FREQUENCY OF ABNORMAL PULMONARY FUNCTION TEST IN ASYMPTOMATIC SMOKERS UNDERGOING CORONARY ARTERY BYPASS GRAFTING

Mehwish Naseer, Fakhar-e-Fayaz, Muhammad Adnan, Imtiaz Ahmed Chaudhry, Tahseen Ahmed, Mohammad Ahmad Khan

Army Cardiac Center, Lahore Pakistan

ABSTRACT

Objective: To determine frequency of abnormal pulmonary function tests in asymptomatic smokers undergoing coronary artery bypass grafting.

Study Design: Descriptive cross-sectional study.

Place and Duration of Study: Department of Anesthesiology, Army Cardiac Center, Lahore, from Aug 2020 to Jan 2021.

Methodology: Total 200 patients undergoing CABG surgery were included in the study with non-probability consecutive sampling technique. Patients 30-60 years of age who are smokers for at-least 10 years with smoking pack years of >5 and are active smokers or have quitted smoking for not more than 1month were included in study. These patients underwent pulmonary function tests by the staff certified in performing and interpreting these tests and their report results were included in data.

Results: All patients were male. Mean age and body mass index were 51.78 ± 6.51 years and 26.12 ± 3.09 kg/m^2 respectively. Mean smoking pack/years were 13.34 ± 4.18. Active smokers were 84% and those who had quitted but not >1 month were 16%. One hundred and twenty-seven patients (63.5%) had normal PFT's, 59 (29.5%) had mild obstruction, 14 (7%) had moderate obstruction with significant *p*-value.

Conclusion: frequency of abnormal pulmonary function tests is statistically significant in asymptomatic smokers presenting for coronary artery bypass grafting.

Keywords: Asymptomatic smokers, Pulmonary function tests, Coronary artery bypass grafting.

How to Cite This Article: *Naseer M, Fayaz F, Adnan M, Chaudhry IA, Ahmed T, Khan MA. Frequency of Abnormal Pulmonary Function Test in Asymptomatic Smokers Undergoing Coronary Artery Bypass Grafting. Pak Armed Forces Med J 2022; 72 (Suppl-1): S72-75.*

INTRODUCTION

Smoking is prevalent all over the world and continues to rise in developing countries. Smoking has deleterious effects on pulmonary functions. Inflammatory cells like CD8+ T-lymphocytes, B cells, neutrophils and macrophages accumulate in response to smoke inhalation and are responsible for an inflammatory reaction making smoking single most common reason of Chronic obstructive pulmonary disease (COPD). Hence, the risk of respiratory mortality or morbidity is high with smoking.[1]

Prevalence of COPD and its consequent burden are expected to rise with rapidly increasing smoking rates in developing countries. Since COPD is not usually diagnosed until it is clinically apparent and moderately advanced, its prevalence is underestimated.[3]

Pulmonary function testing (PFT) are commonly used to assess lung impairment. Spirometry determines the global lung function derived from measurements at the airway opening.[2] To date, no consensus exists on how, when, and where public screening for COPD with spirometry should be implemented.[3]

After cardiothoracic surgery, respiratory failure is a common complication which ranges in frequency from 2-22%. Many studies have shown that it is associated with increased hospital length of stay, morbidity, and mortality, greater resource utilization and costs.[4]

Some studies have identified COPD as the main predictor of the early and late outcomes of CABG. Therefore, the routine use of the preoperative pulmonary function test (PFT), as a screening tool, is justified in cardiac patients. However, there are still debates on the relationship between COPD and increased risk of early morbidity and mortality after CABG. It seems that the predictive role of COPD in patients undergoing CABG depends on its severity as the frequency of postoperative poor outcome in most patients with mild to moderate COPD tends to be similar to that of patients without COPD.[5]

We have recently started doing pulmonary function tests in asymptomatic smokers undergoing CABG and included it in our routine screening tests. The main aim of the study is to evaluate whether this

Correspondence: Dr Mehwish Naseer, Department of Anaesthesia, Army Cardiac Center, Lahore Pakistan

routine screening in asymptomatic smokers will just add to the cost or it will help us in early detection of COPD and in turn to reduce postoperative complications with timely detection and treatment of reversible elements of the disease before bringing them for coronary artery bypass grafting.

METHODOLOGY

It was a descriptive cross-sectional study conducted in Anesthesia department of Army Cardiac Centre CMH Lahore, September 2020 to February 2021. Ethics committee permission was taken. Total 200 patients undergoing CABG surgery were included in the study after taking informed consent with non-probability consective sampling technique.

Inclusion Criteria: Patients 30-60 years of age who were smokers for atleast 10 years with smoking pack years of >5 and were active smokers or have quitted smoking for not >1 month were included in study. These patients underwent pulmonary function tests by the staff certified in performing and interpreting these tests and their report results were included in data. Patients who did not have cough, sputum production or sign and symptoms of chronic obstructive airway disease were included.

Exclusion Criteria: Patients with low ejection fraction (<30%), cardiac failure, arrhythmias, renal failure, hepatic failure, with intra-aortic balloon pump, those undergoing emergency surgery, ASA status IV, known asthma, COPD or any other lung disease (obstructive or restrictive) and taking its treatment were excluded. Alcohol consumers and huka smokers were also excluded.

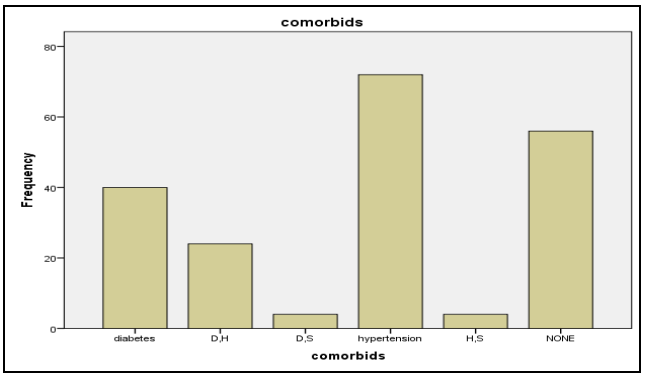
Calculated sample size was 310.[1] but it was on general population.as we conducted study only on patients presenting for CABG that's why our sam-ple size is smaller than the calculated one. A predesig-ned performa was used to record demographic variab-les and pulmonary function tests results. All data was recorded by researcher himself. The data thus collected was subjected to statistical analysis using the computer software SPSS-20. Qualitative data was analyzed in the form of frequencies and percentages while quantitative data was analyzed in the form of mean and standard deviation. A *p*-value of ≤0.05 was considered as statistically significant.

RESULTS

All patients were male. Mean age and BMI were 51.78 ± 6.51 and 26.12 ± 3.09 respectively. Mean smoking pack years were 13.34 ± 4.18 (Table-I). Out of 200 patients 40 (20%) had diabetes, 24 (12%) had both diabetes and hypertension, 4(2%) had stroke with diabetes, 72 (36%) had hypertension with 4 (2%) having stroke along with hypertension. Fifty six (28%) patients had no comorbids (Figure-1). One hundred and forty four (72%) patients were of ASA-III, 56 (28%) of ASA-II. Active smokers were 168 (84%) and those who had quitted but not >1 month were 32 (16%). Out of total 200 patients 124 (62%) had triple vessel coronary artery disease, 52 (26%) patients had double vessel coronary artery disease, 24 (12%) patients had single vessel coronary artery disease (Figure-2). One hundred and twenty seven patients (63.5%) had normal PFT's, 59 (29.5%) had mild obstruction, 14 (7%) had moderate obstruction with significant *p*-value (Table-II).

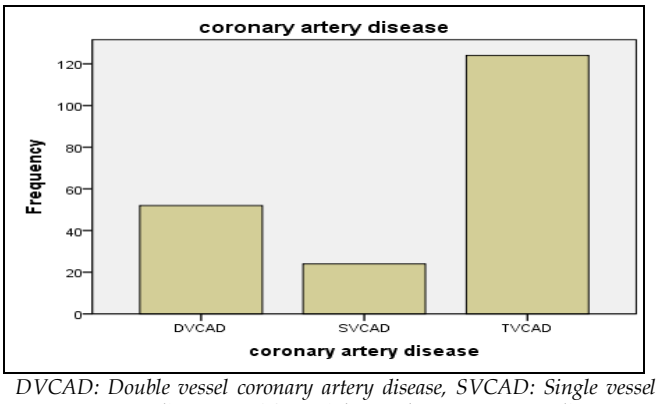
Table-I: Demographic variables.

	n	Minimum	Maximum	Mean	SD
Age	200	36	60	51.78	6.513
BMI	200	21	35	26.12	3.091
Pack/ years	200	6	20	13.34	4.184
ASA	200	2	3	2.72	0.450



D,H: Diabetes, Hypertension, D,S: Diabetes, Stroke, H,S: Hypertension, Stroke

Figure-1: Distribution of comorbids among patients.



DVCAD: Double vessel coronary artery disease, SVCAD: Single vessel coronary artery disease, TVCAD: triple vessel coronary artery disease.

Figure-2: Coronary artery disease of patients.

Table-II: Pulmonary function test results.

	Frequency	Percentage	*p*-value
Normal	127	63.5	0.04
Mild obstruction	59	29.5	
Moderate obstruction	14	7.0	

DISCUSSION

Spirometry is the readily available test to perform and access lung function tests.[1] By assessing PFTs we get information which helps us to diagnose multiple lung disorders. It is useful in detection of early-stage abnormalities in asymptomatic, adult smokers as clinically COPD often presents later in the course of the disease.[7]

Sophie *et al,* concluded that pulmonary function tests help in early identification of abnormalities in asymptomatic smoker. Abnormal PFT were present in 6 (85.71%) cases with pack years >15 as compared to 30 (69.77%) cases with pack year <15.[1]

Wang *et al* concluded that voluntary public screening with lung function tests help to identify COPD in asymptomatic smokers. A greater number of asymptomatic than symptomatic participants had airway obstruction in their study. They also concluded that it is more important to screen asymptomatic subjects earlier.[3]

Ivanov *et al* concluded in their study that preoperative PFT have little clinical utility in patients undergoing cardiothoracic surgery.[4]

Najafi *et al* concluded that patients presenting for coronary artery bypass grafting and with different levels of COPD developed respiratory failure more frequently. This finding suggest the prognostic value of preoperative PFT for determining COPD severity and postoperative morbidities.[5]

Mehta *et al* suggested that pulmonary function tests should be conducted early in smokers to rule out reduction in lung volumes. The American College of Physicians, the United Kingdom National Institute for Health and Care Excellence (NICE) have suggested not to perform PFT in asymptomatic patients but there are many recent studies advocating the pulmonary function tests efficacy in asymptomatic patients and their benefit in early detection of abnormalities in lung volumes.[7]

Stafyla *et al* reported a significant prevelance of COPD among the smokers subjected to screening spirometry and many of the cases were previously undiagnosed and made case finding worthwhile.[12]

In our study we enrolled 200 asymptomatic smokers presenting for coronary artery bypass grafting and got their PFT done preoperatively out of which 73 patient's PFTs turn out to be abnormal which was statistically significant (*p*-value=0.04). Out of them 59 (29.5%) showed only mild obstruction and 14 (7%) showed moderate obstruction. This shows the advantage of getting preoperative pulmonary function tests in asymptomatic smokers with atleast 5 pack years of smoking coming for coronary artery bypass grafting as this will help in their perioperative management and getting better postoperative outcome in return.

CONCLUSION

Abnormal pulmonary function tests in asymptomatic smokers are statistically significant and we should perform preoperative PFT in such patients presenting for coronary artery bypass grafting.

Conflict of Interest: None.

Author's Contribution

MN: Manuscript design, write-up, FF: Manuscript design, proof reading, MA: Data collection, IAC: Statistics, TA: Proof reading, MAK: Data collection.

REFERENCES

1. Sophie K, Singh N, Dharvey AJ. Study of pulmonary function test in asymptomatic smokers and nonsmokers between 30-50 years of age in a tertiary care hospital. Int J Adv Med 2017; 4(4): 959-963
2. Vogt B, Deuß K, Hennig V, Zhao Z, Lautenschläger I, Weiler N, et al. Regional lung function in nonsmokers and asymptomatic current and former smokers. ERJ Open Res 2019; 5: 240-2018.
3. Wang S, Gong W and Tian Y. Voluntary pulmonary function screening identifies high rates of undiagnosed asymptomatic chronic obstructive pulmonary disease. Chron Respirat Dis 2016; 13(2): 137-143.
4. Ivanov A, Yossef J, Tailon J, Worku BM, Gulkarov I, Tortolani AJ, et al. Do pulmonary function tests improve risk stratification before cardiothoracic surgery? J Thorac Cardiovasc Surg 2016; 151(4): 1183-1189.
5. Najafi M, Sheikhvatan M, Mortazavi SH. Do preoperative pulmonary function indices predict morbidity after coronary artery bypass surgery? Ann Card Anaesth 2015; 18(3): 293-298.
6. Firdaus AA, Hoesein M, Zanen P. Don't forget symptomatic smokers without airflow obstruction. Ann Am Thorac Soc 2017; 14(5): 615-616.
7. Mehta V, Desai N, Patel S. When pulmonary function test is available, should we wait for the COPD symptoms to develop?. J Clin Diagn Res 2016; 10(10): OE08.
8. Kuwata T, Shibasaki I, Ogata K, Ogawa H, Takei Y, Seki M, et al. Lung-diffusing capacity for carbon monoxide predicts early complications after cardiac surgery. Surgery Today 2019; 49: 571-579.
9. El-Sobkey SB, Gomaa M. Assessment of pulmonary function tests in cardiac patients. J Saudi Heart Assoc 2011; 23(2): 81-86.
10. Kurlansky P. Preoperative PFTs: The answer is blowing in the wind Paul Kurlansky, MD. J Thorac Cardiovasc Surg 2016; 151: 918-919.

11. Stafyla E, Kotsiou OS, Deskata K, Gourgoulianis KI. Missed diagnosis and overtreatment of COPD among smoking primary care population in Central Greece: old problems persist. Int J Chron Obstruct Pulmon Dis 2018; 13: 487.
12. Johnson KM, Sadatsafavi M, Adibi A, Lynd L, Harrison M, Tavakoli H, Sin DD, Bryan S. Cost Effectiveness of case detection strategies for the early detection of COPD. Appl Health Econ Health Policy 2021; 19(2): 203-215.
13. Viceconte M, Rocco IS, Pauletti HO, Vidotto M, Arena R, Gomes WJ, Guizilini S. Chronic obstructive pulmonary disease severity influences outcomes after off-pump coronary artery bypass. J Thorac Cardiovasc Surg 2018; 156(4): 1554-1561.
14. Risom EC, Buggeskov KB, Mogensen UB, Sundskard M, Mortensen J, Ravn HB. Preoperative pulmonary function in all comers for cardiac surgery predicts mortality. Interact Cardiovasc Thorac Surg 2019: ivz049.
15. Reddi BA, Johnston SD, Bart S, Chan JC, Finnis M. Abnormal pulmonary function tests are associated with prolonged ventilation and risk of complications following elective cardiac surgery. Anaesth Intensive Care 2019; 47(6): 510-515.
16. Ponomarev D, Kamenskaya O, Klinkova A, Loginova I, Vedernikov P, Kornilov I, et al. Chronic lung disease and mortality after cardiac surgery: a prospective cohort study. J Cardiothorac Vasc Anesth 2018; 32(5): 2241-2245.
17. Yokota S, Koizumi M, Togashi K, Morimoto M, Yasuda Y. Preoperative pulmonary function tests do not predict the development of pulmonary complications after elective major abdominal surgery: a prospective cohort study. Int J Surg 2020; 73: 65-71.
18. Powell CA, Caplan CE. Pulmonary function tests in preoperative pulmonary evaluation. Clin Chest Med 2001; 22(4): 703-14.
19. Fujii M, Nishina D, Bessho R. Preoperative assessment of pulmonary function tests and outcomes after cardiac surgery. Heart Surg Forum 2020; 23(2): E245-E249.
20. Adabag AS, Wassif HS, Rice K, Mithani S, Johnson D, Bonawitz-Conlin J, Ward HB, McFalls EO, Kuskowski MA, Kelly RF. Preoperative pulmonary function and mortality after cardiac surgery. American Heart J 2010; 159(4): 691-697.
21. oncada G, Dendale P, Linsen L, Hendrikx M, Hansen D. Reduction in pulmonary function after CABG surgery is related to postoperative inflammation and hypercortisolemia. Int J Clin Exp Med 2015; 8(7): 10938-46.
22. Henn MC, Zajarias A, Lindman BR, Greenberg JW, Melby SJ, Quader N, et al. Preoperative pulmonary function tests predict mortality after surgical or transcatheter aortic valve replacement. J Thorac Cardiovasc Surg 2016; 151(2): 578-585.
23. Magee MJ, Herbert MA, Roper KL, Holper E, Dewey TM, Snelus T, Mack MJ. Pulmonary function tests overestimate chronic pulmonary disease in patients with severe aortic stenosis. Ann Thorac Surg 2013; 96(4): 1329-1335.
24. Bedzra EKS, Dardas TF, Cheng RK, Pal JD, Mahr C, Smith JW. Pulmonary function tests do not predict mortality in patients undergoing continuous-flow left ventricular assist device implantation. J Thorac Cardiovasc Surg 2017; 154(6): 1959-1970.
25. Baris O, Findik O, Argun Baris S, Benli ED, Duzyol C, Tekeli Kunt A. Multidimensional evaluation of pulmonary function and exercise capacity by bode index in patients with on-pump coronary artery bypass grafting. Am J Cardiol 2021; 150: 55-59.