Naskah dr. Derallah (RS)

by Yola Handayani 2

Submission date: 30-May-2023 01:42PM (UTC+0700)
Submission ID: 2105064698
File name: UI_dr._Derallah_2023.doc (122K)
Word count: 5454
Character count: 26160

CORRELATIONS BETWEEN MEASUREMENT RV, RV/TLC, FRC/TLC WITH CLINICAL SYMPTOMS IN COPD PATIENTS IN PERSAHABATAN HOSPITALS JAKARTA.

Derallah A LINDRA, Faisal YUNUS, Triya DAMAYANTI

Department of Pulmonology and Respiratory Medicine Faculty of Medicine, University of Indonesia, Persahabatan Hospital Jakarta

Email : ansusadera@yahoo.co.id

Abstract

Introduction: This is a preliminary study to measure lung volume in patients with stable COPD in RSUP Persahabatan Jakarta to determine the prevalence of the increasing value of the lung volume in patients with stable COPD.

Methods: This study used a cross-sectional study design of outpatiens with stable COPD who visited Asthma-COPD clinica RSUP Persahabatan Jakarta. The Lung volume test using a gas dilution MBNW taken consecutively from February to March 2016.

Results: Test Spirometry and Lung volumes performed on 36 subjects. There were 3 subjects (8.3%) the COPD group A, 10 subjects (27.8%) COPD Group B, 9 subjects (25%) COPD Groups C and 14 subjects (8.9%) COPD Group D. At the age <60 years of 9 there were subjects (25%) and ≥60 years of 27 subjects (75%). Value RV / TLC has a significant relationship with the MmRC scale, a 6-minute walking test and exacerbation within one year, however of FRC / TLC significantly associated with MmRC scale.

Conclusion: Value RV / TLC has a significant relationship with the MmRC scale, a 6-minute walking test and exacerbation within one year, however of FRC / TLC significantly associated with MmRC scale.

Keywords: Residual volume (RV), RV / TLC, FRC / TLC, COPD.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is defined as a chronic progressive disease characterized by air flow obstruction that has no real change in its course. According to the 2014 Global Chronic Obstructive Lung Disease (GOLD) COPD is a preventable and treatable lung disease, characterized by persistent air flow barriers which are usually progressive and are associated with chronic inflammatory and respiratory tract responses to toxic / dangerous particles or gases, exacerbations and comorbidities contribute to the severity of the disease.[1,2]

Changes in COPD pathology are complex and are associated with worsening respiratory physiology. Distal airways experience inflammation, airway wall fibrosis, smooth muscle hypertrophy, goblet cell hyperflation, mucus hypersecretion and pulmonary parenchymal destruction. The volume and number of submucosal glands and goblet cells increase which results in chronic mucus hypersecretion in chronic bronchitis. In emphysema, widening of the airways persists distal to the terminal bronchioles due to damage to the airway wall without fibrosis.[3,4]

Pulmonary function measurement has an important role in helping the diagnosis and management of patients with respiratory disease. Pulmonary function tests that are often used are spirometry, diffusion

capacity measurement, lung volume, respiratory muscle strength and bronchial provocation test. Lung volume testing is very necessary in helping to diagnose, manage and prognosis for COPD. The importance of this test was shown by one of the studies by Talag AA et al[5] which explained that in COPD patients who experience hyperinflation it is necessary to have investigations such as spirometry and other tests, one of which is a static volume test. However, it is different from the results of a study by Dykstra et al[6] who performed lung volume examination in 4,774 patients with obstructive pulmonary disease who found that there was little correlation between static volume and clinical symptoms. But in Indonesia there is no research data on the static volume test on clinical COPD patients in Indonesia.

Based on the description above the author wants to do research on how the relationship between RV, RV / TLC ratio, the ratio of FRC / TLC to clinical symptoms in patients with stable COPD with influencing factors.

MATERIAL AND METHODS

The design of this study was a cross sectional study, conducted at the Asma-PPOK Persahabatan Hospital starting from February-April 2016. The sampling technique in this study was consecutive sampling, every affordable population who arrived at the time of data collection was examined and samples that meet the research criteria are included as research samples.

Admission Criteria are all stable COPD patients who visit the Asthma-COPD and are willing to sign an informed consent form after the full explanation of the research procedure. Rejection criteria are COPD patients suspected of having acute pulmonary infectious disease characterized by the addition of symptoms of shortness of breath, sputum and sputum discoloration, patients suffering from life-threatening infections, fatal terminal diseases, severe underlying diseases including immunocompromis, COPD patients who are unable complete spirometry examination and measurement of lung volume and former TB.

The latest chest X-ray was not performed, this was based on the assumption that subjects who had been diagnosed with COPD in the Asthma-COPD at Persahabatan Hospital. Researchers explain the purpose and background of the study to research subjects who meet the acceptance criteria and do not meet the rejection criteria. The patient must sign an approval letter after receiving an explanation if the patient understands and agrees to participate in the study and a copy of the statement will be given to the patient. Stable COPD patients who were controlled to the Asthma-COPD at Persahabatan Hospital will be taken for history, physical examination, then stable COPD patients will be tested for spirometry and RV test, FRC and TLC are calculated as tight scores based on mMRC and filled out research worksheets. Recording of required data: General records which include gender, age, smoking history, Brinkman Index. Record of measurements of the Body Mass Index, tightness score based on the criteria of mMRC, 6 minute walking test, exacerbation in the previous year.

RESULT

This study is a cross sectional study that aims to answer the question "What is the relationship between RV, RV / TLC ratio, the ratio of FRC / TLC to stable COPD patients and their relationship with clinical symptoms that visit the Asma-PPOK Polyclinic Jakarta Persahabatan Hospital". The results of this study are primary data obtained from interviews, physical examination, spirometry examination and lung volume test. A total of 36 consecutive subjects were collected and interviewed then spirometry examination and lung volume test.

Characteristics Of Research Subjects

A total of 36 study subjects consisted of 97.2% of men and 2.8% of female subjects. Subjects aged more than or equal to 60 years as many as 75% are the most subjects. Subjects with a diagnosed duration of COPD less than 5 years were 77.8% of subjects and more than or equal to 5 years as much as 22.2%. If divided into COPD groups according to the latest GOLD criteria, group A-B COPD was 36.1% and group C-D COPD was 63.9%. As many as 41.7% of subjects with normal BMI are the most BMI. The highest MmRC value in MmRC is more or equal to 2 as much as 69.4%. Other congested symptom scores in the form of CAT obtained CAT more than or equal to 10 as many as 66.7% are the most CAT. The most six-minute walking test at a distance of 250-350 meters by 55.6% followed by a distance of more than 350 meters by 25% and a distance of 150-250 meters by 19.4%. History of exacerbations is more than or equal to 2 as many as 61.1% of subjects and exacerbations of less than 2 as many as 38.9%. Smoking history in the former smoker subject was 97.2% while non-smokers were 2.8%. The brinkman index of the most smokers in the medium Brinkman Index was 55.6%, then the Brinkman Index was 38.9% by weight. Symptoms of shortness of breath are the most complaints of 72.2% while symptoms of chronic cough are 27.8% of subjects. Subjects of COPD who were accompanied by comorbid were 52.8% more subjects than without comorbidities.

Table 1 Characteristics Of Research Subjects

Subject characteristics		Total (n)	%
Gender	Man	35	97.2
	Woman	1	2.8
Age	< 60 years	9	25
	≥ 60 years	27	75
History of COPD	< 5 years	28	77.8
	≥ 5 years	8	22.2
COPD group	Group A	3	8.3
	Group B	10	27.8
	Group C	9	25
	Group D	14	38.9
Body Mass Index (BMI)	Malnutrition	4	11.1
	Normal	15	41.7
	More nutrition	9	25
	Obese	8	22.2
mMRC	< 2	11	30.6
	≥ 2	25	69.4

Six minute walking test	>350	9	25
	250-350	20	55.6
	150-250	7	19.4
	<150	0	0
Exacerbation	< 2	14	38.9
	≥ 2	22	61.1
Smoking history	Not a smoker	1	2.8
	Former smoker	35	97.2
Brinkman Index	Not a smoker	1	2.8
	light	1	2.8
	medium	20	55.6
	weight	14	38.9
Symtoms	Dyspnoe	26	72.2
	Chronic cough	10	27.8
Comorbid	Without comorbid	17	47.2
	With comorbid	19	52.8

The Relationship Between RV, RV / TLC And FRC / TLC Values With FEV_1 Values In Stable COPD Patients.

Table 2 shows the relationship between RV, RV / TLC and FRC / TLC values with FEV_1 values. There is no meaningful relationship between FEV_1 and RV, RV / TLC and FRC / TLC values. RV values that are smaller, RV / TLC and FRC / TLC are found in degrees III-IV compared to degree I-II.

Table 2 The Relationship Between RV, RV / TLC And FRC / TLC Values With FEV_1 Values In Stable COPD Patients.

Category	FEV_1		Total	P
	I-II	III-IV		
RV				
Normal	18	16	34	0.236
	52.9%	47.1%	100%	
Increase	2	0	2	
	100%	0%	100%	
RV/TLC				
Normal	1	0	1	0.888
	100%	0%	100%	
Increase	19	16	35	
	54.3%	45.7%	100%	
FRC/TLC				
Normal	9	6	15	0.962
	60%	40%	100%	
Increase	11	10	21	
	52.4%	47.6%	100%	

The Relationship Between RV Values, RV / TLC And FRC / TLC With Clinical Symptoms In Stable COPD Patients.

Table 3 shows the relationship between RV values, RV / TLC and FRC / TLC with clinical symptoms. There is no significant relationship between clinical symptoms and RV values. Increased RV values are found in symptoms of tightness. The value of RV / TLC when compared to clinical symptoms shows no

significant relationship. The value of RV / TLC increased more in the symptoms of shortness of breath compared to symptoms of cough by 71.4% or as many as 25 subjects. The relationship between the value of FRC / TLC and clinical symptoms also showed no significant relationship. The value of FRC / TLC increased more in the symptoms of shortness of breath compared to symptoms of chronic cough by 81% or as many as 17 subjects.

Table 3 The Relationship Between RV Values, RV / TLC And FRC / TLC With Clinical Symptoms In Stable COPD Patients.

Category	Symptoms		Total	P
	Cough	Dyspnoe		
RV				
Normal	10	24	34	0.135
	29.4%	70.6%	100%	
Increase	0	2	2	
	0%	100%	100%	
RV/TLC				
Normal	0	1	1	0.094
	0%	100%	100%	
Increase	10	25	35	
	28.6%	71.4%	100%	
FRC/TLC				
Normal	6	9	15	0.337
	40%	60%	100%	
Increase	4	17	21	
	19%	81%	100%	

The Relationship Between RV, RV / TLC Values And FRC / TLC On The mMRC Scale In Stable COPD Patients.

Table 4 shows the relationship between RV, RV / TLC and FRC / TLC values with the MmRC scale. There is no meaningful relationship between mMRC scale and RV, RV / TLC and FRC / TLC values when compared with the mMRC scale show a meaningful relationship. RV / TLC values increased more on the mMRC scale skala2 compared to the mMRC <2 scale of 68.6% or as many as 24 subjects. The relationship between FRC / TLC values with the mMRC scale shows a meaningful relationship. The value of FRC / TLC increased more on the mMRC scale ≥2 compared to the MmRC <2 scale of 81% or as many as 17 subjects.

Table 4 The Relationship Between RV, RV / TLC Values And FRC / TLC On The mMRC Scale In Stable COPD Patients.

Category	MmRC		Total	P
	<2	≥2		
RV				
Normal	10	24	34	0.378
	29.4%	70.6%	100%	
Increase	1	1	2	
	50%	50%	100%	
RV/TLC				
Normal	0	1	1	0.032
	0%	100%	100%	
Increase	11	24	35	
	31.4%	68.6%	100%	

FRC/TLC				
Normal	7	8	15	0.006
	46.7%	53.3%	100%	
Increase	4	17	21	
	19%	81%	100%	

The Relationship Between RV, RV / TLC And FRC / TLC Values On The 6-Minute Walking Test In Stable COPD Patients.

Table 5 shows the relationship between RV, RV / TLC and FRC / TLC with a 6-minute walking test. There was no significant relationship between the 6-minute walking test scale and RV value. The value of RV / TLC when compared with the 6-minute walking test shows a meaningful relationship. The value of RV / TLC increased more in the 6-minute walking test less than 350 meters compared to the 6-minute walking test 350 meter road test of 74.3% or as many as 26 subjects. The relationship between the value of FRC / TLC with the 6-minute walking test showed a non-significant relationship but the FRC / TLC value increased more in the 6-minute <350 meter walking test compared to the 6-minute >350 meter walking test of 85.7% or 18 subjects.

Table 5 The Relationship Between RV, RV / TLC And FRC / TLC Values On The 6-Minute Walking Test In Stable COPD Patients.

Category	6 minute walking test		Total	P
	<350	≥350		
RV				
Normal	25	9	34	0.295
	73.5%	26.5%	100%	
Increase	2	0	2	
	100%	0%	100%	
RV/TLC				
Normal	1	0	1	0.022
	100%	0%	100%	
Increase	26	9	35	
	74.3%	25.7%	100%	
FRC/TLC				
Normal	9	6	15	0.168
	60%	40%	100%	
Increase	18	3	21	
	85.7%	14.3%	100%	

Relationship Between RV, RV / TLC Values And FRC / TLC Against Exacerbations In 1 Year In Stable COPD Patients.

Table 6 shows the relationship between RV, RV / TLC and FRC / TLC with exacerbations in 1 year. There was no significant relationship between exacerbations in 1 year and RV values. RV values that increased significantly were found in exacerbations in 1 year ≥2 compared to exacerbations in 1 year <2. The value of RV / TLC when compared to exacerbations in 1 year shows a meaningful relationship. The value of RV / TLC increased more in exacerbations in 1 year ≥2 compared to exacerbations in 1 year <2 by 62.9% or as many as 22 subjects. The relationship between the value of FRC / TLC and exacerbations

in 1 year showed a non-significant relationship but the value of FRC / TLC increased more in exacerbations in 1 year ≥2 compared to exacerbations in 1 year <2 by 71.4% or as many as 15 subjects.

Table 6 Relationship Between RV, RV / TLC Values And FRC / TLC Against Exacerbations In 1 Year In Stable COPD Patients.

Category	Exaserbation 1 years		Total	P
	<2	≥2		
RV				
Normal	14	20	34	0.413
	41.2%	58.8%	100%	
Increase	0	2	2	
	0%	100%	100%	
RV/TLC				
Normal	1	0	1	0.012
	100%	0%	100%	
Increase	13	22	35	
	37.1%	62.9%	100%	
FRC/TLC				
Normal	8	7	15	0.057
	53.3%	46.7%	100%	
Increase	6	15	21	
	28.6%	71.4%	100%	

DISCUSSION

This study aims to determine the increase in lung volume values namely residual volume, the ratio between residual volume and total lung capacity and the ratio between functional residual capacity and total lung capacity in stable COPD who visited the Polyclinic Asma-PPOK Persahabatan Hospital Jakarta conducted in February - March 2016. In this study interviews, physical examinations, spirometry tests and lung volume tests were conducted.

Characteristics Of Research Subjects In General

A total of 36 study subjects consisted of 35 subjects (97.2%) men and 1 subject (2.8%) female subjects. This is similar to the research from Ismail[7] in the Persahabatan Hospital that getting male sex is the most gender (92.3%), but slightly different from Travers et al [8] and O'donnell et al [9] in Canada getting male gender 72% and 64%. In contrast to the study Stroband et al [10] in Leiden to get fewer male gender categories (28%).

This study had subjects with age more than or equal to 60 years as many as 27 subjects or 75% were the most subjects while the age of less than 60 years was 9 people or by 25%. Research from Ismail's research[7] also shows similar results, namely the highest age is 60-90 years as many as 42 subjects or 64.6%. Similar results were also reported by Travers et al. [8] mean ages of the study subjects were 60 years and also the study of O'donnell et al [9] mean age of the study subjects as 66 years.

Subject nutritional status based on BMI in this study showed 41.7% of subjects with normal BMI, 25% with over nutrition, 22.2% with obesity and the least with less BMI of 11.1%. Similar to Ismail's research [7] in the normal BMI category, the largest is 40 people or 61.5%. Results different from Travers' study [8] getting a BMI average of 26.8, also similar to O'donnell et al's study [9] getting an average BMI was 25.8

and research from Stroband et al [10] with an average BMI of 26.2. The three studies obtained obesity nutritional status is the highest average BMI.

The scale of tightness in this case is the mMRC scale, in this study the highest mMRC score is mMRC more than or equal to 2 as much as 69.4% or as many as 25 subjects, while the MmRC scale of less than 2 was 11 subjects or 30.6%. This result is similar to the Stroband et al study [10] in Leiden getting the most MmRC scale on MmRC scale more than 3.

The value of the most 6-minute walking test in this study is a distance of 250-350 meters as much as 55.6% followed by a distance of more than 350 meters as much as 25% and a distance of 150-250 meters as much as 19.4%. Similar to the study by Hartman JE et al[19] getting a mean 6-minute road test in 91 COPD subjects of 319.2 ± 97.5 meters, but different from the study of Balcells et al [12] in Spain who received a midpoint test of the 6-minute road test on COPD subjects in the study this is 440 meters, also similar to the research by Nizet et al. [13] in the Netherlands also get a mean test score of 6 minutes of 410 meters.

Smoking history in the former smoker subject was 97.2% while non-smokers were 2.8%. Similar to the study of Balcells et al [12] in Spain, the subjects who had and were smoking were 94% while those who never smoked were smaller by 6%, but different studies from Nizet et al [13] in the Netherlands in their study of smoking with the subject smokers are 29.8%.

While the brinkman index value in this study was the subject with the highest number of smokers in the moderate Brinkman Index as much as 55.6% then the heavy Brinkman Index was 38.9%. In contrast to the Brinkman Index results from Travers et al's study [8] and Stroband et al [10] getting the most Brinkman Index is the heavy Brinkman Index.

Symptoms in COPD subjects in this study were dominated by symptoms of 72.2% shortness of breath while the symptoms of chronic cough were 27.8% of subjects. Slightly different from the study conducted by Kitaguchi et al [11] in Japan, the most clinical symptoms in subjects with COPD were symptoms of shortness of breath, which was 36.5% while chronic cough was 28.2% and other symptoms were 35.3%.

COPD patients in this study were mostly accompanied by 52.8% comorbid while 47.2% without comorbidities. In contrast to the research conducted by Nizet et al [13] in the Netherlands in his study obtaining COPD subjects with comorbid only 38.3% of which included cardiovascular comorbid 17%, diabetes mellitus 14.9%, hypertension 8.5% and other comorbidities 8.5%.

The relationship between RV, RV / TLC and FRC / TLC values with FEV_1 values in stable COPD patients.

There is no meaningful relationship between FEV_1 and RV, RV / TLC and FRC / TLC values. The residual volume is ≥ 120%, RV / TLC > 30% and FRC / TLC > 55% is smaller in degrees III-IV compared to degree I-II. This is possible because the predicted RV values used are taken from European subjects. In contrast to the study of Dykstra et al[6] in Rochester in 4774 subjects and using a body plethysmograph and also predictive values used using predictions with the same race. There was a

negative relationship between RV, RV / TLC, FRC / TLC with FEV_1 which means that the higher RV, RV / TLC and FRC / TLC in COPD patients the lower the FEV_1 value obtained. Weaknesses in Dykstra et al study were that some patients did not remember the diagnosis of previous pulmonary disease that was told by their doctor.[6] In line with the study of Papaioannou et al[15] in Greece in 49 male subjects had a significant relationship ($p < 0.003$) between an increase in the value of FRC / TLC with a decrease in FEV_1 value, the percentage of the relationship was 64%.

The Relationship Between RV Values, RV / TLC And FRC / TLC With Clinical Symptoms In Stable COPD Patients.

RV values increased more found in symptoms of tightness but there was no significant relationship with clinical symptoms. Similarly, the value of RV / TLC when compared with clinical symptoms also showed no significant relationship but the value of RV / TLC which increased in this study was more on the symptoms of shortness of breath compared to symptoms of cough which was 71.4%. In line with the study by Stroband et[10] in Leiden which examined 114 COPD patients who were divided into two groups, namely the group with chronic bronchitis and without chronic bronchitis comparing the RV / TLC values showed that there were no significant differences ($P = 0.61$) between events chronic bronchitis and without chronic bronchitis with 46.6% and 47.8%, respectively.

The relationship between the value of FRC / TLC and clinical symptoms also showed no statistically significant relationship but the value of FRC / TLC increased more in the symptoms of shortness of breath compared to symptoms of chronic cough which was 81%. In contrast to Parker et al study [14] in Canada in 20 patients with a prospective cohort method five times of observation, it was found that there was an increase in symptoms of shortness of breath compared to chronic cough associated with an increase in lung volume values both RV, RV / TLC and FRC / TLC values . This was in Parker et al study that there was an increase in trapped air and pulmonary hyperinflation so that symptoms of breathlessness were more dominant than chronic cough.[14]

The Relationship Between RV, RV / TLC Values And FRC / TLC On The mMRC Scale In Stable COPD Patients.

This study obtained results that there was no significant relationship between the mMRC scale and the RV value. This study got RV values increased in mMRC ≥2 by 50% ($P = 0.378$). The higher the RV value, the higher the value of the mMRC obtained, this is because the RV prediction that is used to produce RV predicted values does not use the value of Indonesian fiction. In contrast to the research from Gompertz et al[18] in Germany conducted with a prospective cohort obtained a positive relationship between the value of mMRC with the volume of residue so that the higher the residual volume value, the higher the value of mMRC with the relationship obtained at $P = 0.02$.

RV / TLC values increased more on the mMRC scale ≥2 compared to the mMRC <2 scale of 24 subjects or 68.6% so that a significant relationship was found between the value of RV / TLC and the mMRC scale. In line with Shin et al[17] in Korea that divides the two groups, namely RV / TLC group ≥ 40% and RV / TLC value group <40%, when linked to the mMRC scale it is statistically significant so that the

higher the RV / TLC value of a person then there will be pulmonary hyperinflation and the higher the value of mMRC obtained.

This study also tried to connect the value of FRC / TLC to the mMRC scale. This study found a significant relationship of FRC / TLC values that increased more on the mMRC scale ≥2 than the mMRC <2 scale of 17 subjects or 81%. In line with the research by Parker et al [14] getting a tendency to increase the mMRC scale with an increase in the value of FRC / TLC, the increasing value of FRC / TLC in COPD patients, the mMRC scale also increased. The tendency of an increase was also shown from the results of the study by Papaioannou et al[15] who obtained an increase in the value of FRC / TLC in the emphysema group followed by an increase in the value of mMRC in the emphysema patient.

The Relationship Between RV, RV / TLC And FRC / TLC Values On The 6-Minute Walking Test In Stable COPD Patients.

This study found no significant relationship between the 6-minute walking test and RV value because of the limited subject due to the prediction used by Europeans. In addition, in this study between FRC / TLC with a 6-minute walking test also showed a non-significant relationship but FRC / TLC increased more in the 6-minute <350 meter walking test compared to the 6-minute >350 meter road test of 85.7%. In contrast to the Wijkstra et al study[16] in the Netherlands in 40 subjects this study did not connect directly but obtained an increase in RV, FRC / TLC with a decrease of 6 minutes of walking test so that the RV value increased and FRC / TLC on COPD subjects decreased test values 6-minute walking is obtained in COPD patients. This is explained by the occurrence of dynamic hyperinflation during activities.

The value of RV / TLC when compared with the 6-minute walking test shows a meaningful relationship. The value of RV / TLC increased more in the 6 minute walking test less than 350 meters compared to the road test 6 minutes >350 meters at 74.3%. In line with research Shin Shin et al[17] who saw the difference between the value of RV / TLC more or equal to 40% and less than 40% connected with a 6-minute walking test. This study found that there was a significant difference in P value = 0.045 with a 6-minute path test value which decreased when hyperinflation occurred.

Relationship Between RV, RV / TLC Values And FRC / TLC Against Exacerbations In 1 Year In Stable COPD Patients.

There was no significant relationship between exacerbations in 1 year with RV values but obtained RV values that increased larger were found in exacerbations in 1 year ≥2 compared to exacerbations in 1 year <2. The relationship between the value of FRC / TLC and exacerbation in 1 year also showed a non-significant relationship but the value of FRC / TLC increased more in exacerbations in 1 year ≥2 compared to exacerbations in 1 year <2 by 71.4%. This study is different from the research from Kim et al[20] who divided the two groups, namely the chronic bronchitis group and without chronic bronchitis with 290 and 771 subjects respectively. Kim research did not directly link the value of lung volume and exacerbations 1 year earlier. The patient also performed a thoracic CT examination to confirm existing abnormalities in the lungs. The results showed a significant relationship between RV values and FRC / TLC with the group without chronic bronchitis as well as exacerbations were also statistically significant. We can see the tendency to increase lung volume with a 1-year exacerbation in the group without chronic bronchitis.

The value of RV / TLC when compared to exacerbations in 1 year shows a meaningful relationship. The value of RV / TLC increased more in exacerbations in 1 year ≥2 compared to exacerbations in 1 year <2 by 62.9%. In line with the research of Shin et al[17] in Korea which also looked at the relationship between RV / TLC values and the occurrence of exacerbations. Another study by Shin et al also found a significant relationship between the value of RV / TLC and the occurrence of exacerbations. The more frequent exacerbations in COPD patients, the higher the RV / TLC value in those COPD patients with P = 0.012. In contrast to research from Birmingham by Gompertz et al[18] conducted on 70 subjects with a retrospective cohort method. Gompertz et al study looked at the relationship between exacerbation events in the previous year by dividing <2 and ≥ 3 exacerbations with one of the lung volume values, namely RV / TLC. There were no significant differences between exacerbations in the previous year <2 with ≥ 3 in terms of RV / TLC with values of 118.8% and 124.8% respectively but there was an increase in lung volume values in this case RV / TLC if the exacerbation was ≥ 3.

Limitations Of Research

This study has limitations in several ways, namely that this study did not carry out FRC examination using a body plethysmograph as a gold standard check and was most accurate in determining functional residual capacity. The number of male subjects in this study were more than female subjects. This study also did not perform chest X-ray examinations so it could not confirm spirometry results. Predictive values used for residual volume still use European predictions because Indonesians do not yet have a standard predicted residual volume value.

REFERENCES

1. Global Initiative for Chronic Obstructive Lung (GOLD). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. National Institute of Health. National Heart, Lung, and Blood Institute, update February 2014.
2. Definisi, Permasalahan di Indonesia. In: Antariksa B, Djajalaksana S, Pradnaparamita, Riyadi J, Yunus F, Suradi, et al., editors. Penyakit Paru Obstruktif Kronik (PPOK) Diagnosis dan Penatalaksanaan. BUKU LENGKAP ed: Perhimpunan Dokter Paru Indonesia (PDPI); Juli 2011; p. 1-4.
3. Hogg JC, Saetta M. Pathology. In: Calverley PMA, MacNee W, Pride NB, Rennard SI, editors. Chronic Pulmonary disease. London: Oxford University Press; 2002; p. 11-7.
4. Joanne LW, Andrew C. Pathologic features of chronic obstructive pulmonary diseases : Diagnostic criteria and differential diagnosis. In: Fishman AP, Elias JA, Grippi MA, Senior RM, Pack AI, editors. Fishman's pulmonary diseases and disorders. New York Mc Graw Hill Medical; 2008; p. 693-704.
5. Talag AA, Wilcox P. Clinical physiology of chronic obstructive pulmonary disease. BCMJ. 2008;97-102.
6. Dysktra BJ, Sanlon PD, Kester MM, Beck KC,Enright PL. Lung volume in 4,774 patient with obstructive lung disease. Chest. 1999;68-74
7. Ismail E. Hubungan antara hasil pemeriksaan kapasitas difusi paru terhadap karbon monoksida metode napas tunggal dengan derajat pasien PPOK di RSUP Persahabatan Jakarta. Tesis Departemen Pulmonologi dan Ilmu Kedokteran Respirasi FKUI. Jakarta ; 2015.
8. Travers J, Laveneziana P, Webb KA, Kesten S, O'Donnell DE. Effect of tiotropium bromide on the cardiovascular response to exercise in COPD. Respiratory Medicine. 2007; 101 : 2017–24.

9. O'Donnell DE, Revill SM, Webb KA. Dynamic Hyperinflation and Exercise Intolerance in Chronic Obstructive Pulmonary Disease. Am J Respir Crit Care Med. 2001 ; 164 : 770–7.
10. Stroband JBS, et al. Chronic bronchitis sub-phenotype within COPD: inflammation in sputum and biopsies. Eur Respir J 2008; 31: 70–7.
11. Kitaguchi Y, Fujimoto k, Kubo K, Honda T. Characteristics of COPD phenotypes classified according to the findings of HRCT. Respiratory Medicine. 2006 ; 100 : 1742–52.
12. Balcells E, et al. Factors affecting the relationship between psychological status and quality of life in COPD patients. Health and Quality of Life Outcomes. 2010 ; 8:108.
13. Nizet TAC, et al. Survival of Chronic Hypercapnic COPD Patients Is Predicted by Smoking Habits, Comorbidity, and Hypoxemia. CHEST. 2005 ; 6 : 127.
14. Parker CM, Voduc N, Aaron SD, Webb KA, O'Donnell DE. Physiological changes during symptom recovery from moderate exacerbations of COPD. Eur Respir J. 2005; 26: 420–28.
15. Papaioannou AI, et al. Systemic and airway inflammation and the presence of emphysema in patients with COPD. Resp Med. 2010;104: 275-82.
16. Wijkstra PJ, et al. elation of lung function, maximal inspiratory pressure, dyspnoea, and quality of life with exercise capacity in patients with chronic obstructive pulmonary disease. Thorax. 1994;49:468-72.
17. Shin TR, et al. The Prognostic Value of Residual Volume/Total Lung Capacity in Patients with Chronic Obstructive Pulmonary Disease. J Korean Med Sci. 2015; 30: 1459-65.
18. Gompertz S, Bayley DL, Hill SL, StockleyRA. Relationship between airway inflammation and the frequency of exacerbations in patients with smoking related COPD. Thorax. 2001; 56:36–41.
19. Hartman JW, Hacken NHTT, Klooster K, Boezen HM, Greef MHGG, Slebos DJ. The minimal important difference for residual volume in patients with severe emphysema. Eur Respir J. 2012; 40: 1137–41.
20. Kim V, et al. The Chronic Bronchitic Phenotype of COPD An Analysis of the COPDGene Study. CHEST. 2011;140:626-33.

Naskah dr. Derallah (RS)

ORIGINALITY REPORT

20%	15%	16%	8%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	jurnalrespirologi.org Internet Source	3%
2	S. D. Davis. "Multicenter Evaluation of Infant Lung Function Tests as Cystic Fibrosis Clinical Trial Endpoints", American Journal of Respiratory and Critical Care Medicine, 12/01/2010 Publication	1%
3	propertibazar.com Internet Source	1%
4	"Abstracts", Respirology, 11/2011 Publication	1%
5	Tutor, James D., Saumini Srinivasan, Memorie M. Gosa, Thomas Spentzas, and Dennis C. Stokes. "Pulmonary Function in Infants with Swallowing Dysfunction", PLoS ONE, 2015. Publication	1%
6	link.springer.com Internet Source	1%
7	jtd.amegroups.com	

	Internet Source	1%
8	hdl.handle.net Internet Source	1%
9	www.ltcn.eu Internet Source	1%
10	Gibson, . "Chronic obstructive pulmonary disease and obliterative bronchiolitis", Clinical Tests of Respiratory Function 3rd Edition, 2008. Publication	1%
11	epdf.tips Internet Source	1%
12	www.synergy-copd.eu Internet Source	1%
13	Jeffery, P.. "Phosphodiesterase 4-selective inhibition: novel therapy for the inflammation of COPD", Pulmonary Pharmacology & Therapeutics, 200502 Publication	<1%
14	Youlim Kim, Sang Hyuk Kim, Chin Kook Rhee, Jae Seung Lee et al. "Air Trapping and the Risk of COPD Exacerbation: Analysis From Prospective KOCOSS Cohort", Frontiers in Medicine, 2022 Publication	<1%

15	books.ersjournals.com Internet Source	<1 %
16	rc.rcjournal.com Internet Source	<1 %
17	pure.rug.nl Internet Source	<1 %
18	www.jurnalrespirologi.org Internet Source	<1 %
19	Alois Zapletal. "Lung recoil and the determination of airflow limitation in cystic fibrosis and asthma", Pediatric Pulmonology, 01/1993 Publication	<1 %
20	stemcellres.biomedcentral.com Internet Source	<1 %
21	worldnutrijournal.org Internet Source	<1 %
22	www.archbronconeumol.org Internet Source	<1 %
23	www.zora.uzh.ch Internet Source	<1 %
24	www.apsresp.org Internet Source	<1 %
25	www.ncbi.nlm.nih.gov Internet Source	<1 %

26	Submitted to Chung Shan Medical University Student Paper	<1 %
27	Submitted to Sheffield Hallam University Student Paper	<1 %
28	Kenneth R. McCurry, Marie M. Budev. "Lung transplant: Candidates for referral and the waiting list", Cleveland Clinic Journal of Medicine, 2017 Publication	<1 %
29	Ramin Baghai-Ravary, Jennifer K. Quint, James J.P. Goldring, John R. Hurst, Gavin C. Donaldson, Jadwiga A. Wedzicha. "Determinants and impact of fatigue in patients with chronic obstructive pulmonary disease", Respiratory Medicine, 2009 Publication	<1 %
30	Submitted to University of Queensland Student Paper	<1 %
31	123dok.com Internet Source	<1 %
32	www.researchgate.net Internet Source	<1 %
33	"1-A1: Lung Cancer 1 : Poster Sessions", Respirology, 2013. Publication	<1 %
	math.buffalostate.edu	

34	Internet Source	<1%
35	www.medrxiv.org Internet Source	<1%
36	epdf.pub Internet Source	<1%
37	Timothy Scheett, Malcolm T. Whitehead, Tyler Martin, Michael J. Webster. "Exercise, Immune Status And Stress Markers In College Students And College Student Athletes", Medicine & Science in Sports & Exercise, 2005 Publication	<1%
38	Submitted to The University of Memphis Student Paper	<1%
39	scholarsrepository.llu.edu Internet Source	<1%
40	"Poster Abstracts Others-Published Only", Respirology, 2005 Publication	<1%
41	Hong, Yoonki, Jae Seung Lee, Kwang Ha Yoo, Ji-Hyun Lee, Woo Jin Kim, Seong Yong Lim, Chin Kook Rhee, Sang-Do Lee, and Yeon-Mok Oh. "Implications of Emphysema and Lung Function for the Development of Pneumonia in Patients with Chronic Obstructive	<1%

Pulmonary Disease", Tuberculosis and Respiratory Diseases, 2016.
Publication

42	pulmologija.weebly.com Internet Source	<1%
43	sciendo.com Internet Source	<1%
44	www.atsjournals.org Internet Source	<1%
45	Lahaije, Anke J. M. C., Laura M. Willems, Hieronymus W. H. van Hees, P. N. Richard Dekhuijzen, Hanneke A. C. van Helvoort, and Yvonne F. Heijdra. "Diagnostic accuracy of metronome-paced tachypnea to detect dynamic hyperinflation", Clinical Physiology and Functional Imaging, 2013. Publication	<1%
46	researchonline.lshtm.ac.uk Internet Source	<1%

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		