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Research Article

Effect of Preoperative Oral Carbohydrate Fluid on Post Operative Nausea and Vomiting in Laparoscopic Cholecystectomy Patients Under General Anesthesia

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ABSTRACT

Background: Postoperative nausea and vomiting (PONV), an unpleasant complication following anaesthesia and surgery has various components such as nausea, retching and vomiting. Although PONV is usually self-limiting and non-fatal, it often causes substantial patient distress and dissatisfaction, augmenting healthcare costs by delaying discharge from post anaesthesia care units and causing unexpected hospital re-admissions. Different pharmacological and non-pharmacological approaches have been used for preventing PONV. Nonetheless, the most effective prophylactic regime has not been determined.

Methods: We conducted a prospective randomised study for evaluation of effect of preoperative oral carbohydrate fluid (GROUP- C) and placebo drink (clear water) (GROUP-P) on PONV in 90 adult patients undergoing laparoscopic cholecystectomy surgery under general anaesthesia. The number of episodes of nausea, retching and vomiting, total requirement of antiemetic dose in 24 hours, pre and postoperative blood glucose levels, patient satisfaction score, VAS score and haemodynamic parameters were recorded in the two groups and statistical analysis was done.

Results: Demographic data was comparable between the two groups with respect to age, gender and BMI. The surgical time and intra-abdominal pressures throughout the surgery were similar in the two groups. In our study the pre-induction blood glucose levels were found to be higher in group C and preoperative thirst was found to be less in group P. Both the groups were comparable in terms of number of episodes of PONV, total requirement of anti-emetic dose in 24 hours, patient satisfaction and well-being. VAS score for pain and requirement of analgesic dose was also similar in the two groups.

Conclusion: Pre-operative oral monosaccharide carbohydrate fluid does not prevent PONV, alter requirement of antiemetic, patient satisfaction and well-being, VAS score for pain, requirement of analgesic dose in patients undergoing laparoscopic cholecystectomy under general anaesthesia, as compared to placebo drink.

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Introduction

PONV is multifactorial with an incidence of approximately 20%-30% [1], which can increase to 40%-70% in high-risk patients [2]. It can cause dehydration, electrolyte imbalance, acid-base disturbances, wound dehiscence and delayed recovery. Rarely serious complications, such as aspiration of gastric contents, esophageal rupture, subcutaneous emphysema, or pneumothorax can also occur [2]. Certain surgeries like upper abdominal surgery, middle ear, head and neck surgery, laparoscopic cholecystectomy and laparoscopic gynecological surgeries are associated with higher incidence of PONV. Different pharmacological and non-pharmacological approaches have been used for preventing PONV. Various drugs such as metoclopramide, ondansetron, corticosteroids, haloperidol have been used to treat PONV, but they are usually associated with side effects [3]. PONV occurs due to hypoperfusion of gastric mucosa in a fasting patient and resultant excessive serotonin release. Fluid supplementation reduces PONV by improving the mesenteric perfusion, preventing gut ischemia and subsequent serotonin release [4]. Preoperative administration of various types of intravenous fluids was assessed by various authors to prevent PONV. Preoperative carbohydrate loading has been shown to prevent postoperative catabolism and insulin resistance [5]. American society of anesthesiologists and European society of anesthesiology allow the intake of clear liquids up to 2 hours before induction of anesthesia, which includes water, fruit juices without pulp, tea, or coffee without milk, based on a meta-analysis of various randomized trials [6]. Oral carbohydrates have been evaluated for prevention of PONV, but variable results have been seen. Due to the importance of PONV prevention and contradictory results in various studies, this study was undertaken.

Methods

After obtaining approval from the institutional ethical committee, a single-blinded randomised comparative study was conducted on 90 patients undergoing elective laparoscopic cholecystectomy under General Anaesthesia. Patients of ASA grade I/II, age group between 18-60 years of either sex were included in the study. Patients with a history of PONV, motion sickness, diabetes mellitus, severe hypertension, cardiac, renal, or hepatic dysfunction, pregnant or menstruating patients were excluded from the study. Patients whose surgery got prolonged (duration> 2 hours), had abnormal blood glucose on the morning of surgery, had taken antiemetic agents within 24 hours of surgery and with a history suggestive of gastroesophageal reflux were also excluded from the study.

The enrolled patients were explained the intervention and written informed consent was taken from all the patients. They were divided into two groups of 45 each. Randomisation was done using the sealed envelope technique. Patients were grouped based on the group names which the envelope contained.

Group C: patients who received 400 ml of 12.5 g% oral carbohydrate (mixture of 50 g of table sugar in 400 ml of water) fluid orally 3 hours before the induction of anaesthesia

Group P: patients who received 400 ml of clear water 3 hours before the induction of anaesthesia

After 3 hours of giving fluid, the patients were shifted to the preoperative area. Each patient was subjected to a questionnaire (Table 1). Blood samples were collected to estimate the blood sugar before induction of anaesthesia.

Table 1- Questionnaire for assessment of symptom

SYMPTOM	PREOP (Just before induction)	POSTOP (24 hours after surgery)
Thirst	Yes/No	Yes/No
Hunger	Yes/No	Yes/No
Dryness of mouth	Yes/No	Yes/No
Weakness	Yes/No	Yes/No
Tiredness	Yes/No	Yes/No
Giddiness	Yes/No	Yes/No
Restlessness	Yes/No	Yes/No

On arrival at the operating table, electrocardiograph (ECG), heart rate (HR), non-invasive blood pressure (NIBP) (systolic, diastolic and mean BP) and arterial oxygen saturation (SpO2) of the patients were recorded. These parameters were monitored and recorded before induction, after intubation at 1,5,15 minutes, after every 15 minutes till the end of surgery, throughout the procedure. Intravenous fluid therapy was started. Anesthesia was induced by injecting IV Fentanyl (1microgram/kg body weight), IV injection Thiopentone Sodium (2.5%) 4-6 mg/kg, IV injection Vecuronium Bromide 0.1 mg/kg. Intermittent positive pressure ventilation (IPPV) was given with face mask through closed circuit using O2, N2O (1%) and Sevoflurane (2-4%) till complete relaxation was achieved. The trachea was intubated using an oral cuffed endotracheal tube of appropriate size.

Anesthesia was maintained by using a mixture of O2, N2O (1:2) and sevoflurane (2%-3%) through the closed circuit. The ventilator parameters for IPPV were adjusted to maintain EtCO2 between 30-35 mm Hg. Top up doses of injection Vecuronium Bromide were given as per requirement. The surgeon created CO2 pneumoperitoneum and an intraabdominal pressure was maintained near 12 mm Hg throughout the surgery. Intra-abdominal pressure was recorded at every 15 minutes during pneumoperitoneum. Adequate fluid therapy was given by IV infusion of Ringer Lactate. Blood sugar was estimated at 60 minutes during the surgical procedure after induction of anesthesia.

At the end of the surgery, the neuromuscular blockade was reversed with injection Neostigmine (0.05mg/kg) and Glycopyrrolate (0.006mg/kg). The trachea was extubated after adequate recovery. No antiemetic was given to any patient and they were kept under observation.

Various parameters were recorded including hemodynamic parameters, PONV episodes and score, VAS score (Visual Analogue scale to measure pain), blood sugar levels and the management was done accordingly. Hemodynamic parameters were recorded at every hour for 6 hours then at 12 and 24 hours.

PONV symptoms were analyzed and following scoring was used within the first 2 hours, 2-6 hours, 6-12 hours and 12-24 hours. 0-No emetic symptoms,1-Nausea, 2-Retching, 3-Vomiting. Nausea was defined as the subjective unpleasant sensation associated with the urge to vomit awareness [7]. Retching was defined as the laboured spasmodic, rhythmic contraction of respiratory and abdominal muscles without the expulsion of gastric contents [7]. Vomiting was defined as the forceful expulsion of gastric contents from the mouth [7]. Any patient with grade≥ 2 was treated with injection Ondansetron 4 mg IV and time recorded. The total dose of Ondansetron given in 24 hours was compared in two groups.

Postoperative pain was assessed on the visual analogue scale (VAS), indicating 0- no pain and 10- worst imaginable pain. It was recorded at 1 hour, 2 hours, 3 hours, 6 hours, 12 hours and 24 hours. If VAS score was > 5, rescue analgesic injection IV Diclofenac Sodium 1mg/kg body weight was injected and time noted (Figure 1).

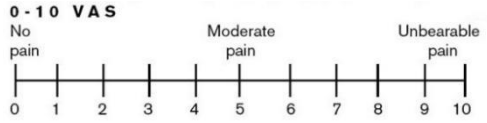

Figure 1-Visual Analog Scale

Blood sugar levels of both groups were measured during the preinduction period, 60 minutes after intubation, then 6 hours, 12 hours, 24 hours postoperatively.

Statistical Analysis

Statistical testing was conducted with the statistical package for the social science system version SPSS 17.0. Continuous variables were presented as mean +/- SD or median if the data was unevenly distributed. Categorical variables were expressed as frequencies and percentages. The comparison of normally distributed continuous variables between the groups was performed using the student's t-test. Nominal categories data between the groups were completed using chi-squared or Fischer exact tests as appropriate. Non-normal distribution continuous variables were compared using the Manny Whitney U test. A p-value less than 0.05 was taken to indicate a significant difference for all statistical tests.

Results

The demographic profiles of the two groups C and P were similar (Figure 2).

Interpretation: There was no statistically significant difference in the BMI between the two groups.

No statistically significant difference was seen in duration of surgery and intraabdominal pressure at any two points in the two groups (Table 2,3 and Figure 3).

Blood sugar levels of both groups were measured during the preinduction period, at 60 minutes, 6 hrs., 12 hrs., 24 hrs. postoperatively. There was a significant difference between the two groups regarding blood glucose levels at pre-induction, group C having highest values. No significant difference was seen between the groups regarding blood glucose at 60 mins, 6 hrs., 12 hrs. or 24 hrs. postoperatively (Table 4 and Figure 4).

VAS score was noted in both the groups at 1 hr, 2 hrs, 3 hrs, 6 hrs, 12 hrs and 24 hrs. No significant difference was seen between the groups in terms of VAS score at any time point (Table 5 and Figure 5).

Interpretation: There was no significant difference between the groups in terms of VAS Score at any of the time points.

PONV episodes were noted and scored at 0-2 hrs., 2-6 hrs., 6-12 hrs., 12-24 hrs. Episodes of PONV in patients of group C were 26.7% and in group P were 22.2%. None of the patients experienced PONV between 2-6 hrs., 6-12 hrs., 12-24 hrs. postoperatively. No statistical significance was seen. Antiemetic doses and a total number of analgesic doses were noted in both groups. The absolute requirement of the antiemetic amount was calculated and no significant difference was seen (Table 6-7 and Figure 6-7).

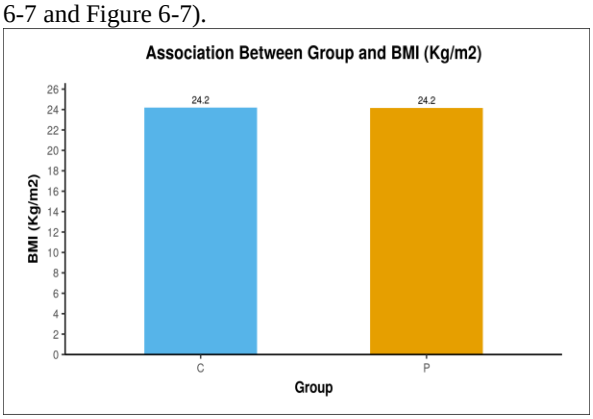

Figure 2- Comparison of the 2 Group in Terms of BMI (Kg/m2) (n = 90)

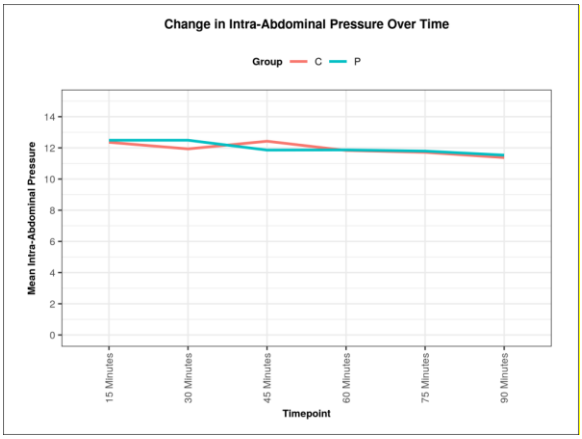

Figure 3- Comparison of the Two Groups in Terms of change in Intra-Abdominal Pressure over time (n = 90

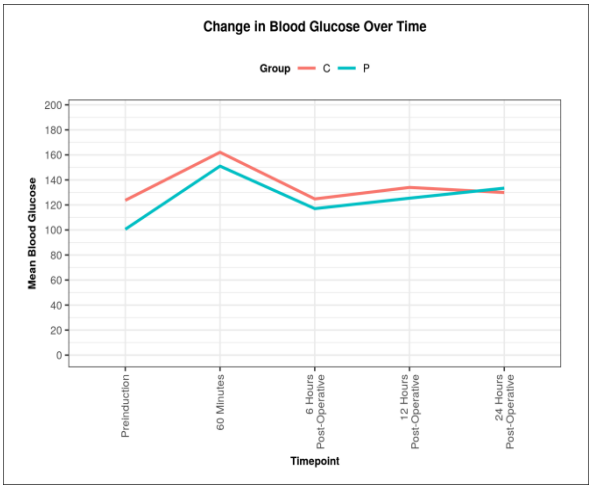

Figure 4- Comparison of the Two Groups in Terms of change in Blood Glucose over time (n = 90)

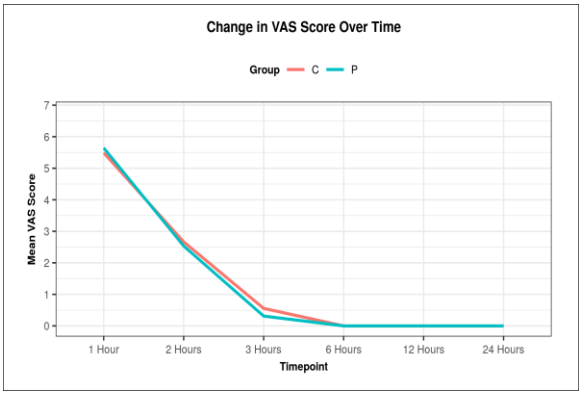

Figure 5- Comparison of the Two Groups in Terms of VAS Score over time (n = 90)

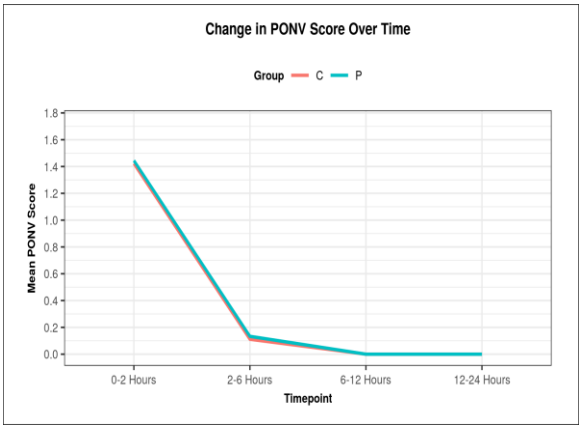

Figure 6- Comparison of the Two Groups in Terms of PONV Score over time (n = 90)

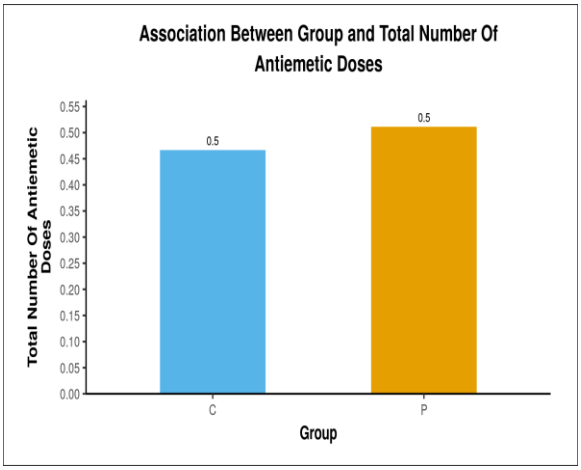

Figure 7- Comparison of the 2 Groups in Terms requirement of Total Number of Antiemetic Doses (n= 90)

Interpretation: There was no significant difference between the various groups in terms of vomiting episodes at any point of time.

Interpretation: There was no significant difference between the groups in terms of requirement of Total Number of Antiemetic Doses (p= 0.678).

Interpretation: There was no significant difference between the groups in terms of Total Number of Analgesic Doses (p = 0.915) (Table 8 and Figure 8).

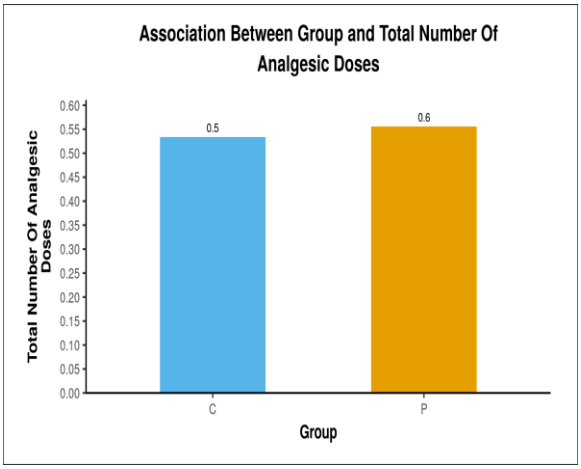

Figure 8- Comparison of the 2 Terms of requirement of Total Number of Analgesic Doses (n= 90)

We scored patients satisfaction criteria: thirst, dryness of mouth, tiredness, hunger, weakness, giddiness, and restlessness during the preoperative and postoperative periods. A significant difference in appetite was seen in the preoperative period but not in the post-operative period. None of the other parameters were significantly different between the two groups both pre and postoperatively (Table 9 and 10).

Interpretation: The difference in thirst was significant in preoperative but not in post-operative period (p value 0.050 and 0.186 respectively). None of the other parameters had any statistically significant difference between the two groups, pre or post operatively.

Table 2- Comparison of the 2 Group in Terms of Duration of Surgery (n = 90)

Duration of Symptoms	Group		Wilcoxon-Mann-Whitney U Test	
	C	P	W	P value
Mean (SD)	87.67 (22.35)	87.67 (19.70)	1030.500	0.887
Median (IQR)	90 (75-100)	90 (75-100)		
Range	45 – 120	45 – 120		

Table 3- Comparison of the Two Groups in Terms of change in Intra-Abdominal Pressure over time (n = 90)

Intra-Abdominal Pressure	Group				P value for comparison of the two groups at each of the timepoints (Wilcoxon-Mann-Whitney U Test)
	C		P		
	Mean (SD)	Medi-an (IQR)	Mean (SD)	Medi-an (IQR)	
15 Mins	12.36 (1.17)	12.00 (1.00)	12.49 (1.01)	13.00 (1.00)	0.468
30 Mins	11.93 (1.23)	12.00 (2.00)	12.09 (1.16)	12.00 (1.00)	0.269
45Mins	12.43 (1.01)	13.00 (1.00)	11.86 (1.26)	12.00 (2.00)	0.367
60 Mins	11.83 (1.70)	12.00 (2.00)	11.87 (0.84)	12.00 (1.75)	0.494
75 Mins	11.71 (1.05)	12.00 (1.25)	11.79 (0.73)	12.00 (1.00)	0.973
90 Mins	11.38 (0.89)	11.00 (1.00)	11.53 (0.92)	12.00 (1.00)	0.571

Table 4- Comparison of the Two Groups in Terms of change in Blood Glucose over time (n = 90)

Blood Glucose	Group				P value for comparison of the two groups at each of the timepoints (Wilcoxon-Mann-Whitney U Test)
	C		P		
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Pre Induction	123.71 (13.99)	122.00 (18.00)	100.56 (10.93)	101.00 (18.00)	<0.001
60 Mins	162.09 (29.88)	164.00 (40.00)	151.04 (31.37)	146.00 (51.00)	0.071
6 Hrs. Post-Op	124.82 (25.51)	118.00 (37.00)	117.07 (25.86)	114.00 (36.00)	0.132
12 Hrs. Post-Op	134.00 (27.46)	130.00 (46.00)	125.42 (24.97)	123.00 (33.00)	0.136

24 Hrs. Post-Op	129.91 (19.14)	129.00 (27.00)	133.42 (24.57)	130.00 (30.00)	0.608
P value for Change in Blood Glucose over time within each group (Fried-man Test)	<0.001		<0.001		

Table 5- Comparison of the Two Groups in Terms of VAS Score over time (n = 90)

VAS Score	Group				P value for compare son of the two groups at each of the time points (Wilcoxon-Mann-Whitney U Test)
	C		P		
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
1 Hr.	5.49 (2.21)	6.00 (3.00)	5.64 (1.75)	6.00 (3.00)	0.851
2 Hrs.	2.67 (1.65)	3.00 (3.00)	2.53 (1.39)	2.00 (1.00)	0.663
3 Hrs.	0.56 (1.22)	0.00 (0.00)	0.31 (1.00)	0.00 (0.00)	0.179
6 Hrs.	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-
12 Hrs.	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-
24 Hrs.	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-
P Value for change in VAS Score over time within each group (Friedman Test)		<0.001		<0.001	

Table 6- Comparison of the Two Groups in Terms of PONV Score over time (n = 90)

PONV Score	Group				P value for comparison of the two groups at each of the time points (Wilcoxon-Mann-Whitney U Test)
	C		P		
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
0-2 Hrs.	1.42 (1.20)	1.00 (3.00)	1.44 (1.16)	2.00 (2.00)	0.953
2-6 Hrs.	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-
6-12 Hrs.	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-
12-24 Hrs.	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	-
P value for change in PONV Score Over Time within each group (Friedman Test)	<0.001		<0.001		

Table 7- Comparison of the 2 Groups in Terms requirement of Total Number of Antiemetic Doses (n = 90)

Total Number of Antiemetic Doses	Group		Wilcoxon-Mann-Whitney U Test	
	C	P	W	P value
Mean (SD)	0.47 (0.50)	0.51 (0.51)	967.500	0.678
Median (IQR)	0 (0-1)	1 (0-1)		
Range	0 – 1	0 – 1		

Table 8- Comparison of the 2 Terms of requirement of Total Number of Analgesic Doses (n = 90)

Total Number of Analgesic Doses	Group		Wilcoxon-Mann-Whitney U Test	
	C	P	W	P value

Mean (SD)	0.53 (0.50)	0.56 (0.55)	1000.500	0.915
Median (IQR)	1 (0-1)	1 (0-1)		
Range	0 – 1	0 – 2		

Table 9- Patient satisfaction parameters (Pre-operative)

Parameters (Pre-Operative)	Present	Group C (n = 45)	Group P (n = 45)	P value
Thirst	Yes	15 (33.3%)	7 (15.6%)	0.050
Hunger	Yes	36 (80.0%)	34 (75.6%)	0.612
Dryness of Mouth	Yes	17 (37.8%)	10 (22.2%)	0.107
Weakness	Yes	23 (51.1%)	20 (44.4%)	0.527
Tiredness	Yes	8 (17.8%)	6 (13.3%)	0.561
Giddiness	Yes	3 (6.7%)	4 (8.9%)	1.000
Restless ness	Yes	30 (66.7%)	27 (60.0%)	0.512

Table 10- Patient satisfaction parameters (post-operative)

Parameters (Post-Operative)	Present	Group C (n = 45)	Group P (n = 45)	P value
Thirst	Yes	32 (71.1%)	26 (57.8%)	0.186
Hunger	Yes	41 (91.1%)	40 (88.9%)	1.000
Dryness of Mouth	Yes	38 (84.4%)	35 (77.8%)	0.419
Weakness	Yes	38 (84.4%)	32 (71.1%)	0.128
Tiredness	Yes	34 (75.6%)	31 (68.9%)	0.480
Giddiness	Yes	7 (15.6%)	8 (17.8%)	0.117
Restlessness	Yes	18 (40.0%)	15 (33.3%)	0.512

Discussion

PONV is such a distressing experience that it has been rated as worse than postoperative pain [8]. It has multifactorial aetiology and increases patient morbidity and healthcare cost. Despite several attempts in the past, the optimal treatment of PONV eludes the medical fraternity. The cause of PONV has been attributed to hypo-perfusion of gastric mucosa [9-11]. In fasting patients' hypovolemia leads to decreased blood flow to the gut which is accentuated by surgical losses of blood and fluid. Gut ischemia if not corrected, results in excessive release of serotonin which combined with CO2 pneumoperitoneum in laparoscopic surgery leads to absorption of CO2 into systemic circulation causing hypercarbia and release of endogenous catecholamines which further increase the risk of PONV [12-14]. Increased abdominal pressure during laparoscopic surgery may also impede gut mucosal blood flow leading to hypoperfusion and gut ischemia [15-18].

An extensive search of literature showed conflicting results of the effect of preoperative oral carbohydrates to prevent PONV. In our study, 12.5 g% of oral carbohydrate containing fluid (400ml) and placebo were given 3 hours preoperatively and their effect on PONV in patients undergoing elective laparoscopic cholecystectomy under general anaesthesia were compared. Factors that predisposed patients to PONV in the present study were female gender, use of opioids, nitric oxide, sevoflurane and laparoscopic surgery. However, these factors were common in both the groups, thus nullifying the confounding effect. We found that preoperative oral carbohydrate fluid comprising of monosaccharide sugar does not prevent PONV as compared to placebo. Similar findings were seen in a study conducted by Bisgaard et al, on 94 laparoscopic cholecystectomy patients [19]. Our findings also collaborate with Asakura et al, who gave preoperative Oral Carbohydrate or Oral Rehydration Solution to 134 patients undergoing minimally invasive body surface surgery [20].

Singh et al observed a significantly less episodes of nausea in 0-4 hours in CHO group as compared to placebo and fasted group (52.5%, 87.5% and 80%) with no difference in 4-12 hours and 12-24 hours after surgery. Vomiting was significantly low in 0-4 hours (17.5%, 42.5% and 47.5%) and 4-12 hours (7.5%, 12.5% and 32.5%) in CHO group but there was no difference in the incidence of vomiting at 12-24 hours between the three groups [21].

Sada et al in their study divided the patients into 3 groups, first group received 12.5 g% carbohydrate drink (800 ml in evening before surgery and 400 ml, 2 hours before induction of anaesthesia), second group received same quantity of placebo drink and third group was kept fasting. They concluded that carbohydrate drink decreases risk of PONV and improves wellbeing in patients undergoing open cholecystectomy, but the effect is less in open colorectal surgeries [22]. Their result was contrary to ours. The difference in results could be

attributed to the structure of carbohydrates used. Monosaccharide which has high osmolality was used in our study as compared to polysaccharide used by Sada et al. Gastric emptying is affected by both volume and composition of liquids. Gunn E Vist et al. researched the effects of osmolality and carbohydrate content on the rate of gastric emptying of liquids. They observed that while volume is the primary determinant of the emptying of liquids from the stomach, composition of the liquid is an additional factor. High lipid and/ or caloric content (glucose) slows the emptying of solids from the stomach [23]. Emptying of neutral, iso osmolar and calorically inert solutions is rapid in comparison to solutions that are hypertonic or contain acid, fat, or certain amino acids.

In our study, the pain was assessed by VAS score, and the analgesic requirement was recorded at various time intervals postoperatively up to 24 hrs. However, no significant difference was seen between the groups. Similar findings were seen in a study done by Bisgaard et al and Hauser et al [19, 24]. Patients who received 12.5% carbohydrate drink (Nutricia) 2 hour before laparoscopic cholecystectomy surgery had similar VAS scores as patients who were placebo treated or kept fasted. Contrary to these results, Singh et al concluded that the mean score for pain was significantly less in the carbohydrate treated group than placebo and fasted patients during 0-4 and 4-12 hours after surgery [21].

In our study blood sugar levels at induction were significantly higher in group that received carbohydrate drink as compared to placebo group. This could be due to faster breakdown and absorption of monosaccharides used in carbohydrate drinks. Blood sugar levels increased significantly at 60 minutes intraoperatively in both groups as compared to their pre-induction value but there was no statistically significant difference between the 2 groups. This could be a manifestation of stress response of the body to surgery and anaesthesia seen in both the groups. Nygren et al also observed that plasma glucose and serum insulin increased significantly to a maximum level at 40 minutes after intake of carbohydrate rich drink [25].

In our study, thirst was observed to be significantly less during preoperative period in patients who received placebo drink, but no statistically significant difference was observed in hunger, dryness of mouth, weakness, tiredness, giddiness, or restlessness between the two groups postoperatively up till 24 hours. Bisgaard et al also had found no statistically significant difference between the 2 group in terms of patient wellbeing during any time period [19]. Nygren and co-workers compared 400 ml of either 12% carbohydrate rich drink or water given 4 hrs before induction of anaesthesia in 12 patients scheduled for elective surgery and observed that carbohydrate drink decreased thirst but not hunger in the preoperative waiting period [25]. Sada et al noted a decrease in patient satisfaction parameters during 24 hr period after surgery with carbohydrate drinks [22]. Kenj et al found that the incidence of dry mouth and hunger was higher in patients who fasted during the preoperative period than patients who received carbohydrate drinks [26]. Hausel et al concluded that carbohydrate treated patients were less hungry, tired, thirsty and less weak during the postoperative period [24].

Variable results have been seen in different studies due to differences in study methodology – composition, quantity and preoperative timing of carbohydrate drink. Elective surgery leads to transient impairment of glucose tolerance and altered insulin sensitivity which is directly related to degree of surgical stress. Laparoscopic cholecystectomy being minimally invasive procedure involves a relatively lesser decrease in insulin sensitivity. Table sugar - a monosaccharide, was used in this study. No positive effect on PONV, VAS score, patient wellbeing was observed in our study.

Conclusion

Pre-operative oral monosaccharide carbohydrate fluid does not prevent PONV, alter requirement of antiemetic, patient satisfaction, well-being, VAS score for pain, requirement of analgesic dose in patients undergoing laparoscopic cholecystectomy under general anesthesia, as compared to placebo drink. Complex sugars may be more beneficial in preventing PONV. Further studies should be done to evaluate the efficacy of complex carbohydrates in a larger subset of population.

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