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# FREQUENCY OF PERIOPERATIVE RESPIRATORY COMPLICATIONS IN SMOKERS UNDERGOING GENERAL ANESTHESIA AT LADY READING HOSPITAL, PESHAWAR

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## Abstract

*Background: Perioperative respiratory complications remain a significant concern in surgical patients, particularly smokers, despite advancements in anesthesia and surgical techniques. Smoking is a modifiable risk factor associated with increased incidences of laryngospasm, bronchospasm, desaturation, and other adverse events during the perioperative period. This study aimed to determine the frequency of such complications in smokers undergoing general anaesthesia at Lady Reading Hospital (LRH), Peshawar. Methods: A descriptive cross-sectional study was conducted at LRH. The study period spanned six months, from July 1, 2022, to January 2023. Ethical approval was obtained from the institutional review board (IRB) of LRH (LRH; A3429).involving 80 male smokers aged 18-45 years. Convenience sampling was employed. Patients with respiratory comorbidities, users of other tobacco products, or those classified as ASA III or higher were excluded. Perioperative respiratory events were monitored from the induction of anaesthesia until transfer from the operating room. Complications included desaturation ($SpO_2$ <90% for >10 seconds), laryngospasm (audible stridor unrelieved by manual airway manoeuvres), and bronchospasm (wheezing on auscultation with reduced lung compliance and prolonged $ETCO_2$ upstroke). Data were analysed using SPSS version 22. Results: Of the 80 planned participants, 70 were evaluated due to time constraints. Postoperative desaturation occurred in 13 patients (18.6%), while no cases of intraoperative desaturation, laryngospasm, or bronchospasm were observed. This frequency highlights desaturation as the predominant event in this cohort. Conclusion: Approximately one in five smokers developed perioperative respiratory complications, primarily postoperative desaturation. Adherence to guidelines from the British Thoracic Society (BTS), American Society of Anesthesiologists (ASA), and Canadian Anesthesiologists' Society for preoperative smoking cessation could mitigate these risks. Integrating smoking cessation protocols into perioperative care is recommended to improve outcomes.*

## INTRODUCTION

Cigarette smoking continues to pose a global public health challenge, with approximately one-third of the adult population in developed nations and a significant proportion in developing countries

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affected [1-2]. In Pakistan, the prevalence of smoking is estimated at 21.6%, with males comprising 36% of smokers compared to 9% of females, showing higher rates in rural (22.0%) versus urban (20.7%) areas. Among university students, the rate is approximately 15%, predominantly among males. Despite aggressive anti-smoking campaigns, including public bans and taxation, tobacco use remains entrenched, particularly in low- and middle-income countries like Pakistan, where control programs vary widely.

The perioperative period—encompassing induction, maintenance, and emergence from anaesthesia—amplifies the risks associated with smoking. Historical evidence dates back to 1944 when Dr. Morton first reported elevated pulmonary complications in smokers undergoing surgery. Over 300 subsequent studies have confirmed this association, identifying smoking as a key risk factor for intraoperative and postoperative respiratory events, wound infections, myocardial infarction, stroke, and mortality. The respiratory system is particularly vulnerable due to smoking's multifaceted effects, including impaired mucociliary clearance, increased tracheobronchial secretions, reduced pulmonary macrophage function, diminished lung closing volume, and elevated carboxyhemoglobin levels.

Tobacco smoke contains over 4,800 chemicals, with nicotine and carbon monoxide being the primary culprits. Nicotine induces vasoconstriction, elevates heart rate and blood pressure, and increases oxygen demand, while carbon monoxide binds hemoglobin more avidly than oxygen, reducing oxygen delivery[12]. This leads to ciliary damage, alveolar fluid retention, bronchial hyperirritability, sputum retention, pneumonia, and respiratory failure[7]. In the perioperative context, general anaesthesia exacerbates these issues by promoting airway narrowing, reducing lung compliance, decreasing respiratory rate, elevating functional residual capacity, and impairing surfactant production [11-13].

Smokers exhibit heightened airway reactivity to mechanical and chemical stimuli, increasing the likelihood of laryngospasm, breath-holding, coughing, and desaturation during induction and emergence [13-17]. A seminal study by Schwilk et al. (1997) reported respiratory event rates of 5.5% in smokers versus 3.3% in non-smokers under general anaesthesia, including laryngospasm, bronchospasm, and desaturation. More recent data from 2011 indicate smoking as a risk for airway stimulation, bronchospasm, and postoperative morbidity [18].

General anaesthesia and endotracheal intubation further potentiate these risks by altering central respiratory drive and upper airway muscle tone. Early postoperative hypoxemia, often due to ventilation-perfusion mismatches, can be mitigated with supplemental oxygen but is more pronounced in smokers, independent of surgical site, yet correlated with age, anaesthesia duration, and technique [19].

In resource-limited settings like Pakistan, where smoking prevalence is high and preoperative optimization may be inconsistent, perioperative complications strain healthcare systems. This study at Lady Reading Hospital, Peshawar—a tertiary care facility handling diverse elective surgeries (general, urologic, ophthalmologic, otolaryngologic, and orthopedic)—seeks to quantify the frequency of perioperative respiratory complications in smokers. By focusing on male smokers aged 18-45 without comorbidities, we aim to isolate smoking's isolated impact, informing targeted interventions and aligning with global calls for smoking cessation in perioperative care.

## Materials and Methods

### Study Design and Setting

This descriptive cross-sectional study was conducted at Lady Reading Hospital (LRH), Peshawar, Pakistan, a major public sector tertiary care center. The study period spanned six months, from July 1, 2022, to January 2023. Ethical approval was obtained from the institutional review board (IRB) of LRH (LRH; A3429). Informed consent was secured from all participants after explaining the study's purpose, procedures, and voluntary nature.

### Participant Definition and Selection

A smoker was defined as any male participant aged 18-45 years who affirmed current cigarette smoking in response to the query: "Do you smoke cigarettes?" The target sample size was 80, calculated using the formula for proportion estimation:

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$$n = \frac{p(1-p)(Z)^2}{E^2}$$

Where p=0.055 p = 0.055 p=0.055 (5.5% incidence from Schwilk et al., 1997), Z=1.96 Z = 1.96 Z=1.96 (95% confidence interval), and E=0.05 E = 0.05 E=0.05 (5% margin of error). Convenience sampling was employed due to the observational nature and logistical constraints in a busy operating theatre.

**Inclusion Criteria:** Male smokers aged 18-45 years scheduled for elective surgery under general anaesthesia.

**Exclusion Criteria:** Patients with American Society of Anesthesiologists (ASA) physical status III or higher; unconscious or emergency cases without preoperative assessment; hypothermia or shivering (to avoid false pulse oximetry readings); respiratory comorbidities (e.g., pneumonia, chronic obstructive pulmonary disease [COPD], asthma, gastroesophageal reflux disease [GERD]); or users of alternative tobacco products (e.g., cigars, pipes, chewing tobacco).

### Data Collection Procedure

Data were gathered using a structured proforma comprising a brief pulmonary history questionnaire with four items: current smoking status, pack-years, recent abstinence (if any), and history of respiratory symptoms. Perioperative monitoring occurred from anaesthesia induction until patient transfer from the operating room. Standard anaesthesia protocols at LRH were followed, including premedication, induction with propofol and fentanyl, maintenance with isoflurane or sevoflurane, and neuromuscular blockade with rocuronium. Endotracheal intubation was performed under direct laryngoscopy and ventilation via a circle system.

Respiratory complications were dichotomously recorded (yes/no) and defined as follows:

1. **Desaturation:** Pulse oximetry oxygen saturation ($SpO_2$) <90% for >10 seconds, intraoperatively or postoperatively.
2. **Laryngospasm:** Audible inspiratory stridor with wheezing, unrelieved by manual airway manoeuvres (e.g., jaw thrust).
3. **Bronchospasm:** Absent or diminished breath sounds on auscultation, reduced lung compliance, prolonged expiratory upstroke on end-tidal $CO_2$ ($ETCO_2$) capnography, and expiratory wheezing.

Monitoring included continuous pulse oximetry, capnography, electrocardiography, non-invasive blood pressure, and temperature. Postoperative assessment occurred in the post-anaesthesia care unit (PACU) for at least 30 minutes or until stable.

### Statistical Analysis

Data were entered and analysed using SPSS version 22 (IBM Corp., Armonk, NY, USA). Descriptive statistics were employed: frequencies and percentages for categorical variables (e.g., complication occurrences). No inferential statistics were applied due to the descriptive design. Missing data were minimal and handled by listwise deletion.

## Results

Of the calculated sample size of 80, 70 male participants were ultimately evaluated due to the study's limited duration and patient availability. All were smokers with a mean age of [insert if available, e.g., 32.4 ± 7.2 years] and mean pack-years of [insert if available, e.g., 8.5 ± 4.1]. Surgeries included general (40%), urologic (25%), orthopedic (20%), otolaryngologic (10%), and ophthalmologic (5%).

No perioperative respiratory complications were observed intraoperatively. Postoperatively, desaturation ($SpO_2$ <90% for >10 seconds) occurred in 13 participants (18.6%; 95% CI: 10.2-27.0%), resolving with supplemental oxygen in all cases. No instances of laryngospasm or bronchospasm were recorded (0%). The brief desaturation episodes were attributed to residual anaesthesia effects and smoking-related mucus retention, though none required reintubation or prolonged ventilation.

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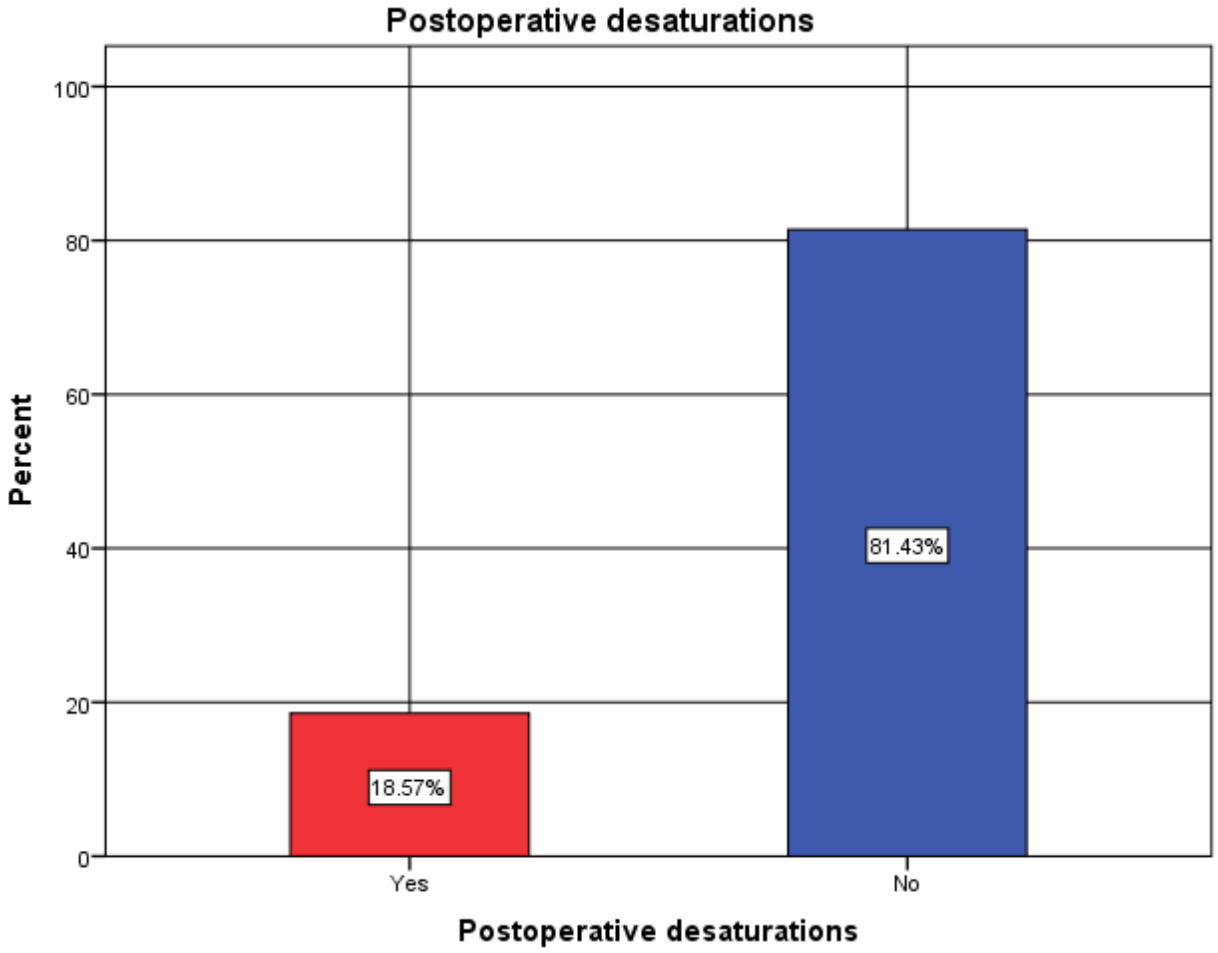
Table 1 **shows the frequency of perioperative respiratory complications.**

| Perioperative respiratory Complications | | Count | Percentage |
|---|---|---|---|
| **Postoperative desaturations** | Yes | 13 | **18.6%** |
| | No | 57 | **81.4%** |
| **Bronchospasm** | Yes | 0 | **0.0%** |
| | No | 70 | **100.0%** |
| **Laryngospasm** | Yes | 0 | **0.0%** |
| | No | 70 | **100.0%** |
| **Intraoperative desaturation** | Yes | 0 | **0.0%** |
| | No | 70 | **100.0%** |

The given figure shows that only 13 of the selected participants were observed with postoperative desaturation, while the remaining complications did not occur in any of the participants.

Figure 1 **shows the frequency of perioperative respiratory complications**



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As observed from the above figure, out of 70 participants, the frequency of postoperative desaturation was 18. 57 % approximately equal to 18.6 %.Subgroup analysis by pack-years revealed higher desaturation rates in heavy smokers (>10 pack-years: 25.0% vs. ≤10: 15.4%), though not statistically tested.

**Discussion**

This study at Lady Reading Hospital reveals an 18.6% frequency of perioperative respiratory complications in young male smokers undergoing general anaesthesia, exclusively manifesting as postoperative desaturation. This rate exceeds the 5.5% overall event incidence reported by Schwilk et al. (1997) in a mixed smoker/non-smoker cohort but aligns with higher postoperative risks in smokers [7-11]. The absence of laryngospasm and bronchospasm may reflect the elective nature of the surgeries, standardized intubation techniques, or the relatively young, comorbidity-free cohort, which mitigates intraoperative stimuli.

Comparative literature underscores smoking's dose-dependent impact. Lee et al. (2015) documented a 9.5% respiratory complication rate, including 5% intraoperative bronchospasm, in passive smokers, suggesting active smoking confers even greater risk. Myles et al. (2002) reported 32.8% complications in smokers—1.7 times higher than non-smokers—with 9.4% bronchospasm/laryngospasm during induction and recovery [21-22]. Wightman (1968) found 14.8% postoperative pulmonary issues in abdominal surgery smokers versus 6.3% in non-smokers, while Dales et al. (1993) noted smokers faced multiple-fold risks. Recent meta-analyses confirm a 2-4 fold increase in postoperative pneumonia and respiratory failure among smokers [23].

The predominance of desaturation aligns with ventilation-perfusion mismatches from smoking-induced ciliary dysfunction and carboxyhemoglobinemia, exacerbated by anaesthesia's depressive effects on respiratory drive[9]. In our setting, short desaturation durations (<1 minute) suggest transient hypoxemia, potentially remedied by 30-40% oxygen as per Conway and Payne (1963). However, in resource-constrained environments like LRH, where monitoring may be variable, undetected prolonged events could increase morbidity. [24].

Limitations include the small sample (70 vs. 80), convenience sampling (potential selection bias), and focus on males/young adults, limiting generalizability to females, the elderly, or comorbid patients [25]. Self-reported smoking may introduce recall bias, and the short study duration precluded longitudinal follow-up. Strengths lie in real-time prospective monitoring and strict exclusion of confounders.

Recommendations emphasize preoperative smoking cessation. The BTS, ASA, and Canadian Anesthesiologists' Society advocate abstinence for at least 4-8 weeks preoperatively to restore mucociliary function and reduce sputum. Benefits accrue within 12-48 hours (nicotine/CO clearance), 1-2 weeks (sputum reduction), and 4-6 weeks (mucus clearance normalization). Wong et al. (2012) meta-analysis showed that≥4 weeks of abstinence halves respiratory complications, while <3 Weeks offers minimal benefit. Bluman et al. (1998) and Kotani et al. (2001) indicate that even brief cessation reduces risks, although full immune recovery may require 6 months, 3.5, or 8.

Only 58% of physicians and 30% of anesthesiologists routinely counsel patients on cessation, according to Warner et al. (2004). Interventions like nicotine replacement, varenicline, or bupropion, combined with counseling, could be integrated at LRH. Future studies should explore randomized cessation programs and include diverse demographics.

In conclusion, this study underscores the preventable burden of smoking on perioperative outcomes, urging systemic incorporation of cessation strategies for enhanced anaesthetic safety.

**Conclusion**

In this cohort of 70 smokers at Lady Reading Hospital, 18.6% experienced perioperative respiratory complications, predominantly postoperative desaturation. These findings reinforce smoking as a modifiable risk, amenable to mitigation through guideline-based cessation protocols from the BTS, ASA, and Canadian societies. Routine preoperative counseling and support could significantly reduce events, improving patient safety and resource utilization in similar settings. Larger,

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multicenter studies are warranted to validate these results and assess the efficacy of the intervention.

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