



A Study Of The Relationship Between Pulmonary Functiontests And Fasting Plasma Glucose And Glycated Haemoglobin Levels Among Asymptomatic Smokers

Thesis

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

لَسْبَدَانِكَ لَا نَعْلَمُ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْعَظِيمُ

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List of Abbreviations

Abb.	Full term
ACC.....	Acetyl CoA corboxycase
Ach	Acetylcholine
ACOS	Asthma and chronic obstructive pulmonary disease overlapping syndrome
ACTH.....	Adrenocorticotropic hormone
AMPK	AMP-activated protein kinase
apo.....	Apolipoprotein
ATS	American Thoracic Society
AVP	Argnine vasopressin
BMI	Body mass index
BOLD	The burden of obstructive lung disease
CAT	COPD Assessment test
CB	Chronic bronchitis
COPD.....	Chronic obstructive pulmonary disease
CRH	Cortitropin reasling hormone
CVD	Cardiovascular diseases
DA.....	Dopamine
DLCO.....	Diffusing capacity of the lung for carbon monoxide
DM	Diabetes mellitus
ERC.....	Functional residual capacity
ERS	European respiratory society
EXACT.....	Exacerbations of the chronic lung disease tool
EXAct.....	Excerbation of ???
FEV	Forced expiratory volume
FEV/FVC	Forced expiratory volume/ Forced vital capacity

List of Abbreviations Cont...

Abb.	Full term
FEV ₁	Forced expiratory volume first second
FFAs	Free fatty acids
FPG.....	Fasting plasma glucose
FRC.....	Functional residual capacity
FVC.....	Forced vital capacity
GH.....	Growth hormone
GLUT.....	Glucose transporter
GLUT.....	Glutathione
GOLD.....	Global imitative for chronic obstructive pulmonary disease
Hb1Ac	Hemoglobin A1c
HDL	High density lipoprotein
HPA	Hypothalamic pituitary adrenal axis
IC	Inspiratory capacity
IMCL.....	Intramycocellular lipid
IMTG	Intramuscle triglyceride
IRS	Insulin receptor substrate
KHNANES	Korean National health and nutrition examination survey III
LDL.....	Low density lipoprotein
LLN.....	Lower limit of normal
LPL	Lipoprotein lipase
Mets	Metabolic syndrome
mg/dl	milligrams per deciliter
mm/Hg	Millimeteres of mercury
mMRC.....	Modified medical research council

List of Abbreviations Cont...

Abb.	Full term
MRC	Medical research council
MVV	Maximal voluntary ventilation
nAchRs.....	Nicotine acetylcholine receptors
NADH	Nicotinamide adenine dinucleotide
NHANES	National Health and Nutrition Survey
NO ₂	Nitrogen dioxide
PLATINO.....	Latin American Lung Disease Investigation Project
RAAS	Renin-angiotensin-aldosterone system
RR	Relative risk
RV	Residual volume
SI.....	Smoking index
T2DM.....	Type 2 diabetes mellitus
TLC	Total lung capacity
TLC	Total lung capacity
VA/Q	Ventilation/perfusion
VGDF.....	Vapor, gases, dust, fumes
VLDL	Very low density lipoproteins
WHO	World health organization
WHO	World Health Organization

INTRODUCTION

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 (***GOLD, 2017***).

Metabolic syndrome is a cluster of metabolic disorders causes a group of risk factors that raises risk of heart disease, diabetes, stroke, and other health problems. It is diagnosed when any three of the following five risk factors are present: • High blood glucose (sugar) • Low levels of HDL (“good”) cholesterol in the blood • High levels of triglycerides in the blood • Large waist circumference or “apple-shaped” body • High blood pressure Metabolic syndrome is a serious health condition (***American Heart Association, 2017***).

A number of studies have suggested that COPD is a risk factor for Type 2 diabetes.

Insulin resistance has been associated with cytokines, including interleukin-6 and tumor necrosis factor alpha soluble receptor, both of which are elevated in chronic obstructive

pulmonary disease (COPD). Few studies have investigated the relationship between pulmonary function tests using spirometry (PFT) and fasting plasma glucose (FPG) or glycated hemoglobin (HbA1c) levels. **Baba et al** studied the relationship between PFT in Japanese people who had health checkups and their FPG or HbA1c levels. They concluded that in Japan, HbA1c levels were higher in participants with FEV1/FVC values <70% in PFT than in those with FEV1/FVC $\geq$ 70%. In preventive medicine, PFT by spirometry should be performed in elderly participants with elevated HbA1c levels who are current or former smokers (**Baba et al., 2017**).

AIM OF THE WORK

The aim of this study was to assess the relationship between pulmonary function tests using spirometry and fasting plasma glucose and glycated haemoglobin among asymptomatic current and former smokers.

Chapter 1

CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Definition of COPD

Chronic obstructive pulmonary disorder (COPD) is a prevalent disease that is growing in incidence around the world. It is characterized by persistent, partially reversible airway obstruction, but is now considered to be preventable and treatable disease. Airflow restriction is correlated with chronic and anomalous inflammatory response to noxious stimuli in the airways and the lung. (*GOLD, 2018*).

A decrease in expiratory airflow is described as obstruction of the airway. Generally speaking, compelled expiratory volume at 1 s / forced volume capability (FEV1/FVC) ratio of less than 70% after use of bronchodilator to recognize COPD patients. The use of reduced limits of ordinary (LLN) values was suggested to identify spirometric airflow limitations, but the present Global Chronic Obstructive Lung Disease initiative. (*GOLD, 2018*).

COPD patients have shown considerable heterogeneity and can be categorized as chronic bronchitis (CB) and emphysema by their clinical and radiological parameters, biomarkers, pulmonary function deficiency and prognosis (Rosenberg, 2015). CB is

described as the appearance of 3 months in each of two successive years of chronic productive cough. (*Rsenber et al., 2015*).

Current GOLD guidelines do not include the use of these terms in the definition of COPD. Asthma and COPD represent different disease entity with different pathogeneses and risk factors. Sometimes clinical manifestations of both diseases may overlap in a patient with airway obstruction and cannot be classified as COPD or asthma only. Large population studies show that some of the patients with airway obstruction are classified with more than one diagnosis. Therefore, overlapping diagnoses of asthma and COPD has been proposed and it is called COPD and Asthma Overlap Syndrome (ACOS) (*Rsenber et al., 2015*).

Epidemiology of COPD

COPD is the world's leading cause of morbidity and death. COPD's incidence and burden is now growing. It is due to the ongoing exposure of smoking and aging population to risk factors in particular. Based on the research population and diagnostic requirements, the prevalence and incidence of COPD is distinct (*Rsenber et al., 2015; Thomsen et al., 2013*).

Prevalence

COPD prevalence demonstrates notable variation owing to study population variations, survey technique and diagnostic criteria (*Yin et al., 2016*). Meta-analysis of 62 research released between 1990 and 2004, including prevalence estimates from 28

distinct nations, showed a concentrated COPD incidence of 7.6% (**Halbert et al., 2006**). The prevalence estimate increased to 8.9% from epidemiologic studies using spirometry data. In accordance with prior findings, the incidence of COPD in research using GOLD criteria to describe COPD was greater than in other techniques of classification. Prevalence was small when calculated on the basis of COPD self-report or physician diagnosis (**Crighton et al., 2015**).

Data from the Third National Health and Nutrition Survey (NHANES III) in the United States estimated that 23.6 million adolescents (13.9%) met the GOLD definition of COPD in 2000 (phase 1 or greater) (**Viegi, et al., 2000**).

According to NHANES information from 2007 to 2010, for adolescents aged 20–79 years, the incidence of airway obstruction was 13.5 percent, with 28.9 million individuals. Of these, 15.9 million were moderately obstructed and 12.9 million were moderately to severe. The Latin American Lung Disease Investigation Project (PLATINO) examined post-bronchodilate incidence (**Brent et al., 2015**).

The project Burden of Obstructive Lung Disease (BOLD) was suggested in 2002 to estimate global incidence. This is standardized epidemiological research based on the population. The presence of COPD was defined by using a post-bronchodilator FEV1/FVC ratio of less than 0.7. Participants from 12 nations included in the BOLD research and conducted