DOI: https://doi.org/10.54393/pjhs.v5i08.1579

PAKISTAN JOURNAL OF HEALTH SCIENCES
https://thejas.com.pk/index.php/pjhs
ISSN (P): 2790-9352, (E): 2790-9344
Volume 5, Issue 8 (August 2024)

Original Article

OPEN ACCESS

Comparative Effects of Preoperative Carbohydrate Loading and Fasting on Recovery Outcomes in Colorectal Surgery

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ARTICLE INFO

Keywords:
Carbohydrate Loading, Colorectal Surgery, Stress Response, Insulin Resistance

How to Cite:
Mureed, A., Dian, A., Shafique, U., Zia, K., Ahmad, Z., & Sattar, A. (2024). Comparative Effects of Preoperative Carbohydrate Loading And Fasting on Recovery Outcomes in Colorectal Surgery: Carbohydrate Loading and Fasting in Colorectal Surgery. Pakistan Journal of Health Sciences, 5(08). https://doi.org/10.54393/pjhs.v5i08.1579

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Received Date: 25th April, 2024
Acceptance Date: 23rd August, 2024
Published Date: 31st August, 2024

ABSTRACT

Preoperative oral carbohydrate treatment improves postoperative recovery. Fasting before surgery increases stress response and insulin resistance. **Objective:** To examine the effects of preoperative oral carbohydrate loading and traditional fasting on gastrointestinal function, independent walking time, and hospital stay after colorectal surgery. **Methods:** A quasi-experiment study with 90 individuals diagnosed by extensive history, clinical examination, and pertinent investigations split patients into Group A and Group B. General Anesthesia was used for all surgeries. Group A had surgery after 6 hours of nil per os, whereas Group B had a clear carbohydrate drink 14 hours before surgery and another 2 hours before anesthesia induction. Up to 72 hours after surgery, bowel noises, first flatus and feces, and time to independent ambulation were monitored. **Results:** The conventional approach in Group A produced a mean time of 51.4 ± 5.2 hours for bowel sounds, 62.9 ± 6.5 hours for first flatus, 77.95 ± 1.00 hours for defecation, 82.73 ± 9.6 hours for independent ambulation, and 5.02 ± 1.4 days for hospital stay. Group B, who received oral carbohydrate loading therapy before surgery, had shorter times for bowel sounds (43.5 ± 9.1 hours), first flatus (54.8 ± 4.6 hours), defecation (67.5 ± 11 hours), and independent ambulation (72.7 ± 6.6 hours), but a similar hospital stay (5.02 ± 1.49 days Hospital stay was not substantially different (p-value = 0.744), but surgical results were (0.000). **Conclusions:** Oral carbohydrate loading before colorectal surgery improves gastrointestinal function, speeds independent walking, and reduces hospital stays.

INTRODUCTION

Preoperative oral carbohydrate therapy shows good postoperative recovery [1]. Preoperative fasting increases the risk of postoperative stress response and postoperative insulin resistance [2]. The stress response is characterized by inflammatory cytokine, pituitary, and sympathetic changes, leading to lipolysis, hyperglycemia, nitrogen loss and postoperative insulin resistance. Peripheral insulin resistance causes less glucose uptake and hyperglycemia; on the other side, hepatic insulin resistance increases gluconeogenesis, leading to "diabetes of injury" [3]. Enhanced Recovery After Surgery (ERAS) perioperative protocols includes a shift from conventional fasting to preoperative oral carbohydrate loading practices [4]. Preoperative carbohydrate loading boosts the immune response, reduces inflammatory cytokine response, and has a good outcome of decreased surgical site infections [5]. Postoperative outcomes are measured in many ways ranging from time to return of GI function, time to first flatus, time to independent ambulation and hospital stay [6]. All these domains are measured and need to be measured to determine surgery and postoperative outcomes [7]. Outcomes are measured to find out the best possible outcome [8]. Preoperative intake significantly influences insulin levels and body

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physiology, whether through oral or intravenous routes. Nil per oral status, indicating no intake, also profoundly impacts body physiology. Preoperative diet or carbohydrate loading effect postoperative recovery; for example, it affects the time to return of GI function, patient if nil per oral or carbohydrate loading, and it is time latency to operation time affects the time to first flatus postoperatively [9]. Same way fasting preoperatively, which is explained as pure nil per oral six hours before surgery [10]. Preoperative fasting induces metabolic stress and insulin resistance, impacting factors like time to independent ambulation and hospital stay, which are influenced by carbohydrate intake timing and route, including nil per oral status [11]. In terms of time to independent ambulation, time to flatus, time of the return of GI function and time of defecation postoperatively and also hospital stay is also strongly affected by carbohydrate loading, time of its intake preoperatively or no carbohydrate intake at all before surgery affects postoperative outcome also affect its postoperative outcomes [12]. Stress-induced high blood sugar levels, common in critically ill patients, influence both preoperative condition and postoperative recovery, irrespective of diabetes, due to the release of counter-insulin hormones. Various colorectal surgeries, including colectomy, hemorrhoidectomy, and others, were performed, with surgical protocols like antibiotic use or carbohydrate loading having significant effects on postoperative recovery, particularly on outcomes such as ambulation, GI function, and defecation [13]. The timing of carbohydrate ingestion in relation to surgery affects postoperative results by affecting inflammatory pathways and interleukin 6 (IL-6) levels. Preoperative carbohydrate loading has been demonstrated in numerous clinical trials to decrease hospital stay, peripheral insulin resistance, and the duration needed for the return of gastrointestinal functions and resumption of work [14,15]. Surgery is a significant process that brings physiological changes in body that prompts metabolic changes. Postoperative insulin resistance contributes to hyperglycemia, which is linked to adverse clinical outcomes, complications, and prolonged hospital stays. To improve perioperative care and outcomes, institutions have developed pathways focusing on managing surgical patients to alleviate physiological stress during procedures [16]. Perioperative dietary approaches encompass fasting or carbohydrate provision, with increasing attention to nutrition. Preoperative carbohydrate loading is advocated by various experts across surgical specialties, showing promising benefits for patient outcomes and mitigating postoperative insulin resistance [17,18].

This study aimed to assess the efficacy of preoperative oral carbohydrate loading and conventional fasting in colorectal surgery in return for gastrointestinal function, time to independent walking and hospital stay.

METHODS

The study, a quasi-experiment study, was conducted at Benazir Bhutto Hospital in Rawalpindi, Pakistan for 6 months from July 2021 to 2022. Patients meeting predefined criteria were selected from the outpatient department after obtaining informed consent. Included were those undergoing open colorectal surgery on elective list and aged between 20 to 65 years old; those detected with stage 4 colorectal malignancy, urgent colorectal surgery, diabetes mellitus, increased risk of gastric content aspiration, immune-modulatory therapy, and history of any drug allergy were excluded from the study. Convenient sampling technique was used. They were divided into two groups, Group A and Group B. Group A underwent surgery after a 6-hour fasting period, while Group B received a clear carbohydrate drink before surgery. General anesthesia was administered for all surgeries, and postoperatively, patients received antibiotics and analgesics. Time to return of bowel sounds, first flatus passage, defecation, independent ambulation, and total hospital stay duration were recorded up to 72 hours post-surgery, with discharge upon tolerating a soft diet. The sample size was determined using the powertwo means analysis of the statistical software Stata [19]. With an alpha threshold of less than 0.05, study power used 80% and 95% confidence levels. With 45 patients in each group, the computed sample size was 90. Attached in Apendix. The findings were displayed as (mean ± SD) values. At the probability level of < 0.05 statistical significance was acknowledged. The paired-t test was used to compare the times for bowel noises, first flatus, defecation, independent walking, and hospital stay days for intergroup comparisons. The Independent t-test was used to compare the groups. All analysis were performed using SPSS version 25.0. Ethical approval was received by the Ethical Review Committee (ERC) Rawalpindi Medical University and Allied Hospitals Rawalpindi under Ref No: 61/REF/RMU/2021.

RESULTS

Figure 2 showed the distribution of gender male and female respectively. Graph shown the 40% female which were 36 in quality and 60% were male which 54 in quantity were.

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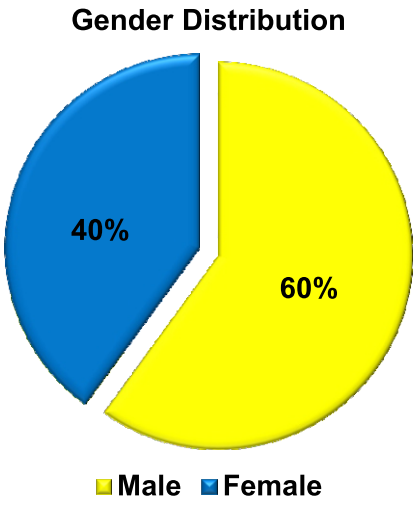

Figure 2: Quantity of Sample Gender Wise Distribution

Table 1 showed the time to first flatus and time to defecation in two groups. It describes the Comparing time to return to bowel sounds (Hours).

Table 1: Comparing Time to Return to Bowel Sounds (Hours) (n=45 per Group)

Outcome Measures	Group	(Mean ± SD)	p-Value
Time to Return to Bowel Sounds	Group A Conventional Fasting	51.48 ± 5.28	0.000
	Group B Preoperative Oral Carbohydrate Loading Therapy	43.53 ± 9.12	
Time to First Flatus	Group A Conventional Fasting	62.93 ± 6.53	0.000
	Group B Preoperative Oral Carbohydrate Loading Therapy	54.80 ± 4.60	
Time to Defecation	Group A Conventional Fasting	77.95 ± 6.745	0.000
	Group B Preoperative Oral Carbohydrate Loading Therapy	67.53 ± 11.104	

Table 2 showed the time to first flatus and time to defecation in two groups. It describes the Gender Stratification and Comparing time to return to bowel sounds (Hours).

Table 2: Gender Stratification and Comparing Time to Return to Bowel Sounds (Hours) (Male (n=27), Female (n=18)

Outcome Measures	Group	Gender	(Mean ± SD)	p-Value
Time to Return to Bowel Sounds	Group A	Male	52.14 ± 6.06	0.311
		Female	50.50 ± 3.79	
	Group B	Male	44.85 ± 11.05	0.239
		Female	41.55 ± 4.63	
Time to First Flatus	Group A	Male	52.14 ± 6.06	0.653
		Female	50.50 ± 3.79	
	Group B	Male	63.29 ± 7.57	0.223
		Female	41.55 ± 4.70	
Time to Defecation	Group A	Male	77.92 ± 6.37	0.972
		Female	78.00 ± 7.45	
	Group B	Male	65.51 ± 13.16	0.138
		Female	70.05 ± 6.15	

DISCUSSION

The average time for the return of bowel sounds was 47.5 ± 8.4 hours, while the mean time for the passage of the first flatus was 58.8 ± 6.9 hours, and defecation occurred at 72.7 ± 10.5 hours postoperatively. Independent ambulation was achieved at 77.7 ± 9.6 hours, and the average hospital stay was 5.07 ± 1.60 days. In the conventional group (Group A), the time for the return of bowel sounds was 51.4 ± 5.2 hours, whereas in Group B, which received preoperative oral carbohydrate loading therapy, it was 43.5 ± 9.1 hours. An independent T-test revealed a significant difference between the two groups in the time for the return of bowel sounds (p-value = 0.000). Previous research suggests that postoperative mortality may decrease with insulin treatment, but similar outcomes can be achieved through strategies like preoperative carbohydrate loading and immune nutrition, indicating the potential benefits of optimizing preoperative nutrition for improved outcomes [20]. In the conventional group, the mean time for the passage of the first flatus was 62.9 ± 6.5 hours, while in Group B, where patients received preoperative oral carbohydrate loading therapy, it was 54.8 ± 4.6 hours. A significant difference was observed between the two groups in the time for passage of the first flatus (p-value = 0.00). Similarly, the mean time for defecation was 77.95 ± 1.005 hours in the conventional group and 67.5 ± 11 hours in Group B, indicating a significant difference (p-value = 0.00). Additionally, the mean time for independent ambulation postoperatively was 82.73 ± 9.6 hours in the conventional group and 72.7 ± 6.6 hours in Group B, with a significant difference between the two groups (p-value < 0.001). This suggests that perioperative dietary supplementation, particularly preoperative oral carbohydrate loading therapy, may positively influence postoperative outcomes in patients undergoing gastrointestinal procedures. Qin PP *et al.*, reported that experimentation included: protein supplementation (preoperative day 30-6), "immunonutrition" (preoperative day 5-1 and postoperative day 1-5) and carb loading surgical or medical procedure day [21]. 90-day postoperative confusion rate, including postoperative irresistible complexities, diminished span from enlistment to medical procedure from 4 weeks to about fourteen days. And it was concluded that blood glucose and other metabolic outcomes of body return back to normal faster in healthy individuals as compared to those diseased and in those who used fluid carbohydrate therapy as compared to those who fasted before surgery. In the conventional group mean time period for hospital stay was found to be 5.13 ± 1.7 days and in group B mean time period for hospital stay was found to be 5.02 ± 1.49. T test showed that no significant difference was seen between two groups in time period for hospital stay with P value of 0.74. Stenberg E et al., reported that carbohydrate fluid were associated with return of bowel sound earlier as

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compared to nil per oral group and these results were in accordance with results of this study [22]. Prior research involved 14 participants assigned to the rehabilitation group and 15 to the control group. Patients undergoing rehabilitation exhibited higher mean levels of complete protein both before surgery (7.4 versus 6.8, p = 0.004) and after surgery (4.9 versus 4.3, p = 0.005). Intraoperative complications were observed in 40% of controls compared to 14.3% in the rehabilitation group, with significantly lower rates of intraoperative blood transfusion in the rehabilitation group (14.3% versus 53.3%, p = 0.027). Despite similar timing of initial ambulation, postoperative complication rates, and length of hospital stay, the study concluded that postoperative recovery occurred more quickly and earlier in healthier individuals with statistical significance.

CONCLUSIONS

Preoperative oral carbohydrate loading therapy has shown early signs of recovery in terms of return of gastrointestinal function, time to independent walking and hospital stay in patients undergoing colorectal Surgery. Gender was also found to impact time to return to first bowel sound and first flatus, with the female gender showing early recovery compared to males.

Authors Contribution

Conceptualization: AM

Methodology: AD, US

Formal analysis: AD

Writing, review and editing: AM, ZA, AS, KZ

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

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