ORIGINAL ARTICLE

OXYGEN DESATURATION DURING FIBREOPTIC BRONCHOSCOPY IN THE PULMONOLOGY UNIT OF AYUB TEACHING HOSPITAL, ABBOTTABAD

Usman Ghani[1], Mohammad Yasin[2], Nazia Jehanzeb[2], Ali Shan[3], Sanaullah Tareen[4], Faheem Jan[5]

[1]Saidu Group of Teaching Hospitals Swat-Pakistan, [2]Department of Pulmonology, Ayub Medical College, Abbottabad-Pakistan
[3]Health Department, KPK-Pakistan, [4]FJ Institute of Chest Diseases, Quetta-Pakistan
[5]Common Management Unit, Islamabad-Pakistan

Background: Fibreoptic bronchoscopy (FOB) was first introduced in 1966 by Shigeto Ikeda. FOB is a procedure that allows a physician to examine the breathing passages (airways) of the lungs. FOB is used by respiratory physicians for diagnostic and therapeutic purposes. Introduction of a bronchoscope into an individual for any procedure may cause hypoxemia, as measured by pulse oximetry, as a drop in oxygen saturation (SpO2). If acute and severe, this may result in dangerous arrhythmias. The objective was to determine the frequency of oxygen desaturation among patients undergoing FOB. **Methods:** The descriptive case series study was carried out in the Department of Pulmonology, Ayub Teaching Hospital, Abbottabad, from August 2022 to January 2023. The study population included all patients of both genders aged 16–80 years undergoing FOB. Patients with a history of recent myocardial infarction, unstable angina, dysrhythmias, and patients with respiratory failure, peripheral vascular disease, shock, and heart failure were excluded. **Results:** Mean age of the patients was 50.65(±15.926) years, ranging from 16 to 80 years. Mean SpO2 before bronchoscopy was 96.8918(±1.24630) %, ranging from 94–100%, during bronchoscopy was 92.773(±3.9145) %, ranging from 86% to 96%, and after bronchoscopy was 96.727 (±1.5779) %, ranging from 93% to 100%. Desaturation of oxygen was observed in 50(51.5%) participants. **Conclusion:** Oxygen desaturation happens in a significant number of patients during FOB. Close monitoring of SpO2 is recommended, especially in patients with a lower normal level of SpO2 during FOB.

Keywords: Oxygen desaturation; Fibreoptic bronchoscopy; Pulse oximeter

Citation: Ghani U, Yasin M, Jehanzeb N, Shan A, Tareen S, Jan F. Oxygen desaturation during fibreoptic bronchoscopy in the pulmonology unit of Ayub Teaching Hospital, Abbottabad. J Ayub Med Coll Abbottabad 2026;38(1):54–7.

DOI:10.55519/JAMC-01-12674

INTRODUCTION

Fibreoptic bronchoscopy (FOB) was first introduced in 1966 by Shigeto Ikeda.[1] FOB allows a physician to examine the airways of the lungs. Since then, FOB is used for diagnostic and therapeutic purposes by respiratory physicians.[2,3] For diagnostic purposes, it is used for bronchoalveolar lavage (BAL), bronchial wash, and biopsy of lungs and bronchial tree. The BAL is analysed for bacteria, fungi, cell cytology, and mucus studies. FOB is used for the removal of foreign bodies and for removal of thick secretion from the airway as well as for bronchial cryotherapy.[4,5] It is also used in the management of resistant asthma in the form of Bronchial thermoplasty. [6]

Complications of FOB include trauma, infection, laryngospasm, vocal cord injury, cardiac arrhythmia, pneumothorax, aspiration and hypoxemia.[7,8] Introduction of a bronchoscope frequently results in a decrease in oxygenation and hypoventilation due to a decrease in the diameter of the airway for effective airflow. This decrease in airflow through the respiratory tree is more pronounced in patients having chronic lung disease which leads to severe hypoxemia. Acute severe hypoxemia may lead to triggering of life-threatening cardiac arrhythmias.[8] A person's normal oxygen saturation is 95–100%. Oxygen saturation less than 90% is known as hypoxemia which may make a patient dyspnoeic and if the duration of drop in oxygen saturation is prolonged, the internal vital organ are affected. The clinical evaluation of oxygen desaturation from baseline can be confirmed by measuring oxygen saturation (O_2 sat%) on an electronic device called pulse oximeter.[9] The pulse oximeter is connected with fingertip or ear lobe to obtain the results. If there is hypoxemia during FOB then the use of supplemental oxygen is required.[10]

Some factors associated with desaturation during FOB have been identified as the presence of hypertension, concomit endocrine - metabolic diseases and the duration of procedure.[11] Various studies have revealed the occurrence of hypoxemia in a lot majority of patients during FOB.[11]

This problem has not been investigated in our region; hence there is scarce evidence regarding this important issue. The results of our study shall be beneficial in providing an insight for the health care providers for proper provision of supplemental oxygen during FOB to avoid any untoward event related to hypoxemia.

MATERIAL AND METHODS

The study was conducted to determine frequency of oxygen desaturation among patients undergoing fibreoptic bronchoscopy in the pulmonology unit of Ayub Teaching Hospital Abbottabad Pakistan

This descriptive case series study was carried out in Department of Pulmonology, Ayub Teaching Hospital Abbottabad over six months from August 2022 to January 2023. A sample size of 97 was studied which was calculated by using WHO software of sample size determination with following assumptions:

Confidence level=95%

Anticipated population proportion =51%[11]

Absolute precision 10%.

With consecutive non-probability sampling technique patients of age 16-80 years, both males and females who were planned for FOB for any indication were included in the study. Patients with history of recent myocardial infarction, unstable angina, dysrhythmias and patients with respiratory failure, peripheral vascular disease, shock and heart failure were excluded.

After approval from Institutional Ethical Review Committee of patients were enrolled. The purpose of study was explained to each patient and written informed consent was obtained from each patient. Demographic data like age, gender and the name of the relevant diseases was documented. Each patient was evaluated through history and clinical examination, including pulse oximetry. Pulse oximetry was done by using the Standard pulse oximeter of Certeza PO910, Holland. SpO2 readings were recorded before, during and 30 minutes after FOB. Baseline SpO2 was recorded for each patient and a drop in SpO2 by 5% during FOB was taken as desaturation. No sedation was given to the study patients, as we routinely give sedation to selected patients only. Data were recorded on a predesigned proforma.

Data were analyzed using SPSS Version 20.0. Quantitative variables such as age and oxygen saturation were measured in terms of mean±standard deviations. Categorical variables such as gender and the relevant diseases were calculated in terms of frequency and percentages. Oxygen saturation (SpO2) levels were stratified against age and gender using Chi square test and *p*-value of less than 0.05 was taken as significant.

RESULTS

A total of 97 patients were studied. Mean age of the patients was 50.65(±15.926) years ranging from 16 to 80 years. Twenty-seven (27.8%) patients were from age group of below 40 years and 70(72.2%) were from age group of 40 years and above. There were 48(49.5%) male and 49(50.5%) female patients. MeanSpO2 before bronchoscopy, during bronchoscopy and after bronchoscopy are shown in table 1.

Regarding previous disease conditions, 9(9.3%) had bronchiectasis, 8(8.2%) had COPD, 10(10.3% had diabetes, 5(5.2%) had hypertension, 20(20.6%) had hypertension and diabetes both, 9(9.3%) had pulmonary TB and 36(37.1%) had no previous disease.

Fifty (51.5%) patients had desaturation during FOB, while 47(48.5%) patients had no desaturation out of total 97 patients.

The desaturation of oxygen was found to be 28(28.9%) in male patients and 22(22.7%) in female patients. The difference of oxygen desaturation with respect to gender was statistically insignificant with a P value of 0.186, as shown in table 2.

Oxygen desaturation with respect to age groups shows that it was found in 1(1.0%) patient of age group of below 40 years while 49(50.5%) patients having oxygen desaturation were from age group of 40 years and above. This difference in oxygen desaturation was statistically significant at *p*=0.000, as shown in table 3.

Table-1: Oxygen saturation (SpO2) of the participants:

	N	Minimum	Maximum	Mean	Std. Deviation
Before bronchoscopy	97	94.00	100.00	96.8918	1.24630
During bronchoscopy	97	86.0	96.0	92.773	3.9145
After bronchoscopy	97	93.0	100.0	96.727	1.5779

Table-2: Frequency distribution of gender with respect to desaturation of oxygen

			Desaturation of Oxygen		Total	*p*-value
			Yes	No		
Gender	Male		28	20	48	0.186
			28.9%	20.6%	49.5%	
	Female		22	27	49	
			22.7%	27.8%	50.5%	
Total			50	47	97	
			51.5%	48.5%	100.0%	

Table-3: Frequency distribution of age with respect to desaturation of oxygen:

		Desaturation of Oxygen		Total	*p*-value
		Yes	No		
Age group	Below 40 years	1	26	27	0.000
		1.0%	26.8%	27.8%	
	40 years and above	49	21	70	
		50.5%	21.6%	72.2%	
Total		50	47	97	
		51.5%	48.5%	100.0%	

DISCUSSION

The study was conducted at the Pulmonology Unit of Ayub Teaching Hospital, Abbottabad. A total sample of 97 patients was studied to determine the frequency of oxygen desaturation among patients undergoing FOB. Our study showed that there was desaturation of oxygen in 50 (51.5%) patients, while in 47(48.5%) patients, desaturation was not observed.

During FOB, the arterial partial pressure of oxygen (PaO2) can decrease, which can result in respiratory failure in so many cases. To avoid such desaturation episodes during FOB, several oxygenation protocols have been proposed. These strategies include conventional oxygen therapy (COT), use of high flow nasal cannula (HFNC), continuous positive airway pressure (CPAP) and other forms of non-invasive ventilation (NIV). As many patients undergoing FOB already have some lung parenchymal disease so the PaO2 can further drop during FOB. This drop can lead to respiratory failure in so many cases. In such cases oxygen support is needed to avoid desaturation episodes during FOB and even after the procedure.[12]

Bronchoscopy procedures are usually safe and useful for the assessment and sampling of the major airways and proximal structure of the lungs. During FOB, oxygen desaturation has been reported very frequently upto a rate of 94%, as reported by Darie A *et al*.[13]

Monitoring of the SpO2 can be easily done with simple pulse oximeter which detects oxygen saturation in peripheral perfusion. SpO2 measurements are usually done at least once before and during the procedure as suggested by Pedersen T *et al*.[14]

We observed no difference in the desaturation among male and female patients while in age group we found that 1(1.0%) patients were of age group of below 40 years while 49(50.5%) patients were from age group of 40 years and above. This finding is statistically significant at p=0.000. Other investigators also reported more desaturation in older individuals.[15]

Reasons for increased desaturation during FOB have been studied by various investigators. The old age, baseline pulmonary dysfunction and longer duration of procedure have been associated with greater desaturation. Though we did not include the status of baseline pulmonary function tests in our study, other investigators who included these tests reported that patients with low FEV1, FVC and FEV1/FVC ratio had more hypoxemia.[15]

The management of hypoxemia during FOB was done by giving supplemental oxygen in our study. Some studies reported deep breathing technique along with the administration of supplemental oxygen. We did not stop the procedure of FOB in any case due to hypoxemia while some investigators have reported stopping the FOB in some cases because of its severity. [15]

Limitations of this study were; firstly, no detailed information about the prior lung function other than pulse oximetry was taken into account before the procedure. Secondly, the studied patients were from the elective FOB list and patients of emergency FOB and patients' of intensive care units were not included, hence the level of desaturation cannot be generalized for such patients. Thirdly, this study was conducted at a single center hence the results may not apply to patients at large.Finally, factors like the competence and experience level of the operators were not taken into account which might have affected the desaturation during FOB.

CONCLUSION

Oxygen saturation level drops in quite large number of patients during FOB. Proper monitoring of SpO2 is mandatory to detect the desaturation in time. The provision of oxygen supply is recommended to benefit patients with low oxygen saturation levels during FOB, especially in high-risk individuals.

AUTHORS' CONTRIBUTION

UG, MY: Concept, write-up. NJ, AS: Data collection, analysis, interpretation. ST, FJ, UG: Proofreading, review.

REFERENCES

1. Antony P, Deshmukh H. Bronchoscopic findings of flexible bronchoscopy: a one-year retrospective study in a tertiary care hospital. Int J Res Med Sci 2018;6(2):591–5.
2. Qanash S, Hakami OA, Al-Husayni F, Gari AG. Flexible Fiberoptic Bronchoscopy: Indications, Diagnostic Yield and Complications. Cureus 2020;12(10):e10953.
3. Shirzadi R, Navaei S, Razavi-Khorasani N, Masiha F, Mirlohi SH, Mohamadi M, *et al*. Indications and complications of flexible fiberoptic bronchoscopy in children: A 5-year experience at a tertiary care hospital in Iran. Iran J Pediatr 2020;30(2):e92535.
4. Adi O, Baherin MF, Fong CP, Fatan AA, Ahmad AH, Yusof AA, *et al*. Emergency physician-performed emergency bronchoscopy in cardiac arrest patient due to acute foreign body airway obstruction. Am J Emerg Med 2022;53:23–8.
5. Tale S, Meitei SP, Prakash V, Negi A, Mishra M, Sindhwani G. Bronchoscopic Cryotherapy for Acute Hypoxemic Respiratory Failure in Three Mechanically Ventilated Patients: A Case Series. Indian J Crit Care Med 2021;25(1):94–7.
6. Cayetano KS, Chan AL, Albertson TE, Yoneda KY. Bronchial thermoplasty: a new treatment paradigm for severe persistent asthma. Clin Rev Allergy Immunol 2012;43(1):184–93.
7. Jacomelli M, Margotto SS, Demarzo SE, Scordamaglio PR, Cardoso PFG, Palomino ALM, *et al.* Early complications in flexible bronchoscopy at a university hospital. J Bras Pneumol 2020;46(4):e20180125.
8. Ergan B, Nava S. The use of bronchoscopy in critically ill patients: considerations and complications. Expert Rev Respir Med 2018;12(8):651–63.
9. Philip KE, Bennett B, Fuller S, Lonergan B, McFadyen C, Burns J, *et al*. Working accuracy of pulse oximetry in COVID-19 patients stepping down from intensive care: a clinical evaluation. BMJ Open Respir Res 2020;7(1):e000778.

10. Chapman S, Robinson G, Stradling J, West S, Wrightson J. Supportive Care: Oxygen therapy. Oxford hand book of Respiratory Medicine. Pakistan: Oxford University press, 2021; p.787–99.
11. Irmak İ, Tekin F, Çöplü L, Selçuk ZT. Factors related to oxygen desaturation during flexible bronchoscopy and endobronchial ultrasound. Tuberk Toraks 2021;69(2):144–52.
12. Antonelli M, Conti G, Riccioni L, Meduri GU. Noninvasive positive-pressure ventilation via face mask during bronchoscopy with BAL in high-risk hypoxemic patients. Chest 1996;110(3):724–8.
13. Darie A, Schumann D, Strobel W, Jahn K, Pflimlin E, Tamm M, *et al*. Predictive value of oxygen desaturation during conscious sedation for flexible bronchoscopy regarding Obstructive Sleep Apnea (PROSA). Eur Respir J 2019;54(Suppl 63):PA2019.
14. Pedersen T, Møller AM, Pedersen BD. Pulse oximetry for perioperative monitoring: systematic review of randomized, controlled trials. Anesth Analg 2003;96(2):426–31.
15. Kang HJ, Kim YJ, Chyun JH, Do YK, Lee BK, Kim WH, *et al*. The Continuous Monitoring of Oxygen Saturation During Fiberoptic Bronchoscopy. Tuberc Respir Dis 2002;52(4):385–94.

Submitted: November 22, 2023	*Revised: February 23, 2026*	*Accepted: July 18, 2026*

Address for Correspondence:

Dr. Mohammad Yasin
Department of Pulmonology, Ayub Medical College, Abbottabad-Pakistan
Cell: +92 312 430 8367
Email: yasinmohammadjan@yahoo.com