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Dexmedetomidine versus dexamethasone adding to ondansetron for prophylaxis against postoperative nausea and vomiting after laparoscopic cholecystectomy

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Abstract
Background: Postoperative nausea and vomiting **(**PONV) remain a major issue even with improvements in pharmaceutical and anesthetic management used to avoid it. Although laparoscopic procedures facilitate a quicker recovery, they also result in a higher incidence of PONV than other surgical procedures.
Aim of the work: To contrast antiemetic impacts among dexmedetomidine and ondansetron in the 1st group against dexamethasone and ondansetron in the 2nd group.
Methods: This comparative work was performed on 70 females ranging in age from 18 to 65 years, American Society of Anesthesiologists (ASA) I or II, who were planned for elective laparoscopic cholecystectomy surgeries. Participants had been assigned at random into two groups equally: Group I (Dexmedetomidine group): received dexmedetomidine 0.5 ug/kg + Ondansetron 4mg and Group II (Dexamethasone group): received ondansetron 4mg + dexamethasone 8 mg.
Results: Nausea by NRS at 0 hr. was a substantially decrease in dexmedetomidine group contrasted to dexamethasone group ($p< 0.001$). Ramsay sedation score and Rhodes Index were significantly difference between both groups ($p< 0.001$). Nausea at 0 hr, pain at 0 hr. and at 1 hr. had a substantially greater risk in group 2 contrasted to in group 1 ($p< 0.001$**). A positive correlation with HR and MAP was existed at 30 min, 60 min and at the end of the operation, nausea at 0 min, pain at 0 min and complications. Also, a negative correlation was existed with the Ramsay sedation score. The dexmedetomidine group showed lower nausea at 0 hr and post-operative pain at 0 hr and at 1 hr than dexamethasone group.
Conclusion: Dexmedetomidine has a similar impact to dexamethasone in decreasing the occurrence and intensity of PONV. Furthermore, dexmedetomidine surpasses dexamethasone in diminishing postoperative pain and overall analgesic use following laparoscopic cholecystectomy, without any negative consequences.

Keywords: Dexamethasone, dexmedetomidine, ondansetron, postoperative nausea and vomiting, laparoscopic cholecystectomy

Introduction
General anaesthesia (GA) is frequently utilized in several surgical procedures. It may lead to problems that include postoperative nausea and vomiting (PONV). PONV is more prevalent in individuals undergoing GA compared to those receiving spinal anaesthesia [1, 2].
PONV continues to provide significant challenges owing to its complicated mechanism, leading to severe effects [3]. Thus, there is an urgent need for an efficient method to prevent or limit PONV. Additionally, PONV may lead to electrolyte imbalance and worsen bleeding, resulting in a delay in hospital release [4].
There is no one antiemetic drug that has been demonstrated to be universally efficient in treating PONV. Overall, the usage of multimodal combination therapy is more effective than monotherapy for preventing PONV [5, 6].
Since both vomiting and nausea were seen as independent phenomena, it is important for research to clearly describe and assess these factors separately [7]. Although it is uncommon for patients to have vomiting without nausea, the occurrence of PONV is very comparable. Therefore, original articles typically do not differentiate between these factors [8].

If PONV was recorded in trials, we regarded the PONV parameters as a suitable replacement for PON. However, when both PONV and PON were stated at the same time, we evaluated the nausea values. The standard time span frequently utilized to assess the efficacy of antiemetic drugs is 24 hours [7].

Ondansetron is a potent serotonin receptor antagonist that plays a crucial role in reducing vomiting and nausea caused by surgery and chemotherapy. It achieves its anti-vomiting action by blocking the activity of 5-Hydroxytryptamine type 3 (5-HT3) receptors in the vomiting center [9].

Dexmedetomidine is a powerful and very specific agonist of the a2-adrenoceptor, which attaches to a receptor found in the brain and spinal cord that is involved in G protein binding. The antiemetic action of dexmedetomidine may be attributed to a reduction in sympathetic tone, which may help alleviate nausea and vomiting caused by elevated levels of catecholamines. Using dexmedetomidine may help decrease the intake of intraoperative opioids, and that in turn reduces the risk of PONV. It impacts the operations of the central nervous and circulatory systems and has analgesic, sedative, and sympatholytic characteristics [10].

Lately, clinical researchers have been primarily interested in studying the impact of dexmedetomidine on PONV. However, there is still continuing debate over the efficiency of dexmedetomidine to prevent PONV, due to varying outcomes found in related literature.

Glucocorticoids may have an anti-emetic impact by blocking inflammatory mediators and interacting with neurokinin, serotonin, a-adrenergic receptors, and other receptors [11].

Moreover, multiple studies have demonstrated that dexamethasone improves the effectiveness of 5-HT3 receptor antagonists in preventing vomiting and nausea. **[12, 13]**.

The purpose of this work was to contrast antiemetic impacts among dexmedetomidine and ondansetron in the 1st group against dexamethasone and ondansetron in the 2nd group.

Patients and Methods

This comparative work was performed on 70 females ranging in age from 18 to 65 years, ASA I or II, who were planned for elective laparoscopic cholecystectomy surgery. The work was performed from September 2022 to September 2023 following permission from the Ethics Committee Tanta University Hospitals, Tanta, Egypt. approval code (22/2/35299) and registration of clinicaltrials.gov (ID: NCT06017167). All participants provided a well-informed written consent.

Criteria for exclusion were females over 65 years of age or under 18 years, ASA III or IV, obesity (BMI more than 40 kgm^2), participants with a documented hypersensitivity to the medications utilized in the study, existing medical conditions that are known to improve the likelihood of postoperative nausea and vomiting (such as vestibular disease), impaired liver or kidney function (indicated by liver enzyme or creatinine levels 1.5 times greater than normal), a history of alcoholism or drug abuse, or recent usage of antiemetics, psychotropic drugs, or glucocorticoids within 24 hours prior to surgery.

The enrolled participants were routinely allocated into two equal groups utilising computer generated tables and randomized into sealed opaque envelopes. Group I (Dexmedetomidine group): received dexmedetomidine 0.5 ug/kg + Ondansetron 4 mg + normal saline to complete 10 ml. volume and Group II (Dexamethasone group): received dexamethasone 8 mg + Ondansetron 4mg + normal saline to complete 10 ml. volume. IV infusion over 10 minutes just after skin incision for port introduction and Pneumoperitoneum creation. A chief nurse who didn't take apart in patient care or data collection opened the envelopes and determined group assignment at the morning of operation, another blind assistant doctor did the preparation of the antiemetic agents, none of them participated in the procedure.

All patients had been exposed to taking of history, physical examination, laboratory investigations [full blood picture (CBC), bleeding time, prothrombin time (PT) and activated partial thromboplastin time]. Prior to the operation, the participants fasted from eating for a duration of 8 hours.

Anesthetic management

Participants were continuously monitored under anaesthesia using ECG, noninvasive blood pressure measurement, pulse oximetry, and capnometry. Following a 3-minute preoxygenation period with 100% oxygen, general anaesthesia was initiated with propofol (1.5-2.5 mg/kg) and fentanyl (1µg/kg). A dose of 0.5 mg/kg of Atracurium was administered to assist in the insertion of a tube into the trachea. The anaesthesia was sustained by administering an inspired concentration of 1-2.5% isoflurane, with the end-tidal concentration being monitored. The isoflurane was delivered in a mixture of 50% oxygen and 50% air. Supplementary doses of fentanyl and atracurium were administered if required. The ventilation was mechanically regulated with a tidal volume of 6-8 ml/kg, a respiratory rate of 10-12 breaths/min, and an inspiratory-to-expiratory ratio of 1:2. Ventilatory adjustments were made to maintain the end-tidal carbon dioxide (CO_2) pressure within the range of 35 to 40 mmHg. After the endotracheal tube was fixed, all participants were placed in a standard reverse. Trendelenburg position with head up 30° and the right side of the OR table was raised 15°. Intraabdominal pressure was noted to be kept up at 10-12 mmHg, with established pneumoperitoneum with CO_2.

Group I patients received a single dose of 0.5 µg/kg dexmedetomidine (Precedex; Ho-Spira Inc., Lake Forest, Illinois, USA), plus 4mg ondansetron (Zofran; GlaxoSmithKline, Alexandria, USA). All drugs were delivered in identical syringes with a total volume of 10 ml (dilution was with 0.9% saline). Group II received IV single dose of 8mg dexamethasone (dexamethasone; Amriya Pharmaceutical Industries), plus 4mg ondansetron (Zofran; GlaxoSmithKline, USA). All drugs were delivered in identical syringes with a total volume of 10ml (dilution was with 0.9% saline) IV infusion over 10 minutes to ensure blindness of the groups.

Paracetamol infusion (1 g) over 15 min was given to all patients, after gas deflation. The IV fluid utilized throughout the surgical procedure consisted of a solution containing 0.9% saline and Ringer's lactate. The rate at which the fluid was delivered was 10 ml/kg. The quantities of fluids provided were calculated. They were kept on 2 ml/kg/h throughout recovery until the point that they could tolerate oral fluids. IV ephedrine (5 mg), Boluses were administered in response to hypotension, which was defined as a reduction in mean arterial pressure (MAP) of 25% from the baseline value on two consecutive measurements within a 2-

minute period. These boluses were given when the hypotension did not improve with a reduction of 0.5% in the inspired isoflurane concentration and a 200-ml fluid bolus. When the heart rate dropped below 45 beats per minute, intravenous boluses of atropine at a dosage of 0.2 mg were administered.

Upon completion of the surgery, the carbon dioxide was meticulously removed from the abdomen. Following the procedure, the muscular relaxation was reversed by administering atropine (0.01 mg/kg) and neostigmine (0.05 mg/kg). The trachea was extubated following a comprehensive oropharyngeal suction.

Participants were monitored at the Post Anesthesia Care Unit (PACU) until they met the requirements for being transferred to the ward. Participants in the ward were monitored for 24 hours after their surgery. The nursing staff reported the occurrence of vomiting and nausea at 0 hr, 6 hr, 12 hr, and 24 hr without knowing which antiemetic the patients had taken. Both the presence of nausea and the occurrence of vomiting were evaluated at this specific time. The severity of nausea was assessed utilizing a 10-point numerical rating scale (NRS), where 0 indicated no symptoms and 10 indicated the most severe symptoms conceivable. Additionally, the number of vomiting episodes was documented. The administered antiemetic for rescue was intravenous ondansetron at a dosage of 4 mg. The occurrence and intensity of PONV were evaluated 24 hours following the operation utilizing the Rhodes Index, which measures the severity of vomiting, nausea, and retching. The Rhodes Index is a dependable and accurate measure used by participants to record their symptoms of vomiting, nausea, and retching. It includes eight elements that are rated on a scale of 0 to 4 [14]. This measure has shown great reliability as a technique for assessing gastrointestinal discomfort following ambulatory surgery. Pain intensity was evaluated utilizing a 10-point NRS at 0 hours, 6 hours, 12 hours, and 24 hours. Participants who reported pain greater than 3 points on the NRS received intravenous fentanyl at a dosage of 50 µg. The Ramsay sedation score was documented.

The primary outcome was occurrence of PONV. The secondary outcomes were the severity of PONV, usage of rescue antiemetic drugs, postoperative pain and sedation.

Sample Size Calculation

The sample size and power analysis were computed utilizing Epi-Info software, a statistical tool developed by the World Health Organization and the Centers for Disease Control and Prevention in Atlanta, Georgia, USA. The version used was 2002. The criteria utilized in the computation of sample size had been as follows: [95% confidence limit and 80% power of the study]. Expected success of pain control in favorable treatment group was 90% as compared to 65% in least favorable treatment groups.

The sample size for each group was determined to be N=34 according to the previously described parameters. To address the issue of incomplete findings, the researcher augmented the sample size to 35 instances.

Statistical analysis

The data were analyzed utilizing IBM SPSS software package version 23.0, (SPSS Inc. in Chicago, IL, USA). Qualitative data were represented utilizing numerical values and percentages. The quantitative data was represented utilizing the mean and standard deviation for numerical parameters that followed a normal distribution, and the median and interquartile range (IQR) for numerical parameters that did not follow a normal distribution. The Kolmogorov-Smirnov test was utilized to confirm the normality of the distribution. Significance of the obtained results was considered at p-value ≤ 0.05.

Results

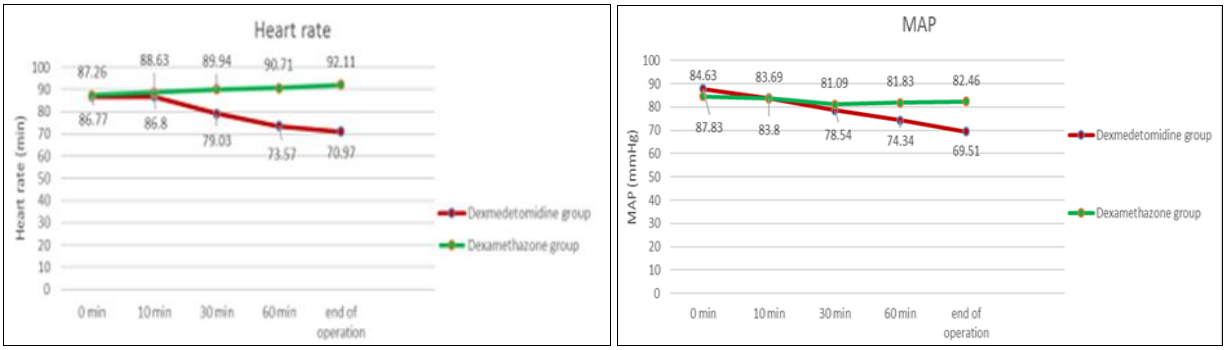
An insignificant variation was existed among both groups as regarding BMI, age, ASA, and duration of operation (p> 0.05). Table 1.

Table 1: Patient characteristics as regard age, BMI, ASA, and duration of operation

		Group (I) (n=35)	Group (II) (n=35)	P
Age (Years)		41.20 ± 8.82	41.23 ± 11.79	0.991[(a)]
BMI (Kg/m^2)		30.07 ± 2.98	30.45 ± 4.36	0.667[(a)]
ASA	I	15 (42.9%)	13 (37.1%)	0.626[(b)]
	II	s20 (57.1%)	22 (62.9%)	
Duration of operation (min)		98.57 ± 14.28	101.29 ± 11.39	0.382[(a)]

Data are presented as mean ± SD or frequency (%). (a): Independent-Sample T Test, (b): Chi-Square Test Group I: Dexmedetomidine group, Group II: Dexamethazone group, BMI: body mass index, ASA: American Society of Anesthesiologists

HR and MAP showed an insignificant difference between both groups as regards at 0 min, and 10 min (p> 0.05). While a substantial decrease was existed among both groups at 30 min, 60 min, and at end of the operation (p< 0.001). The dexmedetomidine group showed a decreased HR and MAP at 30 min, 60 min, and at end of the operation than dexamethasone group. Figure 1.



a) b)

Fig 1: (A) Heart rate and (B) mean arterial blood pressure changes between both groups

An insignificant variation was existed among both groups as regards the APFEL score, vomiting at 0 hr, 1 hr, 6 hrs, 24 hrs, nausea at 1 hr, 6 hrs, and 24 hrs, rescue antiemetic and PONV. There was a significant decrease between both groups as regard nausea by NRS at 0 hr. ($P< 0.001$). a significant variation was existed between both groups regarding Ramsay sedation score ($p< 0.001$). Table 2.

Table 2: Comparison between both groups regarding APFEL score, vomiting, nausea, nausea by NRS, rescue antiemetic, Ramsay sedation score, POVN

		Group (I) (n=35)	Group (II) (n=35)	P
APFEL score	2	28 (80%)	31 (88.6%)	0.324[(b)]
	3	7 (20%)	4 (11.4%)	
Vomiting	At baseline	0 (0%)	2 (5.7%)	0.151[(b)]
	1hr	3 (8.6%)	5 (14.3%)	0.452[(b)]
	6hrs	3 (8.6%)	2 (5.7%)	0.643[(b)]
	24hrs	1 (2.9%)	2 (5.7%)	0.555[(b)]
Nausea distribution	At baseline	5 (14.3%)	20 (57.1%)	<0.001*[(b)]
	1hr	14 (40%)	20 (57.1%)	0.151[(b)]
	6hrs	13 (37.1%)	17 (48.6%)	0.334[(b)]
	24hrs	14 (40%)	16 (45.7%)	0.629[(b)]
Nausea by NRS	At baseline	0 (0)	1 (1)	<0.001*[(c)]
	1hr	0 (1)	0 (2)	0.066[(c)]
	6hrs	2 (3)	0 (2)	0.424[(c)]
	24hrs	0 (1)	0 (1)	0.577[(c)]
Rescue antiemetic		8 (22.9%)	13 (37.1%)	0.192[(b)]
Ramsay sedation score	2	22 (62.9%)	35 (100%)	<0.001*[(b)]
	3	13 (37.1%)	0 (0%)	
PONV		4 (33.3%)	8 (66.7%)	0.604[(b)]

Data are presented as frequency (%) or median (IQR). * Statistically significant at $p< 0.001$, (b): Chi-Square Test, (c): Mann-Whitney U, Group I: Dexmedetomidine group, Group II: Dexamethazone group, NRS: numerical rating scale

A substantial variation was existed among the two groups regarding Rhodes Index (p- < 0.05). Table 3.

Table 3: Comparison between both groups regarding Rhodes Index

		Group (I) (n=35)	Group (II) (n=35)	P
Rhosdes Index	0	7 (20%)	8 (22.9%)	0.009*[(b)]
	3	2 (5.7%)	2 (5.7%)	
	4	2 (5.7%)	7 (20%)	
	5	5 (14.3%)	2 (5.7%)	
	6	9 (25.7%)	4 (11.4%)	
	7	4 (11.4%)	0 (0%)	
	8	2 (5.7%)	0 (0%)	
	9	3 (8.6%)	0 (0%)	
	10	0 (0%)	5 (14.3%)	
	11	1 (2.9%)	3 (8.6%)	
	12	0 (0%)	2 (5.7%)	
	13	0 (0%)	2 (5.7%)	
	14	0 (0%)	0 (0%)	
	15	0 (0%)	0 (0%)	
	16	0 (0%)	0 (0%)	
	17	0 (0%)	0 (0%)	
	18	0 (0%)	0 (0%)	
	19	0 (0%)	0 (0%)	

	20	0 (0%)	0 (0%)	
	21	0 (0%)	0 (0%)	
	22	0 (0%)	0 (0%)	
	23	0 (0%)	0 (0%)	
	24	0 (0%)	0 (0%)	
	25	0 (0%)	0 (0%)	
	26	0 (0%)	0 (0%)	
	27	0 (0%)	0 (0%)	
	28	0 (0%)	0 (0%)	
	29	0 (0%)	0 (0%)	
	30	0 (0%)	0 (0%)	
	31	0 (0%)	0 (0%)	
	32	0 (0%)	0 (0%)	

Data are presented as frequency (%) or median (IQR). * Statistically significant at $p< 0.001$, (b): Chi-Square Test, (c): Mann-Whitney U, Group I: Dexmedetomidine group, Group II: Dexamethazone group, NRS: numerical rating scale

Nausea at 0 hr had a substantially greater risk in group 2 contrasted to in group 1 (OR: 8.00, 95% CI: 2.509 - 25.507, $P< 0.001$**), pain at 0 hr had a substantially greater risk in group 2 contrasted to in group 1 (OR: 8.727, 95% CI: 2.925 - 26.043, $P< 0.001$*), also, pain at 1 hr had a substantially greater risk in group 2 contrasted to in group 1 (OR: 14.222, 95% CI: 3.651 - 55.394, $P< 0.001$*). Table 4.

Table 4: Odd ratio (OR) and 95% Confidence Interval (CI) of vomiting, nausea, pan and rescue analgesic between both groups

		OR	95% CI	P
Vomiting	At baseline	1.061	0.978 - 1.151	0.151
	1hr	1.778	0.391 - 8.092	0.452
	6hrs	0.646	0.101 - 4.128	0.643
	24hrs	2.061	0.178 - 23.826	0.555
Rescue antiemetic		1.761	0.614 - 5.049	0.290
Nausea	At baseline	8.00	2.509 - 25.507	0.001**
	1hr	2.00	0.772 - 5.180	0.151
	6hrs	1.598	0.616 - 4.148	0.434
	24hrs	1.263	0.489 - 3.261	0.629
Pain	At baseline	8.727	2.925 - 26.043	0.001**
	1hr	14.222	3.651 - 55.394	0.001**
	6hrs	1.00	0.188 - 5.332	1.00
	24hrs	2.364	0.807 - 6.927	0.112
Rescue analgesic		2.276	0.868 - 5.969	0.092

*: Statistically significant at $p< 0.001$. OR: Odd ratio, CI: Confidence Interval

There was a substantial difference between both groups as regard rescue analgesic, post-operative pain at 0 hr and complications ($P< 0.001$). an insignificant variation was existed among both groups post-operative pain at 6 hrs, and 24 hrs. The dexmedetomidine group showed lower nausea at 0 hr and post-operative pain at 0 hr and at 1 hr than dexamethasone group. Table 5.

Table 5: Comparison between both groups regarding post operative pain, complications and rescue analgesic

		Group (I) (n=35)	Group (II) (n=35)	P
Post-operative pain	At baseline	0 (0)	1 (2)	<0.001*(c)
	1hr	0 (1)	2 (5)	<0.001*(c)
	6hrs	2 (2)	3 (5)	0.207(c)
	24hrs	1 (2)	2 (1)	0.285(c)
Complications	Pain	12 (34.3%)	28 (80%)	<0.001**(b)
	Shivering	0 (0%)	3 (8.6%)	
Rescue analgesic		12 (34.3%)	28 (80%)	<0.001*(b)

Data are presented as frequency (%) or median (IQR). * Statistically significant at $p< 0.001$, (b): Chi-Square Test, (c): Mann-Whitney U, Group I: Dexmedetomidine group, Group II: Dexamethazone group**,** PONV: postoperative nausea and vomiting

A positive correlation with HR and MAP was existed at 30 min, 60 min and at the end of the operation, nausea at 0 min, pain at 0 min and complications. Also, there was a negative correlation with the ramsay sedation score. While, there was not correlated with age, BMI, ASA, duration of operation, HR and MAP at 0 min and at 10 min, APFEL, vomiting 0 min, 1 hr, 6 hrs and at 24 hrs, rescue antiemetic, nausea and pain at 1 hr, 6 hrs and at 24 hrs, rescue analgesic, and Rhode's Index. Table 6.

Table 6: Spearman correlation of Dexmedetomidine group and Dexamethasone group with other parameters

		Groups	
		r	p
Age		0.064	0.596
BMI (Kg/m^2)		-0.029	0.811
ASA		0.058	0.632
Duration of operation		0.125	0.303
HR	0 min	0.058	0.636
	10 min	0.085	0.484
	30 min	0.713	0.001**
	60 min	0.809	0.001**
	at the end of operation	0.861	0.001**
MAP	0 min	-0.204	0.091
	10 min	-0.042	0.731
	30 min	0.245	0.041*
	60 min	0.627	0.001**
	at the end of operation	0.773	0.001**
APFEL		-0.118	0.332
Vomiting	At baseline	0.171	0.156
	1hr	0.09	0.460
	6hrs	-0.055	0.648
	24hrs	0.071	0.562
Rescue antiemetic		0.126	0.297
Nausea	At baseline	0.447	0.001**
	1hr	-0.029	0.812
	6hrs	-0.173	0.152
	24hrs	0.058	0.635
Pain	At baseline	0.489	0.001**
	1hr	0.517	0.001**
	6hrs	0.000	1.00
	24hrs	0.190	0.116
Rescue analgesic		0.201	0.095
Ramsay sedation score		-0.478	0.001**
Rhodes Index		0.034	0.778
Complications		0.509	0.001**

r: spearman correlation. *: Statistically significant at $p< 0.05$, **: Statistically significant at $p< 0.001$, BMI: body mass index, ASA: American Society of Anesthesiologists, HR: Heart rate, MAP: mean arterial pressure.

Discussion

General anaesthesia is frequently employed in several surgical procedures. It may lead to problems such as PONV. General anaesthesia is more prevalent than spinal anaesthesia [15].

The main result of the work was that the occurrence of PONV, as regard vomiting an insignificant variation was existed among the two groups at 0 hr., 1 hr., 6 hrs., 24 hrs. As regard nausea, the dexmedetomidine group showed lower nausea at 0 hr than dexamethasone group by NRS. While an insignificant variation was existed among the two groups at 1 hr, 6 hrs, and 24 hrs.

Our study shows as regard Rhodes Index, the dexmedetomidine group showed lower scales than dexamethasone group. As regards rescue antiemetic, an insignificant variation was existed among the two groups. Our results is steady with Bakri *et al.* [16] announced that dexmedetomidine decrease the occurrence and severity of PONV, similar to dexamethasone when he compared The impact of a solitary administration of dexmedetomidine combined with dexamethasone in diminishing PONV subsequent to laparoscopic cholecystectomy. Furthermore, Massad *et al.* [17] discovered that dexmedetomidine effectively decreased the occurrence of PONV in female patients who were having elective diagnostic laparoscopic gynecological surgeries. They ascribed this finding to the decline in the overall use of anesthetic medicines.

The current investigation reveals that the occurrence of PONV in the Dexamethasone group is consistent with the findings reported by Wang, J., *et al.* [18], Feo, C., *et al.*, [19], and Erhan, Y., *et al.* [20] about the preventive usage of dexamethasone against PONV following laparoscopic cholecystectomy. The precise mechanism by which dexamethasone produces its antiemetic effects is not well understood.

The present study showed that the dexmedetomidine group showed a decreased HR and MAP at 30 min, 60 min, and at end of the operation than dexamethasone group. Dexmedetomidine is a very effective agonist of the alpha-2-adrenergic receptor, known for its widespread usage in medical settings owing to its ability to reduce anxiety, induce sedation, provide pain relief, regulate sympathetic activity, and control hemodynamics [21]. The MAP and HR in the dexmedetomidine group were substantially reduced compared to the dexamethasone group. The findings of Khare *et al.* [22] corroborated our results, as they observed that dexmedetomidine consistently resulted in considerably decreased MAP and HR values at various points throughout the procedure.

In our study the dexmedetomidine group showed lower post-operative pain at 0 hr and at 1 hr than dexamethazone group. While an insignificant variation was existed among the two groups at 6 hrs, and 24 hrs. The study conducted by Sharma *et al.* provided evidence that the utilization of dexmedetomidine infusion during laparoscopic cholecystectomy resulted in a statistically significant decrease in Visual Analog Scale pain scores and a reduction in the need for postoperative analgesics, compared to the utilize of paracetamol infusion [23]. Our study was in line with Gurbet *et al.* [24] Also, Arain *et al.* [25].

The decreasing of postoperative pain by dexmedetomidine may be attributed to the activation of the α2-adrenoreceptor in the dorsal horn of the spinal cord. This activation hinders the release of substance P, that is responsible for modulating the transmission of nociceptive signals in the central nervous system. As a result, a decrease in nociceptive inputs was existed throughout the acute postoperative period [26].

Our work showed that according to Ramsay sedation scale, a significant variation was existed between both groups. The explanation could be that dexmedetomidine acts on α2 adrenergic receptors of the locus coeruleus (a rod-shaped nucleus in the pons that is the primary source of norepinephrine throughout the brain) resulting in a state of sedation similar to natural sleep with less respiratory depression and easy arousability so it doesn't affect the orientation and cooperation of the patient [27]. Our results were supported by study of Olutoye *et al.*, [28] reported that A total of 109 participants were randomly assigned to receive a single intraoperative dosage of either dexmedetomidine at a concentration of 0.75 mic/kg or 1 mic/kg, or morphine at a concentration of 50 mic/kg or 100 mic/kg. The administration of the drugs took place over a period of 10 minutes following endotracheal intubation.

The Ramsay sedation score in the postanesthetic care unit (PACU) reduced with time in all four groups. However, no significant variations in sedation were existed between the groups in the PACU over time, as determined by a two-way repeated-measures ANOVA. At the 60-minute mark in the

PACU, participants in all four groups had an average Ramsay score. In this research, the occurrence of post-anesthetic shivering was decreased in the group that received dexmedetomidine. One possible reason is that dexmedetomidine inhibits vasoconstriction, that is associated with the threshold for shivering. According to Elvan *et al.* [29], it was found that recipients who were given a loading dose of 1 mg/kg dexmedetomidine followed by an infusion of 0.4 mg/kg/hour had a reduced incidence and severity of shivering in contrast to individuals who received normal saline. This was observed in female patients undergoing abdominal hysterectomy.

The current research is limited by the fact that it only includes female patients in the sample group. Additionally, the preoperative volume status of patients might impact intraoperative hypotension and PONV. Therefore, it is important to assess patients' intravascular volume prior to surgery utilizing measuring methods such as evaluating the diameter of the inferior vena cava. The present investigation was constrained by a very small sample size since it was conducted at a single site. Additional well controlled studies with larger sample size covered more centers are needed to confirm our results for its safe use.

Conclusion

Dexmedetomidine has a comparable impact to dexamethasone in diminishing the occurrence and intensity of PONV. Furthermore, dexmedetomidine surpasses dexamethasone in diminishing postoperative pain and overall analgesic use throughout the first 24 hours following laparoscopic cholecystectomy, without any negative consequences. Additional research is required to ascertain the most effective dosage and timing of dexmedetomidine medication in order to avoid PONV without impacting patient's hemodynamics or sedation. Thus, we can conclude that administering a solitary dosage of dexmedetomidine is suitable for the prevention of PONV among individuals who are having laparoscopic cholecystectomy.

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