https://doi.org/10.29309/TPMJ/2024.31.05.8039

The Professional Medical Journal
www.theprofesional.com
2024, Volume, 31 Issue, 05

ORIGINAL ARTICLE

Comparison of efficacy of intraoperative intravenous 5% dextrose versus intravenous ringer lactate for prevention of postoperative nausea and vomiting in patients undergoing elective laparoscopic cholecystectomy.

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Article Citation: Hashmi M, Javaid H, Bano R, Umair MS, Ali MM, Siddiqui SZ. Comparison of efficacy of intraoperative intravenous 5% dextrose versus intravenous ringer lactate for prevention of postoperative nausea and vomiting in patients undergoing elective laparoscopic cholecystectomy. Professional Med J 2024; 31(05):712-717. https://doi.org/10.29309/TPMJ/2024.31.05.8039

ABSTRACT… Objective: To assess the effectiveness of intraoperative intravenous 5% dextrose in contrast to intravenous Ringer lactate for averting postoperative nausea and vomiting among individuals undergoing elective laparoscopic cholecystectomy at a Tertiary Care Hospital in Karachi. **Study Design:** Randomized Control Trial. **Setting:** Department of Anesthesia, Dow University of Health Sciences, Located at Civil Hospital in Karachi. **Period:** 25-09-20 to 25-03-21. **Methods:** Patient data was collected in a prospective manner following verbal consent. A total of 60 patients, meeting the diagnostic criteria, were incorporated in the study. A concise medical history was obtained, and demographic details were recorded in the performa. Data was all variables were collected and analysed using SPSS version 22. **Results:** This study encompassed a total of 60 patients. In the dextrose group, the mean age, duration of surgery, length of hospital stay, height, weight, and BMI were 48.21±6.24 years, 2.54±1.78 hours, 4±2.54 days, 147±4.21 cm, 71.7±7.25 kg, and 28.9±5.14 kg/m2, respectively. Conversely, in the ringer lactate group, these values were 49.48±8.41 years, 2.97±1.56 hours, 4±1.89 days, 158±5.28 cm, 78.7±9.87 kg, and 29.6±4.91 kg/m2. The efficacy for preventing postoperative nausea and vomiting was 80% for the dextrose group and 36.7% for the ringer lactate group in our study. **Conclusion:** Administering preoperative fluid supplementation with dextrose resulted in a reduced occurrence of postoperative nausea and vomiting (PONV) in comparison to ringer lactate.

Key words: Dextrose, Efficacy, Laparoscopic Cholecystectomy, Nausea, Postoperative, Ringer Lactate, Vomiting.

INTRODUCTION

Laparoscopic cholecystectomy stands as the gold standard for removing the gallbladder in cases of symptomatic gallbladder disease and is the most commonly performed laparoscopic procedure globally.[1,2] It has been proved that in experienced hands laparoscopic cholecystectomy decreases hospital stay, postoperative ileus and morbidity as compare to open cholecystectomy.[2,3] The collective incidence of these complications is estimated to surpass 30% in the absence of prophylactic interventions.[4] Notably, the frequency of PONV can escalate to significant levels, ranging from 70% to 80%, in populations at higher risk, encompassing females, individuals with obesity, and young non-smoking patients. Contributing factors to the increased incidence of PONV include a previous history of PONV or motion sickness, extended surgery duration, and the use of laparoscopic procedures, with rates varying between 54% and 92%.[5]

Anesthesia-related predictors encompass the utilization of inhalation anesthetics, anesthesia duration, postoperative opioid and nitrous oxide use. In the realm of surgical patients, postoperative nausea and vomiting (PONV) often outweighs postoperative pain in terms of concern, with patients consistently ranking PONV as the most unfavorable complication.[6,7]

Recent investigations have put forth two proposed strategies centered on perioperative fluid therapy and carbohydrate (dextrose) loading. Despite continuous efforts, the exact mechanism remains elusive. A hypothesis suggests that postoperative

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Article received on: 11/12/2023
Accepted for publication: 10/02/2024

nausea and vomiting (PONV) may be influenced by gastric mucosal hypoperfusion, which arises from hypovolemia due to prolonged preoperative fasting. The administration of intravenous fluid, particularly solutions rich in dextrose, has undergone scrutiny to assess its impact on the occurrence and severity of PONV, potentially through a mechanism involving hyperglycemia. Nevertheless, the available data from various clinical trials are limited and yield conflicting outcomes.[8] Saleh et al. conducted a study demonstrating the effectiveness of intraoperative intravenous 5% dextrose in comparison to intravenous Ringer lactate for preventing postoperative nausea and vomiting. They reported incidence rates of 60% and 26.2%, respectively. These findings underscore the potential role of intravenous dextrose in mitigating PONV, suggesting a noteworthy contrast in efficacy when compared to intravenous Ringer lactate.[9,10]

The study explores anesthesia-related predictors and compares the efficacy of intraoperative intravenous 5% dextrose to intravenous Ringer lactate for preventing postoperative nausea and vomiting, addressing the need for effective strategies given the substantial impact of PONV on patient well-being and healthcare costs.

METHODS

This randomized controlled was conducted at Department of Anesthesia, Dow University of Health Sciences from September 2020 to March 2021. Prior to the study, approval was obtained from the institutional ethical review committee (DUHS/IRB/213) (10.4.20). The sample size of 60 patients was determined using WHO software with a test power of 95%, a 95% confidence interval, and an assumed efficacy of intraoperative intravenous 5% dextrose versus intravenous Ringer lactate (60% vs 26.2%). Patients aged 20-60 years of both genders, with ASA ≤ II, undergoing elective laparoscopic cholecystectomy were included, while those with recent analgesic or anti-emetic use, a history of Hepatitis C, B, or HIV infection were excluded.

Measurements of height, weight, and BMI were conducted at admission, and patients were randomly assigned to either the Intravenous 5% dextrose or Intravenous Ringer lactate group. All patients received general anesthesia by the same surgeon using a consistent approach. Infusion of study fluids commenced 30 minutes before anesthesia induction, and patients were monitored throughout and after anesthesia. Post-surgery, patients were assessed using a 4-point Verbal Descriptive Scale (VDS) within 4 hours, and efficacy was determined based on operational definitions. Data, including quantitative variables (age, length of hospital stay, height, BMI, weight, and duration of surgery) and qualitative variables (gender, residence status, hypertension, diabetes mellitus type II, BMI > 30kg/m^2, smoking status, and efficacy), were recorded in a performa.

The data analysis process using SPSS Version 20 included the computation of mean and standard deviations for quantitative variables, along with frequencies and percentages for qualitative variables. To assess the efficacy comparison between the two groups, Chi-square tests were employed, with the control of effect modifiers through stratification. Post-stratification chi-square tests were subsequently utilized, with a significance level set at $p \leq 0.05$ to determine statistical significance.

RESULTS

Table-I presents the frequency distribution of age in the 20-40 years and 41-60 years categories for both the Dextrose and Ringer Lactate groups. Within the Dextrose group, 14 individuals (46.7%) were male, and 16 individuals (53.3%) were female. In the Ringer Lactate group, 19 individuals (63.3%) were male, and 11 individuals (36.7%) were female. Regarding the duration of surgery, less than 2 hours was recorded for 15 individuals (50%) in the Dextrose group and 16 individuals (53.3%) in the Ringer Lactate group. On the other hand, more than 2 hours of surgery duration was observed for 15 individuals (50%) in the Dextrose group and 14 individuals (46.7%) in the Ringer Lactate group. Examining residence status within the Dextrose group, 15 individuals (50%) resided in urban areas, and the other 15 individuals (50%) were from rural areas. In the Ringer Lactate group, 14 individuals (46.7%) were urban residents,

while 16 individuals (53.3%) lived in rural areas given in Table-II.

In the dextrose group comprising 30 patients, the observed age ranged from a minimum of 20 years to a maximum of 60 years. Our study's mean age was 48.21 years, with a standard deviation of ±6.24. Additionally, the mean duration of surgery, length of hospital stay, height, weight, and BMI in our investigation were 2.54 ± 1.78 hours, 4 ± 2.54 days, 147 ± 4.21 cm, 71.7 ± 7.25 kg, and 28.9 ± 5.14 kg/m2, respectively. Furthermore, the overall mean age in our study was 49.48 years, with a standard deviation of ±8.41. In contrast, the mean duration of surgery, length of hospital stay, height, weight, and BMI were documented as 2.97 ± 1.56 hours, 4 ± 1.89 days, 158 ± 5.28 cm, 78.7 ± 9.87 kg, and 29.6 ± 4.91 kg/m2, respectively, as outlined in Table-III.

Variables	Character-stics	Dextrose Group	Ringer Lactate Group
Age	20-40 Years	12 (40%)	15 (50%)
	41-60 Years	18 (60%)	15 (50%)
Gender	Male	14 (46.7%)	19 (63.3%)
	Female	16 (53.3%)	11 (36.7%)
Duration of surgery	<2 hours	15 (50%)	16 (53.3%)
	>2 hours	15 (50%)	14 (46.7%)
Residence Status	Urban	15 (50%)	14 (46.7%)
	Rural	15 (50%)	16 (53.3%)
Diabetes Mellitus Type II	Yes	13 (43.3%)	07 (23.3%)
	No	17 (56.7%)	23 (76.7%)
Hypertension	Yes	11 (36.7%)	08 (26.7%)
	No	19 (63.3%)	22 (73.7%)
Smoking Status	Yes	13 (43.3%)	06 (20%)
	No	17 (56.7%)	24 (80%)
BMI Status	<30 Kg/m^2	12 (40%)	06 (20%)
	>30 Kg/m^2	18 (60%)	24 (80%)

Table-I. Demographics details of included patients

DISCUSSION

Postoperative nausea and vomiting (PONV) persists as a common complication following general anesthesia, often leading to substantial distress and dissatisfaction among patients. The occurrence of PONV subsequent to elective surgery is believed to be associated with gut ischemia, stemming from hypovolemia due to overnight fasting. A range of risk factors contributes to the likelihood of PONV, encompassing elements related to the patient, anesthesia, surgical procedure, and postoperative conditions. Despite continual efforts, the current approaches for preventing and addressing PONV are limited, with a noteworthy 25% of patients enduring its effects within the initial 24 hours post-surgery.[11,12]

Variables	Charac-terstics	Mean±SD	Min-Max
Age dextrose group	Years	48.21±6.24	20-60
Age ringer group	Years	49.48±8.41	20-60
Duration of surgery dextrose group	Hours	2.54±1.78	1-3
Duration of surgery ringer group	Hours	2.97±1.56	1-3
Length of hospital stay dextrose group	Days	04±2.54	3-7
Length of hospital stay ringer group	Days	04±1.89	3-7
Height dextrose group	Cm	147±4.21	138-172
Weight dextrose group	Kg	71.7±7.25	68-115
Height ringer group	Cm	158±5.28	138-172
Weight ringer group	Kg	78.7±9.87	68-115
BMI dextrose group	Kg/m^2	28.9±5.14	23-33
BMI ringer group	Kg/m^2	29.6±4.91	23-33

Table-II. Descriptive statistics in intravenous 5% dextrose group versus ringer lactate group

Groups	Efficacy		P-Value
	Yes	No	
Dextrose Group	24 (80%)	06 (20%)	0.01
Ringer Lactate Group	11 (36.7%)	19 (63.3%)	

Table-III. Efficacy in intravenous 5% dextrose group versus ringer lactate group

Chi-square, observed difference was statistically significant

Notably, Lambert K G et al. demonstrated a reduction in PONV incidence with preoperative fluid bolus using the 4-2-1 rule.[13] Our research presents an innovative and economical method for reducing the incidence of postoperative nausea and vomiting (PONV) by administering 5% dextrose during the perioperative period for patients undergoing laparoscopic cholecystectomy. Unlike certain recent studies that investigate preoperative interventions, such as the administration of carbohydrate-rich drinks,

our study concentrates on the perioperative application of 5% dextrose. Yilmaz N et al. (2013) documented reduced occurrences of postoperative nausea and vomiting (PONV) as well as diminished consumption of antiemetic medications in patients who underwent preoperative oral carbohydrate administration compared to those who underwent fasting.[14] However, Lauwick SM et al. (2009) found contradictory results in a study involving women scheduled for thyroidectomy.[15]

Our findings are consistent with the research conducted by Dabu-Bondoc S et al. (2013), which focused on gynecologic laparoscopic and hysteroscopic procedures in nondiabetic, ASA class I or II nonsmoking outpatients. In their study, they observed that post-anesthesia intravenous dextrose administration contributed to enhanced management of postoperative nausea and vomiting (PONV). This improvement was demonstrated through reductions in the requirement for antiemetic rescue medications and a decrease in the length of stay in the post-anesthesia care unit (PACU).[16] Conversely, a study by Patel P et al. on ASA I and II female patients did not establish a correlation between the administration of dextrose during emergence from anesthesia and the incidence or severity of PONV within the initial 2 hours post-anesthesia.[17]

Our study's findings, particularly in the context of the Dextrose group, resonate with those reported by Mishra et al. (2017). In their investigation, they noted that within Group D (presumably receiving dextrose), 28% of patients encountered postoperative nausea and vomiting (PONV). In contrast, within Group NS (presumably not receiving dextrose), a higher percentage, specifically 66%, experienced PONV within the initial 24 hours following surgery (p-value 0.001). The incidence of PONV demonstrated a significant reduction of 38% in Group D compared to Group NS (p-value 0.001). This reinforces the potential efficacy of dextrose in mitigating postoperative nausea and vomiting, aligning with our study's observations.[18] Moreover, Nayak et al. similarly reported results that indicate the administration of intravenous dextrose before anesthesia induction could be considered a recommended and effective prophylactic measure for preventing postoperative nausea and vomiting following laparoscopic cholecystectomy. These findings echo the trend seen in our study, supporting the notion that dextrose administration has a positive impact on reducing PONV.[19] It's noteworthy that our results are in line with the findings of Verma et al., adding to the cumulative evidence supporting the prophylactic potential of dextrose in the context of postoperative nausea and vomiting.[20]

The decrease in postoperative nausea and vomiting (PONV) incidence within the dextrose group in our study could be linked to caloric supplementation, potentially alleviating postoperative catabolism and insulin resistance. Consequently, this might have enhanced patient comfort and lowered the risk of experiencing postoperative nausea and vomiting. Furthermore, the direct impact of dextrose on the gastrointestinal tract wall, resulting in heightened osmotic pressure and diminished muscle contraction, likely contributed to the observed positive outcomes.

CONCLUSION

Administering preoperative fluid supplementation with dextrose resulted in a reduced occurrence of postoperative nausea and vomiting (PONV) in comparison to ringer lactate.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

1. Deng R, Huang G, Liu W, Liu X. **Effects of perioperative dextrose infusion on preventing postoperative nausea and vomiting in patients undergoing laparoscopic surgery: A meta-analysis of randomized controlled trials.** Journal of International Medical Research. 2021; 49(12). doi:10.1177/03000605211063264

2. Farooq U, Rashid T, Naheed A, Barkat N, Iqbal M, Sultana Q. **Complications of laparoscopic cholecystectomy: An experience of 247 cases.** J Ayub Med Coll Abbottabad. 2015 Apr-Jun; 27(2):407-10.

3. Khan N, Naeem M, Bangash A, Sadiq M, Hamid H. **Laparoscopic cholecystectomy: An experience at Lady Reading Hospital, Peshawar.** J Ayub Med Coll Abbottabad. 2010 Apr-Jun; 22(2):46-51.

4. Firouzian A, Kiasari AZ, Godazandeh G, Baradari AG, Alipour A, Taheri A et al. **The effect of intravenous dextrose administration for prevention of post-operative nausea and vomiting after laparoscopic cholecystectomy: A double-blind, randomised controlled trial.** Indian J Anaesth. 2017; 61(10):803–10.

5. Atashkhoei S, Naghipour B, Marandi PH, Dehghani A, Pourfathi H. **Effect of Intraoperative dextrose infusion for prevention of postoperative nausea and vomiting in diagnostic gynecologic laparoscopy.** Cres J Med Biol Sci. 2018; 5(1):45-49.

6. Apfel CC, Kranke P, Eberhart LH. **Comparison of surgical site and patient's history with a simplified risk score for the prediction of postoperative nausea and vomiting.** Anaesthesia. 2004; 59(11):1078-82.

7. Moon, Y. E. **Postoperative nausea and vomiting.** Korean J Anesthesiolgy. 2014; 67(3):164-70.

8. Gan TJ, Diemunsch P, Habib AS, Kovac A, Kranke P, Meyer TA, et al. **Consensus guidelines for the management of postoperative nausea and vomiting.** Anesth Analg 2014; 118:85-13.

9. Rao V, Bala I, Jain D, Bharti N. **Effect of intravenous dextrose administration on postoperative nausea and vomiting in patients undergoing laparoscopic cholecystectomy: A randomized controlled trial.** Eur J Anaesthesiol. 2017; 34(10):705-07.

10. Kranke P, Eberhart LH. **Possibilities and limitations in the pharmacological management of postoperative nausea and vomiting.** Eur J Anaesthesiol. 2011; 28(11):758-65.

11. Magner JJ, McCaul C, Carton E, Gardiner J, Buggy D. **Effect of intraoperative intravenous crystalloid infusion on postoperative nausea and vomiting after gynaecological laparoscopy: Comparison of 30 and 10 mL kg (−1).** Br J Anaesth. 2004; 93(3):381-85.

12. Patel P, Meineke MN, Rasmussen T. **The relationship of intravenous dextrose administration during emergence from anesthesia to postoperative nausea and vomiting: A randomized controlled trial.** Anesth Analg. 2013; 117(1):34-42.

13. Lambert KG, Wakim JH, Lambert NE. **Preoperative fluid bolus and reduction of postoperative nausea and vomiting in patients undergoing laparoscopic gynecologic surgery.** AANA J. 2009; 77(2):110-4.

14. Yilmaz N, Çekmen N, Bilgin F, Erten E, Ozhan MÖ, Coşar A. **Preoperative carbohydrate nutrition reduces postoperative nausea and vomiting compared to preoperative fasting.** J Res Med Sci. 2013; 18(10):827-32.

15. Lauwick SM, Kaba A, Maweja S, Hamoir EE, Joris JL. **Effects of oral preoperative carbohydrate on early postoperative outcome after thyroidectomy.** Acta Anaesthesiol Belg. 2009; 60(2):67-73.

16. Dabu-Bondoc S, Vadivelu N, Shimono C, English A, Kosarussavadi B, Dai F, et al. **Intravenous dextrose administration reduces postoperative antiemetic rescue treatment requirements and postanesthesia care unit length of stay.** Anesth Analg. 2013; 117(3):591-6.

17. Patel P, Meineke MN, Rasmussen T, Anderson DL, Brown J, Siddighi S, et al. **The relationship of intravenous dextrose administration during emergence from anaesthesia to postoperative nausea and vomiting: A randomized controlled trial.** Anesth Analg. 2013; 117(1):34-42.

18. Mishra A, Pandey RK, Sharma A, Darlong V, Punj J, Goswami D, Sinha R, Rewari V, Chandralekha C, Bansal VK. **Is perioperative administration of 5% dextrose effective in reducing the incidence of PONV in laparoscopic cholecystectomy?: A randomized control trial.** Journal of Clinical Anesthesia. 2017 Aug 1; 40:7-10.

19. Nayak KB, Sahoo AK, Panigrahi S. **Efficacy of ringer's solution and 5% dextrose in preventing post-operative nausea and vomiting score in laparoscopic cholecystectomy.** International Journal of Health Sciences. 2022; 6(S2):13150-13155.

20. Nayak KB, Sahoo AK, Panigrahi S. **Efficacy of ringer's solution and 5% dextrose in preventing post-operative nausea and vomiting score in laparoscopic cholecystectomy.** Int J Comp Appl. 2020; 32(6):583-88.

AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Hanya Javaid	Drafting, Data collection.	
3	Rafiah Bano	Proof reading Description of results.	
4	Muzaffar Shah Umair	Data analysis.	
5	Muhammad Moazzam Ali	Data collection.	
6	Safia Zafar Siddiqui	References, Statistics work.	