ISSN: 0975-3583, 0976-2833 VOL14, ISSUE12, 2023

COMPARISON OF HAEMODYNAMIC CHANGES DURING ENDOTRACHEAL INTUBATION AMONG MALE SMOKERS AND NONSMOKERS UNDERGOING ELECTIVE SURGERY UNDER GENERAL ANAESTHESIA-AN OBSERVATIONAL CLINICAL STUDY IN A TERTIARY CARE CENTRE

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ABSTRACT

Aim: The aim of the present study was to compare the change in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure during endotracheal intubation among smokers and non-smokers undergoing elective surgery under general anaesthesia.

Methods: 110 male patients (55 smokers and 55 nonsmokers) of ASA I or II scheduled for elective surgeries requiring general anaesthesia in Sapthagiri Institute of Medical Sciences and Research Centre, Bangalore, were enrolled in the study. On the day of surgery, heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure were measured 3 minutes before intubation, at the completion of intubation and every minute for the first 5 minutes after intubation and in every 5 minute for initial 20 minutes.

Results: Among smokers the increase in heart rate was higher and statistically significant (<0.001) when compared with nonsmokers immediately following intubation and persisted till next 20 minutes. The change in systolic blood pressure, diastolic blood pressure and mean arterial blood pressure were higher and statistically significant (<0.001) among smokers when compared with nonsmokers for initial 15-20 minutes following laryngoscopy.

Conclusion: The study concludes that smokers have a significantly exaggerated haemodynamic response immediately after intubation than nonsmokers, which last up to next 15-20 minutes in terms of tachycardia and hypertension. Thus, abstinence of smoking is mandatory to reduce morbidities and mortality associated with smokers undergoing general anesthesia.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE12, 2023

Keywords: General anaesthesia; Smoking; Endotracheal intubation

1. INTRODUCTION

The recent developments in intravenous anesthetics have allowed intravenous anesthetics to move from being complimentary to becoming the main anesthetics during surgery. Propofol and remifentanil's context-sensitive half times are short. So, in the setting of total intravenous anesthesia, even when the anesthesia is performed over a long period of time, the recovery time is quite short compared to that of inhalational anesthetics.[1] Remifentanil is an opioid with one of the shortest context-sensitive half times. During endotracheal intubation, it inhibits the activation of the sympathetic nervous system and prevents increases of the blood pressure and heart rate. Much research has been done on the optimal dose for the effects.[2] There are many reports of clinical situations where certain dosage amounts of remifentanil suppressed the hemodynamic and cardiovascular responses from endotracheal intubation in hypertensive patients[3], elderly patients[4] and diabetic patients.[5]

Smokers are known to have an extremely increased cardiovascular response compared to that of nonsmokers.[6,7] Yet, there have hardly been any reports on the appropriate dosages of remifentanil for smokers and nonsmokers to repress the cardiovascular response to endotracheal intubation. For smokers, endotracheal intubation increases the myocardial oxygen demand, but it constricts the coronary artery, which elevates vascular resistance and reduces the blood flow rate.[8] So preventing the hemodynamic changes due to endotracheal intubation is very important. Endotracheal intubation is an essential manipulation in respiratory failure or general anesthesia, but the resulting hemodynamic response and complications can cause serious problems for the patient. The force applied by the laryngoscope during endotracheal intubation and the irritation caused when the tube enters the trachea, expansion of the cuff, and pressure on the ring cartilage, among other factors, can stimulate the autonomic nervous system, resulting in hemodynamic changes in the patient, and can also cause cerebral hemorrhage or aneurysm rupture in patients with cerebrovascular disease.[9,10]

Endotracheal intubation is a commonly used, necessary maneuver for securing the airway when inducing general anesthesia. However, endotracheal intubation causes the stimulation of the sympathetic nervous system, which increases the plasma catecholamine level and this can cause an elevated blood pressure and tachycardia.[11] Most myocardial ischemia that occurs during anesthesia is related to endotracheal intubation and especially to tachycardia.[12] So it is important to prevent hemodynamic changes during anesthetic induction.

The aim of the present study was to compare the change in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure during endotracheal intubation among smokers and non-smokers undergoing elective surgery under general anaesthesia.

2. MATERIALS AND METHODS

All patients aged 18-70 years undergoing elective surgery under general anaesthesia in sapthagiri institute of medical sciences and research Centre, Bangalore were taken for this observational clinical study from December 2019-November 2021. The inpatients who were scheduled to undergo elective surgery under general anasesthesia in Sapthagiri Institute of Medical Sciences and research Centre, Bangalore, Karnataka under Department of Anaesthesiology. 110 male patients of ASA 1 and ASA 2 grade posted for elective surgery requiring general anaesthesia in Sapthagiri Institute of Medical Sciences and Research Centre,

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Bangalore were enrolled into study. Out of the 110 patients, Group A included 55 male smokers and Group B included 55 male nonsmokers.

INCLUSION CRITERIA:

- Male Patients aged 18-70 years undergoing elective surgeries under general anaesthesia
- American society of anaesthesiologist grade 1 and 2
- Smokers using >10 cigarettes per day for atleast 5 years or smoking index >50
- Smokers with a period of abstinence of more than or equal to 2 hours before surgery
- Patients who have never smoked

EXCLUSION CRITERIA:

- Patients with persistent preinduction systolic blood pressure >160 mm hg and diastolic blood pressure >90 mm hg
- Patients with BMI (body mass index)>35 kg/m^2
- Smokers with a smoking index of less than or equal to 50
- Smokers with a period of abstinence of more than or equal to 6 months before surgery
- Patients taking any medications affecting heartrate or blood pressure
- Anticipated difficult intubation

3. METHODOLOGY:

The institutional research methodology and ethics committee approval and clearance was obtained for the study. Routine preanesthetic checkup was done and only those patients who met the inclusion and exclusion criteria were included in the study. They were briefed on the procedure involved in the study, and the informed written consent was obtained from the participant. All patients underwent pre-anaesthetic checkup, where a detailed history regarding smoking status and duration of abstinence from smoking along with any other comorbidities were taken. General physical examination of the patients was performed along with all relevant investigations. All patients were kept nil per oral for atleast 8 hours before surgery. In preoperative ward 18G IV cannula was secured and infusion of normal saline was given at maintenance flowrate. After shifting patient to the operating table, all basic monitoring devices were attached including ECG, pulse oximeter, ETCO2(End tidal carbondioxide) and NIBP. All patients were given premedication of Inj.Midazolam 1 mg IV, Inj.Glycopyrrolate 0.2 mg IV, Inj.Ondansetron 4 mg IV, Inj.Fentanyl 2mcg/kg IV; After a 5 min stabilization period, baseline measurement of heart rate, systolic Blood pressure, diastolic blood pressure and mean arterial pressure were recorded. Following preoxygenation for 3 minutes, patient induced with intravenous propofol 2mg/kg over a period of 1 minute and intubation facilitated with Inj.vecuronium 0.1 mg/kg intravenously. Patients are ventilated manually by a facemask for 3 minutes. Laryngoscopy performed with Macintosh blade of size 3 or 4 and intubated with appropriate sized Cuffed endotracheal tube. The interval between the onset of laryngoscopy and completion of tracheal intubation was recorded. Anaesthesia was maintained using oxygen(O2) and nitrous oxide(N2O) (50:50) and sevoflurane (0.4%- 2%) with closed circuit using total fresh gas flow of 5L/min. Haemodynamic parameters-heart rate, systolic, diastolic and mean arterial pressure was measured 3 min before intubation, at the completion of intubation and every minute for the first 5 minutes after intubation and every 5 minutes for next 15 minutes. These measurements were recorded by an investigator, who were unaware of the study groups to reduce bias.

STUDY VARIABLES EXPOSURE VARIABLE:

- Smoking

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OUTCOME VARIABLE:

- Heart rate
- Systolic blood pressure
- Diastolic Blood pressure
- Mean Arterial Pressure

OTHER VARIABLES:

- Age
- BMI
- Smoking Index
- ASA Grade
- Modified Mallampati Score
- Cormack-Lehane Grading
- Interval between the onset of laryngoscopy and completion of tracheal intubation

STATISTICAL METHODS AND ANALYSIS

Data was analyzed using R software version 4.1.1. R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/. All categorical data was presented using Frequency and percentage and all continuous measurements was summarized using Mean±SD after assessing normality assumption using Shapiro wilk test. Each clinical factors were compared between Smokers and Non-smokers using Chi-square test for categorical factors and independent sample T-test for continuous measures factors. The trend of haemodynamic parameters such as Heart rate, Systolic Blood pressure, Diastolic Blood pressure and Mean arterial pressure were compared between Smokers and Non- Smokers using linear mixed models. P-Value is considered significant at 5% level of significance for all comparisons.

4. RESULTS

Table 1: Baseline characteristics

Variables	GROUP		TOTAL	P-VALUE
	SMOKER	NON-SMOKER		
AGE				
<=25YEARS	5 (9%)	7 (13%)	12 (11%)	0.498
26-45YEARS	28 (51%)	32 (58%)	60 (55%)	
46-70YEARS	22 (40%)	16 (29%)	38 (34%)	
TOTAL	55 (100%)	55 (100%)	110 (100%)	
BMI				
NORMAL	32 (58%)	35 (64%)	67 (61%)	0.558
OVERWEIGHT	23 (42%)	20 (36%)	43 (39%)	
TOTAL	55 (100%)	55 (100%)	110 (100%)	
ASA				
1	0 (0%)	32 (58%)	32 (29%)	0.444
2	55 (100%)	23 (42%)	78 (71%)	
TOTAL	55 (100%)	55 (100%)	110 (100%)	
CORMACK-				

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LEHANE				
1	24 (44%)	23 (42%)	47 (43%)	0.425
2A	23 (42%)	25 (45%)	48 (44%)	
2B	8 (15%)	7 (13%)	15 (14%)	
TOTAL	55 (100%)	55 (100%)	110 (100%)	

Among the smokers 9% were between the age of 18 and 25 years; 51% were between the age of 26 and 45 years and 40% were between the age of 46 and 70 years. Among non-smokers 13.l % were between the age of 18 and 25 years; 58 % were between the age of 26 and 45 years and 34% were between the age of 46 and 70 years. Since majority of subjects belonged to age group 26-45 years the result of this study is mainly applicable to this age group. Among the smokers 42% were overweight and 58% are of normal weight. Among non-smokers 39% were overweight and 61% are of normal weight. ASA status and Mallampati score are predictors of difficult airway and a difficult intubation. All smokers being ASA 2 and among non-smokers majority are ASA grading 1(58%) and with a p value of 0.444 and which difference was statistically not significant. Cormack-lehane grading indicates difficulty in visualization of the vocal cords. Among the two groups the Cormack-lehane grading was also comparable and difference is statistically not significant (P-value-0.425).

Table 2: Comparison of heart rate at different interval of time among smokers and non-smokers

TIME	**HEART RATE**		**P-VALUE ¶**	**MEAN DIFFERENCE OF MEAN CHANGE FROM BASELINE**		**P-VALUE ¶**
	SMOKERS	**NON-SMOKERS**		**MEAN**	**95% C. I**	
BASELINE	77.56±9.26	77.8±10.55	<0.001	-	-	-
AT INTUBATION	108.11±6.43	91.33±12.89		17.02	(13.66,20.38)	<0.001
1 MIN	100.06±6.53	88.11±12.46		12.18	(8.82,15.54)	<0.001
2 MIN	97.33±7.53	85.8±14.58		11.76	(8.4,15.13)	<0.001
3 MIN	95.2±8.51	82±13.13		13.44	(10.07,16.8)	<0.001
4 MIN	90.98±14.6	80.42±12.09		10.8	(7.44,14.16)	<0.001
5 MIN	90.46±10.21	78.24±11.77		12.45	(9.09,15.82)	<0.001
10 MIN	88.26±9.52	77.49±10.35		11	(7.64,14.36)	<0.001

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15 MIN	86.96±9.03	75.67±8.53		11.53	(8.17,14.89)	<0.001
20 MIN	84.09±9.26	74.82±7.6		9.51	(6.15,12.87)	<0.001

The mean baseline heart rate of smokers were 77.56 (SD 9.26) and of nonsmokers were 77.8 (SD 10.55) and the difference was not significant statistically. Both smokers and nons mokers showed increase in heart rate after intubation with a maximum heart rate being at the completion of intubation. The mean heart rate at 1 minute after intubation of smokers were 100.06(SD 6.53) which was higher when compared with non-smokers 88.11(SD 12.46) and was statistically significant (p<0.001).

Table 3: Comparison of systolic blood pressure at different interval of time among smokers and non-smokers

TIME	**SBP**		**P-VALUE ¶**	**MEAN DIFFERENCE OF MEAN CHANGE FROM BASELINE**		**P-VALUE ¶**
	SMOKERS	**NON-SMOKERS**		**MEAN**	**95% C. I**	
BASELINE	115.6±11	114.36±7.35		-	-	-
AT INTUBATION	141.56±7.47	127.6±10.33		12.73	(8.77,16.69)	<0.001
1 MIN	137.26±7.88	123.31±10.06		12.71	(8.75,16.67)	<0.001
2 MIN	132.82±10.25	120.38±14.12		11.2	(7.24,15.16)	<0.001
3 MIN	129.38±10.61	116.38±9.49		11.76	(7.81,15.72)	<0.001
4 MIN	126.91±9.72	114.31±8.83		11.36	(7.41,15.32)	<0.001
5 MIN	125.2±12.18	113.27±8.14	<0.001	10.69	(6.73,14.65)	<0.001
10 MIN	122.82±10.28	111.66±8.96		9.93	(5.97,13.89)	<0.001
15 MIN	120.87±10.54	111.26±6.8		8.38	(4.42,12.34)	<0.001

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20 MIN	118.13±9.14	111.36±5.66		5.53	(1.57,9.49)	0.006

The mean baseline systolic blood pressure of smokers is 115.6 (SD 11) and that of nonsmokers 114.36(SD 7.35) but the difference was not statistically significant. The mean systolic blood pressure at I minute, 2 minutes, 3 minutes,4-minute,5 minutes,10 minutes and 15 minutes after intubation of smokers were 137.26(SD 7.88),132.82(SD 10.25),129.38(SD 10.61),126.91(SD 9.72),125.2(SD 12.18),122.82(SD10.28),120.87(SD 10.54) respectively. The systolic blood pressure at l minute, 2 minutes, 3 minutes, 4 minutes, 5 minutes,10 minutes and 15 minutes after intubation of non- smokers were 123.31 (SD 10.06),120.38(SD 14.12),116.38(SD 9.49),114.31(SD 8.83),113.27(SD 8.14),111.66(SD 8.96) and 111.26(SD 6.8) respectively and the difference was statistically significant (P value <0.001).

Table 4: Comparison of diastolic blood pressure at different interval of time among smokers and non-smokers

TIME	**DBP**		**P-VALUE¶**	**MEAN DIFFERENCE OF MEAN CHANGE FROM BASELINE**		**P-VALUE¶**
	SMOKERS	**NON-SMOKERS**		**MEAN**	**95% C. I**	
BASELINE	77.71±6.13	76.26±6.06	<0.001	-	-	-
AT INTUBATION	103.47±8.14	87.06±10.07		14.96	(11.49,18.44)	<0.001
1 MIN	98.02±8.33	83.78±12.53		12.78	(9.31,16.25)	<0.001
2 MIN	92.95±8.93	78.98±9.69		12.51	(9.04,15.98)	<0.001
3 MIN	89.89±8.75	76.8±8.26		11.64	(8.16,15.11)	<0.001
4 MIN	86.75±7.82	74.42±7.76		10.87	(7.4,14.35)	<0.001
5 MIN	84.67±7.76	72.58±7.43		10.64	(7.16,14.11)	<0.001
10 MIN	81.84±7.94	70.96±7.21		9.42	(5.95,12.89)	<0.001
15 MIN	80.16±8.18	71.4±6.51		7.31	(3.84,10.78)	<0.001
20 MIN	78.11±7.02	72.2±5.7		4.45	(0.98,7.93)	0.012

The mean baseline diastolic blood pressure of smokers were 77.71 (SD 6.13) which was higher than that of nonsmokers 76.26 (SD 6.06) but the difference was not significant statistically. The mean diastolic blood pressure at 1 minute, 2 minutes, 3 minutes and 4 minutes,5 minutes,10 minutes,15 minutes and 20 minutes after intubation of smokers were 98.02(SD 8.33),92.95(SD 8.93),89.89(SD 8.75),86.75(SD 7.82),84.67(SD 7.76),81.84(SD

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7.94),80.16(SD 8.18),78.11(SD 7.02) respectively. The mean diastolic blood pressure at 1 minute, 2 minutes, 3 minutes and 4 minutes,5 minutes,10 minutes,15 minutes and 20 minutes after intubation of non-smokers were 83.78(SD 12.53),78.98(SD 9.69),76.8(SD 8.26),74.42(SD 7.76),72.58(SD 7.43),70.96(SD7.21),71.4(SD 6.51) and 72.2(SD 5.7) respectively.

Table 5: Comparison of mean arterial pressure at different interval of time among smokers and non-smokers

TIME	MAP		P-VALUE ¶	MEAN DIFFERENCE OF MEAN CHANGE FROM BASELINE		P-VALUE ¶
	SMOKERS	NON-SMOKERS		MEAN	95% C. I	
BASELINE	90.42±7.64	87.87±6.73	<0.001	-	-	-
AT INTUBATION	113.51±11.42	98.53±9.71		12.44	(8.96,15.91)	<0.001
1 MIN	109.29±6.2	93.58±10.46		13.16	(9.69,16.64)	<0.001
2 MIN	105.47±8.72	89.98±10.71		12.95	(9.47,16.42)	<0.001
3 MIN	102.27±8.62	88.66±9.38		11.07	(7.6,14.55)	<0.001
4 MIN	99.6±9.34	86.53±9.17		10.53	(7.05,14)	<0.001
5 MIN	97.46±9.45	85.26±8.68		9.65	(6.18,13.13)	<0.001
10 MIN	95.02±7.95	83.86±8.6		8.62	(5.14,12.1)	<0.001
15 MIN	93.06±7.96	83.31±8.02		7.2	(3.72,10.68)	<0.001
20 MIN	91.27±6.84	83.44±6.71		5.29	(1.81,8.77)	0.003

The mean baseline MAP of smokers was 90.42 (SD 7.64) which was higher than that of nonsmokers 87.87 (SD 6.73) but the difference was not significant statistically. The MAP at 2 minutes, 3 minutes, 4 minutes,5 minutes,10 minutes,15 minutes and 20 minutes after intubation of non-smokers were 89.98(SD 10.71),88.66(SD 9.38),86.53(SD 9.17),85.26(SD 8.68),83.86(SD 8.6),83.31(SD 8.02) and 83.44(SD 6.71) respectively. The mean arterial blood pressure of smokers at 1 minute, 2 minutes, 3 minutes ,4 minutes,5 minutes,10 minutes and 15 minutes after intubation was higher when compared with non-smokers and was statistically significant ($p<0.001$).

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5. DISCUSSION

Tobacco use affects most of the major organ system of the body, especially cardiovascular system. Due to effect on sympathetic nervous system[13,14], Nicotine produces hypertension and tachycardia. Carbon monoxide present in cigarette smoke, substitutes oxygen in the molecule of hemoglobin and shifts the oxygen-hemoglobin dissociation curve to the left, and decreases oxygen available to the tissues.[15] Carbon monoxide has a dose-response relationship with the number of cigarettes smoked and its tissue concentration results in an impaired oxygen delivery, producing tissue hypoxia. Cigarette smoke also damages cilia and its endothelial function, leads to increased mucus production, it impairs clearing of secretions, may lead to sputum retention[16], pneumonia, and respiratory failure.[17,18]

Demographic data comparing AGE, BMI, ASA grade, MPC grading, CL grading shows no statistically significant difference among both the groups. In our study, the mean heart rate at the completion of intubation among smokers were 108.11±6.43 when compared with non-smokers 91.33±12.89 and this difference was significant ($p<0.001$) with a higher heart rate for smokers. The mean heart rates were found statistically significant and higher among smokers when compared with non- smokers at 1 minutes, 2 minutes, 3 minutes, 4 minutes, 5 minutes, 10 minutes,15 minutes and 20 minutes after laryngoscopy and also noted a decreasing trend in change in heartrate. In a similar study conducted by study by Jee D et al[19] which studied the intubation response among smokers, selected young males in the age group 20-29 years, didn't find any significant response in heart rate between the two groups even though there was increase in heart rate lasting for 1 min in smokers but in nonsmokers it lasted for more duration (2 minutes). The baseline heart rate was comparable in between the groups at the onset. In the present study also the mean base line heart rate of smokers and nonsmokers were comparable, smokers 77.56 and nonsmokers 77.8. Smokers and nonsmokers b o t h show return of mean heart rate to the preinduction baseline values towards the end of study which is also very similar to that seen in most of the studies.[13,14]

The rise in heart rate immediately after intubation was also reported in studies of Cuvas et al[20] and Erskine RJ et al[21] In the former study the significant change was noted only when the heart rate of male smokers were compared with female nonsmokers. There was no significant change when compared with other groups (male non-smokers and female smokers). Laxton et al[22] it was shown that the heart rate of the smokers on completion of intubation and at 45 seconds after intubation was significantly higher than non- smokers. But their subjects were all females and studies in women had shown that their cardiovascular regulatory functions including baroreflex sensitivity and sensitivity to catecholamines might be different from men.

In another similar study conducted by Meenakshi Agarwal et al[23] in 2019, found that Mean pulse rate was increased in all groups just after intubation and just after extubation but the amplitude of rise was maximum in Group-III (both smokers and tobacco chewers) than smokers (Group II). Least increase was noted among non-smoker group (Group I). In our study, the mean systolic blood pressure at the completion of intubation among smokers was 141.56 (SD 7.47) when compared with non-smokers 127.6 (SD 10.33), which is higher and this difference was significant ($p<0.001$). The mean systolic blood pressure at 1 minute, 2-minute, 3-minute, 4-minute, 5-minute, 10 minute and 15 minutes after laryngoscopy among smokers and non-smokers showed statistically significant (p value <0.001). In our study, the mean baseline diastolic blood pressure of smokers was 77.71 (SD 6.13) which was higher than that of nonsmokers 76.26 (SD 6.06) but the difference was not significant statistically.

The mean diastolic blood pressure of smokers in all instances after laryngoscopy are higher than that of non-smokers, a maximum being at the completion of intubation. The mean diastolic

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blood pressure at the completion of intubation among smokers were 103.47(SD 8.14) when compared with non-smokers 87.06(SD 10.07) was, higher and this difference was significant ($p<0.001$). The mean diastolic blood pressure of smokers at 1 minute, 2 minutes, 3 minutes, 4 minutes, 5 minutes, 10 minutes and 15 minutes after intubation was higher when compared with non-smokers and was statistically significant ($p<0.001$). The increase in Diastolic Blood pressure noted maximum at intubation and immediate 5 minutes following laryngoscopy and was higher and statistically significant when compared to non-smokers till initial 15 minutes following laryngoscopy (p value <0.001). In our study, the mean baseline MAP of smokers was 90.42 (SD 7.64) which was higher than that of nonsmokers 87.87 (SD 6.73) but the difference was not significant statistically.

The mean MAP at the completion of intubation and at 1 minute among smokers were 113.51(SD11.42) and 109.29 (SD 11.42) respectively was higher compared with non- smokers 98.53 (SD 9.71) and 93.58 (SD 10.46) and this difference was statistically significant ($p<0.001$). The mean arterial blood pressure of smokers at 1 minute, 2 minutes, 3 minutes, 4 minutes, 5 minutes, 10 minutes and 15 minutes after intubation was higher when compared with non-smokers and was statistically significant ($p<0.001$). The increase in Mean Arterial pressure (MAP) noted maximum at intubation and immediate 5 minutes following laryngoscopy and was higher and statistically significant when compared to nonsmokers till initial 15 minutes following laryngoscopy (p value <0.001). In another study by Jee D et al[19] also showed statistically significant differences, when smokers and non-smokers were compared for the systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressures (MAP) immediately after intubation. But there is elevation in SBP, DBP and MAP 1 to 5 minutes after intubation. Similar changes were shown in some previous studies[1,2,14] who also didn't get statistically significant changes in various blood pressure recordings post intubation.

6. CONCLUSION

The study concluded that smokers have a significantly exaggerated haemodynamic response immediately after intubation than non-smokers which last up to next 15-20 minutes. The haemodynamic response being in the form of increase in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure, these changes being maximum at the completion of intubation. Thus, abstinence of smoking is mandatory to reduce morbidities and mortality associated with smokers undergoing general anesthesia.

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