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Original Article

Comparison of Pre-Operative Intravenous Versus Oral Glucose Administration on Recovery Outcome in Post-Anesthesia Care Unit in Colorectal Surgery Patients

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ABSTRACT

Objective: To explore the recovery outcome after pre-operative administration of glucose (Carbohydrate/Dextrose) in the oral versus intravenous form in patients undergoing elective colorectal surgery in the post-anesthesia care unit.

Study Design: Quasi-experimental study.

Place and Duration of Study: Department of Anesthesiology, Combined Military Hospital Rawalpindi, Pakistan from Aug 2022-Jan 2023.

Methodology: A Quasi-experimental study was conducted in which 160 patients were divided into two groups of 80 patients each. After the fasting duration of 8 hours, Group-O received 1 g/kg of Dextrose dissolved in 100 ml of normal saline administered orally 2 hours prior to surgery whereas Group-I received 1g/kg of Dextrose dissolved in 100 ml of Normal Saline administered intravenously 2 hours prior to surgery. Variables measured were post-operative pain on Visual Analog Scale (VAS), incidence of nausea, vomiting, thirst, hunger, fatigue, and anxiety.

Results: Stay in recovery did not significantly change between both groups with 5.29±0.25 hours in the Intravenous group versus 5.28±0.27 hours in the Oral group (p 0.60). However, post-operative pain scales were significantly different with 3.28±0.57 versus 4.13±0.41 between both groups (p<0.0001).

Conclusion: The Intravenous glucose administration results in better post-operative pain scores with less incidence of nausea, vomiting and fatigue whereas the oral administration of glucose provides decrease incidence of thirst, hunger, and anxiety

Keywords: Carbohydrate, Colorectal, Dextrose, Intravenous, Oral, recovery.

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INTRODUCTION

The human body is designed to cope up with stress responses to maintain homeostasis and integrity.[1] The surgical stimulus given during surgery to the patient results in the activation of various neuronal, humoral, and catabolic mechanisms designed to keep the stress of surgery to a minimum and maintain body functions.[2] This results in the breakdown of proteins, lipids and carbohydrates with an increased sympathetic drive.[3] All these factors result in post-operative complications increasing morbidity as well as mortality.[4]

The mechanisms implicated during the surgical stress response are breakdown of carbohydrate followed by lipids and proteins, sodium and water retention through the renin-angiotensin pathway, insulin resistance by the body to cope up with the ongoing stress responses, release and regulation of glucocorticoids, interleukins, and tumor necrosis factor (TNF).[5] The overall result is to provide the body with adequate support; but, this catabolic cycle results in decreased immunity, depletion of energy reserves and electrolyte imbalances resulting in untoward complications in the post-operative period.[6] These mechanisms are more profound in prolonged and major abdominal surgeries especially colorectal surgeries.[3,7]

Fasting before surgery has been the standard in clinical practice to decrease the chance of aspiration and reflux during induction of anesthesia and during surgery.[8] However, it is now being debated that prolonged fasting is detrimental for the patient and decreased fasting times not only result in similar incidence of aspiration and reflux but also result in a better hemodynamic profile.[9] Decreased fasting time also provides a better hemodynamic profile, good energy reserves and less post-operative complications.[8]

One of the methods used is the administration of carbohydrates 2-3 hours before surgery to maintain adequate glycemic levels to decrease post-operative

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complications.[10] However, national literature on the topic is lacking.

This study aimed to explore the efficacy of pre-operative administration of glucose (Carbohydrate/Dextrose) in the oral versus intravenous form in patients undergoing elective colorectal surgery and compare the recovery outcome in the post-anesthesia care unit.

METHODOLOGY

This Quasi-Experimental study was carried out at the Department of Anesthesiology, Combined Military Hospital, Rawalpindi from August 2022 to January 2023 after approval from the ethical review board (vide letter no. 276). A sample of 160 patients scheduled for colorectal surgery were included in the study. WHO sample size calculator was used keeping the confidence interval at 95%, power of test at 80% with the difference between mean pain scores post-operatively of oral and intravenous modalities being 1.9,[11] minimum sample size 157 patients was calculated.

Inclusion Criteria: Patients of both genders with ASA I and II, presenting to the hospital for elective colorectal surgeries under general anesthesia between 35-65 years of age, weight between 55-85 kg who consented to take part in the study were included.

Exclusion Criteria: Patients with major cardiac or respiratory disease, low ejection fraction, allergy to Propofol, Atracurium, coagulation disorders, pregnancy, sepsis, diabetes or hypertension, BMI more than 31 kg/m^2 and history of acid reflux were excluded.

The patients were divided into two groups (Figure). Eighty participants were placed in the oral carbohydrate group (Group-O) and Eighty participants were placed in intravenous carbohydrate group (Group-I). Once the patients were divided into groups, an informed written consent was taken. Standard monitoring including non-invasive blood pressure, heart rate, capnography and ECG were attached to participants in both groups. Both groups had a fasting duration of 8 hours. Group-O received 1g/kg of dry Dextrose powder dissolved in 100 ml of Normal Saline administered orally 2 hours prior to surgery whereas Group-I received 1g/kg of dry Dextrose dissolved in 100 ml of Normal Saline administered intravenously 2 hours prior to surgery.

General anesthesia was induced after pre-medication with 10 mg Metoclopramide and 4 mg Dexamethasone in both groups by IV Propofol 1.5 mg/kg, IV Nalbuphine 0.15 mg/kg, IV Atracurium 0.5 mg/kg and maintained with Isoflurane at 1.0 MAC. At the end of surgery, reversal was done through Neostigmine 2.5 mg with Glycopyrrolate at 0.04 mg/kg. In both groups, bradycardia was defined as a heart rate of <60 beats per minute,[12] and hypotension as MAP <50 mm Hg,[13] and was treated with 5 mg Ephedrine and 600 mcg of Glycopyrrolate when needed.

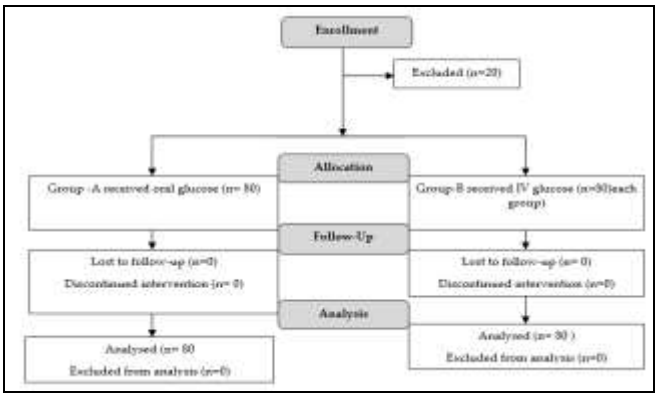

Figure: Patient Flow Diagram

Post-operatively, the patients were retained in the post-operative surgical ward and parameters were assessed one hourly for 06 hours by an independent anesthesia resident unaware of the study protocol. Variables measured were post-operative pain on visual analog scale (VAS) as standardized on a pre-made chart with score from 0-10, zero being no pain to 10 having intolerable pain, incidence of nausea, vomiting, thirst, hunger, fatigue, and anxiety.

Demographic data were statistically described in terms of Mean±SD, frequencies, and percentages when appropriate. Independent samples t-test was used to compare means between groups. Chi-square was used to compare median values for statistical significance. A *p*-value of <0.05 was considered statistically significant. All statistical calculations were performed using Statistical Package for the social sciences (SPSS) version 26:00.

RESULTS

A total of 160 patients were included in the study. Mean age of patients was 41.71±6.12 years in the intravenous versus 42.21±5.84 years in the oral glucose group (p=0.15). The mean weight was 68.30±3.64 kg in the intravenous versus 67.82±3.43 kg in the oral group (p=0.13). Mean duration of colorectal surgeries in both groups were comparable with 129.77±7.46 minutes in

the intravenous group versus 129.03±7.07 minutes in the oral group (p=0.270).

Duration of stay in the recovery was not significantly different between both groups with 5.29±0.25 hours in the intravenous group versus 5.28±0.27 hours in the oral group (p 0.60). However, post-operative pain scales were significantly different with median score of 3.00 (IQR=1.00) versus 5.00 (IQR=1.00) between both groups (p<0.001) (Table-I).

Table-I: Age and Height Characterisitics Between Both Groups (n=160)

Variable	Group-I (n=80)	Group-O (n=80)	*p*-value
Mean age (years)	41.71±6.12	42.21±5.84	0.15
Mean weight (kg)	68.30±3.64	67.82±3.43	0.13
Mean duration of surgery (minutes)	129.77±7.46	129.03±7.07	0.27
Mean duration of recovery stay (hours)	5.29±0.25	5.28±0.27	0.60
Median pain score on visual analog scale (0-10)	3.00 (IQR=1.00)	5.00 (IQR=1.00)	0.001

When comparing post-operative complications, the incidence of nausea was more in the oral Glucose group with 24(30%) patients versus 15 (18.8%) in the Intravenous group. The incidence of vomiting was similarly more in the oral group; 14(17.5%) patients versus 10(12.5%) in the Intravenous group. However, incidence of hunger and thirst was more in the Intravenous group with 17(21.3%) and 18(22.5%) patients affected versus 12(15%) and 09(11.3%) patients in the oral group (Table-II).

Table-II: Comparison of Parameters Between Both Groups (n=160)

Variable	Group-I (n=80) n(%)	Group-O (n=80) n(%)
Nausea	15(18.8)	24(30)
Vomitting	10(12.5)	14(17.5)
Hunger	17(21.3)	12(15)
Thirst	18(22.5)	09(11.3)
Fatigue	08(10)	15(18.8)

The incidence of fatigue was more in the oral group with 15(18.8%) patients affected compared to 08(10%) in the intravenous group. But anxiety was seen more in the Intravenous group with 12(15%) patients affected versus 08(10%) in the oral group (Table-II).

DISCUSSSION

The findings of our study show that IV glucose administration results in better post-operative pain scores with less incidence of nausea, vomiting and fatigue in comparison to administration of oral glucose whereas the oral route of administration has decreased incidence of thirst, hunger, and anxiety.

When comparing the demographics of our study sample, age and weight were comparable between both groups to eliminate their role in affecting the study. Pain scores were significantly reduced in the IV group versus the oral group which was also seen in previous studies carried out by A Pareek *et al*.[14] and NK Chaudhry *et al*.[15] In our study it was evident that the pain scores on visual analogue scale improved with administration of glucose which is in line with studies where the overall pain scores were reduced by administration of glucose/dextrose.[16,17] However, our study also observed that the effect was more profound once it was given intravenously rather by the oral route.

In contrast to a study carried out by Jablameli *et al*.[11] who found better recovery times in the oral group, we observed no significant difference to recommend one modality to be superior to the other. We believe that the better recovery times in oral administration might be attributed in part to the reduced incidence of anxiety and apprehension in the oral group, these patients remained considerably more comfortable than the IV group. More studies are needed to conclusively check the psychological effects of glucose administration in these patients.

When comparing our demographic data of colorectal patients and the overall outcome, pain scores were considerably reduced, post-operative complications were significantly better whether given by the oral or intravenous route. While the incidence of nausea, vomiting and fatigue were lessened more in the IV group, thirst, hunger, and anxiety was lesser in the oral group. The findings of our study are comparable to a study conducted on patients of laparoscopic cholecystectomy by Hausel *et al.*, which also depicted that the incidence of post operative nausea and vomiting was reduced in patients who were administered carbohydrate drinks prior to surgery.[18] These findings were in line with majority of the existing studies including a study done on cardiac surgery patients which also showed improved post operative outcomes of oral administration of glucose prior to surgery.[19] The study recommends the use of pre-operative glucose administration in patients undergoing colorectal surgery to counter the

physiological complications of prolonged fasting seen in patients.

CONCLUSION

We conclude that IV glucose administration results in better post-operative pain scores with less incidence of nausea, vomiting and fatigue whereas the oral administration of glucose provides decrease incidence of thirst, hunger, and anxiety.

LIMITATIONS OF STUDY

The limitations of this study are that of a single center. Multi-center study will cater more to our demographic area.

Conflict of Interest: None.

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Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

MHS & OM: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

SZH & TAK: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SAT & AAA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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