

Original Research Article**STUDY OF HAEMODYNAMIC CHANGES DURING LARYNGOSCOPY AND TRACHEAL INTUBATION USING INJECTION DEXMEDETOMIDINE AND INJECTION CLONIDINE - A COMPARATIVE STUDY**

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Abstract**Aim and objectives:**

- 1) To evaluate the effects of haemodynamic changes during Laryngoscopy and tracheal intubation using inj. dexmedetomidine and inj. clonidine.
- 2) To compare haemodynamic changes during Laryngoscopy and tracheal intubation using inj.dexmedetomidine and inj.clonidine.
- 3) To compare the side effects.

Materials & Methods

After approval of the institutional ethical committee, this prospective observational study was conducted on 60 patients of ASA Grade I & II, undergoing elective surgeries under general anaesthesia.

Group D: injection Dexmedetomidine 0.5mcg/kg diluted to 20ml with normal saline were given over 10 minutes.

Group C: injection. Clonidine 1mcg/kg diluted to 20ml with normal saline were given over 10 minutes.

All patient received Injection Pentazocine 0.3mg/kg and were pre-oxygenated for 3minute Anaesthesia was induced with thiopantone sodium (5mg/kg intravenous) till loss of eyelashreflex over 30 second and mask ventilation was confirmed. Injection succinylcholine 1.5mg/kg was given to facilitate laryngoscopy and intubation. anaesthesia was maintained with oxygen nitrous oxide ,halothane with intermittent use of injection Atracurium and controlled ventilation.

At the end of surgery the neuromuscular blockade was antagonized with injection Glycopyrolate (.01mg/kg)Intavenou .and injection Neostigmine(.05mg/kg)i.v. and patient were extubated.

Result

Dexmedetomidine is more effective than Clonidine in attenuation of haemodynamic changes during laryngoscopy and intubation

Conclusion

Dexmedetomidine significantly attenuates the haemodynamic changes during laryngoscopy and intubation. Clonidine also significantly attenuates the haemodynamic changes during laryngoscopy and intubation. Thus we conclude that Dexmedetomidine is a better drug to attenuate the haemodynamic response during laryngoscopy and intubation.

Keywords: Dexmedetomidine, Clonidine, hemodynamic response, laryngoscopy and orotracheal intubation.

1. INTRODUCTION

Since the time of introduction of endotracheal intubation in anaesthesia in the last quarter of the 19th century it has become one of the frequently performed procedures in the practice of anaesthesia.

Endotracheal intubation is the translaryngeal placement of a tube into the trachea via nose or mouth. The technique of laryngoscopy and intubation induces noxious stimuli that lead to extreme haemodynamic stress which is associated with intense sympathetic activity marked by tachycardia and hypertension¹.

The increase in pulse rate and blood pressure are usually transitory, variable & unpredictable. Normal, healthy persons tolerate this response, but in susceptible and high risk individuals, this transient sympathetic response can evoke life-threatening conditions.

Various non-pharmacological & pharmacological methods have been used to attenuate the haemodynamic response to laryngoscopy & endotracheal intubation.

Alpha-2 agonists have been used for attenuating the sympathetic response and among alpha-2 agonist both Clonidine and Dexmedetomidine appear to fulfil all the above criteria. Both drugs have actions on both alpha-1 and alpha-2 receptors but dexmedetomidine is highly specific and selective alpha-2 adrenoceptor agonist with alpha2:alpha1 binding selectivity ratio of 1620:1 compared to 220:1 for clonidine.

Aim and objectives:

- 1) To evaluate the effects of haemodynamic changes during Laryngoscopy and tracheal intubation using inj. dexmedetomidine and inj. clonidine.
- 2) To compare haemodynamic changes during Laryngoscopy and tracheal intubation using inj. dexmedetomidine and inj. clonidine.
- 3) To compare the side effects.

2. MATERIAL AND METHOD

The study was conducted on patients undergoing laryngoscopy and tracheal intubation in elective surgeries under general anaesthesia.

After approval of the institutional ethical committee, this prospective observational study was conducted on 60 patients in the age group of 20 to 50 years, ASA Grade I & II of either sex, undergoing elective surgeries under general anesthesia.

Patients were divided in to two groups comprising 30 patients each:-

Group (D) Dexmedetomidine Group were given injection Dexmedetomidine 0.5mcg/kg diluted to 20ml with normal saline over 10 minutes

Group (C) Clonidine group were given injection Clonidine 1mcg/kg diluted to 20ml with normal saline over 10 minutes.

Material:- The study includes drugs dexmedetomidine hydrochloride 100mcg/ml 1ml vial and injection clonidine hydrochloride 150mcg/ml 1ml ampoule

Patient Exclusion Criteria:

- 1) Stenosis, Left ventricle failure, Atrioventricular conduction block, asthma, chronic obstructive pulmonary disease, any liver or renal disease
- 2) Patient taking antihypertensives, analgesics, sedatives, beta-blockers.

On the day prior to surgery pre anesthetic evaluation was done and patients were explained about the procedure and technique and written informed consent was taken.

All routine investigations like Complete blood count, Urine (r & μ), Blood urea, creatinine, Blood sugar, Electrocardiogram were done prior to surgery.

Pre-Medication:

All patient were given Injection glycopyrolate 0.2mg Intravenous, and injection Ondansetran 4mg intravenous, Injection Ranitidine Hydrochloride 50mg intravenous before infusion.

Technique and Method:-

On the day of surgery, Anaesthesia machine and circuits were checked, resuscitation equipments were kept ready. after confirmation of Nill per oral status, patients were shifted to the operating room and connected to monitor.

Preoperative base line parameters, were recorded after 5 minute of settling in the operative room and also after infusion of Dexmedetomidine./Clonidine (T1)

All patient received Injection Pentazocine 0.3mg/kg and were pre-oxygenated for 3min. Anaesthesia was induced with thiopantone sodium (2.5% 5mg/kg intravenous) till loss of eyelash reflex over 30 second and mask ventilation was confirmed. Injection succinylcholine 1.5mg/kg was given to facilitate laryngoscopy and intubation. At the onset of apnea using laryngoscopy intubation was done with a well lubricated appropriate size cuffed endotracheal Tube and anaesthesia was maintained with oxygen nitrous oxide, halothane with intermittent use of inj. Atracurium and controlled ventilation.

At the end of surgery the neuromuscular blockade was antagonized with inj. Glycopyrolate (.01mg/kg) intravenous and injection Neostigmine(.05mg/kg)intravenous and patient were extubated after complete reversal of neuromuscular blockade.

Data Collection

Sequence	TIME	SBP	DBP	HR
Basal reading when pt.is shifted to OT(T0)				
After Induction (T1)				
After intubation(T2)				
At 2 min after intubation(T3)				
At 6 min after intubation(T4)				
At 10 min after intubation(T5)				

Statistical Analysis Plan: Statical analysis was done using statistical package for social sciences version 15.0.chi-square test, Unpaired t-test were used.

3. OBSERVATIONS AND RESULTS

Observation duly recorded, have been tabulated and statistically analyzed in this section. Comparison of quantitative data between groups was done by unpaired t-test. A $p < 0.05$ was considered clinically significant.

Table 1: Demographic profile of patients:

Demographic profile	Dexmedetomidine-Group Mean \pm SD	Clonidine-Group Mean \pm SD	p-value
Age(yrs)	32.06 \pm 4.96	32.13 \pm 5.34	>0.05
Gender(M:F)	17:13	18:12	>0.05
Weight(kg)	48.13	48.06	>0.05

Inference:- Demographic profile in term of age ,sex, weight were comparable in both the groups.

P-values;- $p > 0.05$ - Statistically not significant (NS),

$p < 0.05$ - Statistically significant (S),

$p < 0.01$ - Statistically highly significant (HS),

$p < 0.001$ - Very highly significant.

Table 2: Age distribution in two groups

Age Group (in years)	Dexmedetomidine-Group		Clonidine-Group	
	No. of Pts.	%	No.of Pts.	%
20-29	11	36.66	10	33.33
30-39	15	50	15	50

40-49	04	13.33	05	16.66
Mean age and SD of Patients	32.06±4.96		32.13±5.34	
p value >0.05				

The above table shows age wise distribution in both the groups. the minimum age in Dexmedetomidine and Clonidine groups were 26 and 25 years respectively. the maximum age in Dexmedetomidine and Clonidine groups were 44 and 45 years respectively. there was no significant difference in the age of patients between the group-D and group-C. both group were similar with respect to age distribution

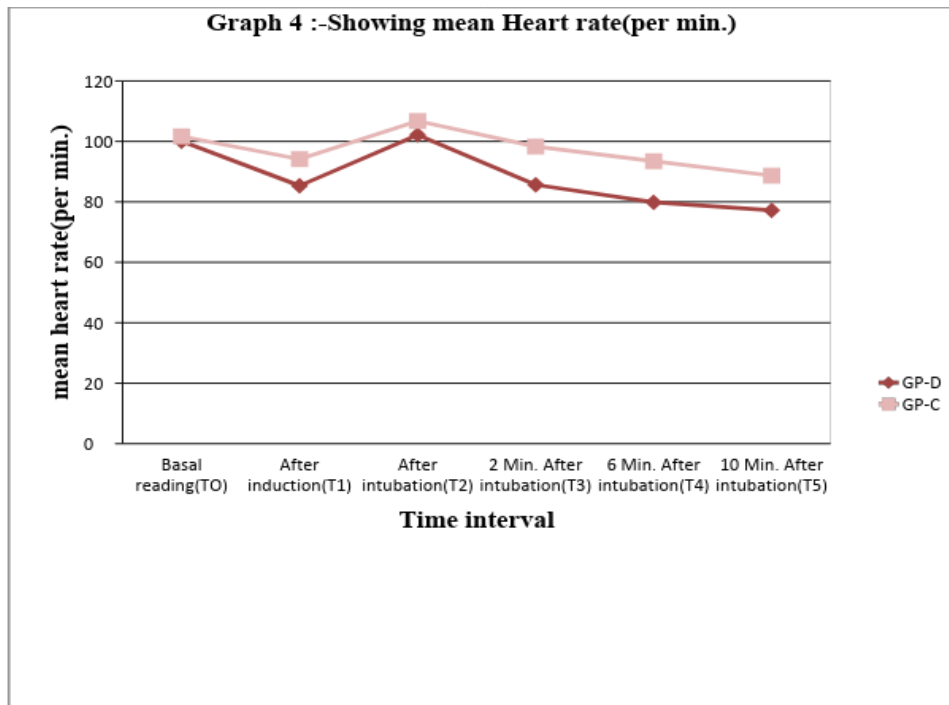
Table 3: Showing Mean Heart rate of patients in both the groups

Time	Dexmedetomidine-Group		Clonidine-Group		P-Value
	mean ±SD	% Change from baseline	mean ±SD	% Change from baseline	
Basal reading when pt.is shifted to OT(T0)	100.06 ±4.56		101.66 ±1.74		>0.05
After induction(T1)	85.33 ±3.30	14.72	94.13 ±1.67	7.40	<0.05
After intubation(T2)	102.13 ±3.30	2.06	106.73 ±2.11	3.01	<0.01
At 2 minute after intubation(T3)	85.63 ±3,03	14.42	98.93 ±1.36	3.30	<0.05
At 6 minute after intubation(T4)	79.83 ±4.21	20.21	93.43 ±1.38	8.09	<0.05
At10 minute after intubation (T5)	77.16 ±2.90	22.88	88.66 ±1.39	12.78	<0.05

Inference:-

The baseline heart rate was comparable in both the group(p>0.05).

At the time of laryngoscopy and intubation, heart rate increased in both Dexmedetomidine & Clonidine group but more in Clonidine group (p<0.01). There was continuous decrease in heart rate at 2,6,10 minutes after intubation in both groups, but the mean heart rate at any time was lower in the Dexmedetomidine group than in the Clonidine group which was statistically significant (p<0.05).



GRAPH SHOWING MEAN HEART RATE OF BOTH THE GROUP

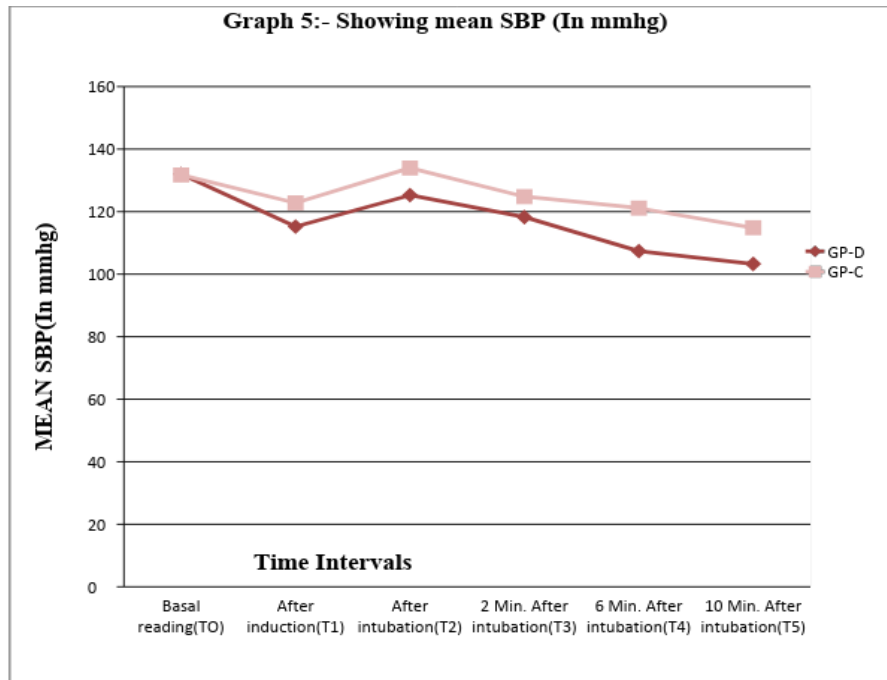
Table 4: Showing mean systolic blood pressure (in mmHg) of patients in both the groups

Time	Dexmedetomidine-Group		Clonidine-Group		P-value
	mean±SD	% Change from baseline	mean±SD	% Change from baseline	
Basal reading when pt.is shifted to OT(T0)	132±1.72		131.73±2.54		>0.05
After induction(T1)	115.2±2.73	12.72	122.8±5.24	6.77	<0.05
After intubation(T2)	125.26±3.58	5.10	133.96±2.49	1.69	<0.01
At 2 Minute after intubation(T3)	118.26±3.87	10.15	124.8±3.54	5.48	<0.05
At 6 minute after intubation(T4)	107.36±2.93	18.66	121.13±4.94	8.04	<0.05
At10 minute after intubation(T5)	103.26±1.85	21.77	114.86±2.82	12.80	<0.05

Inference:-

The baseline SBP were comparable in both the group($p>0.05$). At time of laryngoscopy and intubation, SBP increased in both Dexmedetomidine & Clonidine group but more in Clonidine group ($p<0.01$). There was continuous decrease in SBP at 2,6,10 minutes after

intubation in both groups but the mean SBP at any time was lower in the Dexmedetomidine group than in the Clonidine group which was statistically significant ($p < 0.05$).



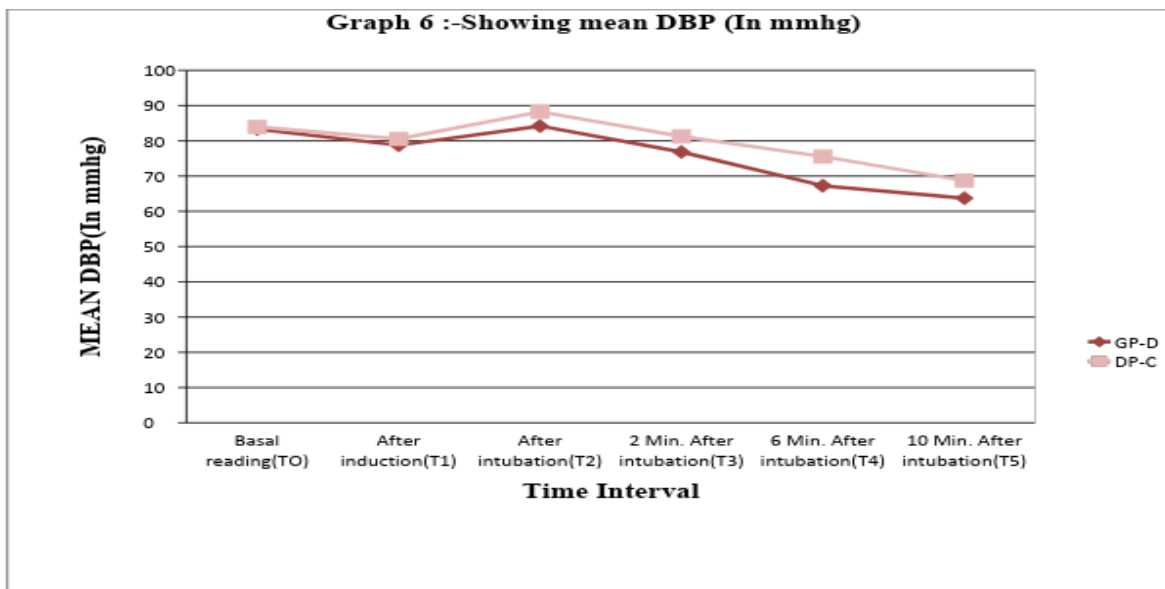
ABOVE GRAPH SHOWING MEAN SBP OF BOTH THE GROUP

Table 5: Showing mean Diastolic blood pressure (in mmHg) of patients in both the groups

Time	Dexmedetomidine-Group		Clonidine-Group		P-value
	mean±SD	% Change from baseline	Mean±SD	% Change from baseline	
Basal reading when pt. shifted to OT (T0)	83.33±3.74	-	83.93±4.50	-	>0.05
After induction(T1)	78.76±2.62	8.02	80.53±5.30	4.05	<0.05
After intubation(T2)	84.20±4.00	1.33	88.26±4.37	5.32	<0.01
At 2 Minute after intubation(T3)	76.83±4.15	10.09	81.26±4.85	3.18	<0.05
At 6 Minute after intubation(T4)	67.26±2.51	21.29	75.56±7.36	9.97	<0.05
At 10 Minute after intubation (T5)	63.73±2.65	25.42	68.73±7.30	18.11	<0.05

Inference:-

The baseline DBP were comparable in both the group($p>0.05$). At time of laryngoscopy and intubation, DBP increase was seen in both Dexmedetomidine & Clonidine group but more in Clonidine group ($p<0.01$). There was continuous decrease in DBP at 2,6,10 minutes after intubation in both groups, but the mean DBP at any time was lower in the Dexmedetomidine group than in the Clonidine group which was statistically significant ($p<0.05$).



ABOVE GRAPH SHOWING MEAN DBP OF BOTH THE GROUP

Table 6: Showing complication of patients in both the groups

COMPLICATION	Dexmedetomidine-group	Percentage (%)	Clonidine-group	Percentage (%)
Hypotension	-	-	2	6.66
Bradycardia	1	3.33	1	3.33

The above table showing that in Dexmedetomidine Group 1 patient had bradycardia intraoperatively which was statistically insignificant. it was immediately corrected with atropine 0.6 mg. In the Clonidine group 2 patients developed hypotension . it responded with 500ml of intravenous ringers lactate administration within 10 minutes . 1 patient had bradycardia it was immediately corrected with atropine 0.6 mg. it was also statistically insignificant.

Result

Both groups were comparable in their age, gender and body weight distribution ($p>0.05$). The basal mean HR \pm SD in the present study Group D and Group C was 100.06 \pm 4.56 and 101.66 \pm 1.74 bpm respectively.

Both groups had rise in HR after intubation that was 2.06% in group D and 3.01% in group C and difference was statistically highly significant ($p<0.01$).

Difference in HR between two groups remained statistically significant at 2,6 and 10 min after intubation ($p<0.05$).

The basal mean SBP in the present study in, Group D and Group C were 132 \pm 1.72, 131 \pm 2.54 mmHg respectively.

Both group had maximum rise in SBP after intubation that was 5.10% in group D and 1.69% in group C which was statistically highly significant ($p<0.01$).

Difference in SBP between two groups remained statistically significant at 2,6and 10 min after intubation ($p<0.05$).

The basal mean \pm SD, DBP in the present study in Group D and Group C were 83.46 \pm 3.74, 83.93 \pm 4.50 mmHg respectively.

Both group had maximum rise in DBP after intubation that was 1.33% in group D and 5.32% in group C which was statistically highly significant ($p<0.01$).

Difference in DBP between two groups remained statistically significant at 2, 6 and 10 min after intubation($p<0.05$).

In Dexmedetomidine group no any patients had hypotension and one patient had bradycardia, while in Clonidine group 2 patients had hypotension and 1patient had bradycardia.

4. DISCUSSION

Laryngoscopy and tracheal intubation are considered as the most critical events during administration of general anaesthesia as they provoke transient but marked sympatho-adrenal response manifesting as hypertension and tachycardia. Many drugs have been tried by various authors for blunting haemodynamic responses to laryngoscopy and intubation like Recently α -2 agonists like clonidine and dexmedetomidine have been tried for suppressing the response to intubation and have been found to have better effects compared to all the drugs mentioned above, without any of the side effects like respiratory depression or increased incidence of post operative nausea and vomiting.

Demographic criteria:-

Two groups were comparable and there was no statistically significant Difference between the mean ages,sex and weight .

In this study optimal age range was 20 to 50 years. The mean values of age with standard deviations are 32.06 \pm 4.96 and 32.13 \pm 5.34 for Dexmedetomidine and Clonidine groups respectively. there were no significant difference between two groups. ($P>0.05$)

Similar to our study Dr A Venkateswara et al found mean values of age with standard deviations are 32.1 \pm 8.8, 35.8 \pm 9.6, and 33.4 \pm 9.2 for normal saline, Dexmedetomidine and Clonidine groups respectively. there is no statistically significant difference between three groups. ($P=0.28$)

Heart rate changes:-

The basal mean HR \pm SD in the present study Group D and Group C was 100.06 \pm 4.56 and 101.66 \pm 1.74 bpm respectively.

After intubation in Group D there was only 2.06%(102.13 \pm 3.30) increase in mean HR was observed from its basal value(100.06 \pm 4.56), whereas in Group C there was 3.01% (106.73 \pm 2.11) increase in mean HR was observed from its basal value (101.66 \pm 1.74), which was statistically highly significant compared to Group-D (P<0.01).

At 2,6 minutes after intubation in Group D there was only 14.42%(85.63 \pm 3.03), 20.21%(79.83 \pm 4.21) respectively decrease in mean HR was observed from its basal value(100.06 \pm 4.56), whereas in Group C there was 3.30%(98.93 \pm 1.36), 8.09%(93.43 \pm 1.38) respectively decrease in mean HR was observed from its basal value(101.66 \pm 1.74), which was statistically significant compared to Group-D (P<0.05)

Similar to our result; Shrisendu et al ,has also found statistically significant rise in HR during intubation in clonidine group compare to dexmedetomidine. In his study this statistically significant higher HR in clonidine group last upto 3 min after intubation.

Scheinin et al reported that use of α 2 agonist leads to bradycardia. During intubation there was rise in heart rate in both the groups which was more in group C compare to group D and this rise in HR in group C was statistically significant (p< 0.05)

Systolic blood pressure changes:-

The basal mean SBP in the present study in, Group D and Group C were 132 \pm 1.72, 131 \pm 2.54 mmHg respectively.

After intubation in Group D there was 5.10%(125.26 \pm 3.58) increase in mean SBP was observed from its basal value(132 \pm 1.72), in Group C there was 1.69%(133.96 \pm 2.49)increase in mean SBP was observed from its basal value(131.73 \pm 2.54), which was statistically highly significant compared to Group-D (P<0.01).

At 2, 6, minutes after intubation in Group D there was 10.15%(118.26 \pm 3.87), 18.66(107.36 \pm 2.93) respectively decrease in mean SBP was observed from its basal value(132 \pm 1.72). whereas in Group C there was 5.48%(124.8 \pm 3.54) ,8.04%(121.13 \pm 4.94) respectively decrease in mean SBP was observed from its basal value(131.73 \pm 2.54),which was statistically significant compared to Group-D (P<0.05).

Similar to our study Shirsendu et al The changes in the SBP and their statistical comparisons indicates that though there was an increase in SBP in all three groups, measured 1 min after drug administration, the difference was not significant. The attenuation of the SBP was highly significant in the dexmedetomidine group as compared to that in the clonidine group (p<0.05 at intubation, 1 and 3 min and p<0.001 at 5 and 10 min).

Similar to our result; Sameer Arora et al, also found that during intubation both groups had maximum rise in SBP but this was more in Group C than in Group D. There was 6% (133.1 \pm 0.9132) rise in SBP in Group D from baseline (126.1 \pm 1.281) SBP whereas Group C had 15% (140.3 \pm 1.283) rise from its baseline(122.5 \pm 1.189), which was statistically highly significant (p<0.001)

Similar to our study; Celik et al found fall in BP after infusion of Dexmedetomidine and **Gupta et al** found fall in BP with Clonidine .

Diastolic blood pressure changes:-

The basal mean \pm SD, DBP in the present study in Group D and Group C were 83.46 \pm 3.74, 83.93 \pm 4.50 mmHg respectively.

After intubation in Group D there was 1.33%(84.33 \pm 4.00) increase in mean DBP compared to basal value (83.46 \pm 3.74), Group C there was 5.32% (88.4 \pm 4.37) increase in mean DBP compared to basal value(83.93 \pm 4.50), which was statistically highly significant from compared to Group-D (P<0.05).

At 2,6 minutes after intubation in Group D there was 10.09% (76.83 \pm 4.15), 21.29%(67.26 \pm 2.51) respectively decrease in mean DBP was observed from its basal value (83.46 \pm 3.74) ,in Group C there was 3.18 % (81.26 \pm 4.85), 9.97 % (75.56 \pm 7.36) respectively decrease in mean DBP compared to basal value (83.93 \pm 4.50) ,which was statistically significant compared to Group-D (P<0.05).

Similar to our result; Sameer Arora et al, has also found during intubation both groups had maximum rise in DBP but this was more in Group C than in Group D. There was 8.90% (88.07 \pm 1.27) rise in DBP in Group D from baseline (80.87 \pm 1.67) DBP whereas Group C had 12.84% (92.00 \pm 0.99) rise from its baseline(81.53 \pm 1.04), which was statistically highly significant (p<0.001).

Similar to our study; N K kalra et al, observed that the DBP of the group receiving 1.5 μ g/kg of clonidine was significantly lower than the group receiving clonidine 1 μ g/kg.

5. CONCLUSION

Following conclusion are drawn from the present study:-

- Dexmedetomidine and Clonidine significantly attenuates the haemodynamic changes during laryngoscopy and intubation.
- Dexmedetomidine is more effective than Clonidine in attenuation of haemodynamic changes during laryngoscopy and intubation.
- Thus we conclude that Dexmedetomidine is a better drug to attenuate the haemodynamic response during laryngoscopy and intubation.

6. REFERENCES

1. Fox EJ, Sklar GS, Hill CH, Villanueva R, King BD. Compilation related to the pressor response to endotracheal intubation, *Anesthesiology*. 1977;47:524-5.
2. Karl et al Insertion of LMA in place of endotracheal intubation to attenuate the cardiovascular response. *IJA*, 1999;43:30-35.
3. Kumar et al- Blocking Glossopharyngeal & superior laryngeal nerve to attenuate the cardiovascular response to laryngoscopy & endotracheal intubation. *IJA*, 1993;41:20-25
4. KING BD, HARRIS LC, Jr, GREIFENSTEIN FE, ELDER JD, Jr, DRIPPS RD. Reflex circulatory responses to direct laryngoscopy and tracheal intubation performed during general anesthesia. *Anesthesiology*. 1951 Sep;12(5):556–566.
5. Denlinger JK, Ellison N, Ominsky AJ. Effects of intratracheal lidocaine on circulatory responses to tracheal intubation. *Anesthesiology*. 1974 Oct;41(4):409–412.

6. Stoelting RK. Blood pressure and heart rate changes during short duration laryngoscopy for tracheal intubation. Influence of viscous or intravenous lidocaine. *Anaesthesia analgesia*. 1978;57:197-9.
7. Dahlgreen N, Messeter K. Treatment of the stress response to laryngoscopy and intubation with Fentanyl. *Anaesthesia*. 1981;36:1022.
8. Fuji Y, Tanaka H, Saitoh Y, Toyooka H. Effects of Calcium channel blockers on circulatory response to tracheal intubation in hypertensive patients: Nicardipine vs Diltiazem. *Canadian Journal of Anaesthesia*. 1995;42:785-8.
9. Martin DE, Rosenberg H, Aukburg SJ, Bartkowski RR, Edwards MW Jr, Greenhow DE, et al. Low-dose fentanyl blunts circulatory responses to tracheal intubation. *Anesth Analg* 1982;61:680-4
10. Ebert JP, Pearson JD, Gelman S, Harris C, Bradley EL. Circulatory responses to laryngoscopy: The comparative effects of placebo, fentanyl, and esmolol. *Can J Anaesth* 1989;36:301-6.
11. Prys-Roberts C, Foex P, Biro GP. Studies of anaesthesia in relation to hypertension versus adrenergic β receptor blockade. *British Journal of Anaesthesia*. 1973;45:671-80.
12. McCammon RL, Hilgenberg JC, Stoelting RK. Effect of Propranolol on circulatory responses to induction of diazepam- nitrous oxide anesthesia and to endotracheal intubation. *Anesthesia analgesia*, 1981 Aug; 60(8): 579-83.