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Relationship between Degrees of Dyspnea with Functional Capacity in Pulmonary Tuberculosis Sequelae Patients

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ABSTRACT

Background: TB disease is still a serious health problem. Due to the changes that occur because of TB infection, appears sequelae in patients with pulmonary tuberculosis. TB sequelae will have an impact on the patient's life, especially to do with the degree of dyspnea and functional capacity.
Objective: To know the relationship between degree of dyspnea with functional capacity in pulmonary tuberculosis sequelae patients.
Method: The design of this study is cross-sectional observational study. Subjects were patients with TB who have had at least 6 months of therapy that has been declared cured by leaving sequelae in Dr. Sardjito Hospital and BP4 Yogyakarta in September 2013. The sample was selected based on the selection criteria. Statistical analysis is using One-Way ANOVA.
Results: From the 42 patients, there were 78.6% of patients with MRC scale 0, 11.9% of patients with MRC scale 1, and 4.8% respectively of patients with MRC scale 2 and 3. The mean of 6-minute walk test distance is 257.02±64.56 meters. There is a significant relationship on comparison of the mean of 6-minute walk test distance on each MRC scale ($p = 0.028$).
Conclusion: There is a relationship between degrees of dyspnea with functional capacity in pulmonary tuberculosis sequelae patients.

Keywords: tuberculosis sequelae, degrees of dyspnea, functional capacity

ABSTRAK

Latar Belakang: *Penyakit TB masih menjadi masalah kesehatan yang cukup serius. Akibat perubahan-perubahan yang terjadi karena infeksi TB maka muncul sekuele pada paru pasien TB. Sekuele TB akan berdampak pada kehidupan pasien, terutama hubungannya dengan derajat sesak nafas dan kapasitas fungsional.*
Tujuan: *Mengetahui hubungan antara derajat sesak nafas dengan kapasitas fungsional pada pasien sekuele tuberkulosis paru.*

Metode: *Desain penelitian ini adalah penelitian observasional potong lintang. Subyek penelitian adalah penderita TB yang telah menjalani terapi minimal 6 bulan yang sudah dinyatakan sembuh dengan meninggalkan sekuele di RSUP Dr. Sardjito dan BP4 Yogyakarta pada bulan September 2013. Sampel dipilih berdasarkan kriteria seleksi. Analisis statistik menggunakan One- Way ANOVA.*
Hasil: *Dari 42 pasien, terdapat 78,6% pasien dengan skala MRC 0, 11,9% pasien dengan skala MRC 1, dan masing-masing 4,8% pasien dengan skala MRC 2 dan 3. Rerata jarak tempuh uji jalan 6 menit adalah 257,02±64,56 meter. Terdapat hubungan bermakna pada perbandingan rerata jarak tempuh uji jalan 6 menit pada setiap skala MRC (p = 0,028).*
Kesimpulan: *Terdapat hubungan antara derajat sesak nafas dengan kapasitas pada pasien sekuele TB paru.*

Kata Kunci: *sekuele tuberkulosis, derajat sesak nafas, kapasitas fungsional*

INTRODUCTION

Tuberculosis (TB) caused by the bacteria Mycobacterium tuberculosis and usually infect the lungs, the consequences can be fatal in 5 years (approximately 50-65% of cases) if left untreated. Transmission is usually via droplets respiratoric. Mycobacteria included into family Mycobacteriaceae and the order Actinomycetales. The most significant pathogenic species clinically is M. tuberculosis. M. tuberculosis is a rod-shaped aerobic bacterium; do not form spores and acid resistant. M. tuberculosis is usually not visible in the gram staining. But when once it stains under microscope, basil will not be decolorized by acid alcohol, so classified as acid-resistant bacilli (BTA) (Longo, et al., 2012). Transmissions of TB through inhalation of organisms in aerosols originating from coughing and sneezing patients with active TB and even then the patient speak or from exposure to contaminated TB patient secretions. The nuclei are small droplets quickly evaporating, and most small (diameter < 5-10 μm) could be in the air for several hours and can be reached a tract terminal respiratorius when inhaled. There are about 3000 of lining that is infectious in any cough. Transmission is determined by the possibility of contact with the TB cases, proximity and duration of contact, the degree of infectious cases and the presence on the same neighborhoods (Longo, et al., 2012).

Pulmonary tuberculosis can be categorized into two primary and post-primary TB. First is primary TB Occurs immediately after infection with tuberculous bacilli. Primary TB usually involves the middle or lower lung. The lesion formed after the infection (Ghon focus) is usually located in the pulmonary periphery and is accompanied by a temporary hilar or paratracheal lymphadenopathy that may not be observed through a standard Chest X-ray. In most cases, the lesion heals itself and leaves the calcified small nodules. It is called the Ghon complex if there is a calcified Ghon focus with regional lymphadenopathy. When bacteria from the sub pleural focus penetrate the pleural cavum pleural effusion will occur. In severe cases, the lesion enlarges and the center undergoes necrosis to form a caverna. Lymphadenopathy can suppress the bronchi which can cause total obstruction and its respiratory distal airway collapse, partial obstruction with wheezing with segment hyperinflation or lung lobe. Bronchiectasis may occur in lung segments or lobes damaged by progressive caseating pneumonia. Small granulomatous lesions may form in many organs and lead to progressive local disease or meningitis (Longo, et al., 2012).

Second is secondary TB reactivation. Usually localized in the apex of the lung or posterior segment of the superior lobe whose PaO2 is high? This high PaO2 supports Mycobacterium growth. Quite often also involves the superior segment of the inferior lobe. The extent of pulmonary parenchymal involvement varies with each patient, may be only small infiltrate or up to a large caverna. When the caverna is formed, the liquid necrotic content enters the airway, spreading bronkogenically into a satellite lesion in the lung that can also have a caverna. The large number of lung segments or lobes involved and the fused lesions leads to caseating pneumonia. These lesions have spontaneous remissions and fibrosis, although not treated, but the caverna will remain. Patients with this chronic condition will still release a bacillus tuberkel capable of infecting others. Very large lesions can cause breathlessness or respiratory distress syndrome (rare) (Longo, et al., 2012).

The sequelae of tuberculosis is a condition with many secondary complications after healing of TB such as chronic respiratory failure, cor pulmonale or chronic pulmonary inflammation (Machida, et al., 2005). Another definition also mentions that sequelae of tuberculosis are a lung disease that undergoes permanent deformity after the healing of tuberculosis (Harada, et al., 1990). Histopathological findings due to tuberculosis include the formation of granulomas kaseosa, tissue liquefaction, and cavity formation. When this happens in the lungs, many patients who recover from TB undergo a permanent anatomical change. This results in pulmonary residual symptoms characterized by changes in the bronchial and parenchymal structures, including bronchovascular distortion, bronchiectasis, emphysematous changes, and fibrosis (Pasipanodya, et al., 2007).

In treated and untreated patients, various residual symptoms and complications may occur in the lungs and outside of the lung of the thoracic region. These residual symptoms can be categorized as follows: (a) parenchymal lesions, including tuberculoma, thin-walled cavities, sikatrik, end-stage lung damage, aspergilloma, and bronchogenic carcinoma; (B) respiratory lesions, including bronchiectasis, tracheobronchial stenosis, and broncholithiasis; (C) vascular lesions, which include pulmonary or bronchial arteritis and thrombosis, bronchial artery dilatation, and Rasmussen aneurysm; (D) mediastinal lesions, which include lymph node calcification and extranodal extension, esophagomediastinal fistula or esophagobronkial fistula, constrictive pericarditis, and fibrotic mediastinitis; (E) pleural lesions, which include chronic empyema, fibrothorax, bronchopleural fistulas, and pneumothorax; And (f) chest wall lesions, which include tuberculosis of the ribs, tuberculosis spondylitis, and malignancy associated with chronic empyema (Kim, et al., 2001).

Shortness of breath in tuberculosis shortness of breath of the respiratory system can be caused by 3 things: respiratory diseases, chest wall disease, and lung parenchymal disease. Airway disease is characterized by obstruction of expiratory airflow, which usually causes dynamic hyperinflation of the lungs and chest wall. Patients with moderate to severe disease have increased resistive and elastic load (term related to the stiffness of the system) in ventilation muscles and increased work in breathing. Patients with acute bronchoconstriction also complain of a tightness, which can occur even when lung function is still normal. These patients usually have hyperventilation.

Both chest tightness and hyperventilation may be associated with stimulation of lung receptors. Chest wall disease that causes stiff chest wall conditions, or weakened ventilatory muscles, is also associated with increased efforts to breathe. Widespread pleural effusion may cause shortness of breath, either improving respiratory activity or stimulating lung receptor if there is associated atelectasis. Disease in the lung parenchyma is associated with increased stiffness (decreased compliance) of the lungs and improves respiratory work. In addition, unbalanced ventilation / perfusion ratios, and damage and / or thickening of the alveolar capillary interface may lead to hypoxemia and increased desire for breathing (Longo, et al., 2012). In patients with sequelae with residual symptoms including parenchymal lesions, airway lesions, vascular lesions, mediastinal lesions, pleural lesions, and chest wall lesions will cause shortness of breath (Kim, et al., 2001).

Shortness of breath is the main symptom that occurs in patients with chronic respiratory illness is a general term that characterizes the subjective sensation of difficulty in breathing. Although it is an indefinite phenomenon generated by a common mechanism, shortness of breath consists of qualitatively different sensations of varying intensity and affects the patient's personal perception, and is closely dependent on several personal factors such as social and economic status, linguistic aspects, affective components -culture and prior personal experience (Crisafulli, et al., 2010).

Assessment of shortness of breath is important as a marker of efficacy outcomes. But in fact, since there are difficulties in the measurement of symptoms, the need arises to translate subjective experiences into numerical parameters. The use of special tools (assessment scale) to measure shortness of breath makes it possible to classify the severity of the symptoms and the resulting disorders, and monitor them over time (Crisafulli, et al., 2010).

The MRC scale, which is the first clinical scale for the determination of shortness of breath, is a scale of 5 points based on the sensation of breathing difficulties experienced by the patient during daily life activities. Patients read the scale and are asked to recognize their own respiratory fatigue levels or, as is more often the case, MRC can be directly administered. Level 0 is the lowest level of respiratory distress felt, and level 4 with the biggest shortness of breath. Levels 0 and 1 in MRC are considered as the scale of symptoms, and when symptom-generating activities are known, levels 2, 3, and 4 indicate an indication for attention to personal capacity and social impact. Variations from 1 point on a fixed scale indicate a perceived clinical improvement (Crisafulli, et al., 2010).

Functional Capacity

Functional capacity is the maximum amount of physical energy expenditure that can be maintained by the patient. There are several ways that you can evaluate objective functional training capacity. The most popular clinical exercise test in order to increase the complexity is stair climbing, 6MWT, shuttle-walk test, detection of exercise-induced asthma, cardiac stress tests (eg, Bruce protocol), and cardiopulmonary exercise test (American Thoracic Society, 2002).

In the early 1960s, Balke developed a simple test to evaluate functional capacity by measuring walking distances over a period of time. A 12-minute walking distance test was developed to evaluate the level of physical fitness of a healthy individual. Then found a 6-minute walk that performed as well as a 12-minute test, to accommodate patients with respiratory illnesses who were too tired from walking for 12 minutes. A review of the walking test concluded that a 6 minute walk test was easy to do, better tolerated, and more reflective of daily living activities than other walking tests (American Thoracic Society, 2002).

A six-minute walk test (6MWT) or a 6-minute walking test is a simple and practical test that requires a length of about 100 feet, which requires no sports equipment or advanced training for technicians. Walking is an everyday activity done by everyone, but not in very weak patients. This test measures the distance of the patient that runs quickly on a flat and hard surface for a period of 6 minutes (6MWD). This test globally and integrally evaluates the response of all the systems involved during exercise, including the pulmonary and cardiac systems, systemic circulation, peripheral circulation, blood, neuromuscular units, and muscle metabolism. But this test does not provide specific information about the function of each organ involved in the exercise. The 6-minute walking test assessed the submaximal level of functional capacity. The measurable variable in the most important 6-minute walking test is the six-minute walk distance (6MWD). Secondary measures include fatigue and shortness of breath (American Thoracic Society, 2002).

A strong indication for a 6 minute walking test is to measure the response of medical intervention in patients with heart or lung disease with moderate to severe severity. The 6-minute walking distance test has also been used as a measure of the patient's functional status at the time, as well as the predictors of morbidity and mortality. Absolute contraindication to walking test 6 minutes include: unstable angina during the previous month and myocardial infarction during the previous month. Relative contraindications include a resting heart rate greater than 120 per minute, systolic blood pressure greater than 180 mmHg, and diastolic blood pressure greater than 100 mmHg. Patients with these findings should be referred to a physician requesting or supervising tests for individual clinical judgment and deciding on test execution. Results from the electrocardiogram performed 6 months earlier should also be reviewed prior to testing. Stable angina is not an absolute contraindication for a 6-minute walking test, but patients with this symptom should test after taking their antiangine medication, and nitrate drugs should be available for emergencies (American Thoracic Society, 2002).

A 6-minute walk should be done indoors, along long, flat, straight, closed corridors with hard surfaces that are rarely skipped. The walking used for walking should be 30m in length. Therefore, a corridor with a distance of 100 feet is required. The length of the corridor should be marked every 3 m. The rotation point must be marked. The starting and ending lines of each round of 60m shall be marked. The shorter corridor causes the patient to take more time to reverse the direction more often, thus reducing the mileage (6MWD). Most studies use corridors as long as 30 m, but some use corridors along the 20 m or 50 m (American Thoracic Society, 2002). Factors that affect functional capacity are pulmonary disorders; such as shortness of breath that occurs in patient's pulmonary TB can reduce functional capacity. In addition, there are many sources that lead to variability in the distance of the 6-minute walking test (6MWD).

METHOD

The study was conducted with an observational, cross-sectional study design in patients with pulmonary TB sequelae to see how the degree of breath affected the functional capacity.

Target population is tuberculosis patients who have undergone therapy at least 6 months who have been declared cured by leaving sequels seen from chest X-rays. Affordable populations are post-TB patients who come to the pulmonary clinic of Dr. Sardjito and BP4 Yogyakarta in September 2013.

The inclusion criteria for the study subjects were post-treatment TB patients based on anamnesis, physical examination, radiological examination (rontgent chest) in the presence of fibrosis, aged 18-59 years, meeting WHO criteria 2009, approving and signing informed consent. Patients have no chronic pulmonary chronic comorbid, silicosis, post-thoracic surgery, bronchial asthma, chronic heart failure, collagen disease, and severe chronic disease.

Samples were taken by consecutive sampling method where every post-TB patient in Lung Polyclinic of Dr. Sardjito and BP4 Yogyakarta who met the study criteria was included in the study in the period in September 2013. The independent variable is the degree of shortness of breath. The dependent variable is functional capacity. The degree of shortness of breath was measured using an MRC breathless scale consisting of 5 scales from 0 to 4 showing the degree of shortness of breath from no shortness of breath to severe levels. Functional capacity (exercise) is the maximum amount of physical energy that can be deployed by the patient. Functional capacity is measured using a 6-minute walking test which is a practical test without the use of exercise equipment and does not require in-depth training of the meter. Functional capacity assessment is seen from the maximum distance traveled in a 6-minute walking test on a flat, hard surface.

Subjects who have met the selection criteria are educated, informed and performed anamnesis and physical examination. All subjects answered the MRC shortness of breath questionnaire and underwent street tests 6 minutes. The results of the history, physical examination, and functional capacity check (6MWT) are recorded in a special form for each subject with an identification number in each form. The degree of shortness of breath was measured from the scale of shortness of breath of MRC that was answered by the patient in the questionnaire guided by the meter. Functional capacity is measured from the maximum distance traveled by subjects in a 6 min (6MWD) walking test observed by the meter. Data were analyzed by using Shapiro-Wilk test to know the distribution of normal data or not because the sample is less than 50. When the data is normally distributed used one-way anova (parametric test) to analyze the correlation between degrees of breathlessness with result of distance of walking test 6 minute. When the data is not normally distributed, Kruskal-Wallis test (non-parametric test) is used. The p value <0.05 is considered significant.

RESULT AND DISCUSSION

Patients with tuberculosis who have done the therapy at least 6 months who have been declared cured by leaving a sequel seen from chest X-ray taken from Lung Polyclinic RSUP Dr. Sardjito and BP4 Yogyakarta in September 2013. The degree of shortness of breath was obtained from the completion of the MRC breathless questionnaire. Then, to find out the functional capacity, the patient underwent a 6 minute walking test. Previously, approval was obtained after the patient got an explanation. A total of 46 patients have followed this study. But only 42 patients were eligible after considering inclusion criteria. From the table it can be seen that most of the research subjects were patients with minimal shortness of breath (MRC scale 0). The result of lung function test also showed mean FVC of patient 79.60% with standard deviation 21.70%, mean FEV1 patient 81.24% with standard deviation 17.34%, and mean FEV1 / FVC ratio 0.90 with standard deviation of 0.15.

Shortness of breath in the respiratory system can be caused by respiratory diseases, chest wall disease, and pulmonary parenchymal disease (Longo, et al., 2012). Patients with sequelae may experience residual symptoms of respiratory lesions such as bronchiectasis, tracheobronchial stenosis, and broncholithiasis (Kim et al., 2001). Other remaining symptoms are chest wall lesions that include tuberculosis of the ribs, tuberculosis spondylitis, and malignancies associated with chronic empyema. In the pulmonary parenchyma, residual symptoms that may occur include tuberculoma, thin-walled, sikatrik, end-stage lung damage, aspergilloma, and bronchogenic carcinoma (Kim et al. 2001).

Table 1 Base characteristic of the Patient

Variable	N	%	average±SB
Gender, n (%)			
Male	28	66.7	
Female	14	33.3	
age			36.21±10.37
Weight (Kg)			54.70±11.46
Height (meters)			1.62±0.08
Body mass indeks (kg/m^2)			20.31±3.88
- < 18.5	12	28.6	
- 18.6 – 22.9	21	50	
- > 23	9	21.4	
MRC scale, n (%)			
0	33	78.6	
1	5	11.9	
2	2	4.8	
3	2	4.8	
4	0	0	
6 minute MWD			257.02±64.56
FVC (% prediction)			79.60±21.70
FVC (L)			2.26±0.81
FEV1 (%prediction)			81.24±17.34
FEV1 (L)			2.02±0.78
Rasio FEV1/FVC			0.90±0.15
Active smoker	12	28.6	
Ex-smoker	11	26.2	
Passive smoker	10	23.8	
Non-smoker	9	21.4	

Chest wall disease causes rigid chest wall conditions or weakened respiratory muscles which are later associated with increased effort to breathe (Longo, et al., 2012). Disease in the pulmonary parenchyma is associated with decreased lung compliance, unequal ventilation or perfusion ratio, alveolar capillary interface defects that can cause hypoxemia and ultimately increase breathing desire.

Assessment of the degree of breathlessness and functional capacity in patients was performed by filling the breathless scale of MRC and a 6-minute walking test. The shortness of breath scale of

MRC is an indirect method for the measurement of shortness of breath (Callens, et al., 2009). This scale is the most commonly used validated scale for assessing shortness of breath in everyday life in patients with chronic respiratory pontitis (Launois, et al., 2012). The shortness of breath scale of the MRC assesses the physical inability associated with shortness of breath by identifying shortness of breath that occurs when it should not (scale 0 and 1) and measuring the limitations of related body movements (2-4 scales). There is a 98% agreement between researchers using this scale. This score also relates to other shortness of breath scale, lung function measurement, and direct measurement of physical disability such as walking distance (Stenton, 2008). Shortness of breath as measured by MRC dyspnea scale is a good predictor of walking distance (Marin, et al., 2001).

Out of a total of 42 patients, various MRC scores were obtained. The most widely obtained were patients with MRC 0 scale of 33 patients, followed by patients with MRC 1 scale of 5 patients. There were only 2 patients on MRC 2 and 3, respectively, and no patients with MRC4 scale were present.

Table 2 Result of MRC patient scale

		Frequency	Percentage
Valid	0	33	78.6
	1	5	11.9
	2	2	4.8
	3	2	4.8
	Total	42	100.0

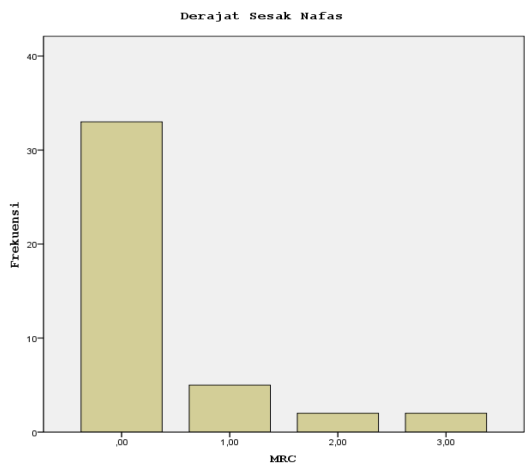

Figure 1 Stem diagram of the patient's MRC scale

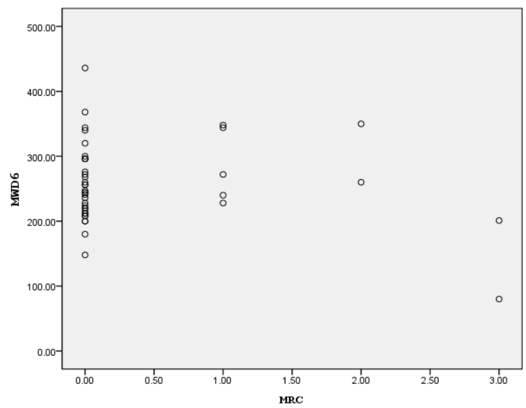

Figure 2 Scatter plot scale MRC with distance of 6 minutes walking test with the distance of the 6-minute test

Table 3 Average and standard deviation of 6-MWD on each MRC scale Mileage (meters)

		mileage	
		Average	Standard deviation
MRC	0	256.73	58.78
	1	286.40	56.75
	2	305.00	63.64
	3	140.50	85.56

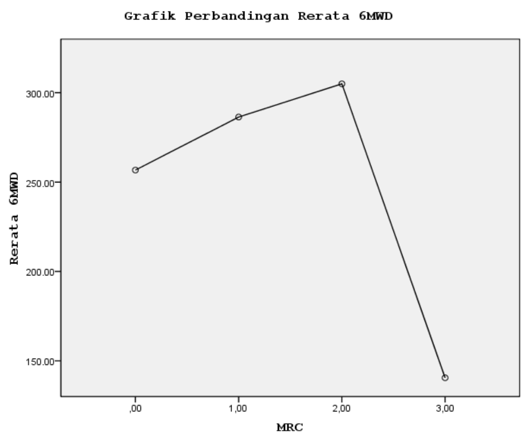

Figure 3 Comparison of the mean distance of 6-MWD

Table 4 One-Way ANOVA MRC scale with 6 minutes walking distance test

6MWD	Sum of Squares	df	Mean square	F	Sig.
Between Groups	36076.731	3	12025.577	3.390	.028*
Within Groups	134814.245	38	3547.743		
Total	170890.976	41			

In patients with MRC scales 0, the mean and standard deviations of the 6 minute walking distance were 256.73 ± 58.78, patients with MRC 1 scales were 286.40 ± 56.75, patients with MRC 2 scales were 305.00 ± 63.64, and patients with MRC 3 scales were 140.50 ± 85.56. There is an average increase of the scale of MRC 0 to 2 and then decreases on the scale of MRC 3.

The data obtained in this study is normally distributed, known after the Shapiro-Wilk test where p> 0,05. Because of normal data distribution, One-Way ANOVA is done and the p value is 0,028. From these results, it can be concluded that there is a relationship between the scale of breathlessness of MRC with distance of 6 minutes walking test because p <0.05.

Table 5 Post hoc LSD analysis of MRC scale with average distance of 6 MWD

(I) MRC	(J) MRC	Mean Difference (I-J)	Sig.
0	1	-29.67273	.306
	2	-48.27273	.273
	3	116.22727	.011*
1	0	29.67273	.306
	2	-18.60000	.711
	3	145.90000	.006*
2	0	48.27273	.273
	1	18.60000	.711
	3	164.50000	.009*
3	0	-116.22727	.011*
	1	-145.90000	.006*
	2	-164.50000	.009*

From the One-Way ANOVA we have done, we know that there is a significant difference between the mean mileage runs for each degree on the MRC scale. However, we do not know which pairs of MRC scales have significant differences in mean distance. Therefore, post hoc LSD analysis is done. From the above results, it can be seen that significant differences exist on the scale of MRC 0 and 3 with a difference of 116.23, MRC 1 and 3 with a difference of 145.90, and MRC 2 and 3 scales with a difference of 164.50.

In normal people, the distance of a 6-minute walking test ranges from 400 meters to 700 meters (Enright, 2003). From the results of the distance of the 6-minute walking test in patients in the study, it can be seen that patients sekuele tuberculosis will experience a significant decrease in functional capacity seen from the distance traveled.

The mean distance of a patient's 6-minute walking test is 257.02 meters with standard deviation of 64.56 meters, which is below the normal limit. Few patients are able to achieve normal range of walking distance even with MRC 0 scale (minimal shortness of breath). Almost all patients have a walking distance of less than 400 m. This means that the sequelae of tuberculosis suffered by patients make the patient's functional capacity decrease.

In theory, there should be a decrease in the distance traveled from the MRC scale 0 to 4. The results showed an increase in walking distance from patients with MRC scale 0-2, and then decreased in patients with MRC scale 3. The higher the patient's MRC scale, Decreases the distance traveled.

There are many things that can affect why these results arise. The scale 0 and 1 on the MRC assess the shortness of breath that occurs when it should not appear. That is, patients with MRC scales 0 and 1 may experience shortness of breath but shortness of breath does not interfere with activity so that increased results on the graph can randomly occur. Then on a scale of 2-4 there starts to be a disruption in the activity so that the distance of the patient's 6-minute walking test decreases (Stenton, 2008).

Other reasons that may affect the above results are psychological effects such as motivated patients for activity and exercise, reduced depression, decreased fear of shortness of breath, and reported fewer episodes of breathlessness, thus improving the mileage of the walking test (Yoshida et al., 2006). Therefore, from the results of the study, it can be concluded that the distance of the 6-minute walking test will decrease in patients with severe shortness of breath with MRC 3 scale, but not too disturbing in mild cases such as in patients with MRC 0-2 scale On the graph actually increases.

But the results in this study are still limited and need to be studied more deeply because of the smoking factor that can cause obstructive lung disease that can also cause shortness of breath.

From the available data, it is known that 12 (28.6%) patients are active smokers and 11 (26.2%) patients are former smokers. Airway obstruction is one of the sequelae of pulmonary tuberculosis. Chronic obstructive pulmonary disease also often appears as a common comorbid in tuberculosis patients. Some of the existing literature supports the role of cigarettes in influencing the progression and clinical course of TB infection. However, without suffering from TB disease, smoking research subjects are at great risk for obstructive pulmonary disease that may cause shortness of breath (Chakrabarti, et, al., 2007).

The design of this study is cross-sectional, so researchers only do data retrieval and observation in one time only. Therefore, researchers can not keep up with the development of the patient's illness, so that the patient's lung condition before suffering TB can not be known. This may lead to a bias against the results of lung condition checks in patients with sequelae, whether worsening of pure pulmonary conditions due to the severity of TB disease or may have occurred prior to smoking-induced tuberculosis. This is reinforced because most of the research subjects are smokers, while smokers themselves have a big risk to suffer from obstructive lung disease.

CONCLUSION

There was a correlation between degrees of breathlessness (MRC breathless scale) with functional capacity (distance of 6-minute walking test) in patients with sequelae of pulmonary TB.

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