Enhanced Recovery after Surgery protocol. Similar sample size was in Gustafsson et al study.[2] Mean age of the study participants in this study is 48.88±17.04 years and in other studies like Gustafsson et al,[2] and Breuer et al,[3] the mean age 58(±13) and 64(±10) in years respectively. In our study mean age is slightly lower than the other studies and this could be due to difference in selection of surgery cases between the studies.

Majority of the study participants were males and is comparable with the other studies like Gustafsson et al and Laffin MR et al.[4]

According to American Society of Anesthesiologist (ASA) physical status classification, in our study about 42% of the study participants were in stage II and remaining 58% were in stage III. Similar and comparable results were found Talutis et al,[5] about 51.6% of the patients were in stage II and 47.6% were in stage III, where as in LaffinMR et al,[4] 37% were in stage II, 32.6% were in stage III and 30.2% were in stage IV and V.

Mean BMI of the study participants was found to 27.6 kg/m2 in this study but in Talutis et al,[5] study and Laffin MR et al,[4] it was found to be 39.5 kg/m2 and 33 kg/m2 respectively , this difference in BMI could be due to geographic difference in body weight and height of the patients.

Duration of surgery in this is around 6.58(2.48) hours and in Talutis et al,[5] study it ranged from 1.5 hours to 11hours.

In the current study the Hemoglobin A1C was 9.09 (±2.04) showing poor glycemic control compared to other studies showing 7(5-12.5) and 6.9(±1.1) in Talutis et al,[5] study and Laffin MR et al,[4] respectively.

Majority of the patients in our study participants about 64% were on oral medications and other 36% of them were on Insulin in Home Diabetes Medications. Similarly on other study by Talutis et al,[5] majority of them were on oral medication.

In present study pre-operatively 400ml of 12.5% of carbohydrate containing 50gm of glucose 2 hours before surgery was given orally. Similar amount of carbohydrate is given in Gustafsson et al,[2] and Breuer et al,[3] whereas in Laffin et al,[4] Oral 500 ml cranberry cocktail or apple juice 1 hour before bedtime, one night before operation, and 3 hours before operation was given. About 12% of the

ISSN (O): 2687-5365; ISSN (P): 2753-6556

patients had hypoglycemic event in this study and similarly in around 7.5% of the patients had hypoglycemic event in Talutis et al,[5] study. Intra-operative insulin was infused for about 16% of the patients in this and in Talutis et al,[5] study 11.3% were infused intra-operative insulin. In our study the pre-operative glucose level was found to be 196.04(±71.98) mg/dl and in Talutis et al,[5] study it was found to be 142 (66-392) mg/dl. In post-op room the blood glucose level was almost similar as the pre-op glucose level, where as in Talutis et al,[5] there is slightly increase in glucose level. During 1st post-op there is significant increase in blood glucose level in this study as well as in Talutis et al,[5] study. There after there is significant decrease in blood glucose level during 5 consecutive days in this study, where as in Talutis et al,[5] study there is decrease in blood glucose level till 3rd post-op day and then it remained constant.

Insulin usage after surgery on day 1 is around 10 units in this study but in Talutis et al,[5] study only 2 units of insulin is used, this difference in insulin use could be due to poor pre-op glycemic control. Then on day 2nd and 3rd 40 units of insulin has been used in this study and on next day insulin units was decreased 24 units and then increased to 28 units on the next day.

Other concerns related oral carbohydrate among patients with type 2 diabetes mellitus is delayed gastric emptying and the associated risk of aspiration after induction of anesthesia. However, it is difficult to correlate the impact of ERAS protocols upon gastroparesis due the low incidence of this condition that affects just 1% of patients in type 2 diabetes.[6] Delayed gastric emptying in patients with type 2 diabetes affect solid food rather than liquid intake and is more among those who have longstanding type 2 diabetes. While some might argue that screening for gastroparesis would allow safe CHOloading in selected patients with DMII, there are no reliable ways to predict delayed gastric emptying, as it has not been related to autonomic neuropathy or other sequelae of diabetes.[2]

CONCLUSION

In conclusion, this study indicates that patients with DM-II well tolerate preoperative CHO-loading without increasing glucose levels, insulin requirements, the incidence of complications, or hospitalization durations. In ERAS protocols, patients with DMII may reap the same physiological benefits of this beverage as patients without DM-II. Further randomized studies are necessary to confirm our findings and investigate protocols for carbohydrate loading in type 2 diabetes patients.

Limitations

Our study has several limitations. First, this is an observational study with a small sample size; therefore, it is difficult to recommend that all diabetic patients consume carbohydrates before surgery. Nonetheless, this study provides evidence that well-controlled type 2 diabetes patients can receive pre-operative carbohydrate drinks according to current fasting guidelines. The data may have introduced a bias in the interpretation of the results. Consequently, the current study has limitations when presenting evidence of glucose control based on reducing insulin resistance under carbohydrate loading. Lastly, a single-center study design and insufficient data restrict the applicability of our findings. Further validation of our results requires prospective, large-scale, randomized, and multicenter studies.

REFERENCES

1. Ljungqvist O, Jonathan E. Rhoads lecture 2011: insulin resistance and enhanced recovery after surgery. JPEN - J Parenter Enter Nutr 2012;36(4): 389e98.
2. Duggan EW, Carlson K, Umpierrez GE. Perioperative hyperglycemia manage- ment: an update. Anesthesiology 2017;126(3):547e60.
3. Wischmeyer PE, Carli F, Evans DC, Guilbert S, Kozar R, Pryor A S, et al. American society for enhanced recovery and perioperative quality initiative joint consensus statement on nutrition screening and therapy within a sur- gical enhanced recovery pathway. AnesthAnalg 2018;126:1883e95.
4. Li L, Wang Z, Ying X, Tian J, Sun T, Yi K, et al. Preoperative carbohydrate loading for elective surgery: a systematic review and meta-analysis. Surg Today 2012;42(7):613e24.
5. Awad S, Varadhan KK, Ljungqvist O, Lobo DN. A meta-analysis of randomised controlled trials on preoperative oral carbohydrate treatment in elective surgery. Clin Nutr 2013;32(1):34e44.
6. AmerMA,SmithMD,HerbisonGP,PlankLD,McCallJL.Networkmeta-analysis of the effect of preoperative carbohydrate loading on recovery after elective surgery. Br J Surg 2017;104(3):187e97.
7. Frisch A, Chandra P, Smiley D, Peng L, Rizzo M, Gatcliffe C, et al. Prevalence and clinical outcome of hyperglycemia in the perioperative period in noncardiac surgery. Diabetes Care 2010;33(8):1783e8.
8. Morin NP. Comment on “enhanced recovery in patients with diabetes: is it time for a moratorium on use of preoperative carbohydrate beverages?” I agree with your perspective. Ann Surg. (2019) 270:e120–1. doi: 10.1097/sla.0000000000003303
9. Smith MD, McCall J, Plank L, Herbison GP, Soop M, Nygren J. Preoperative carbohydrate treatment for enhancing recovery after elective surgery. Cochrane Database Syst Rev. (2014) 14(8):CD009161. doi: 10.1002/14651858.CD009161.pub2
10. Boden G. Obesity, insulin resistance and free fatty acids. CurrOpin Endocrinol Diabetes Obes. (2011) 18:139–43. doi: 10.1097/MED. 0b013e3283444b09.

ISSN (O): 2687-5365; ISSN (P): 2753-6556