https://doi.org/10.29309/TPMJ/2024.31.07.8150

The Professional Medical Journal
www.theprofesional.com
2024, Volume, 31 Issue, 07

ORIGINAL ARTICLE

Dexamethasone effect on serum glucose concentration in diabetic versus non-diabetics patients undergone laparoscopic cholecystectomy: A randomized controlled trial.

Afnan Amjad[1], Muhammad Ismail Ahmad Khan Zalmay[2], Farees Ahmad Khan[3], Rahida Karim[4], Momnah Ahmad[5], Muhammad Batoor Zaman[6]

Article Citation: Amjad A, Zalmay MAK, Khan FA, Karim R, Ahmad M, Zaman MB. Dexamethasone effect on serum glucose concentration in diabetic versus non-diabetics patients undergone laparoscopic cholecystectomy: A randomized controlled trial. Professional Med J 2024; 31(07):1061-1065. https://doi.org/10.29309/TPMJ/2024.31.07.8150

ABSTRACT… Objective: To evaluate dexamethasone's effect on serum glucose concentration in diabetic versus non-diabetics patients undergone laparoscopic cholecystectomy. **Study Design:** Randomized Controlled Trial. **Setting:** Department of Anesthesiology, Lady Reading Hospital, Peshawar. **Period:** January 2022 to December 2022. **Methods:** One hundred and eight patients presenting for laparoscopic cholecystectomy were included. Patients were divided in two groups, fifty four patients in diabetic group and fifty four in non-diabetic group. Dexamethasone was administered in both groups prior the anesthesia induction. Blood glucose levels were recorded at baseline, at 6th and 12th hours in both groups. **Results:** Total 108 patients divided in two groups, 54 in diabetic group, and 54 in non-diabetic group. Patient's mean age was 38.67±13.66 years in diabetic group while 42.31±12.58 years in non-diabetic group. Mean BMI was 25.27±2.34 kg/m^2 in diabetic group while 24.96±2.20 kg/m^2 in non-diabetic group. The gender distribution of the patients in both groups is presented in Figure-1. No noteworthy significance in the rise of blood glucose levels was discerned between the two groups from baseline to the 6th hour. However, a substantial increase in blood glucose levels at the 12th hour was evident in the non-diabetic group (P = 0.0001). **Conclusion:** We conclude that 8 mg dexamethasone triggers a significantly elevated hyperglycemic surge in non-diabetic patients as compared to diabetics.

Key words: Dexamethasone, Hyperglycemia, Diabetes Mellitus.

INTRODUCTION

Postoperative nausea and vomiting (PONV) are frequently reported symptoms by patients who undergo laparoscopic surgery. The occurrence of PONV nearly 20%. The management of nausea and vomiting targets specific receptors/mediators that significantly contribute to an individual patient's symptoms.[1]

Diabetes is a persistent metabolic disorder that necessitates ongoing medical attention.[2,3] It is characterized by a lack of insulin or associated abnormalities that result in inadequate breakdown of carbs, lipids, and proteins.[4] The management of blood glucose levels remains a critical concern for individuals receiving surgical treatment due to the potential stress-induced hyperglycemia that can occur in patients irrespective of their diabetic status. While there are no documented specific blood glucose values, it is widely acknowledged in clinical practice that insulin therapy is required when blood glucose levels above 180 mg/dl.[5-7]

Nevertheless, preoperative starvation, the use of long-acting insulin, or the use of oral anti-diabetic medications preceding surgery might lead to hypoglycemia. Infections and cardiac problem are often observed and related to DM. The likelihood of infection occurring during the postoperative phase is influenced by the peri-operative blood glucose levels, instead of the HbA1c levels.[8,9] More precisely, there is a 30% higher likelihood of developing an infection after surgery for every 40 mg/dL rise in glucose levels

1. MBBS, FCPS Fellow Anesthesia, Shaukat Khanum Memorial Cancer Hospital & Research Centre, Peshawar.
2. MBBS, Lady Reading Hospital, Peshawar.
3. MBBS, MD, Khyber Teaching Hospital, Peshawar.
4. MBBS, FCPS, Associate Professor Paediatric, Hayatabad Medical Complex, Peshawar.
5. MBBS, Trainee Medical Officer, Lady Reading Hospital, Peshawar.
6. MBBS, Trainee Medical Officer, Khyber Teaching Hospital, Peshawar.

Correspondence Address:
Dr. Afnan Amjad
Department of Anesthesia
Shaukat Khanum Memorial Cancer Hospital
& Research Centre, Peshawar.
afnanamjad27@yahoo.com

Article received on: 03/01/2024
Accepted for publication: 20/03/2024

in the blood during the surgical procedure.[10]

Dexamethasone first emerged as a potent anti-emetic drug for patients receiving cancer treatment. It was established that the administration of dexamethasone is more efficacious during induction. Nevertheless, the specific mechanism responsible for the anti-emetic properties of dexamethasone remains unclear.[11,12] Intervening with glucocorticoids during the perioperative phase assists in managing alleviation of hormonal, inflammatory and immunological factors induced by surgical pressure. This approach also helps mitigate challenges such as post-surgery vomiting, laryngeal edema and nausea. Moreover, corticosteroids can influence post-receptor processes, leading to a modulation in insulin sensitivity in peripheral and hepatic tissues.[13]

This study aims to evaluate dexamethasone's effect on serum glucose concentration in diabetic versus non-diabetics patients' undergone laparoscopic cholecystectomy. The findings of this research work will enhance the quality of patient outcomes in the surgical setting by examining the relationship between serum glucose concentration and dexamethasone. By providing light on this interplay, it seeks to contribute to the improvement of perioperative care practices.

METHODS

After taking ethical approval (1068/LRH/MTI) (15-12-21) from the hospital this randomized controlled trailed was executed at Lady Reading Hospital, Peshawar from January 2022 to December 2022. One hundred and four patients presenting for laparoscopic cholecystectomy having age 18 to 60 years of either gender were selected for the study. The patients had American Society of Anesthesiologists physical status I and II with BMI < 30 kg/m^2. We excluded pregnant patients and those patients who received hyperglycemic drugs on the same day. Patients were divided in two groups using blocked randomization technique. Group A comprised 54 diabetic individuals who received 8 mg dexamethasone, while Group B consisted of 54 non-diabetic patients who also received 8 mg dexamethasone. Anesthesia induction included propofol (2-2.2 mg/kg) and atracurium (0.6 mg/kg) as a muscle relaxant for facilitating endotracheal intubation. Maintenance of anesthesia utilized sevoflurane (0.5-1.0 MAC) in oxygen (FiO2 0.5) alongside fentanyl, adjusted to ensure hemodynamic stability. Controlled ventilation was maintained, and adjustments were made to keep end-tidal CO2 between 30-35 mmHg. The surgical procedure followed a standardized approach and was executed by the same surgical team throughout. Post-surgery, blood glucose levels of the patients were recorded at baseline, at 6th hour and at 12th hour. All the information including the demographics were recorded.

The sample size in our study was estimated using openepi, taking the power of beta 80%, previous rise in mean blood glucose level 35.63 ± 23.21 mg/dl in non-diabetic patients and 23.33 ± 22.39 mg/dl in diabetic patients.

All the data were analyzed using SPSS 23. T test was applied to assess the blood sugar level between both groups at different intervals. P value < 0.05 was taken as significant.

RESULTS

One hundred and eight patients divided in two groups, fifty four diabetic in group A and fifty four non-diabetic patients in group B were recruited in this study. Patient's mean age was 38.67 ± 13.66 years in group A while 42.31 ± 12.58 years in group. Mean BMI was 25.27 ± 2.34 kg/m^2 in group A while 24.96 ± 2.20 kg/m^2 in group B. The gender distribution of the patients in both groups is presented in Figure-1. Figure-2 presents the ASA status of the patients in both groups. The blood glucose level at baseline, at 6th hour and at 12th hour is presented in Table-I which demonstrates that through the entire study duration diabetic had higher levels of blood glucose. No substantial disparity in the increase of blood glucose levels was noted between the two groups from the baseline to the 6th hour. There was a notable surge in blood glucose level at 12th hour in the non-diabetic group ($P = 0.0001$).

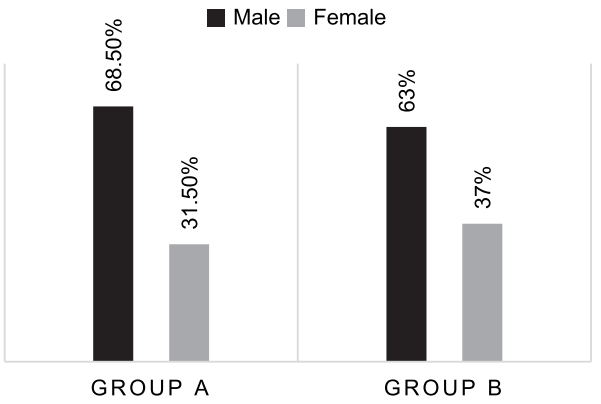

Figure-1. Gender distribution

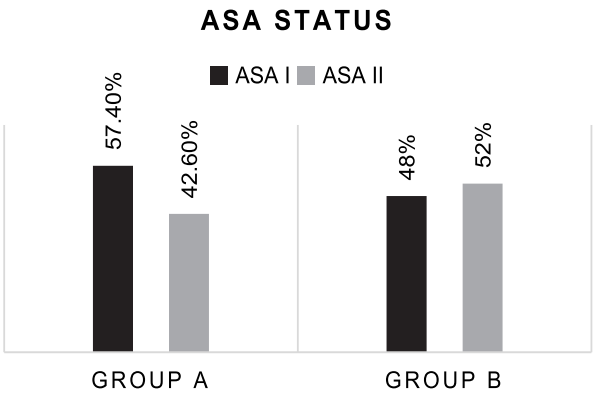

Figure-2. ASA status

Interval	Groups	N	Mean (mg/dl)	Std. Deviation	P-Value
Blood glucose level at baseline	Group A	54	125.5370	12.95670	0.0001
	Group B	54	95.7963	8.47277	
Blood glucose level at 6 hours	Group A	54	163.4074	15.98527	0.0001
	Group B	54	128.8704	15.76962	
Blood glucose level at 12 hours	Group A	54	148.7593	9.40079	0.0001
	Group B	54	132.1296	16.55642	

Table-I. Blood glucose level at different intervals between both groups

Rise of blood glucose from baseline to 6th and 12th hour	Groups	N	Mean (mg/dl)	Std. Deviation	P-Value
Blood glucose rise from baseline to 6 hours	Group A (Diabetic)	54	37.8704	24.27052	0.25
	Group B (Non-diabetic)	54	33.0741	18.66977	
Blood glucose rise from baseline to 12 hours	Group A (Diabetic)	54	23.2222	15.43051	0.0001
	Group B (Non-diabetic)	54	36.3333	19.32834	

Table-II. Rise in blood glucose level from baseline to 6th and 12th hour between both groups

DISCUSSION

Dexamethasone, a potent corticosteroid, has emerged as a valuable tool in the management of PONV. While the exact mechanisms of its antiemetic effects are not fully understood, dexamethasone is believed to act on multiple pathways involved in the emetic response.

Several studies have investigated the efficacy of dexamethasone in managing PONV across various surgical procedures. The anti-inflammatory and immunosuppressive properties of dexamethasone may contribute to its antiemetic effects by modulating the release of inflammatory mediators associated with nausea and vomiting. Additionally, dexamethasone may influence neurotransmitter systems, such as serotonin and dopamine.[15,16]

The dosage and timing of dexamethasone administration are critical factors in its effectiveness. Typically, a single intravenous dose of dexamethasone administered before the induction of anesthesia has proven to be effective for reducing PONV. The choice of dose may vary depending on the patient population, surgical procedure, and other individual factors.[17]

While dexamethasone can be effective in managing PONV, it is important to be aware of potential side effects, including hyperglycemia. Dexamethasone is a potent glucocorticoid that can influence glucose metabolism, leading to elevated blood sugar levels. This side effect is particularly relevant for individuals with or at risk of diabetes.[18]

The mechanism behind dexamethasone-induced

hyperglycemia involves multiple pathways. Dexamethasone increases the production of hepatic glucose, reduces the uptake of peripheral glucose, and can impair insulin sensitivity. As a result, patients receiving dexamethasone, especially at higher doses, may experience an increase in blood glucose levels.[19]

We conducted our trail on 108 patients undergoing laparoscopic cholecystectomy, we divided the patients in two groups, diabetic and non-diabetic. After administrating dexamethasone we observed that the blood sugar levels were notably elevated in the diabetic group at baseline, at 6 hours and at 12 hours. Upon comparing the elevation of the blood glucose levels from the baseline to 6 and 12 hours we observed that at 12 hours the blood sugar level was considerably greater in the non-diabetic group as compared to the diabetic group ($P = 0.0001$).

A study comparing the effect of dexamethasone between diabetics and non-diabetic for PONV found that at 12th hour from the baseline the blood glucose level significantly increased in the non-diabetic group.[14] Another study found that after receiving preventive dexamethasone 8 mg for postoperative PONV, diabetic individuals did not exhibit a greater vulnerability than non-diabetics to develop postoperative hyperglycemia.[20]

CONCLUSION

We conclude that 8 mg dexamethasone triggers a significantly elevated hyperglycemic surge in non-diabetic patients as compared to diabetics. It also increases the blood sugar level in diabetic patients post administration.

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. A Mahrous M, A El-Azab G, A Tawfik H. **Evaluation of clinical outcomes and efficacy of palonosetron and granisetron in combination with dexamethasone in Egyptian patients receiving highly emetogenic chemotherapy.** Cancer Chemotherapy and Pharmacology. 2021 Jul; 88:121-9.

2. Legese GL, Asres G, Amare T. **Determinants of poor glycemic control among type 2 diabetes mellitus patients at University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia: Unmatched case-control study.** Frontiers in Endocrinology. 2023 Feb 9; 14:1087437.

3. Yang X, Liu Q, Hu G, Liu M. **Cardiovascular risk factor status in hospitalized patients with Type 2 diabetes in China.** Frontiers in Endocrinology. 2021 Jul 22; 12:664183.

4. Yang X, Liu Q, Hu G, Liu M. **Cardiovascular risk factor status in hospitalized patients with Type 2 diabetes in China.** Frontiers in Endocrinology. 2021 Jul 22; 12:664183.

5. Horton WB. **Inpatient management of diabetes and hyperglycemia. InThe Diabetes Textbook: Clinical Principles.** Patient Management and Public Health Issues. 2023 Jun 3 (pp.739-753). Cham: Springer International Publishing.

6. Gregory NS, MacKenzie CR. **Perioperative care of the orthopedic patient with diabetes mellitus.** Perioperative Care of the Orthopedic Patient. 2020; 211-21.

7. Emidio AC, Faria R, Bispo B, Vaz-Pinto V, Messias A, Meneses-Oliveira C. **GlucoSTRESS-A project to optimize glycemic control in a level C (III) Portuguese intensive care unit.** Revista Brasileira de Terapia Intensiva. 2021 Apr 19; 33:138-45.

8. Kaur N, Shenoy BK, Govindswamy S, Iyer SS. **Effect of 0.9% saline and Ringer's lactate on mean change in blood glucose levels under spinal anaesthesia among diabetic patients.** Group. 2020 Feb 6; 24(76):60-9.

9. Radkowski P, Kędziora B, Eliszewska L, Jackowska K, Mandziuk-Radkowska O, Dawidowska-Fidrych J. **Perioperative management of patients with diabetes.** Medical Studies/Studia Medyczne. 2023 Jul 1; 39(3):272-80.

10. Zukowska A, Zukowski M. **Surgical site infection in cardiac surgery.** Journal of Clinical Medicine. 2022 Nov 26; 11(23):6991.

11. Mannion JD, Rather A, Manifold S, Gardner K, McEvilly M, Yaeger J, et al. **Postoperative hyperglycemia in patients with and without diabetes after major joint replacement: The impact of an enhanced glucose management program.** JBJS Open Access. 2021 Jul 1; 6(3):e20.

12. Caputo R, Cazzaniga ME, Sbrana A, Torrisi R, Paris I, Giordano M, et al. **Netupitant/palonosetron (NEPA) and dexamethasone for prevention of emesis in breast cancer patients receiving adjuvant anthracycline plus cyclophosphamide: A multi-cycle, phase II study.** BMC Cancer. 2020; 20:232.

13. Sadhoo N, Prakash J, Kumar V, Kharwar RK, Ahmad S, Sethi BK. **A comparison of prophylactic antiemetic therapy with palonosetron and dexamethasone as single-agents or in combination in adult patients undergoing laparoscopic surgery: A randomized trial.** International Journal of Critical Illness and Injury Science. 2023 Jan 1; 13(1):4-10.

14. Rhou YJ, Hor A, Wang M, Wu YF, Jose S, Chipps DR, et al. **Dexamethasone-induced hyperglycaemia in COVID-19: Glycaemic profile in patients without diabetes and factors associated with hyperglycaemia.** Diabetes Research and Clinical Practice. 2022 Dec 1; 194:110151.

15. Mohammed, A. H., Ismail, M. M. A., Mohammed, H. S. **The effect of dexamethasone on postoperative blood glucose levels in diabetic and nondiabetic Patients who are undergoing laparoscopic cholecystectomy.** SVU Int J Med Sci. 2020; 3(1):19-24.

16. Abbass A, Botros AR, Abdel-salam A, Amin N. **Palonosetron, Dexamethasone and their combination for prevention of postoperative nausea and vomiting after laparoscopic gynecological surgeries.** Zagazig University Medical Journal. 2021 Mar 1; 27(2):294-304.

17. Pang QY, Wang JY, Liang XL, Jiang Y, Liu HL. **The safety of perioperative dexamethasone with antiemetic dosage in surgical patients with diabetes mellitus: A systematic review and meta-analysis.** Perioperative Medicine. 2023 Mar 8; 12(1):4.

18. Ali Z, Shah MA, Mir SA, Hassan N, Masoodi SR. **Effects of single dose of dexamethasone on perioperative blood glucose levels in patients undergoing surgery for supratentorial tumors–An observational study.** Anesthesia Essays and Researches. 2020 Jan 1; 14(1):56-61.

19. Geng Z, Bi H, Zhang D, Xiao C, Song H, Feng Y, et al. **The impact of multimodal analgesia based enhanced recovery protocol on quality of recovery after laparoscopic gynecological surgery: A randomized controlled trial.** BMC Anesthesiology. 2021 Dec; 21:1-8.

20. Herbst RA, Telford OT, Hunting J, Bullock WM, Manning E, Hong BD, et al. **The effects of perioperative dexamethasone on glycemic control and postoperative outcomes.** Endocrine practice. 2020 Feb 1; 26(2):218-25.

21. Dimmen A, Timko S, Greenwood J, McShane F, Ulinski J. **Effect of dexamethasone administration for postoperative nausea and vomiting prophylaxis on glucose levels in adults with diabetes undergoing elective surgery: A systematic review with meta-analysis.** JBI Evidence Synthesis. 2023 Nov 1; 21(11):2156-87.

AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Afnan Amjad	Concept, Study design, Data collection.	
2	M. Ismail Ahmad Khan Zalmay	Data analysis, Review and editing, Data collection.	
3	Farees Ahmad Khan	Data analysis, Literature review.	
4	Rahida Karim	Literature review, Finantial help.	
5	Momnah Ahmad	Data collection.	
6	M. Batoor Zaman	Re-reading, Correction of mistakes.	