"EVALUATION OF CRITERIA FOR CLINICAL CONTROL IN PATIENTS WITH COPD-A HOSPITAL BASED PROSPECTIVE STUDY"

By

REG NO. BR0118003

Dissertation

Submitted to the
KAHER, Belagavi, Karnataka
In partial fulfillment
of the requirements for the degree of

M.D in

RESPIRATORY MEDICINE

DEPARTMENT OF RESPIRATORY MEDICINE,

J. N. MEDICAL COLLEGE,

BELAGAVI- 590010.KARNATAKA

APRIL-2021

KLE ACADEMY OF HIGHER EDUCATION AND RESEARCH, BELAGAVI, KARNATAKA

Endorsement by Head of the Department, Principal/ Head of the Institution

This is to certify that the thesis **"EVALUATION OF CRITERIA FOR CLINICAL CONTROL IN PATIENTS WITH COPD - HOSPITAL BASED PROSPECTIVE STUDY"** is a bonafide research work done by**(REG NO:BR0118003).**

Dr.Gajanan S Gaude
MD, DNB, FCCP, FAPSR, FICS, FNCCP
Professor and Head,
Department of Respiratory Medicine,
J.N Medical College
Belagavi-10

Date:
Place : Belagavi

Dr.(Mrs.)N S Mahantashetti$_{\text{MD (Paed.)}}$
Principal,
J. N. Medical College,
Nehru Nagar,
Belagavi – 10

Date:
Place: Belagavi

PLAGIARISM ACCEPTED LETTER

KLE
JAWAHARLAL NEHRU MEDICAL COLLEGE
(Recognized by Medical Council of India, New Delhi)
Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (GoI)
Nehru Nagar, Belagavi- 590 010, Karnataka, INDIA
0831 - 2471350 0831 - 2470759 www.jnmc.edu principal@jnmc.edu

Ref No: MDC/PG/ Date: 30-09-2020

ACCEPTANCE LETTER

The softcopy of thesis entitled: **"EVALUATION OF CRITERIA FOR CLINICAL CONTROL IN PATIENTS WITH COPD- A HOSPITAL BASED PROSPECTIVE STUDY "has** been submitted for Anti-Plagiarism check through Turnitin software. The scan has been carried out and the scanned output reveals a match percentage of **8%** which is within the acceptable limits of **10%** as per the guidelines given by UGC.

Chairperson-Antiplagiarism Committee &
Principal,
J. N. Medical College, Belagavi.

KAHER BELAGAVI J. N. MEDICAL COLLEGE

To,
Reg. No. BR0118003,
Postgraduate Student,
2018-19 Batch,
Department of Pulmonary Medicine,
J. N. Medical College, Belagavi.

LIST OF ABBREVIATIONS

6MWD	–	6 Minute Walk Distance
6MWT	–	6 Minute Walk Test
BMI	–	Body Mass Index
BODE	–	BMI, Obstruction of airways, Dyspnoea scale, Exercise capacity
CAT	–	COPD Assessment Test
CCQ	–	Clinical COPD Questionnaire
COPD	–	Chronic Obstructive Pulmonary Disease
DLCO	–	Diffusing Lung Capacity for Carbon monoxide
FEV_1	–	Forced Expiratory Volume in 1 second
FVC	–	Forced Vital Capacity
GOLD	–	Global Initiative for Chronic Obstructive Pulmonary Disease
FRC	–	Forced Residual Capacity
HRQOL	–	Health related quality of life
IC	–	Inspiratory Capacity
MMRC	–	Modified Medical Research Council dyspnoea grading scale
OPD	–	Out Patient Department
PFT	–	Pulmonary Function Test
PM	–	Particulate Matter
PR	–	Pulse Rate
ROS	–	Reactive Oxygen Species
RR	–	Respiratory Rate
RS	–	Respiratory System
RV	–	Residual Volume
SpO_2	–	Peripheral capillary oxygen saturation

ABSTRACT

Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory lung disease that causes obstructed airflow from the lungs most often secondary to tobacco smoke. It is associated with concomitant chronic disease and presents with symptoms of dyspnea, cough, mucus (sputum) production, and wheeze. In Asthma the term control is well defined, however in COPD it is not the same. Patients of COPD with similar lung function tests may have different symptoms and health status Despite different pharmacological and non-pharmacological treatment modalities, patients might have symptoms and exacerbations. The concept of control of COPD was introduced by Soler-Cataluna et al. It is defined as “maintenance of a situation of Low Impact over time adapted to the severity of the disease itself. As the disease is Dynamic there is a need to have criteria to determine the stability of the patient and to assess the risk of exacerbation.

Objectives

To evaluate the concept of clinical control of COPD in the Indian setup.

Methods

Stable COPD patients visiting the outpatient clinic of the department of respiratory medicine were prospectively evaluated for the criteria of control of COPD. With ethical committee clearance and inclusion and exclusion criteria, 106 COPD patients were enrolled in this prospective study.

Spirometry as per guidelines,6MWT, demographic details, history was recorded during a hospital visit.BODE index vas calculated and questionnaires CAT(COPD assessment test) and CCQ (clinical COPD questionnaire) were filled by patients during the same visit.

Patients were reassessed after 3 months, exacerbation history, clinical symptoms were recorded along with clinical examination.CAT & CCQ questionnaires were filled. As per criteria for clinical control of COPD Impact and stability were assessed and participants were classified into Controlled and Uncontrolled subjects. Post evaluation these patients were followed up for 24 weeks for exacerbations and hospital admission.

Results

A total number of 106 patients were included in this study and evaluated for the control status. The mean age of the patients in the study population was 61.11+/-10.25 years, with a maximum in-between age group of 50-69 years. Most of the patients were males (68.8%) and 33 females (31%). Out of 106,65 male and 06 females were smokers.majority of the patients had COPD <10 years with 50.94 % of the patients.among comorbidities most of the patients suffered from Hypertension (52.8 %), followed by Diabetes Mellitus (33%), and IHD (15%).

After complete evaluation as per the criteria predefined for the control of COPD,55 patients (51.88%) in mild/moderate COPD and 16 patients (15.09%) in severe COPD were classified as Control COPD patients.On follow-up, 21.95% had an episode of exacerbations in Control COPD patients and (64.7%) in uncontrolled COPD patients.The overall hospitalisation rate was 14.28%

Conclusion

The Criteria for Control of COPD is a unique and effective method to assess the COPD patient and control status of disease.

Keywords : COPD, CAT, CCQ, COPD CONTROL .

CONTENTS

SL. NO.	TOPIC	PA NO.
1.	INTRODUCTION	1-2
2.	OBJECTIVES	3
3.	REVIEW OF LITERATURE	4-26
4.	METHODOLOGY	27-33
5.	RESULTS	34-48
6.	DISCUSSION	49-54
7.	CONCLUSION	55
8.	SUMMARY	56-57
9.	BIBLIOGRAPHY	58-68
10.	ANNEXURE I – CONSENT FORM	69-73
11.	ANNEXURE II – PROFORMA	74-77
12.	ANNEXURE-III- ETHICAL CLEARANCE LETTER	78
13.	ANNEXURE IV – PHOTOGRAPHS	79
14.	ANNEXURE V – MASTER CHART	80-82
15.	ANNEXURE VI – KEY TO MASTER CHART	83

LIST OF TABLES

TABLE NO	DESCRIPTION	PAGE NO
1	Risk Factors of COPD	7
2	Classification of Airflow Limitation and GOLD staging	17
3	MMRC Dyspnoea Scale	21
4	BODE scoring system	22
5	Criteria to assess the impact of COPD patients with mild to moderate severity.	31
6	Criteria to assess the impact of COPD patients with moderate to severe severity	32
7	Criteria to establish Control and Uncontrolled patients	33
8	Age Distribution	35
9	Gender Distribution	36
10	Smokers Distribution	37
11	Duration of COPD	38
12	Symptomatology	39
13	Co-morbidities	40
14	Baseline Characteristics of Study Population	41
15	Controlled COPD Patients	43
16	Characteristics of Controlled COPD patients	44
17	Controlled and Uncontrolled COPD patients Comparison	45
18	BODE Index among 2 groups	46
19	Follow Up of study subjects	47
20	Hospitalisation	48

LIST OF FIGURES

FIGURE NO	DESCRIPTION	PAGE NO
1	Prevalence of COPD In india	**5**
2	Pathogenesis of COPD	**14**
3	Combined COPD assessment	**30**
4	Flow chart patients	**34**
5	Age distribution	**35**
6	Gender distribution	**36**
7	Smokers distribution	**37**
8	Duration of COPD	**38**
9	Symptomatology	**39**
10	Co-morbidities	**40**
11	Baseline characteristics	**42**
12	Controlled and Uncontrolled COPD patients	**46**
13	Exacerbations	**47**
14	Hospitalisation	**48**

LIST OF PHOTOGRAPHS

PHOTOGRAPH NO	DESCRIPTION	PAGE NO
1	Spirometer	**79**

INTRODUCTION:

Chronic obstructive pulmonary disease (COPD) is a chronic inflammatory lung disease that causes obstructed airflow from the lungs most often secondary to tobacco smoke. Global Initiative for Chronic Obstructive Lung Disease (GOLD)[1] defined COPD as, "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."[1]

It is associated with concomitant chronic disease and presents with symptoms of dyspnoea, cough, mucus (sputum) production, and wheeze. It is commonly caused due to exposure to cigarette smoke, particulate matter, or irritating gases for long term exposure.

In Asthma the term control is well defined [2], however in COPD it's not same. Patients of COPD with the similar lung function tests may have different symptoms and health status. In spite of different pharmacological and non-pharmacological treatment modalities, patients might have symptoms and exacerbations. Therefore, previous studies have elucidated the need for individualized and multidisciplinary treatment.[3]

The concept of control of COPD was introduced by Soler-Cataluna et al[4]. It is defined as "maintenance of a situation of Low Impact over time adapted to the severity of the disease itself ". IMPACT relates to disease presentation during medical consultation while STABILITY is the clinical status over time[4].

Patients of COPD present with a variety of symptoms and the management is based on the severity of airflow obstruction comorbidities and disease severity. As per GOLD guidelines, management is based on Group A-D.[5,6]

A patient with a similar group may have different levels of symptoms and the risk of exacerbations may be different hence there is a need to focus on therapy based on an individual basis. As the disease is Dynamic there is a need to have criteria to determine the stability of the patient and to assess the risk of exacerbation.[7]

The concept of COPD Control Panel has also been introduced towards the common objective of determining Control as a valid predictor of prognosis in patients with COPD. However, there is a paucity of studies aimed at supplementing the same.

Hence in this study, an attempt will be made to evaluate the Concept of Control of COPD in the Indian scenario.

OBJECTIVES:

Primary objective:

To evaluate the concept of clinical control of COPD in Indian setup.

Secondary objective:

To validate the concept of clinical control of COPD in Indian setup.

REVIEW OF LITERATURE:

COPD -chronic obstructive pulmonary disease is a heterogeneous disease that is characterized by progressive but not fully reversible airflow obstruction and which is also associated with many comorbidities and systemic changes.

DEFINITION

The definition of COPD has evolved over the time, The Global Initiative for Chronic Obstructive Lung Disease (GOLD)[1] has defined COPD as a common and preventable and treatable disease characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases[1] .

COPD BURDEN

World health organization estimates to have 65 million moderate to severe COPD cases globally.[9]

Prevalence in aged above 30 years is estimated to be 11.4 % globally with higher among men 14.3 % and 7.6% in women, WHO region-wise higher in the American region with 14.1% and least in the Southeast Asian region with a prevalence of 7.8 %.[10]

It was seen more common in men earlier, but due to urbanization and increased exposure to air pollution, it is seen almost equal in both men and women around the world.[11]

Valuation of the exact prevalence of COPD is challenging because of variation among methods used in studies such as use of the self-report questionnaire, spirometry, GOLD, ATS/ERS criteria and age group analyzed.

National Health and Nutrition Examination Survey analyzed the prevalence of COPD in the US population aged 6-79 years using pre and post-bronchodilator pulmonary function tests and estimated 10.2 to 20.9 % prevalence and also found a decrease of prevalence by 33% after using post-bronchodilator criteria.[12]

In Latin American Cities prevalence was 7.8% to 19.7 % using spirometry as described in PLATINO – The Latin American Project for the Investigation of Obstructive Lung Disease.[13]

In India, the prevalence of COPD has increased from 3.3% to 4.2% as estimated in the year 2016.[14]

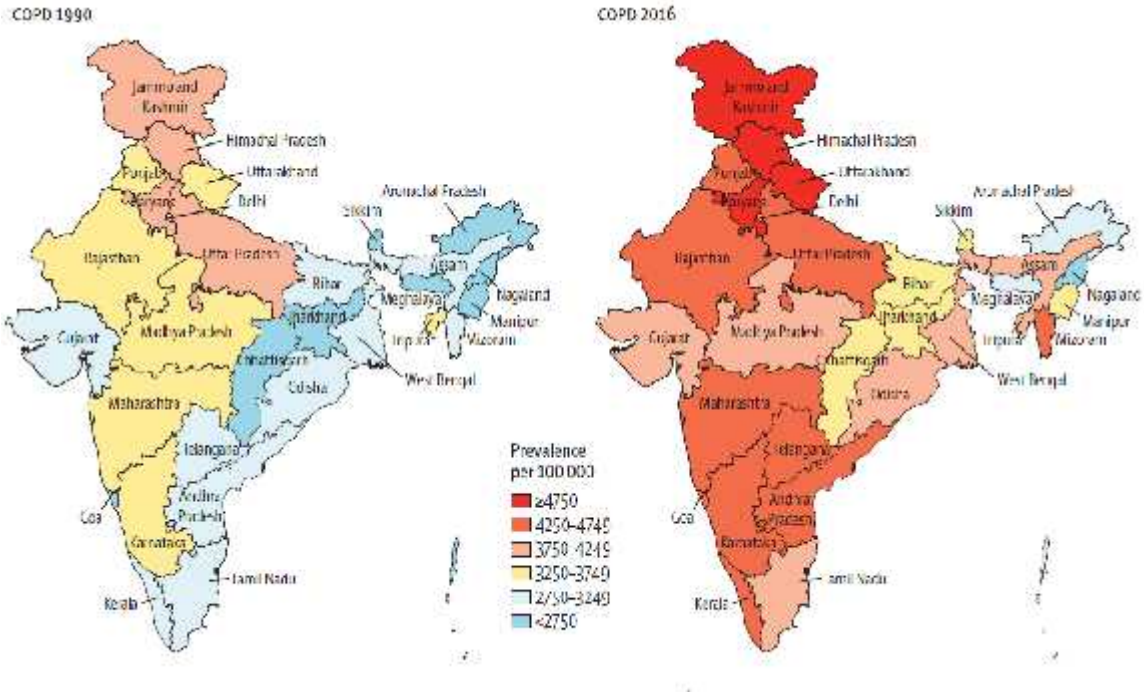


Figure 1: Prevalence of COPD In india. [14]

In 2016 out of total global DALYs due to chronic respiratory disease, COPD was predominant with 75.6 % of total DALYs.[14]

After ischemic heart disease, COPD is the second cause of disease burden in INDIA with 8.7 % of total death and 4.8 % of total DALYs.[15]

Case fatality is documented to be 15.3%, with an increase in death rates 53.7 % attributed to Air pollution, 25.4 % to tobacco use, 33.6 % to ambient air pollution ,25.8 % to household air pollution and 16.5 % to occupational Risk.[16]

THE COST BURDEN OF COPD

Apart from the health impact of the disease, the economic burden is always high with loss of billions every year. In India, The estimated economic loss due to COPD is about Rs.35,000 crores for the year 2011 and around Rs.48,000 crores for the year 2016. [17]

A Canadian report that registered 790 COPD patients with an exacerbation. Out of which 151 required hospitalization, they projected an average charge of US$ - 9,557.[17]

Similarly, a Swedish study[19] estimated the the cost of COPD exacerbations to be SEK 2,111 and SEK 21,852 respectively. Another study with cohort of 2,414 COPD patients, found that the average cost of an Acute Exacebation of COPD was US$159.[18]

Lakium et al[19] estimated the cost burden of COPD in southern INDIA. The total direct cost of medicines in a COPD patient accounted to be Rs.29,885 $\pm$ 11,995.33 and the total mean indirect medical cost was Rs.7,441.25 $\pm$ 2,228.90.[19]

Another study done in North India estimated the cost burden of COPD to be Indian Rs. 33,354 to Rs.63,642. The maximum cost was for the hospital with 71% of total and least with transportation of 2% of total cost .[20]

RISK FACTORS

Copd is a heterogeneous disease; various risk factors are associated and can be described as

Table 1: Risk factors of COPD

Environmental factors	Host factors
Smoking	Age
Occupational exposure	Gender
Air pollution and particulate matter exposure	Family history/Genes
Low socioeconomic status	Airway hyper responsiveness
Childhood infections	

SMOKING

Tobacco abuse via smoking cigarette is a common cause for COPD. Cigarette is a well-engineered method for slow delivery of nicotine to the body, nicotine present in tobacco leaf after smoking reaches the blood after alveolar deposition which causes elevation of Heart rate and blood pressure. It is associated with accelerated lung aging and emphysema progression and autophagy impairment .

The prevalence of COPD was seen to be 4.2% at the beginning increased to 13.1 percent at the end in a prospective study of 14926 patients -Rotterdam study .Higher incidence rate was seen in smokers.[21]

In India, tobacco leaves are dried and rolled in tendu leaves -biddi and smoked which is cheaper and has a higher amount of tar compared to cigarette.

In a multi-centric study in India, 35295 adults above age 35 years were evaluated and adults diagnosed as COPD were 4.1% of study subjects, with higher rates in smokers and males. The prevalence was 8.2 % in bidi smokers and 5.9 % in cigarette smokers.[22]

AIR POLLUTION

Outdoor air pollutants present in the atmosphere are either primary or secondary released from Industries, vehicles, or other sources.

These pollutants cause oxidative stress and bronchial hyperreactivity which results in the development of COPD. [23]

PM <2.5 um, Environmental smoke causes oxidative stress, systemic and respiratory inflammatory changes, reduced ciliary action in airways, and increased bronchial reactivity in predisposed . It also degrades body elastin and causes possible lung injury.[24]

INDOOR AIR POLLUTION

Solid fuel smoke/biomass fuel smoke is another important risk factor for COPD. Biomass fuel such as wood smoke, burning of animal dung, charcoal, etc on

pooled analysis it showed that solid biomass fuel exposure increases the risk of COPD by 3 times (OR= 2.65).[25]

LOW SOCIOECONOMIC STATUS

Poor nutrition, overcrowding, poor education, ambient air pollution, recurrent infections are linked to COPD. There is association seen between low socioeconomic status and COPD.[26]

AGE AND GENDER

Age is one of the risk factors for COPD and it is seen more commonly in men over women, In India prevalence of COPD had shown an increasing trend after age 30 years, with the greater percentage in men and highest among age >80 years with a prevalence of 37.8% and women of age 75-79 yr with a prevalence of 19.7 %.[11]

But recent data shows almost equal prevalence among both the genders probably due to increased pollution, urbanization, smoking habits, second-hand smoke, and altered lifestyle.

GENETIC SUSCEPTIBILITY

COPD is a disease of complex genetic trait, SERPINA1 was the first gene identified to be associated with COPD, this gene encodes for alpha-1 antitrypsin (A1AT).[27]

A number of disease-specific Sinlge Nucleotide Polymorphism is associated with COPD such as AGER SNP, rs2070600. Many association has been found for loci already associated with COPD diagnosis and lung function which included

FAM13A, TNS1,HTR4, HHIP, AGER, TSHD4, CHRNA5/CHRNA3, and ADAM19 .[28]

In a 2017 genetic association study in 15256 COPD cases, 22 new loci associated with genome-wide significance were found. Out of 13 association 9 were associated with general population sample and 4 were new which included EEFSEC, DSP, MTCL1, and SFTPD. [29]

PATHOGENESIS

COPD is a clinical expression of complex alterations in the structure and function of alveolar tissue along with small airways. Small airway remodeling and narrowing along with damage to lung parenchyma and alveolar attachments of airways leading to emphysema are the two major causes of COPD. Few major pathogenetic processes leading to this pathway are

INFLAMMATION

Irritant inhaled substances like cigarette smoke and air pollutants or gases activate surface macrophages and airway epithelial cells to release multiple chemotactic mediators like chemokines that attract circulating neutrophils, monocytes, and lymphocytes in the lung. [30]

Tumor necrosis factor-alpha (TNF alpha), Interleukin 1 (IL-1), IL-6, IL-8, and transforming growth factor-beta (TGF beta) along with chemokine's like CXCL 10 and CXCL 11 which cause small airway fibrosis are few inflammatory mediators released by activated epithelial cells of the airway. [30]

They recruit T cells leading to further activation of macrophages and release of metalloproteinase causing further inflammation.

Macrophages activated from cigarette smoke or any noxious particles activate inflammatory mediators like TNF alpha, CXCL 1, CXCL 8, reactive oxygen species, and secrete enzymes like MMP 2, MMP 9, MMP 12 causing pathological destruction.[31]

The Recruited neutrophils in the airway they secrete serine proteases including neutrophil elastase, cathepsin G, MMP 8, MMP 9 which cause alveolar destruction.

PROTEASE ANTIPROTEASE IMBALANCE

Stimuli like cigarette smoke, noxious particles produce oxidative stress and release inflammatory mediators which cause inflammation. Along with this, it inactivates several antiproteases like SLP, alpha 1 antitrypsin by oxidation which causes protease antiprotease imbalance and further leads to the progression of inflammation[32].

OXIDATIVE STRESS

It occurs when an excess of ROS is produced because of the antioxidant defense mechanism resulting in harmful effects like damage to lipids, proteins, and DNA. Additionally, this oxidative stress decreases the antioxidant level due to the downregulation of Nuclear erythroid factor 2 (NRF 2) which helps in the increased production of antioxidants, further reducing antioxidant.[33]

PATHOPHYSIOLOGY

Inflammatory injury to airways, lung parenchyma and pulmonary vasculature in various combinations leading to airflow obstruction, exaggerated work of breathing, and gas exchange abnormalities are the characteristics of COPD.

AIRFLOW LIMITATION AND AIR TRAPPING

Airflow limitation in the expiratory phase is the main physiological defect in COPD. Intrinsic airway factors are related to increased mucosal secretions and bronchial wall remodeling whereas dynamic expiratory compression of small airways and the loss of elastic tissue support are the Extrinsic factors involved [1].

Hyperinflation in COPD causes an increase in the amount of air remaining in the lung at the end of tidal exhalation and thus there is increase in functional residual capacity (FRC) and increased residual volume (RV).

As a consequence, work of breathing is increased and dyspnea starts. Since expiratory time is important for lung emptying, factors like increasing respiratory rate during exercise result in a progressive increase in FRC or delayed emptying.[34]

VENTILATION-PERFUSION IRREGULARITIES

Gas exchange irregularities results in reduced oxygen and increased carbon dioxide in blood. Reduced ventilation could be due to reduced ventilatory drive which causes Co2 retention.

MUCOUS HYPERSECRETION

In chronic bronchitis, chronic airflow irritation causes goblet cell hyperplasia and enlarged submucosal gland resulting in chronic productive cough. Many of the inflammatory mediators and proteases stimulate mucous hypersecretion.

VENTILATORY MUSCLE DYSFUNCTION

There are various contributing factors for ventilatory muscle dysfunction in COPD. As a consequence of hyperinflation, muscle strength and endurance of inspiratory muscles are at a mechanical disadvantage. Other factors that may further contribute to exercise limitation are nutritional depletion, tissue hypoxia, and loss of muscle mass.[35]

COPD AS A SYSTEMIC DISEASE

COPD is a respiratory disease with permanent and progressive airflow obstruction with extrapulmonary manifestations which was acknowledged recently. Large clinical trials and many epidemiological studies have helped us in understanding the importance of comorbidities. [36]

A study done by Antonelli-Incalzi[37] demonstrated the impact and prognostic role of comorbidities in COPD. In their data analysis of 270 patients of COPD, understood about common comorbidities associated. Most common was hypertension (28%), diabetes mellitus (14%), and ischemic heart disease (10%). The median survival was 3.1 years and during a five year follows up period 228 out of 270 patients died. Hence, along with management of airflow limitation there is need to tailor thereapy for comorbidities also.[37]

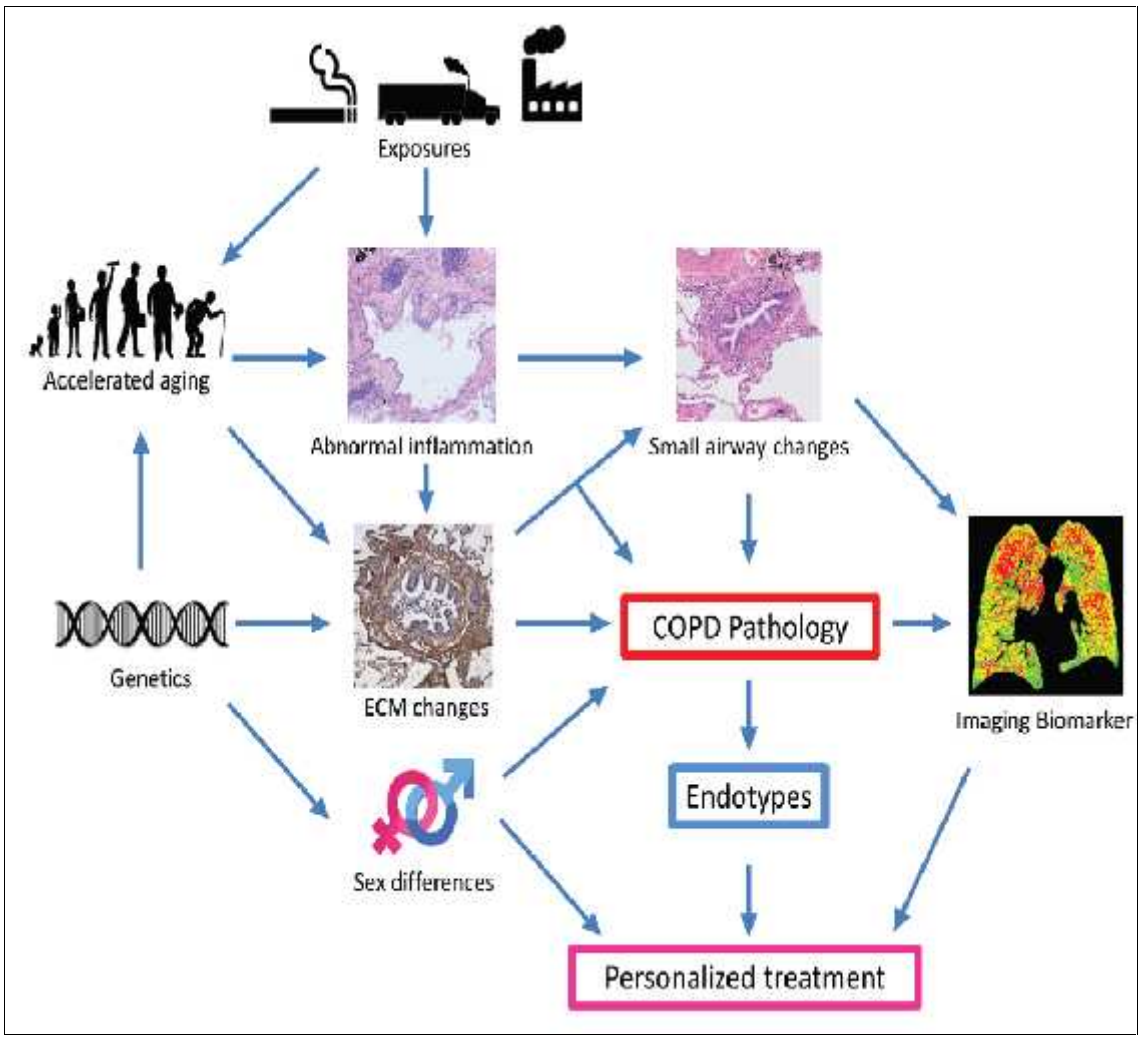


Figure 2 : Pathogenesis of COPD[38]

DIAGNOSIS

HISTORY

A detailed medical history has to be taken. History of symptoms of cough/breathlessness/wheeze and others along with onset and progression with history of comorbidities, personal habits, previous hospitalization, allergy, and drug history, occupation, family history of non-communicable diseases and socioeconomic status to be recorded in details.

PHYSICAL EXAMINATION

The physical examination gives status of BMI, disease severity, hyperinflation, respiratory failure, and corpulmonale.

PULMONARY FUNCTION TEST / SPIROMETRY

Spirometry is a simple test carried out using a spirometer, it is an objective measure of airflow limitation.

It is essential to diagnose COPD. As per GOLD criteria, COPD should have a post-bronchodilator value of <0.7 and it is an objective measure of airflow limitation.

IMAGING

1. Chest Roentgenogram
2. Computed tomography
3. Body Plethysmography

It is used to calculate TLC total lung capacity and airway conductance, it helps in the identification of the early course of disease compared to spirometry.

Gupta et al[39] studied 350 COPD patients for a study of body plethysmography in Pune and concluded that parameters such as airway conductance and IC help in the identification of disease at early stages.

DLCO

Diffusion capacity for carbon monoxide is a non-invasive test which measures gas transfer (carbon monoxide) and interaction with alveocapillary interface, it correlates emphysema in COPD.

Balasubramaniam et al[40] evaluated the diffusion capacity of carbon monoxide in COPD assessment of 1806 patients from COPD gene study, found impairment in DLCO, And FEV1 alone or combine were associated with worst morbidity.

ASSESSMENT OF DISEASE SEVERITY

Goals are to determine:

- Level of airflow obstruction
- Impact of COPD on a patient's overall health condition
- Risk of future exacerbations, hospital admissions, and death.

Assessment of comorbidities such as cardiovascular disease, metabolic disorders, depression, anxiety, osteoporosis, etc

Above mentioned goals helps in guiding the treatment plan.

Pulmonary function test abnormality and disease severity

Patient with symptoms of dyspnea, chronic cough or sputum production, and previously mentioned risk factors should undergo spirometry or pulmonary function test

According to GOLD 2019 guidelines, post-bronchodilator FEV1/FVC < 0.70 confirms the diagnosis of COPD, and its severity is classified as

Table 2: Classification of airflow limitation severity and GOLD staging [1]

FEV1 % predicted	Grading	GOLD Staging
>80	Mild	1
50-80	Moderate	2
30-49	Severe	3
<30	Very severe	4

Different studies have observed a strong correlation between FEV1% and symptoms and health status.[41]

PATIENT'S SYMPTOMS ASSESSMENT

Assessment of patient symptoms helps to achieve an accurate diagnosis and also help in deciding therapeutic plans.

COPD patients commonly present with Dyspnoea/Breathlessness. British medical research questionnaire MRC scale further modified to MMRC modified British medical research dyspnoea scale is used to assess the breathlessness severity.[42]

However, COPD presents with other symptoms apart from Dyspnoea With time many comprehensive tools have been evaluated such as St. George Respiratory Questionnaire (SGRQ), COPD Assessment Test (CAT), and COPD Control Questionnaire (CCQ).[43,44]

They have a set of questions to evaluate overall symptoms and to grade severity.

COPD EXACERBATION ASSESSMENT

AECOPD acute exacerbation of COPD is seen in the natural course of COPD which is marked by acute onset of breathlessness, cough, increased sputum production, wheeze which worsen with time and resulting emergency visits to hospital or use of rescue medications.[45]

It may be associated with acute viral or bacterial infection or may occur independently as the severity of COPD progress exacerbations rate is more frequent and few subgroups are more prone for exacerbation.[46]

Various biomarkers are evaluated for diagnosis of AECOPD which includes C-reactive protein (CRP), erythrocyte sedimentation rate (ESR) and fibrinogen, cytokines such as interleukin (IL)-6, IL-8, and TNF-α, brain natriuretic peptide (BNP), matrix metalloproteinase (MMP)-9, adiponectin. The most commonly studied biomarker was CRP, followed by IL-6 and TNF-α.CRP is appeared to be constantly elevated in exacerbations.[47]

PRESENCE OF ANY COMORBIDITIES

COPD is an important component of a multimorbid condition in the elderly. Other common coexisting diseases includes cardiovascular diseases, skeletal muscle dysfunction, anxiety, depression, metabolic syndrome, osteoporosis, and lung carcinoma.[48] COPD itself might escalate the risk for other diseases like lung carcinoma. This association might be because of other mutual risk factors (e.g., smoking), similar gene susceptibility, or reduced clearance of carcinogens.[49]

Comorbidities are seen in these patients with any amount of airflow obstruction, which can influence hospitalizations and mortality independently. This deserves specific treatment along with COPD treatment.[50]

Combined COPD assessment as per GOLD 2019 [51]

ABCD Assessment tool :

POST BRONCHODILATOR
FEV1/FVC < 0.7

GOLD	FEV1 PREDICTED
1	>80
2	50-79
3	30-49
4	<30

Moderate or severe exacerbation history:

>2 or >1 causing hospital admissions	**C**	**D**
0 or 1 (not causing hospital admission)	**A**	**B**
	mMRC 0-1,	mMRC>2,
	CAT < 10	CAT >10

BMI , mMRC, 6MWT and BODE INDEX

BODY MASS INDEX

Nutritional deficiency is one of the most common findings observed in advanced COPD patients. Prevalence in loss of weight in COPD patients who visits OPD ranges from 20% and it increases to 35% who are hospitalized[52]. It was also observed that low BMI could be a risk factor for COPD mortality. Less BMI was associated with an increased risk of mortality.

MODIFIED MRC DYSPNOEA SCALE (mMRC)

The most common disabling symptom of COPD is breathlessness, [53] this is the main reason for a patient to seek medical attention. MMRC scale is simple to know the level of breathlessness and disability during an activity.[54]

Though this is a good scale, these days it is considered to be a primitive method of assessing symptoms and HRQOL since breathlessness is not the only symptom of COPD. Since it predicts dyspnea in a better way, it is considered as one among the components in the BODE Index. Grading is as follows

Table 3: MMRC Dyspnea Scale [55]

MMRC 0	I only get breathless with strenous activity
MMRC 1	I get short of breath when hurrying on the level or walking up a slight hill
MMRC 2	I walk slower than people of the same age on the level because of my breathlessness or I have to stop for breath when walking on my own pace on the level
MMRC 3	I stop for breath after walking about 100 meters or after a few minutes on the level
MMRC 4	I am too breathless to leave the house or I am breathless when dressing or undressing

SIX MINUTE WALK TEST (6MWT)

Six Minute Walk Test (6MWT) is a simple and accurate test for understanding the severity of the disease and exercise tolerance in a COPD patient. It gained acceptance because of its simplicity, reliability, and standardization.[56] Various factors reduce 6MWD like female sex, shorter height, lack of motivation, impaired cognition, musculoskeletal, or cardiopulmonary diseases[57]. It helps in disease severity ranking and helps in predicting survival.

The main disadvantage of this test is the measurement of the functioning of all muscles rather than measuring the fatigue in an individual group of muscles or specific muscles. Milder disease patients may not demonstrate reduced exercise capacity.

Association between 6MWD, peak VO2, and death rate in COPD patients was studied by Cole and colleagues which showed that 6MWT is one of the better predictors of mortality. It is better than the peak VO2 obtained in the CPET test.[58]

Table 4: BODE scoring system [59]

BODE SCORES

BODE COMPONENTS	0	1	2	3
Predicted FEV1 %	>65	50-64	36-49	<35
6MWD (mts)	>350	250-349	150-294	<149
Dyspnea scale	0-1	2	3	4
BMI	>21	<21	-	-

In 2004, Celli et al[60] studied 207 COPD patients in which the predictive validity of the above variables was assessed and they quoted that these variables predict mortality in COPD patients.

Claudia et al[61] did a study in 625 COPD patients, a 6 monthly follow up was done till 2 years and BODE index scores which ranged from 0-10 were divided into four quartiles and this was compared with the rate of mortality. They observed that the 4th quartile which had 7-10 BODE scores yielded more mortality in comparison with other quartiles. Hence it is proved that composite indices are better predictors of mortality than individual components.

Marin et al[62] did a prospective cohort study on the BODE index for predicting COPD exacerbations risk. He considered 275 patients from two tertiary care centers

in Spain. Exacerbations per year were 1.95 and the meantime of first exacerbation was inversely proportional to the BODE quartiles. Meantime taken to visit an ER was 6.7, 3.6, 2, and 0.8 years with a significant p-value. On application ROC curves, BODE was shown to be a better predictor than FEV1.

In another retrospective study done by Hogdev et al[63] , 76 COPD cases with a mean age of 59 years and a mean FEV1 of 35% were taken to compare frequent and infrequent exacerbators with the BODE index. Exacerbations were found by patient interviews and health databases. A total of 178 exacerbations were noted and a significant difference was found between frequent and infrequent exacerbations and BODE index with a p-value of 0.002.

COPD HEALTH-STATUS QUESTIONNAIRES

Dartmouth COOP chart:[64]

This is a self-administered or interviewer based questionnaire. It has a 6-9 single item chart. Physical activities, emotional reactions, daily and social activities, pain are various domains of this scale.

EuroQoL (EQ 5D) :[65]

It consists of five domains based on a visual analog scale. It is a self-administered scale that takes around 8 minutes. Mobility of patient, Self-care, usual activities, pain, anxiety & depression is various domains of the scale. Patients who had health problems on EQ-5D had significant low mean SF-12 scores for all the dimensions. Patients who show a health issue on EQ-5D had a significant low mean SF-36 scores for all the dimensions.

Nottingham Health Profile (NHP) : [66]

It is useful in evaluating perceived distress in various populations. It takes around 8-10 minutes to administer the scale. There are 38 questions under 6 domains. It is one of the most widely used scoring systems in the subjective evaluation of disease all over the world.

St. George Respiratory Questionnaire (SGRQ) :[67]

It is divided into two parts, part 1 has symptom score and part 2 covers impact and activity scores which altogether constitute a total SGRQ score.

Part 1 has 8 questions which record a 12-month recall of patient's symptomatology, Part 2 has 8 questions which measure the patient's level of activity and psycho-social activity subjectively

COPD patients have SGRQ scores >25. Scores < 25 are usually found in healthy people.[68]

COPD Assessment Test (CAT)[69] :

It is a short and simple questionnaire invented in 2009 to calculate COPD impact. It also helps in monitoring long term follow up. It has 8 items, a six-point scale (0-5) with a score range of 0-40. High scores indicate a bad HRQOL. It is a self-administered scale in 50 languages. It is a reliable scale with good responsiveness. It is endorsed by GOLD for its use in diagnosis and treatment. It predicts future exacerbations. [70]

Clinical COPD Questionnaire (CCQ) :

It is a self-administered, reliable, validated, specialized score for COPD developed in 2003.[71] It is supposed to be used in daily practice. It has 10 items under 3 domains i.e, symptom score, functional score, and mental state. They were asked to record experiences in the last 7 days. HRQOL is poor with higher scores. It is available in 53 languages.[72]

CONCEPT OF COPD CONTROL

The concept of control of COPD was introduced by Soler-Cataluna et al. It is defined as "maintenance of a situation of Low Impact over time adapted to the severity of the disease itself."[4]

Criteria to be fulfilled for control are [4]

1. Low Impact according to baseline severity of the disease.
2. Stability – which is defined by no exacerbation in the previous 3 months and no significant clinical deteriorating.

Miravitlles et al [82] conducted a Multicenter Prospective study on 314 COPD patients with a mean age of 68.5 years and airflow obstruction defined by mean FEV1 was 52.6 % of predicted. As per the criteria for Control of COPD, only 21 % of the patients were classified as controlled.

All of them were under mild/moderate COPD. High level of Dyspnea, High CAT score, severe COPD were the main reasons for Uncontrolled COPD patients. They also suggested redefining the cut-offs of the criteria and further studies to Validate this new Concept of control of COPD.

Another Multicenter study done by Nuñez et al [83] included Severe and very severe COPD patients from Spark Study Population and patients were followed for 52

weeks for exacerbations. Out of 2044 patients, 418 (20%) of the patients were classified as controlled. On follow up they found that exacerbation rates lower in controlled patients vs uncontrolled with a rate ratio of 0.56, they also found there was a delay in time to first exacerbation.

In conclusion, they found an association between control status and risk of exacerbations and ended with a discussion that the concept of clinical control could be utilized as a Predictor of risk of future exacerbations.

Another study done by Nibber et al[84] who retrospective observed COPD patients in the United Kingdom .Majority of patients were mild/moderate COPD (90%) ,3549 patients were included in the study and Controlled COPD patients were 4.5% at baseline using clinical criteria & 21.5 % using CAT score. Controlled COPD patients had less comorbidities ,Low mMRC scores ,better FEV1 and CAT score.On follow up they found time to first exacerbation was high in controlled patients compared to uncontrolled in mild/moderate COPD.

In another attempt to validate the Clinical Control of COPD as a tool for treatment optimization, Soler-Cataluna et al[85] studied 256 patients of COPD with 1 year follow up to validate the modified controlled criteria (MCC) of COPD .84 % were Men in this study cohort ,there mean FEV1 was 58 % of predicted and Mean age was 68 years . They found that 61.5% were controlled if the BODE index was used as adjustment of disease severity and 59.6% were controlled using FEV1 values and CAT scores. They concluded that modified Clinical Criteria had a higher number of Controlled patients. They prospectively validated the concept of control in COPD and also proposed new criteria for easy application.

METHODOLOGY:

This study was conducted in the Department of Respiratory Medicine at K.L.E.S Dr.Prabhakar Kore Hospital & Medical Research Centre, Belagavi.

It was done between period of January 2019 to January 2020.

Design :

Prospective study

Method of data collection:

Data was collected from diagnosed COPD cases as per GOLD 2019 guidelines attending the outpatient clinic at Respiratory Medicine in KLE'S Dr.Prabhakar Kore Hospital and Medical Research Centre, Belagavi.

Sample size:

Universal sample

Selection criteria:

Inclusion criteria:

I. COPD patients diagnosed by spirometry,ration of FEV1 / FVC $\leq$ 0.7 .

II. Age more than 40 years

III. Smoker/ex-smoker

IV. In a clinically stable state

Above patient attending outpatient clinic of Department of Respiratory Medicine in KLE'S Dr.Prabhakar Kore Hospital and Medical Research Centre, Belagavi.

Exclusion criteria :

1. Diagnosis other than COPD such as Bronchial asthma .
2. Diagnosis of congestive cardiac failure or unstable angina or recent MI.
3. Any major life-threatening illness
4. Patients who are unable to perform spirometry or 6-minute walk test.
5. Malignancy such as Bronchogenic carcinoma

Procedure:

After approval of the Ethical and Research committee of our college J.N. Medical College, Belagavi. The patients visiting the outpatient clinic were explained in detail about this study, once written informed consent was taken they were enrolled in the study.

It is a prospective hospital-based study. Stable COPD cases were diagnosed by spirometry based on GOLD guidelines, after considering inclusion and exclusion criteria were included in the study.

A detailed history in the form of a systematic proforma of Demographic details like age, gender, height, weight, BMI, presenting complaints, comorbidities, habits(smoking, alcohol consumption, tobacco chewing), MMRC dyspnea grading along with the duration of COPD was taken.

All patients were subjected to clinical examination, baseline transcutaneous saturation, PFT, and oral questionnaires on the same day.

Within that session, clinical, social, and demographic data were collected; then, Spirometry and six minute walk test was done. , BODE index was calculated, Questionnaires CAT and CCQ were filled in the same day.

BODE index-Body mass index which was measured by knowing height and weight. Airflow obstruction measured using spirometry which was performed 15minutes after the inhalation of 400mcg salbutamol according to ATS guidelines[1] .Dyspnoea was measured with the help of mMRC dyspnoea scale and exercise capacity was tested by performing best of two 6 minute walk tests performed at least with a gap of 30-minute interval.

CAT-(COPD assessment test)[4] -a specific questionnaire that consists of 8 questions that assess cough, phlegm, chest tightness, breathlessness, daily activity limitations, patient confidence, quality of sleep, and energy. The total score ranges from 0 to 40.

CCQ-(Clinical COPD questionnaire)[5] consists of 10 questionnaire divided into three domain - symptoms (4 items), functional status (4 items), and mental state (2 items). Each question is categorized from 0 to 6 points of the Linker scale. Final score was calculated as the total average of each questionnaire score.

The severity of COPD was assessed by the BODE index, Patients were categorized into mild/ moderate COPD with BODE index 4 or less and severe/very severe COPD with BODE index 5 or more.

The second visit was done after 3 months; the control status of the patient was evaluated.

Control of COPD was defined as[4]

Low impact- based on clinical symptoms at time of hospital visit, CAT score and CCQ score.

+

Stable- evaluated as no clinical worsening or no exacerbations in the past three months, CAT score less than three-unit increase and change in CCQ less than 0.4.

Impact was measured through clinical criteria, CAT and CCQ score as per Table 01.

Patients were classified as Controlled and Uncontrolled.

After the second visit both controlled and uncontrolled patients were followed up for exacerbations episode or any hospital admission over 24 weeks.

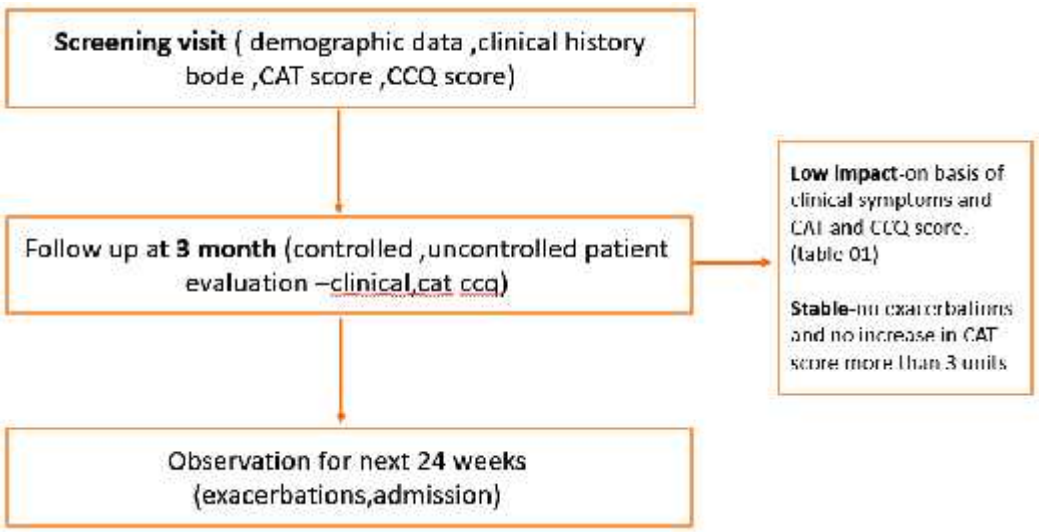


Figure 3: Flow chart for study design

Table 5 : Criteria to assess the impact of COPD patients with mild to moderate severity (BODE index <4 points).[4]

	Low Impact	**High Impact**
Clinical evaluation		
Dyspnea (mMRC)	0–1	≥2
Rescue medication	<3 times in the last week	>3 times in the last week
Daily physical activity(time walked per day)	≥60 minutes	<60 minutes
Sputum color	Absent or white	Dark
Questionnaires of clinical control		
CAT	<10	>10
CCQ	<1	>1

Table 6 : Criteria to assess the impact of COPD patients with moderate to severe severity (BODE index >5 points).[4]

	Low Impact	High Impact
Clinical evaluation		
Dyspnea (mMRC)	0–2	≥3
Rescue medication	<2 times in the last week	>2 times in the last week
Daily physical activity(time walked per day)	≥30 minutes	<30 minutes
Sputum color	Absent or white	Dark
Questionnaires of clinical control		
CAT	<20	>20
CCQ	<2	>2

Table 7 : Criteria to establish Control and Uncontrolled patients [4]

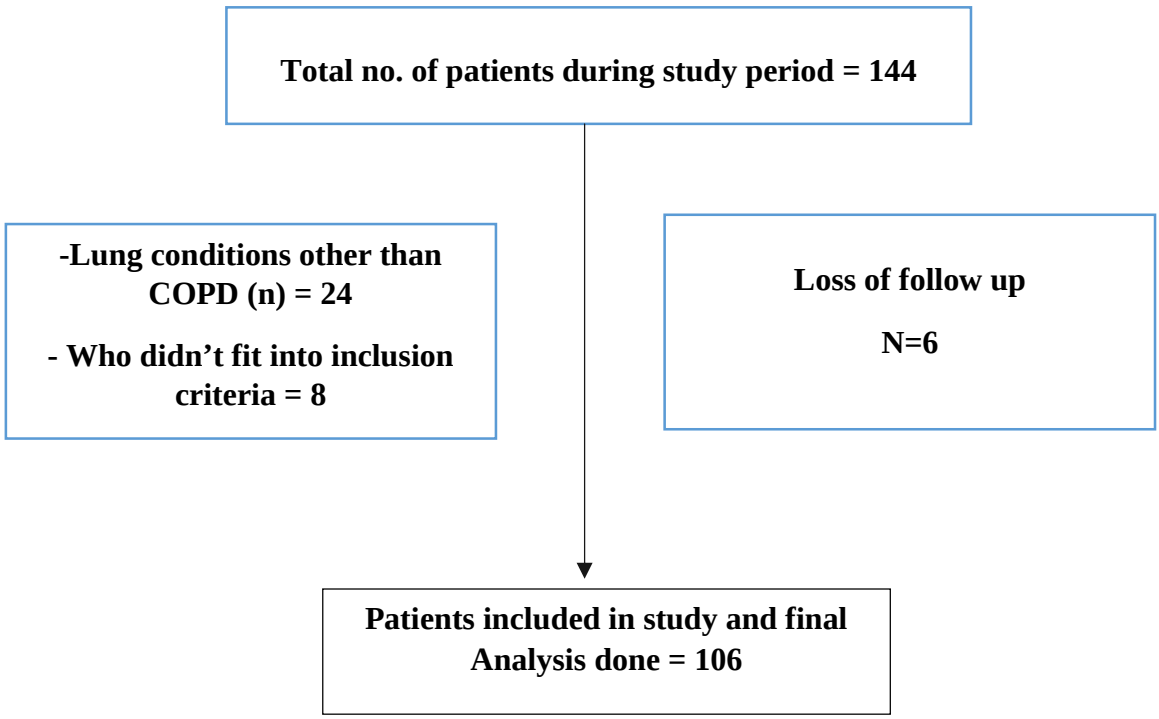
	Control	**Uncontrolled**
Current clinical situation		
Impact (adjusted according to severity)	Low	High
Clinical changes in the last 3 months		
Changes in the CAT	<2	>3
Changes in the CCQ	<0.4	>0.4
Exacerbations in last three months	No	Yes

Statistical Analysis :

Obtained data was entered into Microsoft Excel Spreadsheet and categorical data were expressed as rates, ratios and percentages. Continuous data was expressed as mean +/- standard deviation and Student unpaired T test was used .For comparison between Controlled and Uncontrolled COPD Chi square test was used . Suitable graphs are used to depict the comparison. SPSS version 12 software was used for calculation . A p-value of <0.05 was considered statistically significant.

RESULTS:

Figure 4: Study Design



A total of 144 patients were evaluated for the present study, among them 24 patients were diagnosed to have disease other than COPD,8 patients did not fulfill the inclusion criteria and 6 patients were loss of follow up.

A total number of 106 patients were included in this study and evaluated as per study design.

Table 8:Age-wise distribution of patients

Age	Number	Percentage
40 - 49	15	14.29
50 - 59	32	30.48
60 - 69	37	35.24
70 - 79	15	14.29
80 - 89	6	5.71
TOTAL	105	100.00

	Mean	S.D.
Age	61.11	10.25

The mean age of the patients in the study population was 61.11+/- 10.25 years.

Most of the patients included in the study were between 50-69 years of age i.e. 65.72% and lowest among the age group of 80-89 years with 5.71 %.

Figure 5: Age Distribution Of Patients

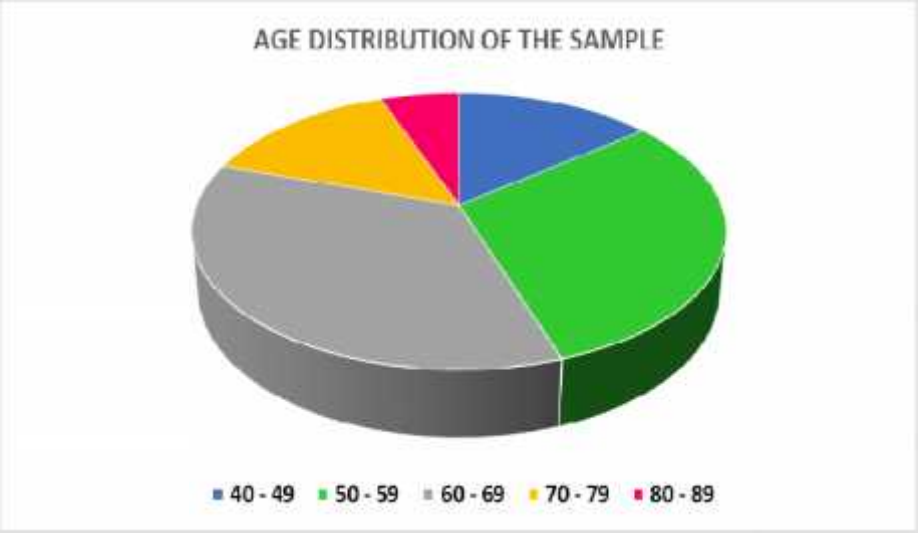


Table 9: Gender distribution of the study population

Gender	No.of Patients	Percentage
Male	73	68.86
Female	33	31.14
Total	106	100

In this study, most of the patients were males (68.8%) and 33 females (31%) among a total of 106 patients.

There was male gender predominance in the study subjects.

Figure6: Gender distribution

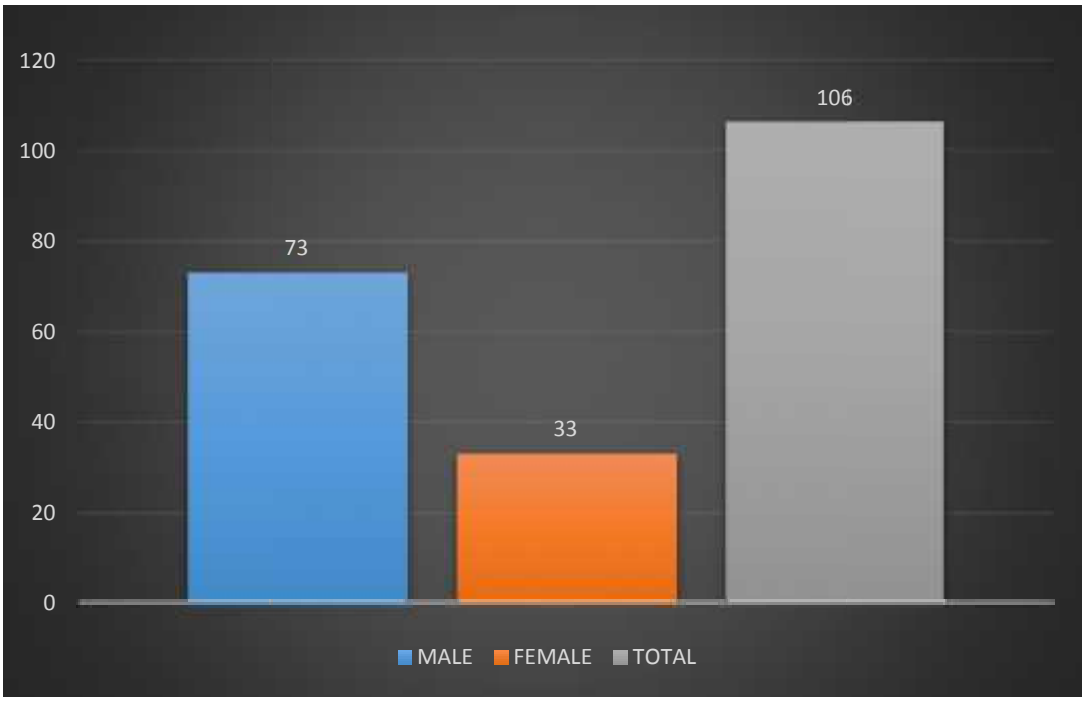


Table 10: Distribution of Smokers

Smoking History	Male	Female	Total	Percentage
Smokers	65	6	71	66.9
Non smokers	8	27	35	33.1
Active smokers	31	0	31	29.2

Out of 106, among males, 65 were smokers and 8 non-smokers, among females, 6 out of 33 were smoker. Overall, 35 patients were active smokers.

Figure 7:Distribution of smokers

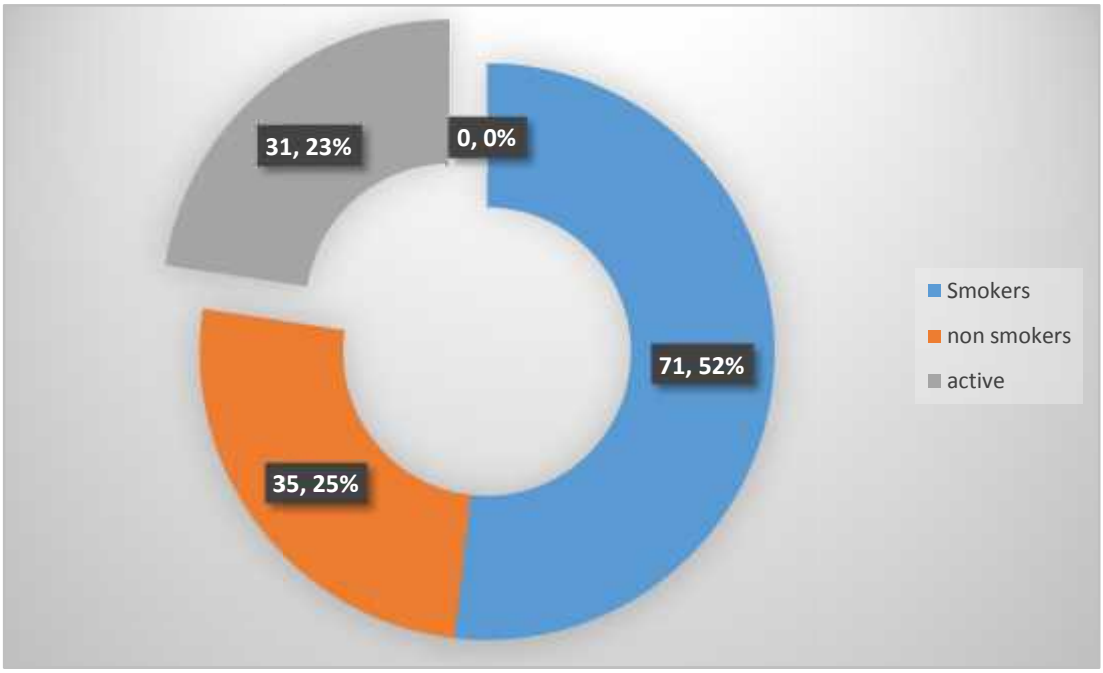


Table 11: Duration of the disease in study subjects

Duration(in years)	Number	Percentage
< 10 YEARS	54	50.94
10-20 YEARS	40	37.73
> 20 YEARS	12	11.33

Disease duration in this study was divided into duration of 10 years each, patient were maximum with duration of less than 10 years of CODP with 54 patients (50.94%) ,between 10 -20 years were 40 patients(37.73%) and 12 patients (11.33%) with COPD more than 20 years.

Figure 8:COPD Duration

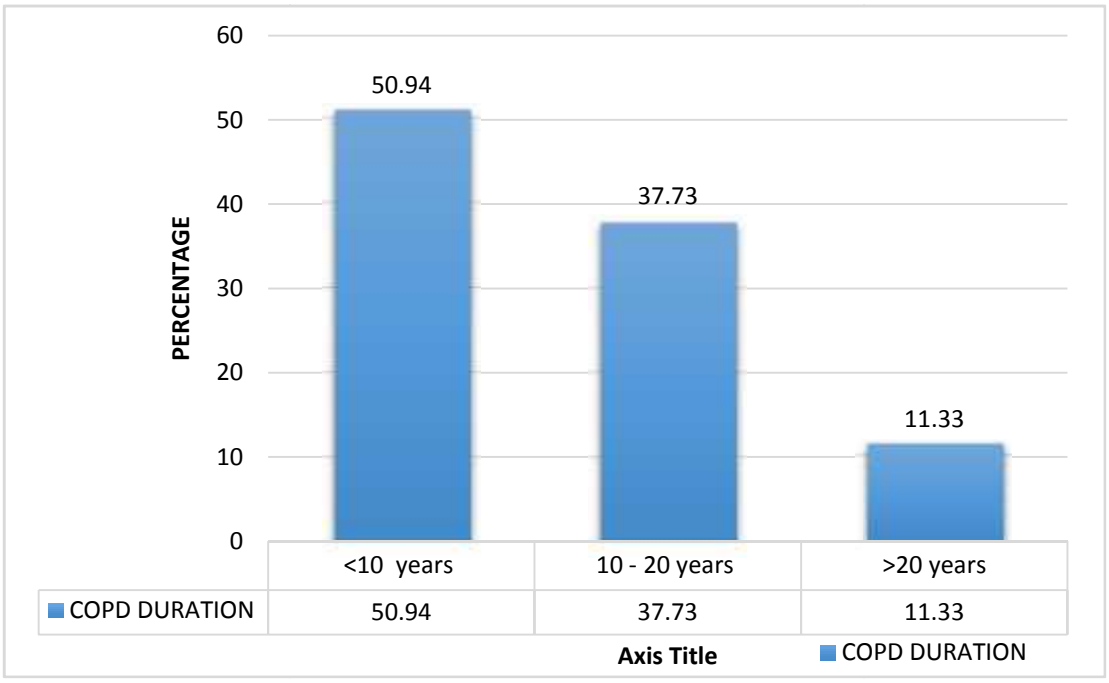


Table 12: Symptoms of study subjects

Symptom	No. of Patients	Percentage
Breathlessness	85	80.1
Cough with expectoration	61	57.5
Chest pain	5	4.71
Wheeze	37	34.9
Others (fever, generalized weakness)	13	12.2

In this study population 85 patients(80.1%) with symptoms of Breathlessness, Most of them had associated wheeze and 61 patients(57.5%) had Cough with expectoration. Very few patients(n=5) had chest pain. Apart from this other symptoms such as fever, generalized weakness were noted.

Figure 9:Symptomatology

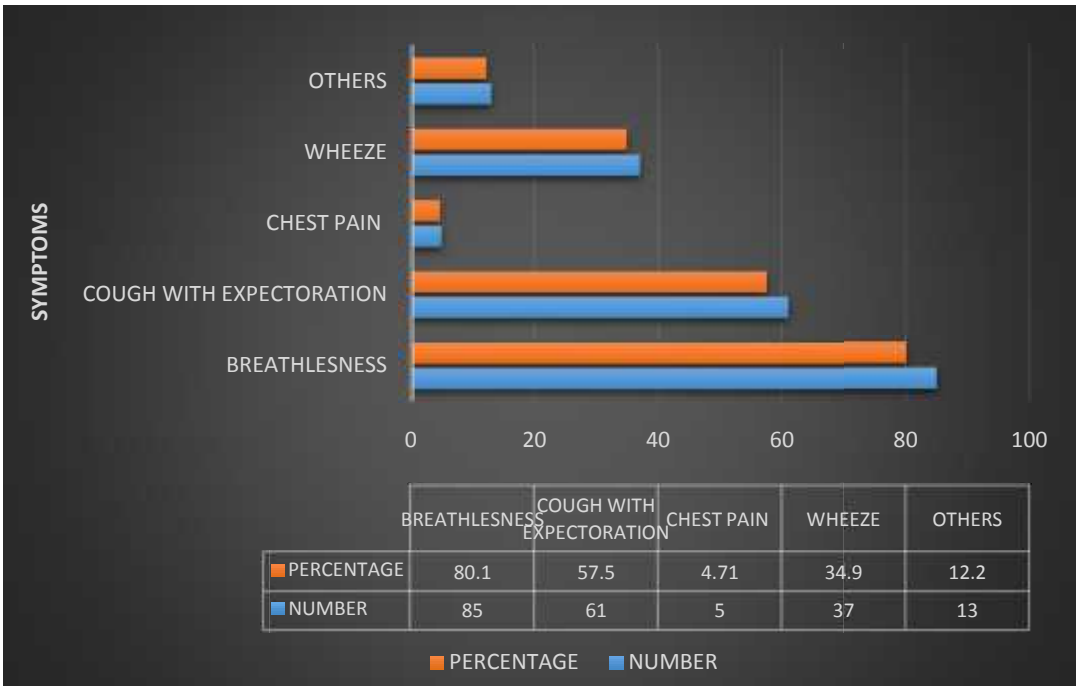


Table 13: Comorbidities

Comorbidities	No. of Patients	Percentage
Diabetes	35	33.01%
Hypertension	56	52.8 %
IHD	16	15.09%

In this study population, most of the patients suffered from Hypertension (52.8 %).Followed by Diabetes Mellitus (33%) and IHD (15%).

Figure 10:Comorbidities

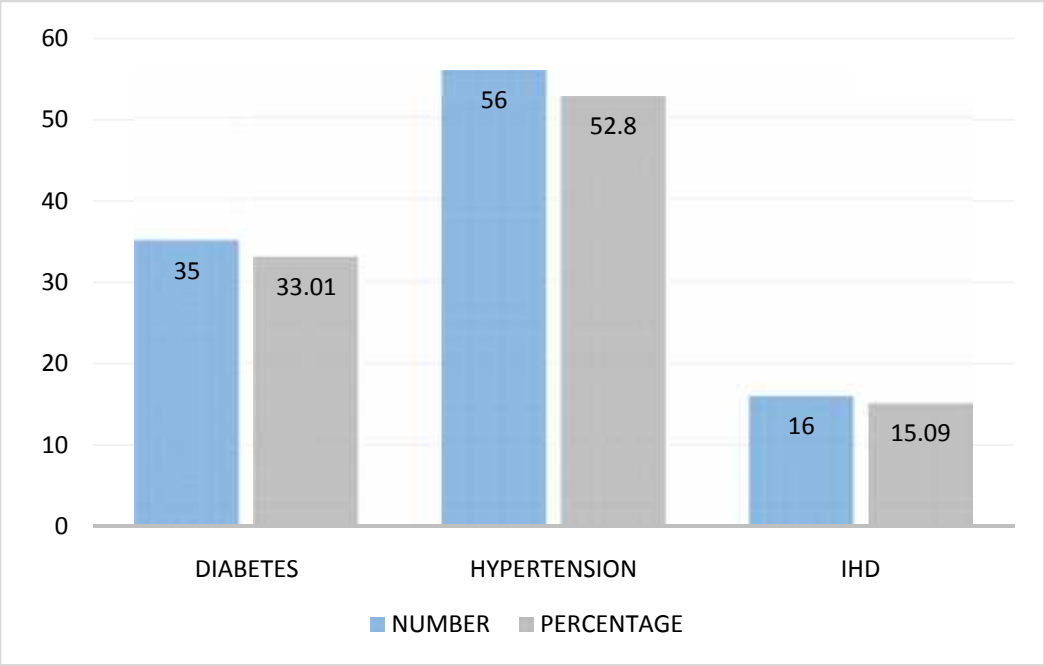


Table 14: Baseline Characterisctics

Parameters	Mean	S.D.
AGE (YEARS)	61.11	10.25
COPD duration (years)	8.12	3.92
FEV1/FVC	0.53	0.12
FEV1 %	57.85	18.4
FEV1	1.18	0.72
SpO2 (%)	96.15	2.14
6MWD	299.48	99.37
BMI	22.45	4.53
BODE	3.47	2.67
CAT SCORE	12.36	7.48
CCQ SCORE	1.35	0.66

The above table describes the demographic details of the patient in this study, age, gender, symptoms, COPD duration, smoking history, and comorbidities are described in previous tables.

The mean age was 61.11 $\pm$ 10.25 years, duration of COPD 8.12 $\pm$3.92 years. The mean ratio of FEV1/FVC was 0.53 and FEV1 % OF 57.85%. All patients were stable and were maintaining spo2 of 96 % on average.

The mean six-minute walk distance was 299.48 meters with a standard deviation of 99.37 meters. On average, the BMI of the study population was normal (22.45).

COPD Assessment Test CAT Score is a simple questionnaire consisting of 8 questions with a score of 0 to 5 and the final score range between 0-40. All patient CAT score was calculated and the mean percentile was 12.36 with SD of 7.48.

The Clinical COPD Questionnaire (CCQ) consists of ten questions and three domains: symptoms, mental state, and functional state, And scored as a seven-point linker scale from zero to six and the mean of all items taken as the final score. In this study, the population mean CCQ was 1.35 with an SD of 0.66.

Figure 11:Baseline Characterisitics

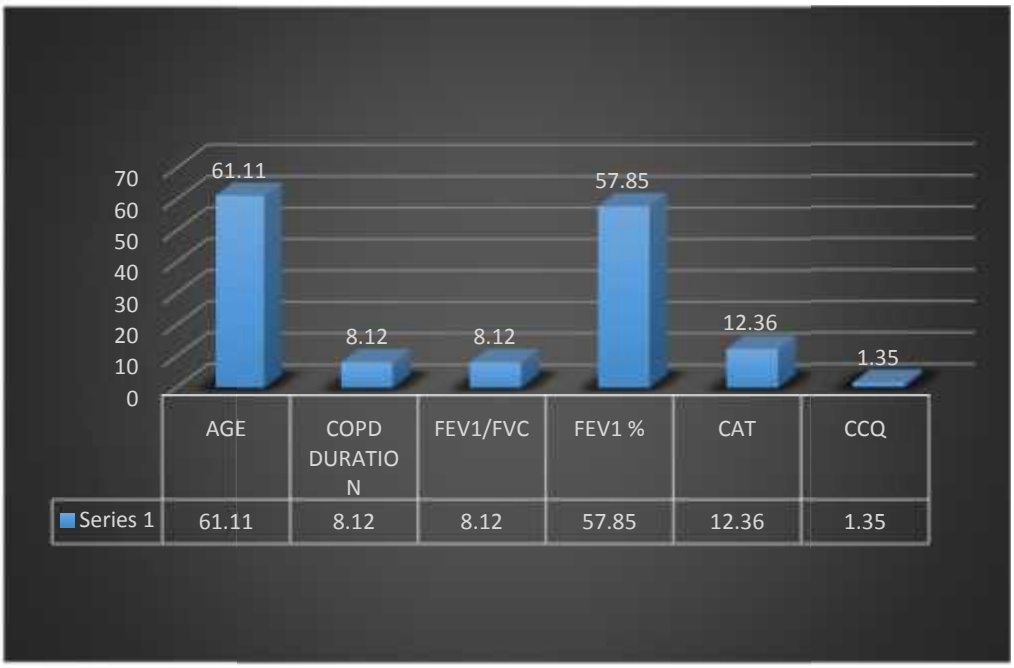


Table 15: Controlled Patients

Parameters	Controlled patients Mild to moderate severity	Controlled patients Severe/Very severe
BODE Index	≤4	≥5
Dypnoea (mMRC)	0-1	0-2
CAT	<10	<20
CCQ	<1	<2
Total number of patients	**55**	**16**
Percentage %	**51.88**	**15.09**

As per the criteria defined for control of COPD among mild to moderate COPD -55 patients (51.88%) were classified as controlled.

In the severe group, 16 patients (15.1%) were classified as Controlled.

Table 16: Characteristics of Controlled Patients

Parameters	CONTROLLED (n=71)			
	Mean	**S.D.**	**Min**	**Max**
FEV1/FVC	**0.53**	0.12	0.2	0.7
FEV1 %	**63.21**	16.94	23	88
6MWD	**327.37**	86.74	107	450
MMRC	**1.06**	0.73	0	2
BMI	**23.06**	3.84	16.03	37.8
CAT	**9.90**	5.86	2	20
CCQ	**1.14**	0.56	0.6	1.9

The above table shows the baseline parameters of Controlled Patients observed.

FEV1/FVC was around 0.53 $\pm$ 0.12 and FEV1 % mean score of 63.21 % $\pm$ 16.94 of predicted. The mean Six-minute walk distance was 327.37 meters with an SD of 86.74 meters. On average, the BMI of the controlled patients was Normal. The mean mMRC score was 1.06 with an SD of 0.73.

CAT- COPD assessment test score which was calculated as an average of all 8 questions, mean average score among controlled patients was 9.90.

The Clinical COPD Questionnaire (CCQ) mean score was 1.14.

Table 17 :Assessment between Controlled and Uncontrolled patients.

Parameters	CONTROLLED (n=71)				UNCONTROLLED (n=34)				
	MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE
FEV1/FVC	0.53	0.12	0.2	0.7	0.54	0.12	0.278	0.707	0.7212
FEV1 %	63.21	16.94	23	88	46.65	16.33	23	80	< 0.0001
6MWD	327.37	86.74	107	450	241.24	99.97	108	450	< 0.0001
MMRC	1.06	0.73	0	3	2.03	0.90	0	4	< 0.0001
BMI	23.06	3.84	16.03	37.8	21.16	5.55	0	38.2	0.0436
CAT	9.90	5.86	2	28	17.50	7.96	8	34	< 0.0001
CCQ	1.14	0.56	0.6	2.8	1.78	0.65	0.9	3	< 0.0001

In this study as per the criteria of control of COPD out of 106 patients 71 patients (66.98%) were found to be controlled during baseline visit, and the remaining 34 (33.02%) were evaluated as uncontrolled patients.

Among Uncontrolled patients, FEV1 values were 46.65 $\pm$16.33 % of predicted, which were low compared to controlled patients, a six-minute walk distance average distance of 241.24 meters.

Other parameters such as mean CAT scores of 17.50 + 7.96 and a mean CCQ score of 1.78 $\pm$ 0.65, were high compared to Controlled patients.

The difference among BMI of the patients in the controlled vs uncontrolled was not significant.

Table 18: BODE Index among 2 Groups

Parameters	Controlled	Uncontrolled	TOTAL
BODE ≤4	55	9	63
BODE ≥ 5	16	26	42
TOTAL	71	35	106
PERCENTAGE	**66.9**	**33.01**	

Once categorized based on BODE Index , there was a higher proportion of controlled patients in BODE ≤4 whereas among Uncontrolled patients higher number was seen in BODE>5.

Figure 12: BODE Index among 2 Groups

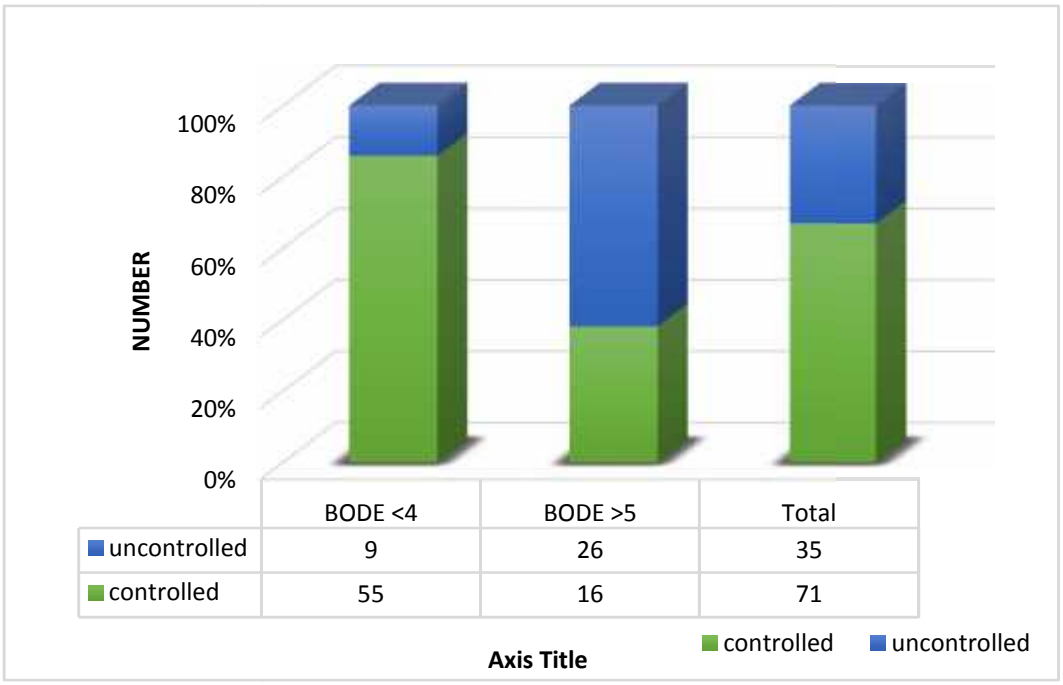


Table 19: Follow up of COPD patients (Controlled & uncontrolled) For Exacerbations

Parameters	No Exacerbations	Exacerbations	Total
Controlled	50	21	71
Uncontrolled	12	23	35
Total	62	44	106
Percentage	58.50	41.50	100

The p-value using the Chi-Square test is 0.0008 (HS)

As per the criteria of control of COPD patients that were classified as controlled, among them 21 patients (29.5%) had an episode of exacerbation.

The uncontrolled patients out of 35,23 patients (64.70%) had an exacerbation

Figure 13:Follow up of COPD

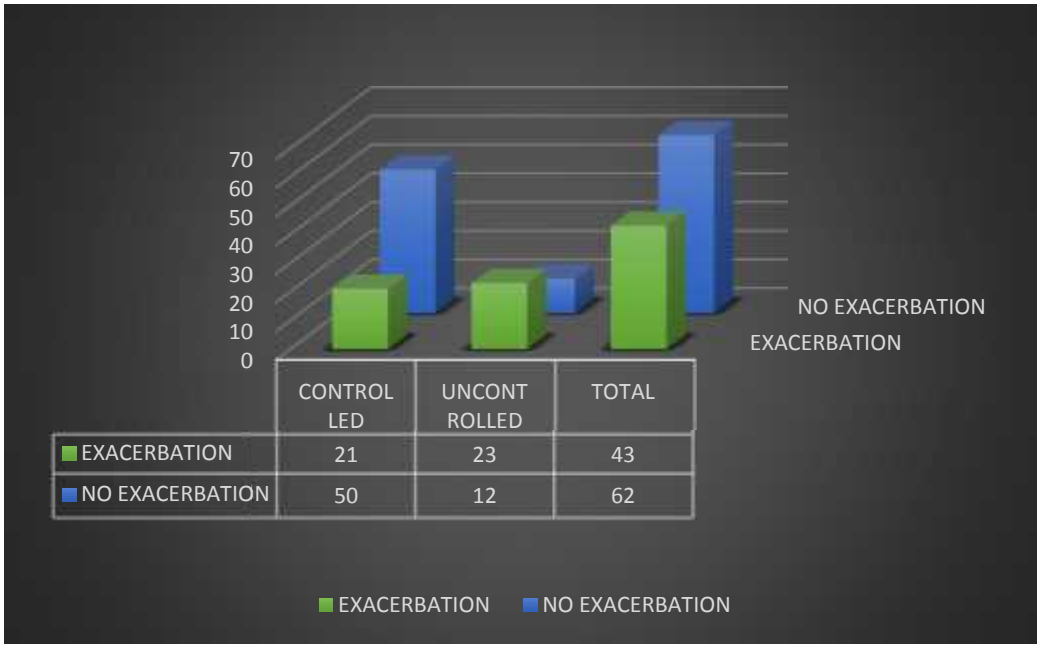


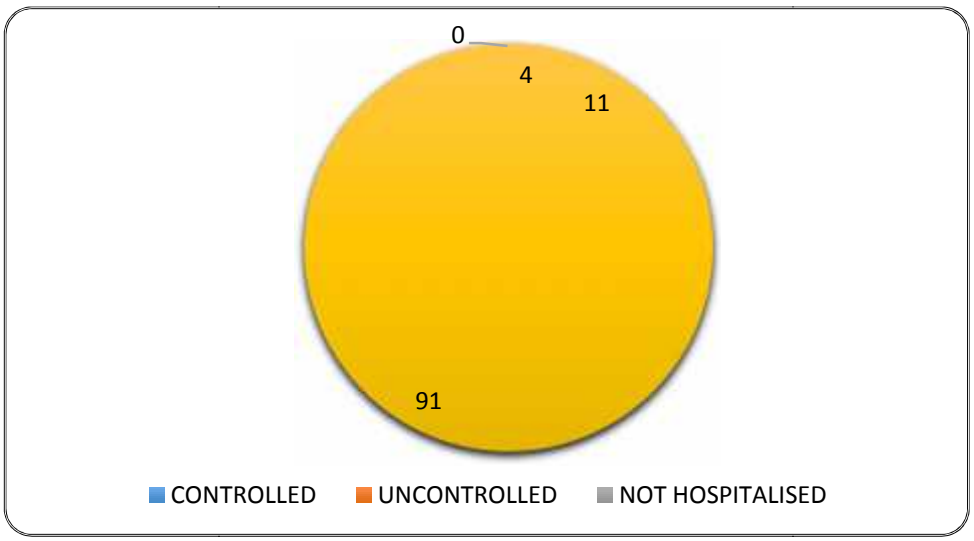
Table 20: Hospitalisation of COPD Patients

Parameters	No hospitalization	Hospitalization	Total	Percentage among Hospitalization
Uncontrolled	24	**11**	35	32.35
Controlled	67	**4**	71	5.6
Total	91	**15**	106	

The p value using Chi-Square test is 0.0068 (VS)

In this study populations, 15 (14.15 %) patients were hospitalized due to episode of exacerbation, 4 patients (28.5 %) due to Hypercapnic respiratory failure , 3 patients (21.4 %) developed Pneumonia ,2 patients (14.2%) had Corpulmonale ,1(7.1%) Arrythmia and 1(7,1%) Pneumothorax.

Figure 14:Hospitalisation



DISCUSSION:

COPD is a heterogeneous disease and is projected to be the 3rd leading cause of death by 2020. The concept of COPD control is new and robust and it was defined by Soler-Cataluña et al and the criteria for Control of COPD were established.

In this study, we tried to evaluate the criteria of COPD control among Indian populations and in the North Karnataka region and classified them as controlled and uncontrolled based on clinical criteria along with the use of the CAT questionnaire and CCQ questionnaire.

A total of 144 patients were screened in OPD for this study, 24 patients had lung conditions other than COPD, 6 patients could not perform a 6-minute walk test,2 patients could not perform spirometry. Finally, 106 diagnosed and stable cases of COPD were enrolled.

At screening visits along with demographic details Baseline spirometry, BODE Index, CAT, and CCQ scores were calculated and the patients were followed up and prospectively evaluated.

In our study Male predominance was seen (n=73) accounting for 68.9% of the study group, the majority were smokers. Only 1/3rd of the population were females. COPD prevalence among males is higher globally with the prevalence of 14.3 %, higher values are also well documented in different regions worldwide but in the current era, there is almost equal prevalence among both the genders.

The prevalence of COPD shows an increasing trend with age above 40 years, in our study most of the patients were in the age group between 50-69 years and among with mean age of 61.11+/- 10.25 years.

BODE index is a multidimensional index developed by Celi et al[61], it helps in the prognostic assessment of COPD, Another study done by Elamparithi et al [2] in stable COPD patients correlated BODE with COPD severity stages.

In this study, The BODE index was used to differentiate mild to severe COPD and BODE <5 was categorized as mild to moderate COPD and BODE>5 were categorized as severe COPD, with such criteria we had 59.3% (n= 63) classified as mild/moderate COPD and 39.6 %(n=42) as severe COPD .

Marin et al [62] prospectively evaluated 275 COPD patients and followed them for 8 years and found that bode index quartiles worsening was inversely proportional to the meantime of exacerbation.

6MWT six-minute walk test is used to test exercise performance in COPD patients, a value of <350 meter has a prognostic value. In our study mean 6MWT distance was 299.48 m and among controlled patients value was higher compared to uncontrolled 327.3 m vs 241.2 meters. A study done by Spruit et al [63] in 2110 stable COPD patients with stage II-IV disease, found a threshold of 334 m for increased risk of death related events and a threshold of 357m for risk of exacerbation and related hospitalization.

CAT COPD assessment Test is used to assess health status in COPD patients and a significant correlation has been seen between CAT score and health status of COPD risk of exacerbation and lung function test.

In this study, CAT Score was used to assess the IMPACT, and Patients with Low impact were categorized into score <10 and < 20 for mild/moderate COPD and severe COPD. At baseline 51.8% (n=55) had scores of less than 10 and 15 % (n=16) had a score of less than 20. Lower scores are associated with less time to exacerbation and risk of exacerbations.

A study was done by Lee et al [77] Prospectively evaluated 545 patients of COPD and evaluated the predictive value of CAT for exacerbation and categorized score in four groups between 0-40, they found that the higher categories were associated with less time to first exacerbation and also at higher risk for exacerbations.

A study done by Zhou et al [78] studied 112 COPD patients and compared the CAT score between COPD and healthy subjects, they found CAT Score to be higher in COPD patients. The observed correlation between increased score and disease severity. they also found a positive correlation between CAT, CT measurement, and mMRC score.

The main objective of this study was to evaluate the criteria for control of COPD. In the study subjects of 106 confirmed cases of COPD, on baseline visit had 59.3% (n= 63) classified as mild/moderate COPD and 39.6 %(n=42) as severe COPD.

As per the criteria predefined,71 patients (66.9%) patients were classified as controlled COPD and the remaining 33.1% of patients were classified was Uncontrolled COPD.

Among the controlled study subjects, it was observed that they had higher predicted % of FEV1 values with a mean of 63.21 %.

6MWD in the controlled group with a mean of 327.37 compared to the uncontrolled with a mean of 241.24m, mMRC score was better with an average of 1.06. The mean CAT score and CCQ score was 9.9 and 1.14 respectively in the Controlled COPD group.

In our study, 71 patients were defined as controlled COPD at baseline visit and among them, 21 patients (29.5%) experienced exacerbations whereas the majority (n=50) 50.5% of patients were in controlled status and did not experience any exacerbations during the follow-up period.

Those defined as Uncontrolled COPD (n=34), during the follow-up period 22 patients (64.7%) had an episode of exacerbation; the remaining 12 patients did not experience an exacerbation.

Nibber et al[79] was the first to evaluate the criteria of COPD Control in the United Kingdom on COPD patients. The majority of patients had mild/moderate COPD (90%), attempted to validate the concept of Control of COPD. Controlled COPD patients were 4.5% & 21.5 % according to clinical criteria and CAT score with CAT score under 10 and 8.3 % were controlled with CAT score Group around 20. They found time to first exacerbation was high in controlled patients compared to uncontrolled.

Miravitlles et al [80] Prospectively evaluated 314 patients with COPD with a mean age of 68.5 years and FEV1 52.6 % of predicted having mild-moderate severity, they found that 67 patients (21%) fulfilled the criteria of Control of COPD.Male gender , no history of previous exacerbations ,no changes of chronic bronchitis were the important factors associated with Control. They also suggested for refinement in

criteria among Severe COPD cases to reduce the restriction for classification among controlled.

Soler-Cataluna et al[81] studied 265 patients of COPD with follow up of 1 year and to validate the modified controlled criteria (MCC) of COPD ,they found that 61.5% were controlled if the BODE index was used as adjustment of disease severity and 59.6% using FEV1 values and CAT scores. They concluded that modified Clinical Criteria had a higher number of Controlled patients.

The hospitalization rate of the patients was observed as 14.2 %, only 15 patients were hospitalized during the study period. A higher proportion of Hospitalization was seen among Uncontrolled COPD patients with 32.3% among this group were hospitalized whereas only 5.6% of patients among the Controlled COPD group.

We found acute exacerbations to be the most common cause for hospitalization followed by Hypecapnoeic respiratory failure. Other causes for hospitalization were pneumonia, pneumothorax, and arrhythmias.

A study was done by Nunez et al [82] prospectively observed 326 patients of COPD, among them 155 (47.5%) had at least one exacerbation in a mean duration of 147 days. Patients with more respiratory symptoms, Poor FEV1% predicted (<55%), high CAT score > 15,were associated with increased risk of exacerbations.

A study was done by Gaude GS[83] , prospectively evaluated 186 patients with COPD with acute exacerbations and hospitalizations observed a mortality rate of 12 % in study subjects,in this study the mortality rate was 20%(3 out of 15) among those hospitalized.

Strengths of the study :

- Prospective study design
- First of its kind to Evaluate the Criteria for control Of COPD

Limitations of the study :

- Single-Center study.
- Sample size not reflecting the true burden of COPD, The sample size of 1O6 wasn't adequate to effectively evaluate the concept.
- Short follow up period.

CONCLUSIONS:

- This study is the first study to be conducted in India and North Karnataka evaluating the Criteria for Control of COPD.

- The Criteria for Control of COPD is a unique and effective method to assess the COPD patient and the disease status during their regular visit.

- In this study we found the criteria for Control of COPD to be effective, simple, and easy to apply in the daily routine evaluation of COPD patients.

- It's likely going to help physicians to assess more accurately the disease status of COPD and to differentiate between controlled and uncontrolled COPD patients and to modify the treatment plan accordingly.

SUMMARY:

- A total of 144 patients were screened for inclusion in the study, but after the application of inclusion and exclusion criteria, 106 COPD patients were evaluated in this study for the criteria for control of COPD.

- In this study male predominance was seen with 73 males (68.86%) and 33 females (31.14%) and the mean age of them was 61.11 ± 10.25 years with a higher percentage among the age group 50-69.

- Most of the patients (66.9%) were smokers with 29.2 % active smokers and the majority had disease with a duration of <10 years (50.94%) of the study subjects.

- Among comorbidities, Hypertension (52.8%) followed by Diabetes Mellitus (33.01%) was observed in this study cohort.

- Among various parameters used in this study, 6MWD was 299.48 m with SD of 99.37 meters, COPD assessment test mean (CAT) score was 12.36 with SD 7.48, and Clinical COPD Questionnaire (CCQ) with a score of 1.35 with SD 0.66.

- The criteria of clinical control of COPD included BODE Index, Dyspnoea scale, and questionaries CAT and CCQ score to identify COPD patients who are in a controlled state, they were group into two severity categories i.e mild/moderate severity and severe/very COPD.

- After complete evaluation as per the criteria predefined for the control of COPD,55 patients (51.88%) were in mild/moderate COPD and 16 patients (15.09%) in severe COPD were classified as Control COPD patients.

- Controlled COPD patients had a better FEV1% score of 63.21% of predicted and average 6MWD was 327.37 meters and BMI was observed to be normal. Mean CAT Score was 9.90 and the Mean CCQ was 1.14.

- Uncontrolled COPD patients FEV1 values were 46.65 % of predicted and six-minute walk distance average distance of 241.24 meters which was lower compared to controlled COPD. Higher mean CAT score of 17.5 and mean CCQ score of 1.78 was seen in Uncontrolled COPD patients and was statistically significant.

- The difference among BMI in each group controlled vs uncontrolled was not statistically significant.

- On follow-up, 21 patients (21.95%) had an episode of exacerbations in the controlled COPD patient group whereas in the Uncontrolled COPD patient group 23 patients (64.7%) had an episode of exacerbation.

- The overall hospitalisation rate was 14.28%(14 patients), with a higher number in Uncontrolled COPD group 11 patients out of 34 (32.35 %), whereas among Controlled COPD had only 4 patients were hospitalised.

- In this study cohort of COPD patients, there was admission due to Hypercapnic respiratory failure (28.5%) followed by Pneumonia (21.4%). Cor Pulmonale, Arrythmia, and Pneumothorax (14.2%).

BIBLIOGRAPHY:

1. Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. 2010. Available from: http://www.goldcopd.com. [Accessed July 16, 2020].
2. Papaioannou AI, Kostikas K, Zervas E, Kolilekas L, Papiris S, Gaga M. Control of asthma in real life: still a valuable goal? Eur Respir Rev 2015;24(136):361-9.
3. Koblizek V, Chlumsky J, Zindr V, Neumannova K, Zatloukal, et al. Chronic Obstructive Pulmonary Disease: official diagnosis and treatment guidelines of the Czech Pneumological and Phthisiological Society; a novel phenotypic approach to COPD with patient-oriented care. Biomed Pap Czech Repub 2013;157(2):189-201.
4. Soler-Cataluna JJ, Alcazar-Navarrete B, Miravitlles M. The concept of control of COPD in clinical practice. Int J Chron Obstruct Pulmon Dis 2014;9:1397-405.
5. Rodriguez-Roisin R, Rabe KF, Vestbo J, Vogelmeier C, Agustí A. Global Initiative for Chronic Obstructive Lung Disease (GOLD) 20th Anniversary: a brief history of time. Eur Respir J 2017;50(1):1700671-77.
6. Wedzicha JA, Miravitlles M, Hurst JR, Calverley PM, Albert RK, et al . Management of COPD exacerbations: a European Respiratory Society/ American Thoracic Society guideline. Eur Respir J 2017;49(3): 1600791-807.
7. Miravitlles M, Soler-Cataluña JJ, Calle M, Molina J, Almagro P, et al. Spanish Guidelines for Management of Chronic Obstructive Pulmonary Disease

(GesEPOC) 2017. Pharmacological Treatment of Stable Phase. Arch Bronconeumol 2017;53(6):324-335.

8. Soler-Cataluna JJ, Marzo M, Catalán P, Miralles C, Alcazar B, Miravitlles M. Validation of clinical control in COPD as a new tool for optimizing treatment. Int J Chron Obstruct Pulmon Dis 2018;13:3719–31.
9. World Health Organization. Burden of COPD. Available from: http://www.who.int/respiratory/copd/burden/en/ [Last accessed on Jun 5 2020].
10. Adeloye D, Chua S, Lee C, Basquill C, Papana A, Theodoratou E, et al. Global and regional estimates of COPD prevalence: Systematic review and meta-analysis. J Glob Health 2015;5(2):020415-32.
11. Salvi S, Kumar GA, Dhaliwal RS, Paulson K, Agrawal A, Koul PA, et al. The burden of chronic respiratory diseases and their heterogeneity across the states of India: The Global burden of disease study 1990–2016. Lancet 2018; 96: e1363–74.
12. Tilert T, Dillon C, Paulose-Ram R, Hnizdo E, Doney B. Estimating the U.S. prevalence of chronic obstructive pulmonary disease using pre- and post-bronchodilator spirometry: The National Health and Nutrition Examination Survey (NHANES) 2007-2010. Respir Res 2013;14(1):103.
13. De Oca MM, Talamo C, Perez-Padilla R, Jardim JR, Muino A, Lopez MV, et al. Chronic obstructive pulmonary disease and body mass index in five Latin America cities: the PLATINO study. Respir Med 2008;102(5):642-50.
14. Tandon N, Anjana RM, Mohan V, Kaur T, Afshin A, Ong K, et al . The increasing burden of diabetes and variations among the states of India: The

Global Burden of Disease Study 1990–2016. Lancet Glob Health 2018;6(12):e1352-62.

15. Dandona L, Dandona R, Kumar GA, Shukla DK, Paul VK, Balakrishnan K, et al. Nations within a nation: variations in epidemiological transition across the states of India, 1990–2016 in the Global Burden of Disease Study. Lancet 2017 2;390(10111):2437-60.
16. Murthy KJ, Sastry JG. Economic Burden of Chronic Obstructive Pulmonary Disease. National Commission on Macroeconomics and Health Background Papers – Burden of Disease in India. Available from: https://www.who.int/macrohealth/action/NCMH_Burden%20of%20disease.pdf .[Last accessed on 17, May 2020]
17. Mittmann N, Kuramoto L, Seung SJ, Haddon JM, Bradley-Kennedy C, Fitzgerald JM. The cost of moderate and severe COPD exacerbations to the Canadian healthcare system. Respir Med 2008;102(3):413-21.
18. Andersson I, Johansson K, Larsson S, Pehrsson K. Long-term oxygen therapy and quality of life in elderly patients hospitalised due to severe exacerbation of COPD. A 1-year follow-up study. Respir Med 2002;96(11):944-59.
19. Lakiang, Nair NS, Ramaswamy A, Singhal U. Economic impact of chronic obstructive pulmonary disease. A cross sectional study at a teaching hospital in South India. J Family Med Prim Care 2018;7:1002-6
20. Koul PA, Nowshehr AA, Khan UH, Jan RA, Shah SU. Cost of Severe Chronic Obstructive Pulmonary Disease Exacerbations in a High Burden Region in North India. Ann Glob Health. 2019 22;85(1):13.

21. Terzikhan N, Verhamme KM, Hofman A, Stricker BH, Brusselle GG, Lahousse L. Prevalence and incidence of COPD in smokers and non-smokers: the Rotterdam Study. Eur J Epidemiol 2016 ;31(8):785-92.
22. Jindal SK, Aggarwal AN, Chaudhry K, Chhabra SK, D'Souza GA, Gupta D, et al. A multicentric study on epidemiology of chronic obstructive pulmonary disease and its relationship with tobacco smoking and environmental tobacco smoke exposure. Indian J Chest Dis Allied Sci 2006;48(1):23-9.
23. Holguin F. Oxidative stress in airway diseases. Ann Am Thorac Soc 2013;10 Suppl:S150-7.
24. Guan WJ, Zheng XY, Chung KF, Zhong NS. Impact of air pollution on the burden of chronic respiratory diseases in China: time for urgent action. Lancet 2016;388(10054):1939-51.
25. Pathak U, Gupta NC, Suri JC. Risk of COPD due to indoor air pollution from biomass cooking fuel: a systematic review and meta-analysis. Int J Environ Health Res 2020 ;30(1):75-88.
26. Grigsby M, Siddharthan T, Chowdhury MA, Siddique A, Rubinstein A, Sobrino E, et al. Socioeconomic status and COPD among low- and middle-income countries. Int J Chron Obstruct Pulmon Dis 2016;11:2497-2507.
27. Eriksson S. Pulmonary emphysema and alpha-1 antitrypsin deficiency. J of Intern Med 1964;175:197-205.
28. Hall R, Hall IP, Sayers I. Genetic risk factors for the development of pulmonary disease identified by genome-wide association. Respirology 2019;24(3):204-14.

29. Hobbs BD, de Jong K, Shrine NR, Wyss AB, London SJ, Cho M. A genome-wide association study of chronic obstructive pulmonary disease identifies 22 risk loci. Nat Genet 2017; 49:426-32.
30. Barnes PJ. Cellular and molecular mechanisms of chronic obstructive pulmonary disease. Clin Chest Med 2014;35(1):71-86.
31. Akata K, van Eeden SF. Lung macrophage functional properties in chronic obstructive pulmonary disease. Int J Mol Sci 2020;21(3):853-57.
32. Fischer BM, Pavlisko E, Voynow JA. Pathogenic triad in COPD: oxidative stress, protease-antiprotease imbalance, and inflammation. Int J Chron Obstruct Pulmon Dis 2011;6:413-21.
33. Vomund S, Schafer A, Parnham MJ, Brune B, von Knethen A. Nrf 2,the master regulator of anti-oxidative responses. Int J Mol Sci 2017;18(12):2772.
34. O'Donnel DE, Webb KA. Exertional breathlessness in patients with chronic airflow limitation. The role of lung hyperinflation. Am J Respir Dis 1993;48:1351-57.
35. Hughes RL, Katz H, Sahgal V, Campbell JA, Hartz R, Sheilds TW. Fiber size and energy metabolites in five separate muscles from patients with chronic obstructive pulmonary disease. Respiration 1983;20:44-47.
36. Celli BR, Thomas NE, Anderson JA, Ferguson GT, Jenkins CR, Jones PW et al. Effect of pharmacotherapy on rate of decline of lung functions in COPD : Results from TORCH study. Am J RespCrit Care Med 2008;178:332-8.
37. Antonelli-Incalxi R, Corsonella A, Pedone C. Drawing impairment predicts mortality in severe COPD. Chest 2006;130:1687-94.

38. Brandsma CA, Van den Berge M, Hackett TL, Brusselle G, Timens W. Recent advances in chronic obstructive pulmonary disease pathogenesis: from disease mechanisms to precision medicine. J Pathol. 2020;250(5):624-35.
39. Gupta YS, Shah SS, Ahire CK, Kamble P, Khare AS, More SS. Body plethysmography in chronic obstructive pulmonary disease patients: A cross-sectional study. Lung India 2018;35(2):127-31.
40. Balasubramanian A, MacIntyre NR, Henderson RJ, Jensen RL, Kinney G, Stringer WW, et al . Diffusing capacity of carbon monoxide in assessment of COPD. Chest 2019;156(6):1111-9.
41. Donohue JF, Jones PW, Bartels C, Marvel J, D'Andrea P, Banerji D, et al. Correlations between FEV1 and patient-reported outcomes: A pooled analysis of 23 clinical trials in patients with chronic obstructive pulmonary disease. Pulm Pharmacol Ther 2018;49:11-19.
42. Kim S, Oh J, Kim YI, Ban HJ, Kwon YS, Oh IJ, et al. Differences in classification of COPD group using COPD assessment test (CAT) or modified Medical Research Council (mMRC) dyspnea scores: a cross-sectional analysis. BMC Pulm Med 2013;13:35.
43. Jo YS, Yoon HI, Kim DK, Yoo CG, Lee CH. Comparison of COPD Assessment Test and Clinical COPD Questionnaire to predict the risk of exacerbation. Int J Chron Obstruct Pulmon Dis 2017 ;13:101-07.
44. Casanova C, Marin JM, Martinez-Gonzalez C, de Lucas-Ramos P, Mir-Viladrich I, Cosio B,et al. Differential effect of modified medical research council dyspnea, COPD assessment test, and Clinical COPD questionnaire for symptoms evaluation within the new GOLD staging and mortality in COPD. Chest 2015;148(1):159-68.

45. Rothnie KJ, Müllerova H, Smeeth L, Quint JK. Natural history of chronic obstructive pulmonary disease exacerbations in a general practice-based population with chronic obstructive pulmonary disease. Am J Respir Crit Care Med 2018;198(4):464-71.
46. Hurst JR, Vestbo J, Anzueto A, Locantore N, Müllerova H, Tal-Singer R, et al. Susceptibility to exacerbation in chronic obstructive pulmonary disease. N Engl J Med 2010;363(12):1128-38.
47. Chen YW, Leung JM, Sin DD. A Systematic Review of Diagnostic Biomarkers of COPD Exacerbation. PLoS One 2016;11(7):e0158843-59.
48. Hillas G, Perlikos F, Tsiligianni I, Tzanakis N. Managing comorbidities in COPD. Int J Chron Obstruct Pulmon Dis 2015 7;10:95-109.
49. Durham AL, Adcock IM. The relationship between COPD and lung cancer. Lung Cancer 2015;90(2):121-7.
50. Putcha N, Drummond MB, Wise RA, Hansel NN. Comorbidities and chronic obstructive pulmonary disease: Prevalence, influence on outcomes, and management. Semin Respir Crit Care Med 2015;36(4):575-91.
51. Singh D, Agusti A, Anzueto A, Barnes PJ, Bourbeau J, Celli BR, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive lung disease. 2019. Eur Respir J 2019;53(5):1900164-76.
52. Schols AM, Slangen J, Volovics L, Wouters EF. Weight loss is a reversible factor in the prognosis of chronic obstructive pulmonary disease. Am J Respir Crit Care Med. 1998 ;157:1791-7.
53. Fletcher CM, Elmes PC, Fairbain AS, Wood CH. The significance of respiratory symptoms and the diagnosis of chronic bronchitis in a working population. Br Med J 1959 ;2(5147):257-66.

54. Bestall JC, Paul EA, Garrod R, Garnham R, Jones PW, Wedzicha JA. Usefulness of the Medical Research Council (MRC) dyspnea scale as a measure of disability in patients with chronic obstructive pulmonary disease. Thorax. 1999 ;54(7):581-6.
55. Mahler DA, Wells CK. Evaluation of clinical methods for rating dyspnea. Chest 1988;93(3):580-6.
56. Enright PL. The six-minute walk test. Respir Care 2003;48(8):783-5.
57. Launois C, Barbe C, Bertin E, Nardi J, Perotin JM, Dury S, et al. The modified Medical Research Council scale for the assessment of dyspnea in daily living in obesity: a pilot study. BMC Pulm Med 2012 1;12:61-67.
58. Cote CG, Pinto-Plata V, Kasprzyk K, Dordelly LJ, Celli BR. The 6-min walk distance, peak oxygen uptake, and mortality in COPD. Chest. 2007;132(6):1778-85.
59. Ong KC, Earnest A, Lu SJ. A multidimensional grading system (BODE index) as predictor of hospitalization for COPD. Chest 2005 ;128(6):3810-16.
60. Claudia GC, Celli BR. BODE index: a new tool to stage and monitor progression of chronic obstructive pulmonary disease. Pneumonol Alergol Pol 2009;77(3):305-13.
61. Cote CG, Celli BR. Pulmonary rehabilitation and the BODE Index in COPD. Eur Respir J 2005;26:630-36.
62. Marin JM, Carrizo SJ, Casanova C, Martinez-Camblor P, Soriano JB, et al. Prediction of risk of COPD exacerbations by the BODE index. Respir Med 2009;103(3):373-8.

63. Motegi T, Jones RC, Ishii T, Hattori K, Kusunoki Y, Furutate R, et al. A comparison of three multidimensional indices of COPD severity as predictors of future exacerbations. Int J Chron Obstruct Pulmon Dis 2013;8:259-71.
64. Yamaguchi M, Nakao M, Obata H, Ikeda H, Kanda T, et al .Application of the COOP/WONCA charts to aged patients with chronic obstructive pulmonary disease: a comparison between Japanese and Chinese populations. BMC Public Health 2013 ;13:754-5.
65. Harper R, Brazier JE, Waterhouse JC, Walters SJ, Jones NM, Howard P. Comparison of outcome measures for patients with chronic obstructive pulmonary disease (COPD) in an outpatient setting. Thorax 1997;52(10):879-87.
66. Prieto L, Alonso J, Ferrer M, Anto JM. Are results of the SF-36 health survey and the Nottingham Health Profile similar? A comparison in COPD patients. Quality of Life in COPD Study Group. J Clin Epidemiol 1997;50(4):463-73.
67. Meguro M, Barley EA, Spencer S, Jones PW. Development and validation of an improved, COPD-specific version of the St. George Respiratory Questionnaire. Chest 2007;132(2):456-63.
68. Ferrer M, Villasante C, Alonso J, Sobradillo V, Gabriel R, Vilagut G, et al. Interpretation of quality of life scores from the St George's Respiratory Questionnaire. Eur Respir J 2002 ;19(3):405-13.
69. Jones PW, Harding G, Berry P, Wiklund I, Chen WH, Kline Leidy N. Development and first validation of the COPD Assessment Test. Eur Respir J 2009 ;34(3):648-54.

70. Lee SD, Huang MS, Kang J, Lin CH, Park MJ, Oh YM, et al. The COPD assessment test (CAT) assists prediction of COPD exacerbations in high-risk patients. Respir Med 2014;108(4):600-8.
71. Van der Molen T, Willemse BW, Schokker S, Ten Hacken NH, Postma DS, Juniper EF. Development, validity and responsiveness of the Clinical COPD Questionnaire. Health Qual Life Outcomes 2003;1-13.
72. Kocks JW, Tuinenga MG, Uil SM, van den Berg JW, Stahl E, van der Molen T. Health status measurement in COPD: the minimal clinically important difference of the clinical COPD questionnaire. Respir Res. 2006;7(1):62-63.
73. Celli BR, MacNee W.Standards for the diagnosis and treatment of patients of COPD. Eur Resp J 2004; 23: 932–46.
74. Sarkar SK, Basuthakur S, Das SK, Das A, Das S, Choudhury S, Datta S. Evaluation of correlation of BODE index with health-related quality of life among patients with stable COPD attending a tertiary care hospital. Lung India 2015;32(1):24-8.
75. Marin JM, Carrizo SJ, Casanova C, Martinez-Camblor P, Soriano JB, et al. Prediction of risk of COPD exacerbations by the BODE index. Respir Med2009;103(3):373-8.
76. Polkey MI, Spruit MA, Edwards LD, Watkins ML, Pinto-Plata V, Vestbo J, et al. Six-minute-walk test in chronic obstructive pulmonary disease: minimal clinically important difference for death or hospitalization. Am J Respir Crit Care Med 2013;187(4):382-6.
77. Lee SD, Huang MS, Kang J, Lin CH, Park MJ, Oh YM , et al. The COPD assessment test (CAT) assists prediction of COPD exacerbations in high-risk patients. Respir Med 2014;108(4):600-8.

78. Zhou A, Zhou Z, Peng Y, Zhao Y, Duan J, Chen P. The role of CAT in evaluating the response to treatment of patients with AECOPD. Int J Chron Obstruct Pulmon Dis 2018;13:2849-58.
79. Nibber A, Chisholm A, Soler-Cataluña JJ, Alcazar B, Price D, Miravitlles M. Validating the concept of COPD control: A real-world cohort study from the United Kingdom. COPD 2017;14(5):504-12.
80. Miravitlles M, Sliwinski P, Rhee CK, Costello RW, Carter V, Tan J, Lapperre TS, et al. Evaluation of criteria for clinical control in a prospective, international, multicenter study of patients with COPD. Respir Med 2018;136:8-14.
81. Nuñez A, Marras V, Harlander M, Mekov E, Esquinas C, Turel M, et al. Association between routine blood biomarkers and clinical phenotypes and exacerbations in chronic obstructive pulmonary disease. Int J Chron Obstruct Pulmon Dis. 2020; 15:681-90.
82. Soler-Cataluña JJ, Marzo M, Catalán P, Miralles C, Alcazar B, Miravitlles M. Validation of clinical control in COPD as a new tool for optimizing treatment. Int J Chron Obstruct Pulmon Dis 2018;13:3719-31.
83. Gaude GS, Rajesh BP , Chaudhury A, Hattiholi J. Outcomes associated with acute exacerbations of chronic obstructive pulmonary disorder requiring hospitalization. Lung India 2015; 32:465-72.

ANNEXURE I – CONSENT FORM

EVALUATION OF CRITERIA FOR CLINICAL CONTROL IN PATIENTS WITH COPD-A HOSPITAL BASED PROSPECTIVE STUDY

You are being asked to enroll in this study as you are eligible for this study All stable COPD patients with age >40 years will be included in this study, during this study patients will be asked questions regarding the presenting complaints and they are supposed to answer to the best of their knowledge. The principal investigator of the study is _____, under the guidance of _____ (guide)

The purpose of this study is to study the EVALUATION OF CRITERIA FOR CLINICAL CONTROL IN PATIENTS WITH COPD-A HOSPITAL BASED PROSPECTIVE STUDY.COPD is a chronic airway disease with subjective and objective manifestation,BODEx Index,CCQ CAT score are multidimensional scoring system which can assess objective manifestations but the validity of these indices are still under evaluation ,hence in this study, we will check then the validity of these indices for clinical control of COPD

PROCEDURE:

Patients whose symptoms are suggestive of COPD or diagnosed cases of COPD attending the Out-Patient clinic of Dr.PrabhakarKore Hospital and MRC will be subjected to detailed History taking , clinical examination followed by the BODE index and CAT and CCQ questionnaire.

BODE index has 4 components

BMI measured by height and weight,airflow obstruction measured by spirometry with standard guidelines ,Dyspnea measured by (mMRC) modified medical research council dyspnea scale,physical activity by self-declared minutes walking per day.

CAT-COPD assessment test is a specific questionnaire that consists of 8 questions which evaluate cough, expectoration,dyspnea ,chest tightness ,patient confidence ,limitations in daily activities ,quality of sleep and energy,score ranges from 0 to 40CCQ Clinical questionnaire-has three-domain symptoms (4 items), functional status (4 items) and mental state (2 items)Graded on 7 points Likert scale from 0 to 6.

All patients will undergo clinical examination, lung function tests, and oral questionnaires on the same day,Within that session ,the clinical ,social, and demographic data will be collected

Alternatives:

Your/your relative's participation in this study is a completely voluntary decision. If you/your relative do/does not want to be a part of the study, you/your relative may refuse for the same or if you/your relative are/is already a part of the study and if you/your relative want/wants to withdraw from the study for any reason, you/your relative may do so without any hesitation. Discontinuation from the study for any reason will not affect your/your relative's current or future relationship with KLES Dr. PrabhakarKore Hospital, Belgaum.

Privacy and confidentiality:

The information provided by you/your relative will be known to the PI and the members of the research team. This information will remain confidential and will be disclosed to others only with your/your relative's written permission or if required by the law.

Financial incentives for participation:

You/your relative will not be paid/offered any gifts for participation in the research. There will not be any remuneration for participating in the research and you/your relative will not be reimbursed for any expenses, such as bus/train/companion/assistant, etc.

Authorization to publish results:

When the results of the research are to be published or discussed in conferences by the PI, no information will be disclosed that will reveal your/your relative's identity.

If you/your relative have/has any questions about this study, you/your relative may contact, Institutional Ethical Committee for Human Subjects Research, Jawaharlal Nehru Medical College, Belgaum, Ph. 0831 2471350. You/your relative will be given a copy of this consent form for your/your relative's information and records.

CONSENT TO PARTICIPATE IN RESEARCH STUDY

"I voluntarily agree to take part in this study by signing below. I may withdraw at any time. I am not giving up any of my legal rights by signing this form. My signature below indicated that I have read this entire consent form or it has been read to me and had all my questions answered. I will be given a copy of this consent form."

Signature of the Participant or legally authorized representative

Participant's Name :_____

Signature :_____

Name of legally authorized representative: _____

Signature :_____

Witness' Name :_____

Signature :_____

Investigator's Name and Signature :_____

Date and Place :_____

ಸಂಶೋಧನಾಅಧ್ಯಯನದಲ್ಲಿಪಾಲ್ಗೊಳ್ಳಲುಒಪ್ಪಿಕೊಳ್ಳಿ

"ನಾನುಈಅಧ್ಯಯನದಲ್ಲಿಪಾಲ್ಗೊಳ್ಳಲುಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದಒಪ್ಪುತ್ತೇನೆ.

ನಾನುಯಾವುದೇಸಮಯದಲ್ಲಿಹಿಂಪಡೆಯಬಹುದು.

ಈಫಾರ್ಮ್‌ಅನ್ನುಸಹಿಮಾಡುವಮೂಲಕನನ್ನಯಾವುದೇಕಾನೂನುಹಕ್ಕುಗಳನ್ನುನಾನುಬಿಟ್ಟುಕೊಡುವುದಿಲ್ಲ.

ಕಳಗಿನನನ್ನಸಹಿಸೂಚಿಸಿದ

ನಾನುಈಸಂಪೂರ್ಣಒಪ್ಪಿಗೆಯನ್ನುಓದಿದ್ದೇನೆಅಥವಾಅದನ್ನುನನಗೆಓದುತ್ತಿದ್ದೇನೆ,

ಮತ್ತುನನ್ನಎಲ್ಲಪ್ರಶ್ನೆಗಳಿಗೆಉತ್ತರಿಸಿದೆ. ಈಸಮ್ಮತಿಯರೂಪದಪ್ರತಿಯನ್ನುನನಗೆನೀಡಲಾಗುವುದು. "

ಪಾಲ್ಗೊಳ್ಳುವವರಸಹಿಅಥವಾಕಾನೂನುಬದ್ಧವಾಗಿಅಧಿಕೃತಪ್ರತಿನಿಧಿ

ಭಾಗವಹಿಸುವವರಹಸರು: _____

ಸಹಿ: _____

ಕಾನೂನುಬದ್ಧವಾಗಿಅಧಿಕೃತಪ್ರತಿನಿಧಿಹಸರು: _____

ಸಹಿ: _____

ಎಟ್ನಸ್ 'ಹಸರು: _____

ಸಹಿ: _____

ತನಿಖಾಧಿಕಾರಿಹಸರುಮತ್ತುಸಹಿ: _____

ದಿನಾಂಕಮತ್ತುಸ್ಥಳ: _____

ANNEXURE-IIPROFORMA

PROFORMA

Name :

Age : Sex :

Occupation :

Chief complaints :

Cough / Breathlessness / Chest pain / Pain abdomen

Other symptoms :

mMRC grading of breathlessness :

Past history:

- K/C/O COPD for _____ years
- No. of Hospitalizations:
- History of Diabetes Mellitus / Hypertension / Asthma / Tuberculosis
- Other Comorbidities

Personal History :

Smoking / Alcohol / Tobacco chewer

General Physical Examination

Height : Weight : BMI :

Pulse rate : BP : RR : SpO_2

Pallor / Icterus / Cyanosis / Clubbing / Pedal edema / Lymphadenopathy / Koilonychia

Systemic Examination

Respiratory System :

Other Systems :

PFT

FEV_1 / FVC :

FEV_1% predicted :

FVC % predicted :

6MWD :

Your name:	Today's date:

CAT
COPD Assessment Test™

How is your COPD? Take the COPD Assessment Test™ (CAT)

This questionnaire will help you and your healthcare professional measure the impact COPD (Chronic Obstructive Pulmonary Disease) is having on your wellbeing and daily life. Your answers, and test score, can be used by you and your healthcare professional to help improve the management of your COPD and get the greatest benefit from treatment.

For each item below, place a mark (X) in the box that best describes you currently. Be sure to only select one response for each question.

Example: I am very happy 0 X 2 3 4 5 I am very sad

			SCORE
I never cough	0 1 2 3 4 5	**I cough all the time**	
I have no phlegm (mucus) in my chest at all	0 1 2 3 4 5	**My chest is completely full of phlegm (mucus)**	
My chest does not feel tight at all	0 1 2 3 4 5	**My chest feels very tight**	
When I walk up a hill or one flight of stairs I am not breathless	0 1 2 3 4 5	**When I walk up a hill or one flight of stairs I am very breathless**	
I am not limited doing any activities at home	0 1 2 3 4 5	**I am very limited doing activities at home**	
I am confident leaving my home despite my lung condition	0 1 2 3 4 5	**I am not at all confident leaving my home because of my lung condition**	
I sleep soundly	0 1 2 3 4 5	**I don't sleep soundly because of my lung condition**	
I have lots of energy	0 1 2 3 4 5	**I have no energy at all**	
		TOTAL SCORE	

CLINICAL COPD QUESTIONNAIRE

Please **circle** the number of the response that best describes how you have been feeling during the **past week**.
(Only **one** response for each question).

On average, **during the past week**, how often did you feel:	never	hardly ever	a few times	several times	Many Times	a great many times	almost all the time
1. Short of breath **at rest**?	0	1	2	3	4	5	6
2. Short of breath **doing physical Activities**?	0	1	2	3	4	5	6
3. **Concerned** about getting a cold or your breathing getting worse?	0	1	2	3	4	5	6
4. **Depressed (down)** because of your breathing problems?	0	1	2	3	4	5	6
In general, **during the past week**, how much of the time:							
5. Did you **cough**?	0	1	2	3	4	5	6
6. Did you **produce phlegm**?	0	1	2	3	4	5	6
On average, **during the past week**, how limited were you in these activities **because of your breathing problems**:	not limited at all	very slightly limited	slightly limited	moderately limited	very limited	extremely limited	totally limited /or unable to do
7. **Strenuous physical activities** (such as climbing stairs, hurrying, doing sports)?	0	1	2	3	4	5	6
8. **Moderate physical activities** (such as walking, housework, carrying things)?	0	1	2	3	4	5	6
9. **Daily activities at home** (such as dressing, washing yourself)?	0	1	2	3	4	5	6
10. **Social activities** (such as talking, being with children, visiting friends/ relatives)?	0	1	2	3	4	5	6

ANNEXURE-III-ETHICAL CLEARANCE LETTER

K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed – to- be- University)
Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (GoI)
JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)
Website: http//www.jnmc.edu
E-Mail : dome@jnmc.edu
Phone: (+ 91-(0)831 Office : 2472550
Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref: MDC/DOME/ 30 **Date: 24/11/2018**

To,

REG NO. BR0118003

J.N.Medical College,
BELAGAVI.

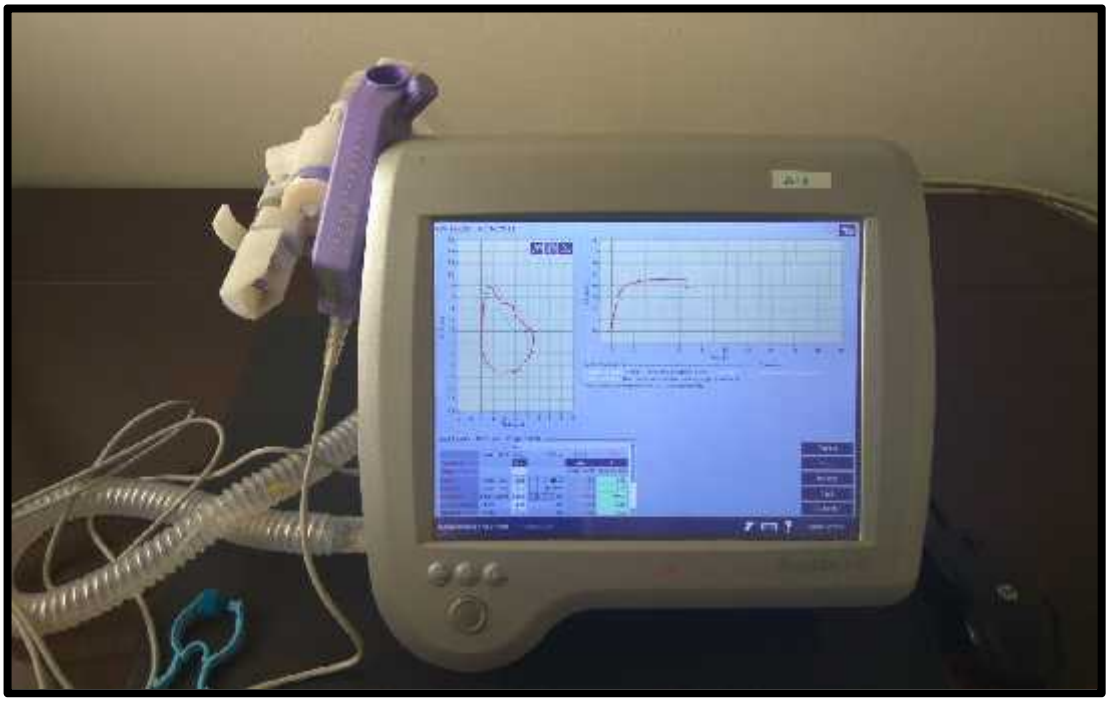
Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"EVALUATION OF CRITERIA FOR CLINICAL CONTROL IN PATIENTS WITH COPD – A HOSPITAL BASED PROSPECTIVE STUDY"**, is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Arathi Darshan)
Member Secretary
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

(Dr. Roopa M Bellad)
Chairman,
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

ANNEXURE IV – PHOTOGRAPHS



Photograph 1.Spirometer

ANNEXURES V - MASTER CHART

Sl No	NAME	AGE	GENDER	SMOKING	COMORBIDITY	RS	SPO2	COUGH	BREATHLESSNESS	CHEST PAIN	WHEEZE	COPD DURATION	GOLD STAGE	FEV1/FVC	FEV1	6MWD	MMRC	BMI	BODE	CAT	CCQ	CAT 1	CCQ1	CONTROLLED	EXACERBATIONS	HOSPITALISATION	DEATH
1	SHIVAJI	65	M	Y	NIL	VBS	95	0	1	0	0	9	1	0.696	81	392	1	24.93	0	8	0.8	7	1	1	1	N	N
2	PITHAMBARAPPA	67	M	y	HTN	VBS	97	0	1	0	1	1	2	0.575	52	250	2	21.23	3	7	0.9	11	1.5	1	0	N	N
3	SUREKHA	55	F	N	HTN	VBS	99	1	0	0	0	2	2	0.671	56	380	1	24.1	3	8	1	7	0.8	0	1	N	N
4	SHANTAVVA	64	F	N	HTN	VBS	95	1	1	0	1	3	2	0.632	57	380	1	29.1	6	22	2.8	26	3.5	1	1	**Y**	N
5	YALLAWA	58	F	N	NIL	VBS	97	0	1	0	1	4	2	0.655	74	440	0	28.9	3	6	1	5	0.8	1	1	N	N
6	AMASIDDA	69	M	Y	HTN	VBS	95	1	1	0	0	1	2	0.675	72	450	0	28.4	3	8	1.2	12	1.6	0	1	N	N
7	HASAN ALI	51	M	Y	HTN	VBS	96	1	0	0	0	9	1	0.375	84	373	0	25.3	0	5	1.1	9	1.4	1	0	N	N
8	AMBU SHIVAJI	65	M	Y	DM	RHONCHI+	96	1	1	0	1	4	2	0.722	64	280	1	16.03	2	6	1.4	6	1.2	1	0	N	N
9	NANAGOUDA PATIL	62	M	N	NIL	VBS	98	1	0	0	0	1	2	0.615	70	320	0	26	6	14	2.6	18	3.2	1	0	N	N
10	RAJSHEKHAR	55	M	Y	HTN	VBS	99	0	1	0	0	3	2	0.544	60	320	1	23.2	1	5	1	5	0.9	1	1	N	N
11	SEEMA	51	F	N	HTN	RHOCHI	96	1	0	0	0	6	2	0.581	59	270	1	23.98	4	10	1.1	14	1.5	0	0	N	N
12	SAVITA	57	F	N	NIL	VBS	96	0	1	0	0	4	1	0.426	80	316	0	24.65	1	7	0.9	6	0.8	1	0	N	N
13	BASSAYA	60	M	Y	DM	VBS	98	1	1	0	0	5	2	0.626	66	290	1	37.8	2	6	0.7	6	0.6	1	0	N	N
14	MALLIKARJUN	66	M	Y	DM	VBS	95	1	1	0	1	7	2	0.655	76	410	1	22.5	3	12	1.4	10	1	1	1	N	N
15	NINGAVVA	77	F	N	NIL	VBS	96	1	1	0	1	3	3	0.278	34	329	3	23.67	6	16	2.4	21	2.9	0	1	Y	N
16	MANGAL PATIL	48	M	Y	NIL	VBS	98	1	1	0	0	4	3	0.312	40	227	3	22.1	6	13	1.2	17	1.5	0	1	Y	N
17	BASAWWA	65	F	N	DM	VBS	96	1	1	0	0	6	2	0.624	70	410	1	20.8	1	8	0.9	12	1.8	0	0	N	N
18	LAXMAVVA	52	F	N	NIL	VBS	97	0	0	0	0	3	2	0.626	71	390	1	18.5	1	7	0.6	7	0.5	1	0	N	N
19	CHANNAPPA	81	M	Y	IHD	VBS	97	1	1	1	0	6	3	0.644	38	163	3	23.03	6	24	3	28	3.3	0	1	N	N
20	JINAPPA	64	M	N	NIL	VBS	96	1	1	0	0	4	3	0.475	47	305	2	17.96	5	14	1.8	18	2.4	1	0	N	N
21	SUNANDA	43	F	Y	NIL	VBS	96	0	1	0	0	5	2	0.686	67	380	1	20.6	1	5	0.9	4	0.9	1	1	N	N
22	BASAPPA	65	M	Y	DM	VBS	96	1	0	1	0	7	2	0.666	74	280	1	19.5	2	9	1.1	14	1.5	0	1	N	N
23	MUDUKAPPA	53	M	Y	NIL	VBS	95	0	1	0	1	8	3	0.564	31	277	2	20.69	6	15	1.3	18	1.9	1	0	N	N
24	KHAIRUNBI	68	F	N	HTN	VBS	96	1	1	0	0	9	2	0.686	71	330	1	20.7	4	11	1.1	8	1	1	0	N	N
25	BHAGOJI	79	M	y	DM	VBS	98	0	1	0	1	4	3	0.527	35	285	1	19.56	5	12	1.4	16	2	1	0	N	N
26	RAJU	45	M	y	NIL	VBS	95	0	1	0	0	7	2	0.614	62	390	1	26.3	1	10	1.2	10	1	1	0	N	N
27	HOLABASU	52	M	N	HTN	VBS	97	1	0	0	0	1	3	0.475	47	305	2	17.96	5	16	1.8	20	2.5	0	1	Y	N
28	KRISHNAVVA	62	F	N	HTN	VBS	99	0	1	0	0	3	2	0.665	71	390	1	21.85	0	6	0.8	5	0.8	1	1	N	N
29	GADABAI	65	F	N	NIL	VBS	94	0	1	0	0	6	1	0.674	80	349	0	24.65	1	11	1.6	10	1.6	0	0	N	N
30	HIRABAI	70	F	N	HTN	SCATTERED	96	1	1	0	1	4	3	0.615	35	325	2	20.08	6	16	2.5	21	3.1	1	1	Y	N
31	RAMAGOUDA	57	M	Y	HTN	VBS	99	0	1	0	1	5	1	0.335	87	437	0	26.9	0	9	1.1	8	1.1	1	0	N	N
32	INDIRABAU	48	F	N	DM	VBS	98	0	0	0	0	7	2	0.674	73	418	1	18.44	1	10	1.1	8	1	1	0	N	N

33	FARZANA	52	F	Y	HTN	VBS	97	0	1	0	1	3	2	0.523	62	219	3	21.91	5	18	1.8	14	1.6	1	0	N	N
34	DAYANAND	65	M	N	NIL	VBS	96	1	1	0	0	7	3	0.366	42	157	2	24.44	5	10	1.2	18	1.8	0	1	Y	N
35	SHIVACHANDRA	65	M	Y	IHD	VBS	96	1	1	1	1	8	3	0.434	48	137	3	19.87	8	16	2.6	22	3.6	0	1	Y	N
36	SHAMA M	45	F	N	NIL	VBS	96	0	0	0	0	9	2	0.458	76	436	0	28.23	0	8	0.9	9	1	1	0	N	N
37	CHANNABASAPPA	63	M	N	HTN	VBS	99	0	1	0	0	7	2	0.315	74	361	1	18.17	1	14	1.2	15	1.2	1	0	N	N
38	GERARD	50	M	Y	NIL	VBS	96	1	1	0	1	8	1	0.573	80	357	1	23.88	0	6	0.8	7	0.8	1	0	N	N
39	SHANTA	50	F	N	HTN	VBS	98	0	0	0	0	9	2	0.425	50	318	1	20.25	3	8	0.7	8	0.9	1	0	N	N
40	NARAYAN	63	M	Y	DM	VBS	96	0	1	0	0	6	3	0.485	48	287	1	19.24	4	9	1.1	15	1.7	0	1	N	N
41	KRISHNA	62	M	Y	NIL	VBS	98	0	1	0	0	4	2	0.529	51	142	2	16.23	6	18	1.4	21	2.1	1	1	Y	N
42	SUSHILA	67	F	N	NIL	VBS	97	1	1	0	1	5	4	0.458	29	153	3	18.71	8	28	1.8	32	2.5	0	1	N	N
43	ISHWAR	68	M	N	HTN	VBS	98	0	1	0	0	4	2	0.452	77	422	1	22.54	0	5	1	5	0.9	1	0	N	N
44	ABDUL	80	M	N	DM	VBS	97	0	1	0	1	7	4	0.529	28	120	2	15.2	8	19	1.9	24	2.5	0	1	N	N
45	NAGAVVA	55	F	N	NIL	VBS	97	1	1	0	0	3	2	0.424	70	438	1	22.1	0	7	0.7	6	0.7	1	0	N	N
46	APPASAB	45	M	N	HTN	RHOCHI	96	0	1	0	0	6	1	0.423	85	389	1	25.48	0	8	0.8	12	1.4	1	0	N	N
47	SHIVAKKA	68	F	N	HTN	VBS	98	0	1	0	0	4	1	0.573	80	357	1	23.88	0	6	0.6	6	0.6	1	0	N	N
48	SURIYAN	56	F	N	NIL	VBS	98	0	1	0	0	5	3	0.434	48	137	3	19.87	8	24	2.2	28	2.9	0	1	N	N
49	KARKALA	70	M	Y	DM	VBS	97	1	1	0	0	7	1	0.426	80	316	0	24.65	1	4	0.9	5	1	1	0	N	N
50	DAYANAND	49	M	N	DM	VBS	96	0	1	0	0	3	4	0.438	31	283	1	31.3	4	15	1.8	12	1.5	1	0	N	N
51	VEERESH	45	M	N	NIL	VBS	95	0	0	0	1	4	1	0.634	86	428	0	24.43	0	4	0.9	5	0.9	1	1	N	N
52	PARAPPA	70	M	Y	HTN	VBS	97	1	1	0	0	6	2	0.668	51	336	1	24.5	2	8	0.7	13	1.4	1	0	N	N
53	KHUTUJABI	60	F	N	HTN	VBS	98	1	1	0	1	9	3	0.519	30	162	2	23.89	6	28	2.8	31	3.5	1	1	Y	N
54	BASAVRAJ	50	M	N	NIL	RHONCHI+	94	0	1	0	0	8	3	0.535	41	171	2	23.9	5	18	1.6	16	1.5	0	1	Y	N
55	KENDAYYA	67	M	Y	DM	VBS	94	1	1	0	0	14	3	0.575	52	250	2	21.23	3	6	1.1	6	1.4	1	1	N	N
56	MADINA	45	F	N	NIL	VBS	96	0	0	0	0	3	4	0.434	48	137	3	19.87	8	18	1.8	24	2.5	0	1	Y	N
57	RAMMAPPA	82	M	Y	HTN	RHONCHI+	95	1	1	0	1	19	2	0.694	77	370	2	22.2	2	24	1.6	22	1.8	1	0	N	N
58	GOURRAVVA	72	F	N	IHD	VBS	95	0	1	0	1	12	3	0.607	33	252	2	22.86	5	8	1	16	1.6	0	0	N	N
59	FAIMIDA	45	F	N	NIL	RHONCHI+	93	1	1	0	0	3	2	0.683	67	310	2	25.5	4	7	1.1	11	1.8	1	1	N	N
60	MAHESH	50	M	N	HTN	VBS	97	1	1	0	0	6	2	0.674	62	446	1	24.5	1	5	0.6	6	0.6	1	0	N	N
61	JAHANGEER	48	M	N	NIL	VBS	96	1	1	0	0	2	3	0.656	32	352	2	18.54	5	20	1.3	24	1.7	0	0	N	N
62	VEERBHADRAYYA	52	M	Y	DM	VBS	97	1	1	0	0	8	2	0.58	60	340	2	24	9	30	2.1	34	2.9	0	1	y	y
63	MALLAPA	45	M	Y	NIL	VBS	97	0	0	0	1	4	1	0.674	80	349	0	24.65	1	4	0.8	5	1.2	1	0	N	N
64	BASARANAYYA	81	M	Y	HTN	SCATTERED	95	1	1	1	1	13	2	0.534	60	290	2	16.1	6	16	0.7	19	1.4	1	1	N	N
65	GUNDU	84	M	Y	HTN	VBS	94	1	1	0	0	22	4	0.301	23	231	1	17.23	6	15	1.4	19	1.9	1	0	N	N
66	RAMAGOUDA	68	M	N	NIL	VBS	95	0	1	0	0	11	2	0.664	72	340	2	38.2	9	34	2.4	36	3.2	0	1	Y	Y
67	VIMAL	58	M	Y	HTN	VBS	95	1	1	0	0	9	3	0.569	36	107	2	21.22	6	18	1.2	22	1.8	1	0	N	N
68	MANJULA	48	F	N	NIL	VBS	97	1	0	0	0	2	2	0.575	52	250	2	21.23	3	5	0.9	6	1	1	0	N	N
69	SHOBHA	68	F	N	DM	VBS	99	1	1	0	0	16	4	0.442	23	230	2	17.23	7	14	1.7	18	2	0	0	N	N
70	SIDAPPA	72	M	Y	NIL	VBS	98	1	1	0	0	26	3	0.387	44	108	2	19.91	7	26	2.3	29	2.8	0	0	N	N
71	SANGAVVA	73	F	N	DM	VBS	99	1	1	0	0	5	3	0.563	74	290	2	20.1	5	8	1	11	1.6	0	0	N	N
72	BALAKRISHNA	59	M	Y	DM	VBS	95	1	1	0	0	8	3	0.354	39	248	0	29.54	4	14	0.9	10	0.7	1	0	N	N
73	HANIFA	51	F	N	NIL	VBS	97	0	1	0	0	3	2	0.707	70	425	4	0	6	20	1.8	25	2.5	0	1	N	N
74	MALLAVA	56	F	N	NIL	VBS	95	1	1	0	0	3	3	0.383	37	190	2	27.23	6	24	2.2	28	2.7	1	1	N	N
75	RAMALING	73	M	Y	DM	VBS	96	1	0	0	0	11	3	0.387	44	108	2	19.91	7	24	2.5	28	2.9	0	0	N	N
76	SIDRAMYA	56	M	Y	NIL	VBS	97	1	1	0	0	2	1	0.581	87	340	0	21.83	1	6	0.7	5	1	1	1	N	N
77	TAYYAVAA	46	F	N	NIL	VBS	96	0	1	0	0	7	2	0.575	52	250	2	21.23	3	6	0.6	6	1.2	1	0	N	N
78	NINGAPPA	66	M	N	HTN	VBS	97	1	1	0	0	8	3	0.654	33	175	3	24.3	7	25	2.6	28	3.2	0	1	Y	N
79	AJIT	55	M	Y	DM	VBS	95	0	1	0	0	9	2	0.599	73	437	0	20.76	1	8	0.9	9	1	1	1	N	N
80	RAMALING	71	M	N	DM	VBS	95	1	0	0	0	7	4	0.543	28	177	2	19.48	7	22	2.4	25	3.5	0	1	N	N
81	BHIMAPPA	56	M	Y	NIL	VBS	97	0	1	0	0	8	2	0.415	79	442	0	22.68	0	4	0.7	5	0.7	1	0	N	N

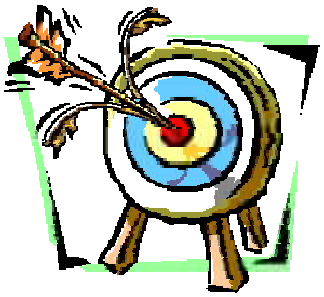
82	CHINAMMA	66	F	N	DM	VBS	94	0	1	0	1	5	3	0.415	47	320	2	26	4	10	0.6	16	1.2	1	0	N	N
83	RAJSHEKHAR	76	M	N	HTN	VBS	90	1	1	0	0	4	3	0.387	44	108	2	19.91	7	22	2.7	26	3.4	1	1	N	N
84	KETAN	50	M	Y	NIL	VBS	97	0	1	0	0	7	2	0.591	63	356	1	29.54	1	6	0.8	6	0.8	1	0	N	N
85	NANA	54	M	y	NIL	VBS	91	0	1	0	1	8	1	0.638	80	431	0	21.44	0	4	0.9	9	1.6	1	0	N	N
86	KAMAPPA	72	M	Y	HTN	VBS	88	1	1	0	0	12	2	0.227	73	340	1	22.52	1	6	1	7	1.2	1	0	N	N
87	MAHANTESH	60	M	N	IHD	RHONCHI+	92	1	1	0	1	15	2	0.382	71	256	1	23.45	1	2	0.9	4	1	1	0	N	N
88	PRABHAKAR	67	M	y	NIL	RHONCHI+	93	1	0	0	0	20	4	0.454	29	153	3	18.71	8	24	2.5	32	3.5	0	1	Y	y
89	GAJANAN	49	M	N	NIL	SCATTERED	93	0	0	0	1	4	2	0.244	64	400	1	21.56	1	8	0.6	9	0.7	1	0	N	N
90	MANVIR	54	M	Y	DM	VBS	93	1	0	0	1	19	2	0.556	77	247	1	29.36	2	10	0.8	14	1.5	1	0	N	N
91	SUSHILA	63	F	N	NIL	VBS	93	1	1	0	1	2	1	0.451	84	384	0	23.55	0	4	0.8	5	0.8	1	0	N	N
92	VYAS B	69	M	Y	HTN	SCATTERED	97	1	1	0	0	15	2	0.448	73	420	1	27.21	0	6	0.7	5	0.7	1	1	N	N
93	REVAPPA	62	M	N	NIL	VBS	96	0	1	0	0	2	3	0.613	39	281	2	21.55	4	8	1	14	1.8	0	0	N	N
94	HUSENAPPA	71	M	y	HTN	VBS	95	1	1	0	0	3	2	0.534	64	450	1	22.25	1	8	1.3	8	1.2	1	0	N	N
95	MALLAWA	78	F	N	NIL	VBS	98	1	1	1	1	13	3	0.466	46	175	2	19.8	6	24	2.4	29	3	1	0	N	N
96	RAJU	61	M	Y	NIL	VBS	96	1	1	0	1	17	1	0.514	88	367	0	23.09	0	8	1.1	6	1	1	0	N	N
97	BALU	69	M	Y	HTN	VBS	98	1	1	0	0	10	3	0.675	62	446	1	24.5	1	6	1	5	1	1	0	N	N
98	SHANKAR	77	M	Y	NIL	RHONCHI+	92	1	1	0	1	4	1	0.425	50	318	1	20.25	3	10	0.9	14	1.4	1	0	N	N
99	NOEL	59	M	N	DM	VBS	90	0	1	0	1	5	3	0.631	68	223	2	22.22	2	9	0.8	10	0.8	1	0	N	N
100	BAPUSAHEB	80	M	N	DM	VBS	93	1	1	0	1	1	4	0.434	25	257	1	18.1	5	16	1.6	19	1.9	1	1	N	N
101	SHIVANAND	51	M	N	NIL	VBS	93	1	0	0	1	6	2	0.491	66	379	1	22.63	0	5	0.6	5	0.6	1	0	N	N
102	TUKARAM	69	M	Y	NIL	VBS	90	1	1	0	1	4	3	0.575	32	184	1	16.19	6	28	2.6	32	3.2	0	0	N	N
103	BASAPPA	62	M	Y	NIL	VBS	93	1	1	0	1	5	3	0.665	41	163	2	25.32	5	9	0.9	14	1.3	0	0	N	N
104	SASHIDEV	57	M	Y	DM	VBS	95	0	1	0	1	4	2	0.596	70	194	1	20.3	3	7	0.8	8	1	1	1	N	N
105	ASHOK	57	M	Y	DM	VBS	94	0	1	0	1	7	4	0.519	30	162	2	23.89	6	30	2.8	33	3.3	0	1	N	N

ANNEXURE-VI

KEY TO MASTER CHART

DM	–	Diabetes Mellitus
HTN	–	Hypertension
IHD	–	Ischemic Heart Disease
BMI	–	Body Mass Index
RS	–	Respiratory System
SpO_2	–	Saturation of oxygen
VBS	–	Vesicular Breath Sounds
FEV_1	–	Forced expiratory volume in 1 second
FVC	–	Forced Vital Capacity
FEV_1%	–	Forced expiratory volume in 1 second predictedpercentage
FVC %	–	Forced Vital Capacity percentage predicted
6MWT	–	6 Minute Walk Test
BODE	–	Total BODE index score
CAT	–	COPD Assessment Test
CCQ	–	Clinical COPD Questionnaire
CAT 1	–	COPD Assessment Test (at follow up visit)
CCQ 1	–	Clinical COPD Questionnaire (at follow up visit)

Introduction



Objectives

Review of Literature

Methodology

Results

Discussion

Conclusion

Summary

Bibliography

Annexure-I

]

Annexure-II

Annexure-III

Annexure-IV

Annexure-V

Annexure-VI