

# Study of Intra-Operative and Post-Operative Complications in Asymptomatic Smokers Under General Anaesthesia.

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## ABSTRACT

**Background:** Smoking tobacco is one of the most common addiction habits and the biggest threat to current and future global health. **Methods:** A prospective comparative study was carried out taking 100 adult male patients posted for surgery under G.A and divided into 2 groups Gr-1(n=50) asymptomatic smokers and Gr(2) (n=50) nonsmokers. Haemodynamic and respiratory complications like increase of heart rate, broncho- spasm, arterial desaturation, coughing, increased oral secretions, laryngospasm are compared between 2 groups. **Results:** It was found that respiratory complications like arterial desaturation, bronchospasm, laryngo spasm and coughing are significantly more( $p>0.01$ ) in smoker group compare to nonsmoker. Increase of heart rate also found more in smoker group during laryngoscopy and intubation which also related to duration and frequency of smoking. There is also increased oral secretions in smokers groups. **Conclusion:** In smokers undergoing surgery under G.A, during PAC risk stratification, optimization of co-morbid conditions, early abstinence from smoking should be advised.

**Keywords:** Bronchospasm, Desaturation, General anaesthesia, Smokers

## INTRODUCTION

Smoking is now increasing rapidly throughout the developing world and is one of the biggest threat to current and future global health.<sup>[1]</sup> Cigarette smoking is the most common type of tobacco used. Tobacco smoking a major risk factor for respiratory complications intra & post operatively in patients undergoing surgery under G.A.<sup>[2]</sup> Smoking may be active or passive. Passive smoking is involuntary inhalation of second hand smoke or environmental tobacco smoke by non-smokers. Second hand smoke contains more than 7000 chemical compounds out of which 250 are harmful and more than 60 can cause cancer. Passive smoking is equally hazardous as active smoking. Second-hand smoke is a mixture of two forms of smoke that come from burning tobacco, which may be side stream that comes from the end of lighted cigarette while main stream is exhaled by the smoker. Second hand smoking causes many of the same diseases as direct smoking.

Environmental tobacco smoke can be evaluated by measuring tobacco smoke pollutants found in air or indirectly by measuring specific biological markers like carbon-monoxide, nicotine, thiocyanates and protein. Recently the term third hand smoke was coined to identify the residual tobacco smoke after the cigarette is extinguished and the second hand smoke has cleaned from air.

Cigarette smoke contains over 4000 substances, some of which are pharmacological active, some antigenic, some cytotoxic, some mutagenic and some other are carcinogenic.<sup>[3]</sup>

It contains gaseous phase and a particulate phase. 80-90% of cigarette smoke is gaseous, containing mainly nitrogen, oxygen, and carbon dioxide. Gaseous phase contains carcinogens such as hydrocyanic acid, hydralazine, cillitoxins and irritants such as ammonia, acrolein, and formaldehyde and an agent impairing oxygen transport compound mainly carbon monoxide. In particulate phase the main toxic ingredient is nicotine. It also contains carcinogens such as tar and polynuclear aromatic hydrocarbon and tumour accelerators such as indole and carbazole.

Despite large scale efforts to create awareness about the hazards of smoking, this habit is still in a increasing trend due to changing life style, adopting

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western culture, marital status, employment status etc.

The post-op complications in smokers in comparison to non-smokers has been reported to increase from 1.4 fold to 4.3 fold.<sup>[4]</sup> The risk is more in case of obese patients and most commonly involving respiratory system like laryngospasm, bronchospasm, hypoxemia etc.<sup>[5]</sup> Risk of wound infection and marked hemodynamic changes following tracheal intubation also added complications during peri-operative period.<sup>[6-8]</sup>

Pre-anaesthetic evaluation and risk stratification is considered as an excellent opportunity to communicate, counsel and help the smokers to quit the habit not only for short term benefit during pre-operative period but also from serious health hazards of smoking and different type of nicotine toxicities and ischemic heart disease. All available measures must be taken to help patients to stop smoking. It is imperative to defer certain elective surgical procedure on patients who is unwilling to stop smoking.

This study was designed to record the nature and incidence of intraoperative and postoperative complications in asymptomatic smokers during general anaesthesia in a group of self-identified smokers and compare it with nonsmokers and to formulate strategies for reduction of perioperative complications and optimization.

#### **Aim and Objectives**

Aim of the study is to compare the nature and incidence of intra operative and post-operative complications between asymptomatic smokers and non-smokers under- going surgery under general anaesthesia

### **MATERIALS AND METHODS**

This is a prospective comparative study carried out from July 2014 to September 2016 after obtaining approval from institutional ethical committee and informed written consents from patients. 100 admitted male patients belonging to ASA Grade-i and-ii in the age group of 16-60 yrs posted for surgery under G.A were taken for study out of which 50 are nonsmokers and 50 are asymptomatic smokers.

**Gr-A:** smoker group - who smoke  $\geq 10$  cigarettes per day for 5 years or more and still asymptomatic (n=50).

**Gr B:** Nonsmokers (n=50)

#### **Procedure**

During pre-anaesthetic check-up optimization of co-morbid conditions like mild diabetes mellitus, mild hypertension, mild bronchitis etc was done in case to case basis. Patients are advised to remain nil orally 6 hrs prior to surgery and pre-medicated with tab Alprazolam 0.5mg and tab Ranitidine 150mg on the night before surgery.

On the day of surgery patients were shifted to O.T. 30 minutes before schedule time and I.V line was secured with 18G cannula and an infusion of R.L started. Patients were connected to vital sign monitors like ECG, NIBP, Pulse Oxymeter .All base line values were recorded. All the patients were pre-medicated with Inj. Glycopyrrolate 4 $\mu$ g/kg I.V. , Injection Pentazocine 0.5 mg/kg I.V. , Injection Midazolam 0.05 mg/kg IV and Injection Ondansetron 4mg I.V 15 minutes before induction of anaesthesia. Patients were pre- oxygenated with 100% O<sub>2</sub> for 5 minutes. General anaesthesia was induced with Inj Propofol 2.0mg/kg I.V. Endotracheal intubation was aided by Inj. Vecuronium bromide 0.1 mg/kg I.V. , mask ventilation for 3 minutes followed by gentle and smooth direct laryngoscopy within 15 seconds. Only first attempt of intubation was considered for evaluation of increase in heart rate. After confirmation of correct tube position tube is fixed and connected to ventilator. Anaesthesia was maintained by nitrous oxide and oxygen in ratio of 2:1; Intermittent Positive Pressure Ventillation (IPPV) and intermittent inj. of muscle relaxant vecuronium. At the end of surgery residual effect of muscle relaxant was reversed with inj. Neostigmine 50  $\mu$ g/kg and inj. Glycopyrrolate 10  $\mu$ g/kg I.V. After throat suction and return of protective reflex patients were extubated and supplemented with oxygen by a poly mask at 6 l/min.

#### **Study parameters were observed as following**

1. Arterial oxygen de-saturation - If SPO<sub>2</sub> in Pulse Oxymetre shows less than 92% for more than 1 min
2. Laryngospasm - Audible stridor not relieved by airway manipulation by an expert anaesthetist.
3. Increase in heart rate during intubation classified in to 4 grades as below  
Gr-1  $\rightarrow$  >10 beats/min  
Gr-2  $\rightarrow$  > 20 beats/min  
Gr-3  $\rightarrow$  >30 beats/min  
Gr-4  $\rightarrow$  >40 beats/min
4. Bronchospasm - Audible wheezing or unexplained increase in airway pressure.
5. Increased oral secretion  
Gr 1- wet (dry with single suction)  
Gr 2- Moderate (2-3 suction required)  
Gr 3-Copious (Suction more than 3 times required)  
Gr 4- Thick (Thready secretions)
6. Severe coughing -For more than 5 secs.
7. Re-intubation after planed extubation.
8. Incidence of pulmonary oedema.
9. Any other cardiopulmonary events

#### **Statistical analysis**

Data are expressed as mean  $\pm$ SD, percentage % and number (n). Statistical analysis was performed using a standard GRAPH PAD INSTAT Software package. Discrete variables were analyzed using chi-square test with p value <0.05 as significant and p value <0.01 as highly significant.

## RESULTS

A prospective comparative study consisting of 50 asymptomatic smokers and 50 nonsmokers was under taken to compare the intra op and post-op complications.

**Table 1: Age distribution.**

Age in years	Smokers		Non-smokers	
	Number	%	Number	%
16-20	-	-	2	4
21-30	9	18	16	32
31-40	14	28	10	20
41-50	10	20	12	24
51-60	17	34	10	20
Total	50	100	50	100
Mean ± SD	43.3 ± 11.312		38.9 ± 11.812	

This table shows the age distribution in both the groups are comparable.

**Table 2: Intra operative and post-operative adverse events**

Events	Smokers		Non-smokers		p-value
	Number	%	Number	%	
1. Oxygen desaturation	13	26	4	8	0.017
2. Laryngospasm	5	10	1	2	0.214
3. bronchospasm	5	10	1	2	0.214
4. Severe coughing	17	34	2	4	0.004
5. Reintubation	-	-	-	-	
6. Pulmonary edema	-	-	-	-	
7. Others	-	-	-	-	
total	40	80	17	34	P < 0.001

This table shows the comparison of individual peri-operative events. Adverse events are statistically significant in smokers compare to nonsmokers except bronchospasm where  $p=0.214$ . Severe coughing during recovery was found to be very significantly high in the smoker group with  $p$  value 0.004. O<sub>2</sub> de-saturation was found to be statistically significant in smokers in compare to nonsmoker with  $P$  value 0.017. During recovery 10% of smokers had Laryngospasm in comparison to 2% in nonsmokers. No incidence of pulmonary oedema or re- intubation incidence after planned extubation in both the groups.

**Table 3: Increase in heart rate during intubation.**

Increase in Heart rate in beats / min	Smokers		Non-smokers		p-value
	Number	%	Number	%	
>10	24	48	3	6	<0.001
>20	39	78	26	52	0.044
>30	8	16	-	-	0.006

This table shows significant tachycardia in smokers group during intubation which is statistically significant.

**Table 4: Oral secretions.**

Oral secretions	Smokers		Non-smokers		p-value
	Number	%	Number	%	
Grade I	2	4	2	4	0.999
Grade II	19	38	45	90	<0.001
Grade III	28	56	3	6	<0.001
Grade IV	1	2	-	-	

In 90% of non- smokers oral secretions at the time of extubation were moderate (Gr ii) while in 56% of patients of smokers had copious amount (Gr iii) oral secretion during extubation and in 2 % cases thready (Gr IV) secretions.

## DISCUSSION

The study was carried out taking 100 adult male patients of ASA Gr I & II where 50 patients are smokers and 50 patients are non-smokers. Sample was age matched with  $P < 0.05$  between two groups. Since smoking habit among females is very less common in India. So only adult male patients are included in study group. History of laryngospasm and bronchospasm were more in smoker group. Only 1 patient (2%) of non-smoker had Laryngo and bronchospasm. This patient had history of upper respiratory tract infection (URTI).

Increased oral secretion in smokers which can trickle down during recovery along with increased airway sensitivity would have caused increased incidence of laryngospasm in smokers. In a pioneer study, a six fold increased incidence of post-operative respiratory morbidity in patient smoking more than 10 cigarettes per day was reported by Morton on 1944.<sup>[5]</sup>

Incidence of oxygen de-saturation in the peri-operative period also increased in smoker (26%) in compare as to non- smokers (8%) which is also corroborated to study of Tait AR et al in 1991.<sup>[9]</sup>

Incidence of respiratory complications like desaturation coughing, breath holding and laryngospasm was also studied by Dennis A et al,<sup>[10]</sup> taking 3 groups as active smoker(Gr I), passive smoker (Gr II) and non-smoker (Gr III) and found active smokers had 42.8% incidence of adverse effects when compared to 19.4% in non-smokers But in our study we found incidence of respiratory adverse effects was 70% in smokers compared to 28% in non-smoker. In large scale study conducted by Schwilk et al in 1997,<sup>[11]</sup> it was found the incidence of specific perioperative respiratory events in smokers were 5.5% in comparison to 3.1 % in non-smokers .

Smokers had a higher rate of respiratory complications (32.8% Vs 25.9) in a similar study done by Paul. S. Myles et al.<sup>[8]</sup> in 2002 which is comparable with our present study.

In our study we observed severe coughing during recovery was significantly high in the smokers group with  $p$  value 0.004. The finding coincides with the result of study by Paul. S. Myles et al. 2002.<sup>[8]</sup>

Madhusudan Rao et al.<sup>[12]</sup> in 2002 have found that desaturation during recovery from general anaesthesia in smokers was significantly greater ( $P < 0.001$ ) specially during transport of patients from O.T to recovery room and more found in upper abdominal and thoracic surgeries.

Haemodynamic response to laryngoscopy and tracheal intubation was documented by many authors (Laxton CH et al in 1999<sup>[7]</sup> Paventi S et al in 2001<sup>[13]</sup> O Cuvas et al in 2008.<sup>[14]</sup> Possible explanation may be effect of nicotine which by sympathetic stimulation increases the heart rate. However we did not find any cardiac arrhythmias in present study for which COHB content in arterial blood requirement is 5-9%. In our study we observed that most of the smokers had significant tachycardia with more than 20 beats/min during intubation ( $P < 0.004$ ). Severe tachycardia  $> 30$  beats/min than pre op value was observed. Only in smokers group (16%) with a p value 0.006 which correspond to the results of similar study by Laxton C.H et al in 1999.<sup>[7]</sup> Severe tachycardia  $> 30$  beats/min than pre op value was observed only in smokers group (16%) with a p value 0.006 which correspond to the results of similar study by Laxton CH et al in 1999.<sup>[7]</sup> The results also corroborate with findings of Paventi S et al 2001.<sup>[13]</sup> They found that neuro endocrine response of smokers was significantly higher than non smokers by measuring the nor epinephrine value. Incidence of complications were more in patients who smoke more cigarettes per day as we found pts having tachycardia ( $> 30$  beats/min) out of which 71% pts take more than 15 cigarettes per day. We also observed that chronicity of smoking also influence complications like durations of smoking more than ten years cause more complications in comparison to smoking duration of less than 10 years. This was explained as chronicity of smoking causes more changes in respiratory tract predisposing to more complications (Wetterslev et al 2000.<sup>[15]</sup>)

## CONCLUSION

In our study we found that smoking is definitely a risk factor for adverse cardio pulmonary events in patients undergoing general anaesthesia. Following steps may be considered to minimize complications.

1. In preanaesthetic check-up for smokers proper risk stratification and counselling of patients.
2. Current smokers should be counselled to abstain from smoking as early as possible before elective surgeries and measures should be taken to motivate them to give up the habit.
3. Pre-oxygenation and post-up supplemental oxygen in PACU.
4. Smooth quick induction intubation technique in view of increase airway sensitivity.
5. Thorough suctioning before extubation.

6. Regional anaesthesia where possible is preferable over G.A as airway manipulation can be avoided.

However further studies are awaited to corroborate our study

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