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Effects of passive smoking on perioperative respiratory and cardiovascular complications

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ABSTRACT

Objective: In this study, we aimed to research whether there is significant difference in the incidence of cardiovascular and respiratory complications during intraoperative and postoperative periods and the duration of recovery in patients who exposed passively to tobacco smoke compared with unexposed patients. *Methods:* 250 adult patients ranging in age from 18 to 60 years with the ASA I or II score who received general anesthesia for various elective surgical operations were selected and divided into two groups. Group 1(study group) included 130 patients who were exposed to passive cigarette smoke, Group 2 (control group) include 120 patients who were not exposed to smoke. Respiratory and cardiovascular complications evaluated and recorded in intraoperative and postoperative period. At the end of the operation, patients taken to the postoperative care unit (PACU) and monitored until Modified Aldrete's Score became 9 or more and stay time in PACU was recorded. *Results:* There was no statistically significant difference concerning demographic data and ASA status between the two groups. Among respiratory complication in the two groups there was no significant difference regarding to bronchospasm, hypoxia, laryngeal spasm. In contrary there was

significant increase in the incidence of cough and hyper secretion in passive smokers. Regarding cardiovascular complications there was no significant difference between the two groups in arrhythmias or ischemia occurrence. In contrary there was significant increase in the incidence of hypertension occurrence in passive smoking group. PACU stay time in the passive smoking group was not significantly longer than control group. *Conclusion:* Passive smoking is associated with higher incidence of perioperative cardiovascular and respiratory complication with no prolongation of PACU stay time.

Keywords: Passive smoking, general anesthesia, hypertension, cough, post anesthesia care unit.

1. INTRODUCTION

Passive smoking requires breathing in the smoke of tobacco from other people. Exhaled smoke is called mainstream smoke which has been exhaled. The smoke drifting from a lit cigarette is called side stream smoke. Environmental tobacco smoke (ETS) or Second-hand smoke (SHS) is a combination of mainstream and side-stream smoke. Second-hand smoke presents significant health hazards for both smokers and non-smoking people. Children are at particular risk of harmful effects of second-hand smoke on their health. In Saudi Arabia, people are exposed to second hand smoke at home, with an average %17.2 and 5.1 days of exposure per week. This second hand exposure for males is 20.9%, with an average of 4.8 days of exposure per week and for females is 13.1%, with an average of 5.5 days of exposure per week. 14.8% of Saudis at work are exposed to second-hand smoke, with an average exposure of 2.2 days per week. This exposure to second-hand work affects 24.9 % of males, with an average exposure of 4.3 days a week and 2.6 % of females, with an average exposure of 14 days a week (Smoking-KSA Findings, 2013).

Active and passive exposure to tobacco smoke is one of the main morbidities and mortality causes. Epidemiological and clinical research has shown that active and passive smoking causes diseases such as cardiovascular, cerebrovascular, lung, gastrointestinal and cancer (Fielding, 1985; Giantz & Parmley, 1991). There are studies showing that active and passive smokers may experience perioperative airway complications in general anesthesia caused by airway changes caused by continued exposure to smoke (Seyidov et al., 2011; Rodrigo, 2001; Koop, 1998; Skolnick et al., 1998; Sternberg et al., 2010; O'Rourke et al., 2006; Jones & Bhattacharyya, 2006; Drongowski et al., 2003; Dennis et al., 1994; Lyons et al., 1996; Mamie et al., 2014; Lakshmipathy et al., 1996). Passive exposure to cigarette smoke is being associated with increased post-operative mortality because of respiratory complications, extended postoperative follow-up and prolonged anaesthetic requirements (Jones & Bhattacharyya, 2006; Drongowski et al., 2003).

In this study, we aimed to research whether there is a significant difference in the incidence of respiratory complications during intraoperative and postoperative period and duration of recovery in patients who have been passively exposed to tobacco smoke compared to non-exposed patients.

2. MATERIAL AND METHODS

After approved by health care authority in Makkah Mukaramah, 250 adult patients ranging in age from 18 to 60 years with the American Society of Anesthesiologists (ASA) I or II score who received general anesthesia for various elective surgical operations were included in our study. The study was conducted between June 2019 and March 2020. Patients with ASA III or IV physical status, having chronic respiratory disease or having acute upper or lower respiratory tract infection within 2 weeks, who have severe systemic disease and active smokers or quitted smokers within 5 years were excluded from the study. The patients have been divided into two groups. Group 1 (study group) included 130 patients who were exposed to passive cigarette smoke, Group 2 (control group) included 120 patients who were not exposed to smoke.

Passive smoke exposure is defined as involuntary smoke inhalation by non-smoker because of living or working with a smoker. And the victims couldn't change their surroundings. The patient's history and previous medical records were important to determine the state of exposure. In our study, patients who were exposed to 5 cigarettes or more per day were considered passive smokers (group1). Anesthesia staff was not informed before about the patient group.

Twenty-gauge intravenous cannula was inserted and fentanyl 1 mcg/kg I.V was given as a premedication. Electrocardiogram (ECG), noninvasive arterial blood pressure, peripheral oxygen saturation (SpO2) and end-tidal CO2 (EtCO2) monitors were attached to the patient. Endotracheal tube (ETT) was inserted to control airway. Induction of anesthesia was performed using 2-2.5 mg / kg of propofol and 0.6 mg / kg of rocuronium I.V. After intubation mechanical ventilation parameters were set at O2\N2O of 50:50 mixture, tidal volume; 6-7 mL /kg and RR; 12-14 breaths / min to obtain end-tidal CO2 levels at 30-35 mmHg. Maintenance of anesthesia was provided with sevoflurane 1-2%. Fentanyl 2mcg/kg I.V was administrated for postoperative analgesia near the end of surgery. All patients were extubated after reversal with atropine 0.01mg\kg and neostigmine 0.05 mg/kg.

Laryngospasm (high bitched sound, failure to ventilate the patient, need of continuous positive airway pressure (CPAP) to maintain ventilation and requirement of additional doses of muscle relaxants), bronchospasm (wheezing, increase peak airway pressure), breath holding (more than 15 seconds), hypoxia (SPO2 below 95%), hypersecretion (increase in quantity and density of secretions and more than 2 times oral or nasal section) and cough (more than 15 seconds) are all accepted as airway complications during the intraoperative and postoperative period. Hypertension (139/89 mm Hg or more), Arrhythmias (any techy or brady Arrhythmia e.g. Premature ventricular contractions (PVCs), Paroxysmal supraventricular tachycardia (PSVT), Ventricular tachycardia (VT), Ventricular fibrillation (VF), or Heart block) and cardiac ischemia (manifested by ST segment and T wave changes) were all considered as cardio vascular complication intra and post operatively. Stay time in PACU is defined as a time spends by the patients in PACU calculated from time of patient entry to PACU to time of patient discharge to postsurgical word.

The safe discharge of patients from the post anesthesia care unit (PACU) depends on Modified Aldrete's Score (MAS). MAS evaluated each 5 min in PACU and patients were discharged from PACU to post-surgical ward when MAS was 9.

Statistical analysis of the data was performed by the program, SPSS (Statistical Package for Social Sciences) Version 15.00. The Mann Whitney U test was a comparison of the differences in the intergroup for abnormally distributed parameters and to determine the group that leads to the difference. The ''Chi-Square test'' and ''Fisher's Exact Chi-square test'' was used for the comparison of qualitative data. Results evaluated at 95% confidence interval and $p < 0.05$ for significance.

3. RESULTS

There was no statistically significant difference between the two groups regarding demographic data and ASA status ($p<0.05$) (table 1, 2).

Table 1 Participant's Ages

	Control (120)		Passive (130)	
Age	No	Percentages	No.	percentages
18-30	49	41.5	53	41.08
31-45	37	31.3	45	34.8
46-60	32	27.1	31	24.03

Table 2 ASA status

ASA	Passive (130)		Control (120)		P-Value	Sig
	I	II	I	II	0.017	N
	40(33.3%)	47(39.2%)	56(46.7%)	44(36.7%)		

Among respiratory complication in the two groups there was no significant difference regarding bronchospasm (p=0.805), hypoxia (p=0.014), laryngeal spasm (0.982). In contrary there was significant difference between the two groups regarding cough (p=0.000) and hyper secretion (0.004) with higher incidence in the passive smoking group (table 3).

Table 3 Respiratory Complications

Respiratory	Control (120)		Passive (130)		P-Value	Sig
	Intraoperative	Postoperative	Intraoperative	Postoperative		
Bronchospasm	6(5.1%)	4(3.4%)	19(14.7%)	7(5.4%)	0.865	N
Hypoxia	29(24.2%)	28(23.3%)	36(27.9%)	26(20.2%)	0.014	N
Laryngeal spasm	7(5.9%)	4(3.4%)	5(3.8%)	3*2.3%)	0.982	N
cough	20(16.8%)	53(44.5%)	36(27.7%)	69(53.1%)	0.000	S
Hyper secretion	32(24.6%)	23(19.2%)	37(30.8%)	26(20%)	0.004	S

Regarding cardiovascular complication there was no significant difference between the two groups in arrhythmias (p=0.77) or ischemia occurrence (0.987). However, there was increased occurrence of hypertension in passive smoker group. It was shown that there is significant difference between the two groups regarding hypertension occurrence (p=0.000) (table 4).

Table 4 Cardiovascular complication

Cardiac	Control (120)		Passive (130)		P-Value	Sig
	Intraoperative	Postoperative	Intraoperative	Postoperative		
Hypertension	40(33.3%)	32(26.7%)	68(53.3%)	44(33.8%)	0.000	S
Arrhythmias	11(9.2%)	2(1.7%)	21(16.2%)	9(6.9%)	0.770	N
ischemia	1(0.8%)	1(0.8%)	3(2.3%)	0	0.987	N

PACU stay time in the passive smoking group (44.94±22.15 min) was not significantly longer than control group (38.88±21.67 min) with P-value (0.777) (table 5).

Table 5 PACU stay time

Groups	Passive Group (130)	Control Group (120)	P-value	Sig
	Mean ±SD	Mean ±SD		
Time	44.94±22.15	38.88±21.67	0.777	N

4. DISCUSSION

Long term passive smoking lead to airway changes and causes a lot of complication in perioperative period especially when using general anesthesia (Seyidov et al., 2011; Rodrigo, 2001; Koop, 1998; Skolnick et al., 1998). Many researchers found significantly higher incidence of perioperative respiratory complication and longer PACU stay time in passive smoker patient (O'Rourke et al., 2006; Jones & Bhattacharyya, 2006). Perioperative cardiovascular complication in passive smoking was not investigated before.

The study found that the incidence of respiratory complications was 86.2 % in the passive tobacco smoke group and 13.8 % in the control group; similar findings were also found in other studies (Giantz & Parmley, 1991). Another study involving 9297 cases reveals that passive tobacco exposure becomes a risk factor for increased perioperative respiratory complications (Sternberg et al., 2010). However, in a study, COHb, PaO2, PaCO2 values evaluated during the anesthesia and postsurgical complications in 150 patients and found no significant differences between exposure to tobacco smoke and non-exposure (Tütüncü et al., 2012).

In our study among respiratory complication investigated only cough and hypersecretion were significantly higher in passive smoking group. Other more serious respiratory complication (laryngeal spasm, hypoxia and bronchospasm) were not significantly different between the two groups. In our study hypertension incidence was significantly higher in passive smoking group than control group. Although more serious arrhythmia and ischemia incidence were not significantly different between the two groups. There are several studies showing that PACU stay time is prolonged in passive smokers, others showed no prolongation. In a study passive smoke exposure is indirectly associated with the prolongation of PACU stay time (Jones & Bhattacharyya, 2006). In another study PACU stay time in passive smokers with less than 10 cigarettes per day (group 1) and more than 10 cigarettes per day (group 2) was significantly longer than control group (Simsek et al., 2016).

In our study, the PACU stay time was not significantly different between passive smokers and control group, this could be explained by the lack of difference between the two groups in major cardiovascular and respiratory complications e.g. (arrhythmia, ischemia, bronchospasm, laryngospasm and hypoxia) which would require more time to deal with and subsequently more PACU stay. However, the major limitation of this study is small sample size that may affect the results accuracy. Therefore, future studies need to recruit a larger sample and focus on the effect of passive smoking on lung function and its subsequent relationship with perioperative respiratory complications.

5. CONCLUSION

Passive smoking is associated with higher incidence of perioperative cardiovascular and respiratory complication with no prolongation in PACU stay time. Fortunately, the incidence of more severe cardiovascular and respiratory complication (e.g. arrhythmias, ischemia, laryngeal spasm, hypoxia and bronchospasm) was not significantly different between passive smoker and non-smoke exposed patients.

Conflicts of interest: The authors declare no conflicts of interest.

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Informed consent

Written & Oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Ethical approval for human

All procedures performed in studies involving human participants were in accordance with the ethical standards of Umm Al Qura University research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards (ethical approval number: 223455/ X 2015).

Ethical approval

The study was approved by the Medical Ethics Committee of Umm Al Qura University (ethical approval code: 223455/ X 2015).

Data and materials availability: All data associated with this study are present in the paper and in soft copy.

Peer-review: External peer-review was done through double-blind method.

REFERENCES AND NOTES

1. Dennis A, Curran J, Sherriff J, et al. Effects of passive and active smoking on induction of anesthesia. Br J Anaesth. 1994;73:450-2.
2. Drongowski RA, Lee D, Reynolds PI, et al. Increased respiratory symptoms following surgery in children exposed to environmental tobacco smoke. Paediatr Anaesth. 2003;13: 304-10.
3. Fielding JE. Smoking: health effects and control. N Engl J Med. 1985;313:491-8.
4. Giantz SA, Parmley WW. Passive smoking and heart disease: epidemiology, physiology and biochemistry. Circulation. 1991;83:1-12.
5. Jones DT, Bhattacharyya N. Passive smoke exposure as a risk factor for airway complications during outpatient pediatric procedures. Otolaryngol Head Neck Surg. 2006;135: 12-6.
6. Koop CE. Adverse anesthesia events in children exposed to environmental tobacco smoke: exposure to environmental tobacco smoke and the risk of adverse respiratory events in children receiving general anesthesia. Anesthesiology. 1998;88:1141-2.
7. Lakshmipathy N, Bokesch PM, Cowen DE, et al. Environmental tobacco smoke: a risk factor for pediatric laryngospasm. Anesth Analg. 1996;82:724-7.
8. Lyons B, Frizelle H, Kirby F, et al. The effect of passive smoking on the incidence of airway complications in children undergoing general anesthesia. Anaesthesia. 1996;51:324-6.
9. Mamie C, Habre W, Delhumeau C, et al. Incidence and risk factors of perioperative respiratory adverse events in children undergoing elective surgery. Paediatr Anaesth. 2004;14: 218-24.
10. O'Rourke JM, Kalish LA, McDaniel S, et al. The effects of exposure to environmental tobacco smoke on pulmonary function in children undergoing anesthesia for minor surgery. Paediatr Anaesth. 2006;16:560-7.
11. Rodrigo C. The effects of cigarette smoking on anesthesia. Anesth Prog. 2001;47:143-50.
12. Seyidov TH, Elemen L, Solak M, et al. Passive smoke exposure is associated with perioperative adverse effects in children. J Clin Anesth. 2011;23:47-52.
13. Simsek E, Karaman Y, Gonullu M. et al. The effect of passive exposure to tobacco smoke on perioperative respiratory complications and the duration of recovery. Rev Bras Anestesiol. 2016;66(5):492-498.
14. Skolnick ET, Vomvolakis MA, Buck KA, et al. Exposure to environmental tobacco smoke and the risk of adverse respiratory events in children receiving general anesthesia. Anesthesiology. 1998;88:1144-53.
15. Smoking-KSA Findings. The Saudi Health Interview Survey (SHIS). 2013.
16. Sternberg BS, Boda K, Chambers NA, et al. Risk assessment for respiratory complications in paediatric anesthesia: a prospective cohort study. Lancet. 2010;376:773-83.
17. Tütüncü A, Dilmen O, Utku T, et al. The effects of passive smoking on COHb, PaO2 and PaCO2 levels and postoperative respiratory complications in children undergoing general anesthesia Turk. Arch Ped. 2012; 47:204-9.