Original Research Article

A study to evaluate the clinical efficacy of intravenous clonidine versus nalbuphine premedication on hemodynamic changes during direct laryngoscopy and intubation

Shreya Saurav[1], Shrutika Bhagat[2], Madiha Shadab[3],Binod Kashyap[4]

[1]Senior Resident, Department of Anesthesia and Critical Care, Patna Medical College and Hospital, Patna, Bihar, India

[2]Senior Resident, Department of Anesthesia and Critical Care, Patna Medical College and Hospital, Patna, Bihar, India

[3]Senior Resident, Department of Anesthesia and Critical Care, Patna Medical College and Hospital, Patna, Bihar, India

[4]Associate Professor & HOD, Department of Anesthesia and Critical Care, Patna Medical College and Hospital, Patna, Bihar, India

Received: 03-09-2021 / Revised: 13-10-2021 / Accepted: 23-10-2021

Abstract

Background: Accentuated hemodynamic changes during direct laryngoscopy can be modified by appropriate premedication. **AIM:** The present study was aimed to comparatively evaluate the clinical efficacy of intravenous clonidine with nalbuphine premedication for reduction in hemodynamic changes during direct laryngoscopy and intubation. **Materials and Methods:** Sixty adult patients of ASA physical status I and II of either gender, were randomized into two equal groups of 30 patients each to receive either clonidine (2 µg/kg) Group I or nalbuphine (0.2 mg/kg) Group II, intravenously 10 minutes before induction. Anaesthetic technique was standardised and direct laryngoscopy with intubation was facilitated with vecuronium bromide. Changes in heart rate, arterial blood pressure and ECG were recorded at baseline, after giving study drug, after laryngoscopy and intubation, then after at 1st, 2nd, 3rd, 5th, 10th, and 15th min of intubation and were noted as primary end points. Any side effects and complications were recorded as secondary end points. **Results:** After premedication in patients of comparable demographic profile, the fall in heart rate and blood pressure showed statistically significant difference between the groups. After laryngoscopy and intubation, the increase in mean heart rate and mean blood pressure occurred immediately in patients of both groups but persisted up to 5 to 7 min in patients of clonidine group and up to 10 minutes in patients of nalbuphine group with statistically significant difference between the groups. **Conclusion:** Intravenous clonidine premedication (2 µg/kg) could effectively reduce the hemodynamic changes during direct laryngoscopy and intubation when compared to intravenous nalbuphine (0.2 mg/kg), administered 10 min before induction.

Keywords: Clonidine, Direct Laryngoscopy and Intubation, Nalbuphine.

Introduction

The direct laryngoscopy and intubation is frequently performed to protect the airway from aspiration and allows unimpeded ventilation during general anaesthesia, but its clinical benefits are not without adverse effects due to increase in plasma catecholamine concentration, which causes transient and variable tachyarrhythmia and hypertension.[1] These hemodynamic changes predispose the myocardium to ischemia that may be life threatening in cardiac compromised patients. Institution of appropriate premedication, smooth induction and rapid intubation can reduce these associated risks of hemodynamic changes.

An ideal anaesthetic drugs or technique should have a rapid onset of action, be safe and convenient to prepare and administer, besides minimizing the hemodynamic changes. It must be applicable to patients of all age groups, prevent impairment of cerebral blood flow and avoid awareness during anesthesia. Clonidine, partial α2 adrenergic agonist, decreases the sympathetic nervous system outflow from central nervous system to peripheral tissues and inhibit release of norepinephrine. It has sedative, analgesic and antihypertensive action in addition to reduction of the anaesthetic drugs requirement.[2,3]Nalbuphine is a semi-synthetic agonist-antagonist opioid analgesic. It is agonist at kappa (κ) receptors and acts as antagonist at mu (µ) receptors. Nalbuphine not only suppresses the hemodynamic response but also provide intraoperative hemodynamic stability with prolonged duration of analgesia. Its potential safety in over dosage i.e. ceiling effect in respiratory depression, makes nalbuphine an ideal analgesic during anaesthesia.[4-6]

This prospective double blind randomized study was designed to comparatively evaluate the clinical efficacy of intravenous Clonidine versus Nalbuphine premedication on hemodynamic changes during direct laryngoscopy and intubation.

Materials and Methods

This prospective randomized study was conducted at Department of Anaesthesia and Critical Care, at Patna Medical College and Hospital, Patna. The study was approved by the institutional research

**Correspondence*
Dr. Madiha Shadab
Senior Resident, Department of Anesthesia and Critical Care, Patna Medical College and Hospital, Patna, Bihar, India
E-mail: madiha1210@gmail.com

and ethical committee. The study was conducted between January 2020 and june 2020. An informed and written consent was taken from the participating subjects prior to the commencement of the study. This prospective double blind randomized study was conducted on 60 patients of either gender age between 18 to 58 years, weighing between 50 and 70 kg with American Society of Anaesthesiology (ASA) physical status I and II, and scheduled for elective surgical procedure under general anaesthesia.

Selection criteria

Patient suffering from cardio-pulmonary diseases, uncontrolled or untreated systemic hypertension, hepatic disease, renal disease, neurological disorder or endocrinal disease, morbidly obese patients, patients with known hypersensitivity or drug allergies, taking any medication, were excluded from the study. Patients with anticipated difficult airway, or may require more than one attempt for intubation or who refused to participate in the study, were also excluded from the study.Sixty adult patients were divided into two equal groups of 30 patients each, according to computer generated random number tables. Patients of Group I received Clonidine (2 µg/kg) and patients of Group II received Nalbuphine (0.2 mg/kg), for intravenous premedication. Both drugs were diluted in 10 mL normal saline and administered 10 minutes priorto induction. Group allocation and study drug preparation was done by an assistant who was blinded to the study protocol. Neither investigator nor the observer were aware of study protocol to keep the double blinding of study.

Anaesthetic Technique

All selected patients were given tab Alprazolam 0.25 mg and tab. Ranitidine 150 mg orally, the night before surgery and were kept fasting for 8 hours prior to surgery. On arrival to operation theatre, all patients were placed in supine position and routine monitoring was commenced using a Multipara monitor and baseline vital parameters of heart rate, systemic blood pressure, peripheral oxygen saturation (SpO2) and electrocardiogram (ECG) were recorded. An intravenous line was secured and lactate Ringer solution was started at the rate of 4-6 ml/kg/h.Study groups were given inj. midazolam 0.02mg/kg, inj. glycopyrrolate 0.2 mg, inj. Fentanyl 100 µg and inj. ondansetron 4 mg, followed by the study drug, clonidine (2 µg/kg) or nalbuphine (0.2mg/kg) solution, intravenously 10 minutes before induction, according to randomization schedule, in double blinded manner.After pre oxygenation for 3 min with 100% oxygen via face mask, anaesthesia was induced with propofol 2 mg/kg, followed by vecuronium bromide 0.1 mg/kg to facilitate direct laryngoscopy and intubation. All patient were manually ventilated with 100% oxygen. When double burst suppression was 95% or when Train of four (TOF) was zero, the laryngoscopy was performed with Macintosh curve blade laryngoscope within a period of 15 seconds with proper sized cuffed endotracheal tube. Any patient requiring more than 20 seconds or more than one attempt for intubation, was excluded from the study. Anaesthesia was maintained with isoflurane, nitrous oxide and oxygen. The patients were mechanically ventilated to keep normocapnia. The tidal volume and ventilatory frequency was adjusted to maintain EtCO2 between 35-40 mm Hg.

The hemodynamic parameters of heart rate, systemic blood pressure (systolic, diastolic and mean arterial pressure) and peripheral oxygen saturation were noted along with analysis of electrocardiogram (ECG) for any change in rhythm and ST segment. These parameters were recorded at baseline, after giving study drug, immediately after laryngoscopy and intubation, then at intervals of 1st, 3rd, 5th, 7th, 10th and 15th min, after intubation. Then monitoring was continued at 5 min interval during intraoperative period till end of surgery and monitoring was continued for 15 mins post extubation.The hemodynamic changes observed as abnormal finding during the study were defined as hypotension when SBP was less than 20% of baseline value or less than 90 mm Hg, whichever was lower and hypertension when SBP was more than 20% of baseline value or more than 140 mm Hg whichever was higher. The tachycardia was defined as heart rate more than 100 beats per min and bradycardia was defined as heart rate less than 60 beats per min.Hemodynamic changes occurring during study period was not treated unless these changes were sustained over a period of time and were compromising patient's safety.Intraoperatively, hypertension was managed by increasing the dial concentration of isoflurane and hypotension was treated primarily by increasing the rate of lactate Ringer infusion, decreasing the dial concentration of isoflurane and additionally with intravenous bolus of inj. mephenteramine, 6mg. Bradycardia was managed by bolus of inj. atropine 0.6 mg.

At the end of surgery, isoflurane was discontinued and residual neuromuscular blockade was antagonized with appropriate doses of intravenous neostigmine (0.05mg/kg) and glycopyrrolate (0.01 mg/kg). Controlled Ventilation was continued to eliminate volatile agent until signs of awakening appeared. Both the level of consciousness and neuromuscular transmission were assessed for adequacy of reflexes. Patients were extubated after sign of adequate reversal and patient were able to obey simple commands.Any postoperative hemodynamic changes, shivering, sedation, respiratory depression, nausea and vomiting were noted and treated accordingly.

Statistical Analysis

The data obtained in the study was presented in a tabulated manner and variables were expressed as mean ± standard deviation (SD), considering the later as the best predictor for

statistical analysis. The results were analyzed using Stat graphic centurion, version 16 (Stat point technologies INC, Warrenton, Virginia). The parameters of both groups were compared using one way analysis of variance (ANOVA), Chi square test, unpaired and paired 'T' test. A P value of less than 0.05 was considered to indicate statistical significance and P value less than 0.001 was considered statistically highly significant.

Results

The present study compared the clinical efficacy of intravenous clonidine with nalbuphine premedication on hemodynamic changes during direct laryngoscopy on 60 adult patients of both genders. The sample size was adequate to detect statistical significance in hemodynamic changes during direct laryngoscopy and intubation. There was no protocol deviation and data of all patients were included for statistical analysis.

Demographic parameters of age, height, weight, gender ratio and ASA physical status were comparable between the groups. [Table 1]

Table 1: Demographic profile (n=60)

Parameters	Group I	Group II	P Value
Age (years)	46.76±12.3	48.54±10.9	0.07
Height (cm)	154.67± 4.8	153.83± 5.4	0.48
Weight (kg)	59.17± 7.5	60.23± 5.3	0.565
Gender (M/F)	18/12	19/11	0.87
ASA (I/II)	20/10	21/9	0.73

Hemodynamic Changes

At base line, the mean heart rate, mean systolic blood pressure, mean diastolic blood pressure, and average mean arterial pressure in patients of Group I was 85.6±6.08 beats/min, 128.87±4.36 mmHg, 84.6±7.05 mmHg, and 98.96 ±10.14 mmHg respectively, while in patients of Group II, it was 89.57±7.2 beats/min, 127.7±3.15 mmHg, 85.3±6.0 mmHg, and 98.62±10.74 mmHg respectively. Both the

groups were comparable with no statistically significant difference. [Table 2]

Table 2: Baseline Hemodynamic parameters

Parameters	Group I	Group II	P value
Heart rate (beats/min)	85.6±6.08	89.57±7.2	0.09
Systolic BP (mmHg)	128.87±4.36	127.7±3.15	0.238
Diastolic BP (mmHg)	84.6±7.05	82.5±6.0	0.219
Mean Arterial Pressure (mmHg)	98.96±10.14	98.62±10.74	0.946

After administration of clonidine (2 µg/kg) and nalbuphine (0.2 mg/kg) the fall in mean heart rate (Group I-80.63 ± 67 b/m, Group II-86.5± 6.32 b/m) showed statistically significant difference between the both. There was fall in systolic blood pressure (Group I-122.03±8.0 mmHg, Group II- 128.67±7.0 mmHg), diastolic blood pressure (Group I-80.9±12.49, Group II- 83.7±11.5 mmHg) and mean arterial pressure (Group I-94.61±13.11 mmHg, Group II-98.0±10.69 mmHg) and the difference was statistically significant between the groups. [Table 3-5]After induction with propofol, there was further fall in mean heart rate (Group I-74.97 ±7.8 b/m, Group II- 83.4±8.4 b/m), systolic blood pressure (Group I-116.2±4.32 mm Hg, Group II- 118.2±4.82 mmHg), diastolic blood pressure (Group I-77.9 ±13.36, Group II-78.6±10.51mm Hg) and mean arterial pressure (Group I-90.66±14.66 mm Hg, Group II- 89.8± 11.92 mm Hg) in patients of both groups. The difference was statistically significant between the group (p= <0.001). [Table 3-5]

After direct laryngoscopy and intubation, in patients of clonidine group, the increase in mean heart rate (96.6±3.2 b/m), systolic blood pressure (136.8±6 mmHg), diastolic blood pressure (89.3±8.5 mmHg), and mean arterial blood pressure (102.17±15.06 mm Hg), occurred immediately after laryngoscopy and intubation and persisted up to 5 to 7 min, thereafter the changes returned to baseline. [Table 3-5]

After direct laryngoscopy and intubation, in patients of nalbuphine group, the increase in mean heart rate (112.11±5.6 b/m), systolic blood pressure (137.2±7.68 mmHg), diastolic blood pressure (91.4±10.1mmHg), and mean arterial blood pressure (106.6±14.32 mm Hg), occurred immediately after laryngoscopy and intubation and persisted up to 10 min, thereafter the hemodynamic changes returned to baseline. [Table 3-5]

The difference in hemodynamic changes between the two groups were statistically significant.

Table 3: Comparison of mean Heart Rate

Heart Rate (beats/min)	Group I		Group II		P value
	Mean	SD	Mean	SD	
Baseline	85.6	6.08	89.57	7.2	0.090
After study drug	80.63	5.67	86.5	6.32	**<0.001
After Induction	74.97	7.8	83.4	8.54	*<0.05
Immediate post Intubation	96.6	3.2	112.11	5.56	*< 0.05
1 min	92.2	4.6	111.6	5.43	*< 0.05
2 min	90.8	5.9	109.9	5.64	*< 0.05
3 min	90.2	4.6	107.91	5.66	*< 0.05
5 min	88.6	5.2	103.26	5.57	*< 0.05
7 min	85.3	6.4	100.97	6.00	*< 0.05
10 min	84.6	5.6	95.23	5.69	*< 0.05
15 min	84.1	4.8	88.1	6.60	*< 0.05

Table 4: Comparison of mean Systolic Blood Pressure

Systolic Blood Pressure (mm Hg) Mm	Group I		Group II		P Value
	Mean	SD	Mean	SD	
Baseline	127.7	4.36	128.87	3.15	>0.05
After study drug	122.03	8.0	128.67	7.0	*<0.05
After Induction	116.2	4.32	118.2	4.82	*0.047
Immediate post Intubation	136.8	6.0	137.2	7.68	*0.038
1 min	136.3	5.6	136.4	8.2	*0.023
2 min	132.3	4.6	135.2	6.43	*0.011
3 min	132.2	4.5	134.9	4.42	*0.023
5 min	131.3	4.4	134.7	3.98	*0.05
7 min	128.7	5.6	132.3	4.4	*<0.05
10 min	126.3	6.0	130.6	2.75	*<0.05
15 min	118.43	3.6	127.34	3.20	*<0.05

Table 5: Comparison of mean Diastolic Blood Pressure

Diastolic Blood Pressure (mm of Hg)	Group I	
	Mean	SD
Baseline	84.6	7.05
After study drug	80.9	12.49
After Induction	76.9	13.36
Immediate post	89.3	8.5

Intubation		
1 min	88.07	7.0
2 min	86.9	11.3
3 min	85.7	12.9
5 min	85.3	11.3
7 min	84.6	13.3
10 min	84.2	10.7
15 min	82.3	11.51

Table 6: Comparison of average Mean Arterial Pressure

Mean arterial pressure (mm of Hg)	Group I		Group II		P
	Mean	SD	Mean	SD	Value
Baseline	98.96	10.14	98.62	10.74	0.946
After study drug	94.61	13.11	98.0	10.69	*0.049
After Induction	90.66	14.66	89.8	11.92	*0.047
Immediate post Intubation	102.17	15.06	106.6	14.32	0.051
1 min	100.6	16.14	105.4	14.05	*<0.05
2 min	98.9	15.11	104.2	14.26	*<0.05
3 min	96.2	13.41	103.2	12.62	*<0.05
5 min	93.6	12.53	103.2	12.02	*<0.05
7 min	92.4	15.57	101.3	11.65	*<0.05
10 min	90.7	15.35	100.4	12.61	*<0.05
15 min	86.3	16.69	99.2	12.51	*<0.05

Discussion

Direct laryngoscopy and intubation is most noxious stimuli during airway management due to intense sympathetic discharge and release of catecholamine, which manifested as hypertension and tachycardia. These short lived hemodynamic changes can be harmful in patients with pre- existing myocardial disease or cerebral insufficiency. If no specific measures are taken to prevent these hemodynamic changes, the cardiac work load may be increased which in turn may result in perioperative myocardial ischemia or acute heart failure. Surgical stress also leads to increase catecholamine release which can further intensify the intraoperative hemodynamic instability.

The various measures to counteract the hemodynamic changes during laryngoscopy and intubation includes a wide variety of drugs and techniques .Out of various approaches, the pharmacological approach is considered to be the best, which include high dosages of opioid analgesics, α-2 adrenergic agonist, beta adreergic blockers and vasodilators but with their own limitations.In the present study, clinical efficacy of intravenous clonidine versus nalbuphine premedication was compared for hemodynamic changes during direct laryngoscopy and intubation. The significance of the study lies in the fact to select the better drug for premedication which could reduce the hemodynamic changes during direct laryngoscopy and intubation. Besides minimizing the haemodynamic changes, premedication must be applicable regardless of the patient group, prevent impairment of cerebral blood flow and avoid awareness during anaesthesia. Drugs should be such that they do not affect the duration or modality of the anaesthetic technique and should not effects the recovery profile of the patient.Not many studies have been done to compare the clinical efficacy of intravenous clonidine with nalbuphine premedication for reduction of haemodynamic changes during direct laryngoscopy and intubation, therefore these premedication were selected for the present study.Clonidine is alpha-2 agonists and showed pharmacological effects on blood pressure and heart rate, due to its sympatho- inhibitory action. It has analgesic, sedative and anxiolytic profile. Antinociceptive action of clonidine is present for both somatic and visceral pain. These properties along with its ability to maintain intra-operative hemodynamic stability make clonidine a useful adjuvant in anaesthesia and intensive care.[7]

Nalbuphine is an agonist-antagonist opioid analgesic causes less respiratory depression by activating the supraspinal and spinal kappa receptor. It does not cause increase in systemic blood pressure, pulmonary blood pressure, heart rate, thus may be useful for providing sedation and analgesia for cardiac patients.[8,9]

The selection of dosages for the present study was based on the assumption that these doses almost equipotent doses could supress the hemodynamic changes with minimal side effects. For the present study, clonidine in dose of 2 µg/kg and nalbuphine in dose of 0.2mg/kg were selected for intravenous premedication.

In the present study, there was significant rise of heart rate in patients of nalbuphine group immediately after intubation till 10 min while in patients of clonidine group, the rise in heart rate was till 3min only. These changes in heart rate were statistically highly significant.

Jiwanmall M et al used intravenous clonidine in the dose of 3 µg/kg and found that target mean arterial pressure could be achieved easily in clonidine group as against the placebo group with significant reduction in intra-operative blood loss with good analgesia.[10] In another study, done by Deepshikha C Tripathi et al, it was observed that clonidine in dose of 2 µg/kg prevented the hemodynamic stress response associated with intubation and extubation.[11]Clonidine, α2-adrenoreceptors agonist, has potent analgesic and sedative effect with a low side effect profile and low abuse potential. It decreases discharge in sympathetic preganglionic fibres in the splanchnic nerve and in postganglionic fibres of cardiac nerves and stimulates the parasympathetic outflow, which may contribute to the slowing of heart rate as a consequence of increased vagal tone and diminished sympathetic drive. In addition, some of the antihypertensive effects of clonidine may be mediated by activation of presynaptic alpha 2 receptors that supress the release of norepinephrine, ATP and NPY from postganglionic sympathetic nerves.In the present study, as increase in mean systolic blood pressure, mean diastolic blood pressure and mean arterial pressure was observed in patients of both groups and these changes showed statistically significant difference from the baseline after laryngoscopy and intubation. The rise was highest in patients of nalbuphine group immediately after laryngoscopy and intubation.Priti M Chawda et al studied the efficacy of nalbuphine in preventing the increase in heart rate and mean arterial pressure in response to laryngoscopy and intubation. They observed significant rise in heart rate in the control group

(20.4%) after intubation at 2 min when compared to nalbuphine group (16.66%). Heart rate and mean arterial pressure gradually decreased after 3 to 8 min in control group but always remained higher than patient of nalbuphine group, thus concluded that nalbuphine attenuated the hemodynamic response to laryngoscopy and intubation.[12] Similar results were found by Chaudhari M et al, showing increase in mean heart rate and increase in systolic blood pressure in patients of nalbuphine group which was statistically highly significant compared to clonidine group, immediately after intubation. The increase in diastolic blood pressure and mean arterial pressure in nalbuphine group was statistically significant when compared to clonidine group immediately after intubation and then after at 1, 3, 5, 7, 10 min and 15 min after intubation.[13]Nath R et al concluded in their study that nalbuphine (0.2 mg/kg) produced stable hemodynamics during stressful period of laryngoscopy and intubation by virtue of its reduction in pulse rate, systolic blood pressure and diastolic blood pressure with fewer adverse effects and good analgesia.[14]

Bhalerao PM et al observed that intraoperative mean pulse rate was 90.82±4.81 beats/min in control group while it was 74.76±9.88 beats/min in clonidine group. The mean systolic blood pressure was 137.87±4.89 and 125.79±6.44 mmHg respectively. They concluded that premedication with intravenous clonidine is effective method to provide stable hemodynamics and protection against stress response induced during laparoscopic cholecystectomy.[15]

Ray M, Bhattacharjee DP et al concluded in their study that immediately after laryngoscopy and intubation, heart rate increased by 10 bpm in patients of clonidine group, while mean arterial pressure in clonidine group decreased significantly for all measurements with the exception during intubation and after induction.[16]

Altan A et al studied clonidine in dose of 3µg/kg and found that, mean arterial pressure increased by 16 mm Hg in control group, whereas in clonidine group, the mean arterial pressure increased only by 10 mmHg, which showed clonidine has significant blunting effect of pressor response of laryngoscopy and intubation.[17] The present study also observed that clonidine effectively reduced the hemodynamic changes.The primary objective of the present study was to comparatively evaluate the clinical efficacy of intravenous clonidine versus nalbuphine premedication on hemodynamic changes during laryngoscopy and intubation in normotensive patients. The findings of present study were in consistence with these previous clinical studies. Based on the results of the present study and the above discussion, intravenous clonidine and nalbuphine, both offered a unique pharmacological profile with sedation, analgesia and intraoperative cardiovascular stability. Clonidine and nalbuphine, both has attenuated but did not abolish the hemodynamic responses to laryngoscopy and intubation.

Conclusion

Intravenous premedication with clonidine or nalbuphine, could reduce the hemodynamic changes by altering the stress induced sympatho-adrenal responses to direct laryngoscopy and intubation with inherent advantage of analgesia and sedation. Clonidine (2 µg/kg) was more effective in reducing the hemodynamic changes of laryngoscopy and intubation than nalbuphine (0.2mg/kg), when administered as premedication 10 minute before induction.

References

1. Freye E, Levy JV. Reflex activity caused by laryngoscopy and intubation is obtunded differently by meptazinol, nalbuphine and fentanyl. Eur J Anaesthesiol. 2007; 24:53-8.
2. Isaac L. Clonidine in the central nervous system: site and mechanism of hypotensive action. J Cardiovasc Pharmacol. 1980; 2(Suppl 1):S5-19.
3. Giovannitti JA, Thomas SM, Crawford JJ. Alpha-2 adrenergic receptors agonist: a review of current clinical applications. Anesth Prog. 2015; 62:31-8.
4. Haq AU, Kazmi EH, Rao ZA. Nalbuphine prevents haemodynamic response to endotracheal intubation. J Coll Physicians Surg Pak. 2005; 15:668-70.
5. Kothari D, Sharma CK. Effect of nalbuphine and pentazocine on attenuation of hemodynamic changes during laryngoscopy and endotracheal intubation: A clinical study. Anaes Essays Res. 2013; 7:326-30
6. Tariq AM, Iqbal Z, Qadirullah. Efficacy of nalbuphine in preventing haemodynamic response to laryngoscopy and intubation. J Postgrad Med Inst. 2014; 28:211-6.
7. Arora S, Kulkarni A, Bhargava AK. Attenuation of hemodynamic response to laryngoscopy and orotracheal intubation using intravenous clonidine. Journal of Anaesthesiol Clin Pharmacol. 2015; 31:110-4.
8. Dabhi P, Mehta S. Effect of intravenous nalbuphine on hemodynamic response to laryngoscopy and intubation. Int J Res Med. 2014; 3:24-7
9. Fating D, Dandekar A, Tirpude A. Role of intravenous Nalbuphine in attenuation of haemodynamic response to laryngoscopy and endotracheal intubation. Journal of Clinical Anaesthesia. 2016; 3:165-69.
10. Jiwanmall M, Joselyn AS, Kandasamy S. Intravenous clonidine as a part of balanced anaesthesia for controlled hypotension in functional endoscopic sinus surgery: A randomized controlled trial. Indian J Anaesth. 2017; 61:418–23.
11. Deepshikha C Tripathi, Komal S Shah, Santosh R Dubey, Shilpa M Doshi, Punit V Raval. Hemodynamic stress response during laparoscopic cholecystectomy: Effect of two different doses of intravenous clonidine premedication. J Anaesthesiol Clin Pharmacol. 2011; 27:475–80.
12. Priti M Chawda, Mayuresh K Pareek, Ketan D Mehta. Effect of Nalbuphine on Haemodynamic Response to Orotracheal Intubation. J Anaesth Clin Pharmacol. 2010; 26:458-60.
13. Chaudhari M.J, Bhatia U, Patel N, Patel K. Efficacy of nalbuphine in preventing hemodynamic response to laryngoscopy and intubation in comparison to clonidine. NHL Journal of Medical Science. 2015; 4:58- 64.
14. Nath R, Dutta S, Khandelwal A. Attenuation of Hemodynamic Response during Laryngoscopy and Intubation with Low Dose Intravenous Nalbuphine. J Hematol Transfus. 2015; 3(5):1036-9.
15. Bhalerao PM, Thombre SK, Kapse US, Targe KV. Intravenous clonidine for suppression of haemodynamic response to laparoscopy-a prospective randomised, placebo controlled, single centre study. Int J Adv Med. 2017; 4:788-92.
16. Ray M, Bhattacharjee DP, Hajra B, Pal R. Effect of clonidine and magnesium sulphate on anaesthetic consumption, haemodynamics and postoperative recovery: A comparative study. Ind J Anaesth. 2010; 54:137-41.
17. Altan A, Turgut N, Yildiz F, Turkmen A, Ustiin H. Effects of magnesium sulphate and clonidine on propofol consumption, haemodynamics and post-operative recovery. British Journal of Anaesthesia. 2005; 93:438- 41.

Conflict of Interest: Nil
Source of support:Nil