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Differences in Lung Function in Various Degrees of Pulmonary Tuberculosis Sequelae

Perbedaan Fungsi Paru Pada Berbagai Derajat Sekuele Tuberkulosis Paru

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ABSTRAK

Latar belakang: Tuberkulosis masih menjadi masalah kesehatan global untuk negara berkembang khususnya di Indonesia yang merupakan urutan kelima tertinggi di dunia. Sekuele tuberkulosis dapat terjadi pada sebagaian besar pasien yang mengalami penyembuhan setelah mendapatkan pengobatan. Perubahan sekuele tuberkulosis menimbulkan perubahan pada paru sehingga mengalami penurunan fungsi paru.
Tujuan: Penelitian ini bertujuan mengetahui perbedaan fungsi paru *forced expiratory volume in one second* (FEV1) dan *forced vital capacity* (FVC) pada berbagai derajat sekuele tuberkulosis.
Metode: Desain penelitian ini adalah potong lintang pada pasien rawat jalan poliklinik BP4 Yogyakarta dari September 2013 hingga sampel terpenuhi. Perbedaan dianalisis dengan uji t dan analisis normalitas dengan uji Shapiro-Wilk. Perbedaan bermakna bila p< 0.05 dengan interval kepercayaan 95%.
Hasil: Hasil penelitian didapatkan subyek penelitian sebanyak 44 pasien yang terdiri dari 29 (65,9%) laki-laki dan 15(34,1%) perempuan. Subyek yang memenuhi kriteria dilakukan pemeriksaan foto *thorak posteroanterior* (PA). Derajat keparahan foto thorak dinilai menurut indeks Willcox. Tes spirometri dilakukan untuk mendapatkan gambaran fungsi paru berupa FEV1 dan FVC. Karakteristik dasar subyek penelitian menurut fungsi paru menunjukkan kelainan restriksi yang paling banyak yaitu 28 (60,9%). Perbedaan fungsi paru FEV1 bermakna pada derajat ringan dengan derajat berat (p= 0,024) dan bermakna pada fungsi paru FVC pada derajat ringan dengan derajat berat (p= 0,031).
Kesimpulan: terdapat perbedaan bermakna fungsi paru FEV1 dan FVC pada derajat ringan dengan derajat berat.

Kata kunci**:** *Sekuele tuberkulosis, fungsi paru, indeks Willcox.*

ABSTRACT

Background: Tuberculosis remains a global health problem to developing countries, especially in Indonesia which is the fifth highest in the world. Tuberculosis sequelae can occur on most patients who experienced healing after treatment. Tuberculosis sequelae changes cause changes in the lungs so that the decline in lung functions.
Objective: This study was to determine differences in lung function, forced expiratory volume in one second (FEV1) and forced vital capacity (FVC) at various degrees of sequelae tuberculosis.
Method: This is a cross-sectional study in an outpatient BP4 Yogyakarta from September 2013 until the sample met. Differences were analyzed by t-test and analysis of normality with Shapiro-Wilk test. Significant difference is when P <0.05 with 95% confidence intervals.
Result: The study subjects were 44 patients consisted of 29 (65.8%) males and 15 (34.1%) women. Subjects who met the criteria examined thoracic images posteroanterior (PA). The degrees of severity of thoracic images were assessed by Willcox index. Spirometry tests performed to get an overview of lung function such as FEV1 and FVC. Basic characteristics of the study subjects according to pulmonary function abnormalities restriction showed at most that 28 (63.6%). Significant differences in FEV1 lung function

in mild degree with severe degree (p = 0024) and FVC significantly in lung function in mild degree with severe degree (p= 0.031).
Conclusion: There are significant differences in lung function, FEV1 and FVC at mild degree by severe degree.

Keywords: Tuberculosis sequelae, pulmonary function, index Willcox

Background

Tuberculosis is a chronic disease that still has a high mortality and morbidity.[1, 2] WHO report in 2009, Indonesia recorded a decrease to rank fifth on the number of TB patients by 429 thousand people. The five countries with the largest number of incident cases in 2009 were India, China, South Africa, Nigeria and Indonesia.[6] In patients with pulmonary tuberculosis pulmonary residual lesions can be extensive as a predictor of permanent disorders that cause respiratory failure.[2] Pulmonary sequelae can lead to secondary complications such as TB was declared cured of chronic respiratory failure, cor pulmonale or chronic pulmonary inflammation.[12] Early tuberculosis sequelae characterized by changes in the lung structure changes such as bronchial and lung parenchymal distortion bronkovaskular, bronchiectasis, and cystic changes emphysematous.[7, 10] Tuberculosis sequelae that often arises is the existence of pulmonary fibrosis on the same network as the network consolidation resulting in decreased lung development as a whole. This resulted in the functional status of patients with tuberculosis experience worsening gas displacement ventilation and worsening shortness of breath resulting in progressive deterioration and decline in overall functional status.[5, 8] Pulmonary function tests are often done by using spirometry to assess the volume and velocity of air flow from the lungs.[3] Spirometry is also often used to assess two types of abnormalities in lung function that is the type of obstruction and restriction.[3] At TB sequelae often lead to obstruction interference restriction followed by disruption and even normal, depending on lesion area affected.[4, 12]

MATERIAL AND METHODS

The study was conducted using a cross-sectional study design. The study was conducted at BP4 in the Yogyakarta Region. The study began in September 2013 to the number of samples being met. Target population is people who have had TB. Inclusion criteria for the study subjects were suffering from TB upright post based on history, physical examination, radiological examination of the chest with the presence of fibrosis and WHO 2009 criteria, age over 18 years, approved and signed informed consent. Exclusion criteria namely the existence of comorbid chronic lung disease, silicosis, post thoracic surgery, bronchial asthma, chronic heart failure, collagen disease, severe chronic illness and refused to participate in research. Exclusion criteria were do anamesis, psychally checked, and investigations such as chest x-ray, ECG and spirometry. Study subjects who meet the inclusion and exclusion criteria were providing education, information, history and physical examination. All subjects were examined using X-ray of the thoracic or previous thoracic X-ray data is then assessed by an expert

Table 1. Basic characteristics of the study subject.

Subject variable	N (%)	Mean±SD
Age(year) (mean±SD), n (%)		37,83 ± 13,10
Sex, n (%)		
- Male	29 (65,9)	
- Female	15 (34,1)	
Height (meter)		1,62 ± 0,07
Weight (kilogram)		54,17 ± 11,13
Body Mass Index (BMI)(kg/m^2)		20,64 ± 3,68
- < 18,5	12 (27,3)	
- 18,5- 22,9	24 (57,7)	
- >23	8 (13,0)	
Smoker		
- yes	25 (58,8)	
- no	19 (43,2)	
FVC (% predictie)(mean±SD),		79,15 ± 24,90
- < 80%, n (%)	24 (54,5)	
- ≥ 80%, n (%)	20 (45,5)	
FVC (L) (mean±SD)		2,16 ± 0,85
FEV1 (% prediksi)(mean±SD)		80,85 ± 21,88
- <50%, n (%)	3 (6,8)	
- ≥50%, n (%)	41 (93,2)	
FEV_1, (L), (mean±SD)		1,93 ± 0,80
FEV1/ FVC ratio (%)		90 ± 15
- < 70 n (%)	7 (15,9)	
- ≥ 70 n (%)	37 (84,1)	
Willcox index		
- I	26 (59,1)	
- II	14 (31,8)	
- III	4 (9,1)	

Radiology Willcox index. The examination of lung function (FEV1, FVC, and FEV1/FVC ratio) based on spirometry screening.

Data were analyzed with the Shapiro Willcox test to determine the distribution of data is normal or not. When the data were normally distributed, the data descriptive calculated by calculating the results of the mean (mean) and standard deviations (SD). T test / U (Mann Whitney) was used to analyze different mean / median difference FVC and FEV1, age,

Table 2. Basic characteristics of lung function by Willcox index

Lung function	Willcox index 1 N (%)	Indeks Willcox 2 N (%)	Indeks Willcox 3 N(%)	Total N(%)
Restrictif	17 (38,6))	7 (15,9)	4 (9,1)	28 (63,6)
Obstruction	0	7 (15,9)	0	7 (15,9)
Normal	9(20,5)	0	0	9 (20,5)
Total	26 (59,1)	14 (31,8)	4 (8,7)	44 (100)

Table 3. Analysis of different mean / median difference of FEV1, FVC, FEV1/FVC ratio of sequlae TB

Variabel	Derajat ringan *Mean±SD*	Derajat berat *Mean±SD*	*Mean difference*	Nilai *p*
FEV1 (%)	86,39± 16,30	71,32± 26,41	15,06	0,024
FVC (%)	85,85± 22,40	69,16± 26,98	16,69	0,031
FEV1/FVC (%)	92,32± 13,54	88,45± 17,31	3,87	0,460

height and weight according to the severity of sequelae of TB with Willcox index.

Discussion

On the basis of the characteristics of the study subjects generally found male gender more 29 (65.9%) than females 15 (34.1%). These results are similar to studies conducted by DiNaso et al., (2011) that men (80%) subjects and 3 women (20%) subjects. This is probably due because more men smoke that affect the occurrence of TB and worsen lung function and healing. But there are other studies that reported from Brazil that the prevalence of TB sequelae in women is higher (60%) than men.This could be due to the specific characteristics of the exclusion criteria is greater in men or the number of samples is small11. Similarly, the age of this study showed that patients experienced an average age of 37.83 ± 13.10 years productive. These results are similar to studies conducted by DiNaso et al., (2011) that were experiencing sequelae has an average age of 32.93±10.25 years who know that TB patients of childbearing age are found in developing countries[2]. Abnormalities of pulmonary function in patients with tuberculosis sequelae can cause abnormal restriction, obstruction or mixed. Abnormalities of restriction and obstruction with low vital capacity is the dominant pattern. The disorder is dependent on the degree of lung lesions affected either due to extensive fibrosis, cavity, bulla formation and bronkiektasis[10]. In this study, a more restrictive disorders found 28 (60.9%) subjects, followed by normal lung function 11 (23.9%) and abnormalities obstruction 7 (15.2%).

Abnormalities of pulmonary function due to tuberculosis sequelae sequelae vary

widely Some writers find more mild restriction disorders in patients with cavities, while patients without cavities showed normal function[13,14]. Other authors actually found the prevalence of obstructive abnormalities more. One was a study conducted in Brazil to analyze the population with severe chronic obstructive pulmonary disease showed 15.7% are sequelae of TB[15]. More than half of patients who have recently completed treatment for tuberculosis in Tarrant County, Texas USA impaired lung function significantly. TB treatment is given to the Directly Observed Therapy. The degree of impairment varies from mild to severe. Abnormalities of restriction and obstruction with low vital capacity is the dominant pattern10. In this study suggests that as many as 60.9% restrictive abnormalities are more dominant than obstructive disorders as much as 15.2%. It is the same as the studies that have been reported previously, reported that the post-TB patients showed abnormalities weight restriction (FVC <40%) were 70% and abnormalities obtruktif (FEV1 <55%) 40%8. Similarly, research conducted by Snider (1971) reported that as many as 24% of abnormalities restriction followed by 23% obstructive abnormalities and abnormalities of the mixture as much as 19%[12]. The results of lung function in this study based on the severity and degree of radiological indicate that there are differences in mean lung function in mild to severe degree in FEV1 ($p = 0.024$) and FVC (0.031). In the above results are similar to the results of the study reported by Ramos et al., (2006) that there are differences in lung function in the first degree with radiological abnormalities of the second degree is 11.7% vs. 14.7% ($p = 0.02$) for the group normal lung function. While the weight of lung function group showed no significant differences in grade I, II and III are 0 vs. 3.3% vs. 20.6% ($p = 0.0002$). The study was conducted radiological examination and spirometry at intervals of 6 months to 16 years[11].

Another study reported that after 9-192 months follow-up (mean 5.6 years) from the time of diagnosis of pulmonary thinking about the relationship between airflow disruption with extensive disease determined radiology and follow-up number.

CONCLUSION

Based on these results, the value obtained significant differences in lung function forced expiratory volume in one second (FEV1) in mild to severe degrees by 10 percent and the value of pulmonary function values Forced vital capacity (FVC) in mild to severe degrees of $\geq 12\%$.

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