Prevalence of chronic kidney disease in patients with chronic obstructive pulmonary disease

Thesis

Submitted for Partial Fulfillment of Master Degree in Chest Diseases & Tuberculosis

Presented By
Mahmoud Sobhi Hassan Ali
M.B.B.Ch.

Supervised By
Prof. Taher Abd El-Hamid El-Naggar
Professor of Chest Diseases and Tuberculosis
Faculty of Medicine - Ain Shams University

Prof. Samar Hassan Sharkawy
Professor of Chest Diseases and Tuberculosis
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University
2019

سورة البقرة الآية: ٣٢

Acknowledgment

First and foremost, I feel always indebted to **ALLAH,**
the Most Kind and Most Merciful.

I'd like to express my respectful thanks and profound gratitude to **Prof. Taher Abd El-Hamid El-Naggar,** *Professor of Chest Diseases and Tuberculosis Faculty of Medicine - Ain Shams University for his keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

I am also delighted to express my deepest gratitude and thanks to **Prof. Samar Hassan Sharkawy,** *Professor of Chest Diseases and Tuberculosis Faculty of Medicine - Ain Shams University, for his kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

Mahmoud Sobhi Hassan Ali

List of Contents

List of Tables

List of Tables Cont...

List of Figures

List of Figures Cont...

List of Abbreviations

Abb.	Full term
AKI	Acute kidney injury
Anti-GBM	Anti-glomerular basement membrane
AV	Arteriovenous
BAL	Bronchoalveolar lavage
BMI	Body mass index
BOLD	Burden of Obstructive Lung Diseases
BUN	Blood urea nitrogen
CCPD	Continuous cycling peritoneal dialysis
CHF	Congestive heart failure
CI	Confidence interval
CKD	Chronic kidney disease
COPD	Chronic obstructive pulmonary disease
CRF	Chronic renal failure
CT	Computed tomography
CVD	Cardiovascular disease
DAH	Diffuse alveolar haemorrhage
eGFR	Estimated GFR
EPO	Erythropoietin
ESA	Erythropoiesis-stimulating agent
ESRD	End-stage renal disease
GFR	Glomerular filtration rate
GN	Glomerulonephritis
Hb	Hemoglobin
HD	Hemodialysis
ICMA	Immunochemiluminescent
iPTH	Intact PTH

List of Abbreviations Cont...

Abb.	Full term
IRMA	Immunoradiometric
IVP	Intravenous pyelography
KDIGO	Kidney Disease: Improving Global Outcomes
KDOQI	Kidney Disease Outcome Quality Initiative
LVH	Left ventricular hypertrophy
MDRD	Modification of diet in renal disease
MRI	Magnetic resonance imaging
NHANES	National Health and Nutrition Examination Survey
PAD	Peripheral artery disease
PD	Peritoneal dialysis
PPIs	Proton pump inhibitors
PRS	Pulmonary Renal Syndrome
PTH	Parathyroid hormone
RAAS	Renin-angiotensin-aldosterone system
ROD	Renal osteodystrophy
RRT	Renal replacement therapy
SE	Standard error
SHPT	Secondary hyperparathyroidism
TNF-α	Tumor necrosis factor-alpha
UACR	Urinary albumin-to-creatinine ratio
USRDS	United States Renal Data System
WHO	World Health Organization

INTRODUCTION

The incidence and prevalence of chronic kidney disease (CKD) continue to rise worldwide. Increasing age, diabetes, hypertension, and cigarette smoking are well-recognized risk factors for CKD ***(Comer et al., 2013)***.

Chronic obstructive pulmonary disease (COPD) is characterized by chronic airway inflammation leading to airway obstruction and parenchymal lung destruction ***(Barnes, 2014).***

Due to some of the common pathogenic mechanisms, COPD has been associated with increased prevalence of CKD ***(Comer et al., 2013).***

Several studies have identified COPD as part of a systemic inflammatory syndrome, ***(Georgian Med. 2013)*** and reported on the association of comorbidities like lung cancer ***(Houghton, 2013),*** osteoporosis ***(Mapel and Marton, 2013),*** progression of atherosclerosis ***(Savransky et al., 2007),*** and CKD.

Advancing age, diabetes, hypertension, body mass index (BMI) > 35, and cigarette smoking have previously been identified as risk factors for new-onset kidney disease ***(Fox et al., 2004).***

Advancing age, history of asthma, severe respiratory problems in childhood, passive smoking, and exposure to

biomass fuel for heating were identified as risk factors for COPD in never-smokers whereas increasing age, history of asthma, and severe respiratory problems in childhood, increasing lifetime exposure to cigarette smoking were identified as independent risk factors for development of COPD in ever-smokers ***(Tan et al., 2015).***

Many studies have reported on the high prevalence of CKD in COPD patients across different populations. Moreover, all the studies adjusted for co-variates including age, gender, BMI, and smoking status and this allowed for drawing a conclusion on the independent association of CKD with COPD.

The mechanism by which COPD potentiates the development of CKD remains unclear.

It might be related to the fact that COPD is mainly a disease of the elderly population who have comorbidities such as DM, HTN and CAD, known risk factors associated with CKD. COPD has been associated with systemic inflammation. Pro-inflammatory cytokines, especially tumor necrosis factor-alpha (TNF-α), play an important role in inflammation ***(Barnes, 2009),*** and have been shown to increase endothelial inflammation and atherosclerosis. This inflammation is also potentially related to development of diabetes, muscle wasting, and kidney disease COPD is associated with microalbuminuria and in hypoxemic and hypercapnic patients effective renal flow was found to be reduced.

These changes may be reflective of increased renin-angiotensin system activity seen in COPD patients. In the Multi-Ethnic Study of Atherosclerosis cohort, Harris et al. found an inverse relation between FEV1 and FVC with urinary albumin excretion and urine albumin to urine creatinine ratio ***(Harris et al., 2012).***

This finding suggests that systemic microvascular injury may contribute to development of CKD in COPD patients.

Medical management of COPD may contribute to the development of CKD. Studies ***(Mapel and Marton, 2013)*** showed that COPD patients were more likely to be on potentially nephrotoxic medications than controls. This includes re-current use of antibiotics, as well as PPIs and certain cardiovascular drugs.

Aim of the Work

To study the relationship between COPD using spirometry, and incidence of CKD through measuring kidney functions urea, creatinine, creatinine clearance.

Chapter 1

CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

Definition

Chronic Obstructive Pulmonary Disease (COPD) is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particles or gases.

The chronic airflow limitation that is characteristic of COPD is caused by a mixture of small airways disease (e.g., obstructive bronchiolitis) and parenchymal destruction (emphysema), the relative contributions of which vary from person to person.

These changes do not always occur together, but evolve at different rates over time. Chronic inflammation causes structural changes, narrowing of the small airways and destruction of the lung parenchyma that leads to the loss of alveolar attachments to the small airways and decreases lung elastic recoil. In turn, these changes diminish the ability of the airways to remain open during expiration. A loss of small airways may also contribute to airflow limitation and mucociliary dysfunction is a characteristic feature of the disease. Airflow limitation is usually measured by spirometry as this is the most widely available and reproducible