

Cardiovascular Disease Prediction Chart in Patients with Chronic Obstructive Pulmonary Disease

Abstract

Cardiovascular Disease (CVD) is the most common comorbidity of Chronic Obstructive Pulmonary Disease (COPD), increasing the risk of hospitalization, length of hospital stay, and death in patients with COPD. This study aimed to identify predictors of cardiovascular disease in COPD patients and build a predictive model based on these predictors. A total of 1022 COPD patients in the National Health and Nutrition Examination Survey (NHANES) participated in the cross-sectional study. All subjects are randomly assigned to the training set (n=709) and the test set (n=313). Differences before and after processing missing data were compared through sensitivity analysis. Univariate and multivariate analyzes were used to screen for cardiovascular disease predictors in COPD patients. The performance of the predictive model was evaluated through the Area Under the Curve (AUC), accuracy, sensitivity, specificity, Negative Predictive Value (NPV), Positive Predictive Value (PPV), and Calibration. A subgroup analysis was performed in patients using different COPD diagnostic methods and in smokers and non-smokers in the trial set. We found that in men, older age, smoking history, overweight, blood transfusion history, history of heart disease in a close relative, White Blood Cell Count (WBC) and Monocyte Count (MONO) were higher associated with increased cardiovascular risk disease in patients with COPD. Higher platelet (PLT) and Lymphocyte (LYM) levels are associated with a reduced risk of CVD in patients with COPD. The predictive model of cardiovascular disease risk in COPD patients was established based on predictors such as gender, age, smoking history, BMI, blood transfusion history, history of heart disease in relatives, etc. leukocytes, MONO, PLT and LYM.

The AUC value of the predictive model was 0.75 (95% CI: 0.71 to 0.79) in the training set and 0.79 (95% CI: 0.73 to 0.85) in the test set. The established prediction model shows good predictive performance in predicting cardiovascular disease in COPD patients. As a complex respiratory disorder, Chronic Obstructive Pulmonary Disease (COPD) is characterized by persistent airflow limitation associated with abnormal inflammation caused by exposure to noxious particles and gases. The prevalence of COPD is 11% to 26% and this worrying trend is expected to continue for the next 25 years. Alarmingly, there are an estimated 6 million deaths from COPD each year worldwide and by 2030, COPD will become the third leading cause of death worldwide. This prediction has come true and COPD will cause 3.23 million deaths in 2019. The prevalence of COPD has placed a great burden on society with an estimated cost of US\$50 trillion per year. COPD is expected to become a major economic burden of chronic human diseases in the future with increasing air pollution and aging rates worldwide. Expressing a particular concern about COPD is essential to society and to the patient.

Keywords: Cardiovascular • Therapeutic • Prediction Chart • Disease • Chronic Obstructive Pulmonary Disease

Introduction

Although COPD primarily affects the lungs, patients also have comorbidities such as Cardiovascular Disease (CVD), lung cancer, and metabolic disease. Cardiovascular disease is the most common comorbidity in COPD, increasing the risk of hospitalization, length of hospital stay,

Shuang Qu*

Department of Respiration, Fu Xing Hospital, Capital Medical University, Beijing, China

*Author for correspondence:

bethany.qu13@126qq.com

Received: 1-Mar-2023, **Manuscript No.** oarcd-23-91807; **Editor assigned:** 2-Mar-2023, **PreQC No.** oarcd-23-91807(PQ); **Reviewed:** 16-Mar-2023, **QC No.** oarcd-23-91807; **Revised:** 23-Mar-2023, **Manuscript No.** oarcd-23-91807(R); **Published:** 30-Mar-2023; **DOI:** 10.37532/rcd.2023.7(2).027-029

and mortality in patients with COPD. Previous studies have reported that the prevalence of cardiovascular disease in COPD patients is about 10% to 38%, and cardiovascular disease causes about 20% to 50% of mortality in the disease patients with COPD. Preventing the onset of cardiovascular disease in patients with COPD is of vital importance to improve the prognosis for these patients [1, 2].

Discussion

A large number of research findings have emerged in the past few years and risk factors for CVD in patients with COPD have been identified in various studies. Increased serum levels of inflammation and oxidative stress-related factors such as vascular cell adhesion molecule-1 and human epididymal protein 4 have been reported to be associated to an increased risk of cardiovascular disease in patients with COPD. Chronic bronchial infection has also been identified to increase the incidence of cardiovascular disease in patients with COPD. Machine learning allows systems to automatically learn and build analytic models from their experiences, and various predictive models have been built to identify people at risk for certain diseases or to use clinical. Predictive models have provided valuable tools to support and guide treatment and care for clinicians and nurses. Previously, a model for predicting cardiovascular disease risk in COPD patients was also established based on the ratio of Mononuclear Leukocyte Level (MONO)/HDL cholesterol to the area under the device performance curve gain (AUC) is 0.73 [3, 4].

This model focused only on the MONO/HDL cholesterol ratio in these patients, who lacked important clinical and demographic variables associated with inflammation in COPD. In this study, we collected data from 1022 patients with COPD from the National Health and Nutrition Examination Survey (NHANES) from 2007 to 2018. The aim of our study was to explore factors predict cardiovascular disease in patients with COPD and build predictive models based on these predictions. A predictive graph of cardiovascular disease in COPD patients was also plotted to rapidly determine the likelihood of cardiovascular disease in COPD patients. This study collected data from 1022 COPD patients with cardiovascular disease to evaluate the factors associated with the occurrence of cardiovascular disease in COPD patients and establish a predictive model based on the predictors. This

data revealed that male, age, smoking history, overweight, history of blood transfusion or heart disease in a relative and levels of WBC, PLT, LYM and MONO were predictors of cardiovascular disease in the patients with COPD. In addition, we established a predictive model for the occurrence of cardiovascular disease in COPD patients based on these predictors, the AUC value of the predictive model was 0.75 in the training set and 0.77 in the test set, showing good predictive performance. Subgroup analysis showed that the predictive model performed better in COPD patients diagnosed by the questionnaire and in patients with a history of smoking [5, 6].

Tobacco smoke is a major cause of COPD, accounting for about 95% of COPD cases in industrialized countries. Smoking has also been reported to be one of the strongest risk factors for COPD with cardiovascular disease. This may be due to different inflammatory responses to smoking in COPD patients, which increase the risk of cardiovascular disease. They have determined that alveolar macrophages in the broncho alveolar lavage fluid of the lungs of smokers can release more reactive oxygen species than non-smokers. Here, COPD patients with a history of smoking have a higher risk of developing CVD. Previously, several studies have shown that age is associated with the incidence of cardiovascular disease in COPD patients. These results supported the results of our study, which showed that increasing age was correlated with a higher risk of CVD in patients with COPD. In the present study, patients with a history of blood transfusion were also associated with an increased risk of CVD in patients with COPD. As noted, blood transfusion is a risk factor for major cardiovascular events in patients with acute myocardial infarction and ischemia [7, 8].

Conclusion

Family history of heart disease is widely suggested as an essential marker for predicting the occurrence of cardiovascular events in patients, which provides evidence for the findings of this study. Our study describes that a history of heart disease in a relative is associated with an increased risk of cardiovascular disease in patients with COPD. Routine blood parameters are essential inflammatory markers of COPD, and several inflammatory factors are also elevated in COPD patients. MONO circulates in the blood, bone marrow, and spleen and is one of the active members of inflammation in COPD. An increase

in leukocytes and a decrease in the number of LYMs have also been identified in patients with COPD compared with healthy subjects. Inflammation is associated with changes in the structure, shape, and dynamics of PLT, which may further influence atherosclerotic and thrombotic events. Another study also showed that increased levels of inflammatory markers were associated with increased rates of atherosclerosis, coronary heart disease, congestive heart failure, and atrial fibrillation. In our study, high levels of WBC and MONO were associated with an increased risk of CVD in patients with COPD, while higher levels of PLT and LYM were associated with a reduced risk of CVD in patients with COPD. For patients with chronic obstructive pulmonary disease, it is necessary to have regular blood tests periodically to pay attention to the white blood cell count, MONO, PLT and LYM to promptly detect patients at high risk of cardiovascular disease [9, 10].

Acknowledgement

None

Conflict of Interest

None

References

1. Palanisami B, Yoxall CW. PC88 National survey of the usage of percutaneous femoral arterial and venous catheterisation in Level 3 NICU units. *Arch Dis Child Fetal Neonatal Ed*, 99, A66-A67 (2014).
2. Kruse RR, Doornik DE, Maltha KV *et al*. Collateral artery pathways of the femoral and popliteal artery. *J Surg Res*, 211, 45-52 (2017).
3. Rizzi M, Goldenberg N, Bonduel M *et al*. Catheter-Related Arterial Thrombosis in Neonates and Children: A Systematic Review. *Thromb Haemost*, 6, 1058-1066 (2018).
4. Levit OL, Shabanova V, Bizzarro MJ. Umbilical catheter-associated complications in a level IV neonatal intensive care unit. *J Perinatol*, 4, 573-580 (2020).
5. Ramasethu J. Complications of vascular catheters in the neonatal intensive care unit. *Clin Perinatol*, 1, 199-222 (2008).
6. Gibson K, Sharp R, Ullman A *et al*. Adverse events associated with umbilical catheters: A systematic review and meta-analysis. *J Perinatol*, 41, 2505-2512 (2021).
7. Barrington KJ. Umbilical artery catheters in the newborn: Effects of position of the catheter tip. *Cochrane Database Syst. Rev*, 1, CD000505 (1999).
8. Demissie K, Rhoads GG, Ananth CV *et al*. Trends in preterm birth and neonatal mortality among blacks and white in the United States of America. *Am J Epidemiol*, 154, 307-315 (2001).
9. Ezechukwu CC, Ugochukwu EF, Egbonu I *et al*. Risk factors for neonatal mortality in a regional tertiary hospital in Nigeria. *Nig J Clin Pract*, 7, 50-52 (2004).
10. Steer P. The epidemiology of preterm labour. *Br J Obstet Gynaecol*, 112:1-3 (2005).