Influence of Pursed-Lips Breathing to Improve Quality of Life in Chronic Obstructive Pulmonary Disease Patients

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Abstract

Background. Worsening of Chronic Obstructive Pulmonary Disease (COPD) may decrease the quality of life of patients. Rehabilitation of patients with COPD may increase exercise tolerance and improve quality of life. Pursed-Lips Breathing (PLB) activates abdominal muscles during expiration for improving gas exchange and oxygen saturation in the arteries, increasing the tidal volume and reduce shortness of breath, anxiety and tension thus improving the quality of life. St George's Respiratory Questionnaire (SGRQ) was a tool to measure the quality of life of patients with COPD, which has been validated. Patients with improved quality of life were characterized by a decrease in SGRQ score after PLB training.
Aims. Analyze the effect of improved quality of life in patients with stable COPD using PLB + standard therapy compared to standard therapy only.
Methods. This research used an open-label Randomized Controlled Trial (RCT) design and conducted in patients ith COPD stage 2 and 3. It was performed in *Rumah Sakit Khusus Paru* (RSKP) Respira Bantul, Yogyakarta. The study group was composed of 47 subjects, who continued the previous standard therapy and performed PLB 8 minutes once a day for 28 days. The placebo group (44 samples) continued the previous standard therapy alone. Measuring the quality of life using the SGRQ performed in both groups before and after the experiment. Statistical analysis included independent t-test and Mann Whitney U-test.
Results. There were improvements in the quality of life that clinically characterized by a decrease in SGRQ total score of 12.19 points out of 100 points total in the PLB group. There was a very significant difference in the decline in total SGRQ score between the study group and placebo groups ($p < 0.001$).
Conclusion. Pursed-Lips Breathing (PLB) improve the quality of life of patients with stable COPD was characterized by a decrease in SGRQ of 12.19 points out of 100 points total.

Keywords. *COPD (Chronic Obstructive Pulmonary Disease), PLB (Pursed-Lips Breathing), SGRQ (St George's Respiratory Questionnaire), quality of life*

Abstrak

Latar Belakang. *Pemberatan PPOK menyebabkan penurunan kualitas hidup pada penderita. Rehabilitasi penderita PPOK dapat meningkatkan toleransi latihan dan meningkatkan kualitas hidup. Pursed-Lips Breathing (PLB) mengaktifkan otot perut selama ekspirasi sehingga meningkatkan pertukaran gas dan saturasi oksigen di arteri, meningkatkan volume tidal dan mengurangi sesak nafas, rasa cemas dan tegang karena sesak sehingga memperbaiki kualitas hidup. St George's Respiratory Questionnaire (SGRQ) adalah alat untuk mengukur kualitas hidup pasien PPOK yang telah divalidasi. Pasien dengan perbaikan kualitas hidup ditandai dengan terjadinya penurunan skor SGRQ sesudah latihan PLB.*
Tujuan Penelitian. *Menganalisis pengaruh perbaikan kualitas hidup pada penderita PPOK stabil dengan menggunakan terapi standar + PLB dibanding hanya terapi standar.*

Metode. *Penelitian ini menggunakan desain penelitian eksperimental, Randomized Controlled Trial (RCT), open label. Penelitian dilakukan pada pasien PPOK stadium 2 dan 3 di Rumah Sakit Khusus Paru (RSKP) Respira Bantul, Yogyakarta. Kelompok perlakuan (PLB) terdiri dari 47 sampel, meneruskan terapi standar sebelumnya dan melakukan PLB 8 menit sehari sekali selama 28 hari berturut-turut. Kelompok plasebo (44 sampel) meneruskan terapi standar sebelumnya saja. Pengukuran kualitas hidup menggunakan SGRQ dilakukan pada kedua kelompok baik sebelum maupun sesudah perlakuan. Pengaruh latihan PLB terhadap perbaikan hidup menggunakan SGRQ pada kelompok perlakuan dibanding plasebo diuji dengan independent t-test/mann whitney u-test.*

Hasil Penelitian. *Terdapat perbaikan kualitas hidup secara klinis ditandai dengan penurunan skor total SGRQ sebesar 12,19 poin dari 100 poin total pada kelompok PLB. Terdapat perbedaan sangat bermakna terhadap penurunan nilai total SGRQ antara kelompok perlakuan dan kelompok plasebo setelah mendapat perlakuan (p <0,001).*

Kesimpulan. *Pursed-Lips Breathing (PLB) memperbaiki kualitas hidup penderita PPOK stabil ditandai dengan penurunan SGRQ sebesar 12,19 poin dari 100 poin total.*

Kata kunci: *COPD (Chronic Obstructive Pulmonary Disease), PLB (Pursed-Lips reathing, SGRQ (St George's Respiratory Questionnaire), kualitas hidup*

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a health problem in the world by the number of year-to-year increased and causes a decrease in the quality of life in patients.[1] Rehabilitation in patients with COPD may increase exercise tolerance and improve quality of life. Pursed-Lips Breathing (PLB) activated abdominal muscles during expiration thus improving gas exchange and oxygen saturation in the arteries, increasing the tidal volume and reduces shortness of breath, anxiety, and tension because of tightness that improves the quality of life.[2]

St George's Respiratory Questionnaire (SGRQ) was a tool to measure the quality of life of patients with COPD that have been validated.[3] Patients with improved quality of life were characterized by a decrease in SGRQ score after practice PLB.

This study aimed to analyze the effect of improved quality of life in patients with stable COPD using PLB plus standard therapy compared to standard therapy only.

Method

This research used experimental research design, an open-label randomized controlled trial (RCT). Data as collected at the Respira Bantul Lung Hospital (RSKP) from 1 August 2016 - 7 January 2017. The treatment group (PLB) was composed of 47 samples, continuing the previous standard therapy and perform PLB 8 minutes once a day for 28 days (4 weeks) in a row. The placeo group (44 samples) continues the previous standard theraphy.

Approval from the Ethics Committee was received. Informed consent as obtained from all research subjects. Subjects who met the inclusion criteria randomly assigned as PLB or controls.

The inclusion criteria were COPD patients stable with GOLD 2 or 3 degrees. The subject had received routine therapy for at least 3 months, not suffering from illness, malignancy, diabetic retinopathy, ischemic heart disease, chronic kidney disease (LFG <15), rheumatoid arthritis, systemic sclerosis, lupus erythematosus, polymyositis or dermatomyositis, osteoporosis, vertebral compression fractures, scoliosis, chronic

pain, osteoarthritis, quadriceps muscle weakness and gastroesophageal reflux disease (GERD). Comorbidities were reviewed from the patient's medical record. Exclusion criteria included experienced acute exacerbations at the time of the study period and did not meet the minimum compliance requirements for running the PLB. The research flow can be seen in Figure 1. Power and Sample Size Calculation® Version 3.0 Software calculated minimum sample size calculations for paired numerical analytical studies analyzing mean differences in clinical trials.

Planned studies from independent controls and experimental subjects with 1 control per experimental subject. In a previous study by Alma HJ et al[4], the response in each group of subjects normally distributed with a standard deviation of 18.6. If the true difference in the experimental and control facilities is 12.87, then a sample of 45 experimental subjects and 45 control subjects were needed to be able to reject the null hypothesis that the population means the experimental and control groups are equal to probability (power) 0.9. The error type I probability associated with this test from this null hypothesis is 0.05. It is estimated that drop out in this study is 20% so the sample size is 55 subjects per research group. The treatment group continued with standard therapy, gave pursed-lip breathing technique training every day for 4 weeks, and then evaluated the quality of life with a questionnaire. The control group divided into 2 stages. Stage I followed standard therapy without performing PLB tehnique training then were evaluated the quality of life with a questionnaire. The patient was given a pursed-lip breathing technique in the second 4 weeks as a placebo in stage II. Measurement of the quality of life using the SGRQ performed in both groups before and after treatment. Purse-Lips Breathing exercise influence on the improvement of life using the SGRQ in the treatment group was compared to placebo using independent t-test/Mann Whitney U-test. The St George's Respiratory Questionnaire (SGRQ) was a tool to measure the quality of life of patients who have COPD validated. The questionnaire contained 76 questions and 3 components of the score, to assess the severity of symptoms, limited activity, social and emotional impact. The higher the SGRQ score showed the lower the quality of life.[3]

The reason for using SGRQ because it validated to measure impaired health quality in patients with COPD and asthma. The use of SGRQ in COPD patients with an ⍺-coefficient of 0.76-0.77, so that the used of SGRQ as an indicator of the quality of life was very specific.[5] SGRQ consists of two parts, the first part showed the symptom score and the second part showed the activity score and disease impact score.[6]

British Thoracic Society (BTS) recommend used SGRQ because it was more sensitive to assess clinical changes. The SGRQ questionnaire can be used to detect responses to medical or non-medical procedures such as pulmonary rehabilitation programs. Clinical changes were minimally significant if the SGRQ value decreased by 4%. SGRQ value in this study exceeded the minimally clinically significant change (21%).

The adjusted SGRQ questionnaire can objectively assess the effects of the disease on daily life. Assessment of quality of life proposed by PW Jones is the influence of disease on daily life. The SGRQ questionnaire more related to the quality of life than pulmonary physiological values. People with COPD due to progressive illness often experience psychological and social disorders. The disorder is in the form of depression, anxiety, anxiety, anger, threatened

death, fatigue, and others. The prevalence of depression in COPD patients estimated at 42%. Other symptoms of depression such as feeling sad, no motivation, feeling tired or not powerful, suicidal desires and psychomotor setbacks often occur in patients with COPD. Other factors that cause depression include disruption of daily activities, unable to work like peers because of the progressive disease. The adjusted SGRQ questionnaire can objectively assess the effect of the disease on daily life. Assessment of quality of life proposed by PW Jones is the influence of disease on daily life. The SGRQ questionnaire more related to the quality of life than pulmonary physiological values.

Results

Result Data were collected at the Respira Lung Hospital (RSKP) Bantul from 1 August 2016 - 7 January 2017. Patients who controlled to the Polyclinic Respira Lung Hospital Bantul after being examined by Lung specialists and fulfilling the inclusion criteria were subjected to the study and informed consent was conducted followed by randomization. The research flow can be seen in Figure 1.

Pursed-Lips Breathing group consisted of 30 men (69.2%) and 17 women (30.8%), while the placebo group consisted of 31 men (67.6%) and 13 women (32.4%). The mean age of PLB group was 63.32 ± 7.11 and the placebo group was 64.82 ± 8.28 years. Pursed-lips Breathing group mean body weight 53.15 ± 10.40 kg and placebo group 53.75 ± 1.54kg.

The average height was 1.59 ± 0.07 PLB group and the placebo group was 1.59 m ± 0.06 m, while the mean body mass index (BMI) PLB group 20.90 ± 3.51 kg/m^2 and IMT placebo group 21.14 ± 3.77 kg/m^2. Smoking status in the group PLB showed 15 subjects of nonsmokers, 24 subjects of ex-smokers, passive smokers do not exist and 8 subjects of active smokers. The placebo group showed 14 subjects of nonsmokers, 23 subjects of ex-smokers, 3 subject of passive smokers, and 4 subjects with active smokers. Routine therapy used in the PLB group, there were 13 subjects used only bronchodilators and 34 subjects used bronchodilators + corticosteroids. In the placebo group, there were 12 subjects used only bronchodilators and 32 subjects used bronchodilators + corticosteroids.

Spirometry performed on the PLB and placebo group both before and after treatment with the assessment of Forced Vital Capacity (FVC) and Expiration Force V. The basic characteristics of the study subjects were the influence of PLB for 4 weeks on COPD patients in the PLB group compared to the placebo group on quality of life which included sex, age, weight, height, body mass index (BMI) smoking status, routine therapy and spirometry results before treatment. The details were in figure 1.

All characteristics of subjects in the PLB and the placebo group were normally distributed when checked with Shapiro-Wilk test.

The PLB group consisted of 30 men (69.2%) and 17 women (30.8%) while the placebo group consisted of 31 men (67.6%) and 13 women respectively (32.4%). The average age of the PLB group was 63.32 ± 7.11 years and the placebo group 64.82 ± 8.28 years. The mean weight of the PLB group was 53.15 ± 10.40 kg and the placebo group was 53.75 ± 1.54 kg. The mean height of the PLB group was 1.59 ± 0.07 m and the placebo group was 1.59 ± 0.06 m, while the mean body mass index (BMI) of the PLB group was 20.90 ± 3.51 kg/m^2 and the placebo group BMI was 21.14 ± 3.77 kg/m^2. Smoking status in the PLB group showed nonsmokers 15 subjects, ex-smokers

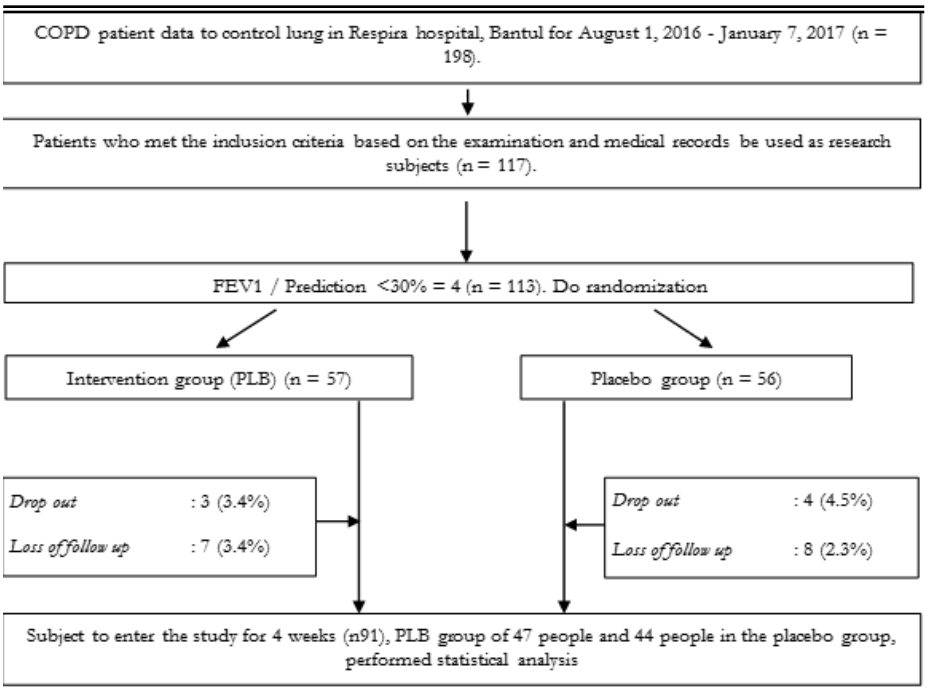

Figure 1. Research flow

24 subjects, no passive smoking, 8 active smokers, and in the placebo group, there were 14 smokers, 23 smokers, 3 passive smokers, active smokers 4 subjects. Routine therapy used in the PLB group consisted of 13 subjects using bronchodilators alone and 34 people using bronchodilators and corticosteroids. In the placebo group, there were 12 people using bronchodilators alone and 32 people using bronchodilator + corticosteroids.

Spirometry performed in the PLB group and placebo both before and after therapy with the Forced Vital Capacity (FVC), Volume 1 Force Expiration (FEV1), FEV1 / FVC and FEV1 / Prediction. Predicted FEV1 values taken from values according to the standards in Indonesia. After calculation, there was no significant difference in the value of spirometry between the PLB group and the placebo group. For the basic characteristics of post-experimental spirometry, results showed in table 2 below, equipped with delta values between pre and post research experiments.

Table 3 displayed data of SGRQ score based on symptom, activity and impact. Total scores were compared before and after theraphy. Tested by Shapiro-Wilk, PLB group activity score after therapy as normally distributed. The data was not normally found in the placebo group for activity score before and after therapy. There as no difference between before and after treatment on symptom scores, activity score, and total impact score. While in the PLB group, there were significant differences in all scores. In table 4, there was no significant difference between dleta of statistical and clinical symptoms between the PLB group and the placebo group. This can be seen from the delta symptom score change in the PLB group which was 9.99+1.91 compared to the standard group of symptoms delta score of 7.25+1.37 ($p = 0.138$)using unpaired t-test. Incontrary, there were significant differences

Table 1. Characteristic of subject

Variable	PLB group (n=47)	Placebo group (n=44)	x/t/u	p-value
	n (%) or Mean ± SD			
Sex				
Male	30 (69.2%)	31 (67.6%)	0.451	0.502*
Age (years old)	63.32±7.11	64.82±8.28	2.481	0.119**
Weight (kg)	53.15±10.40	53.75±1.54	0.011	0.916**
Height (m)	1.59±0.07	1.59±0.06	2.478	0.119**
Body Mass Index (kg/m^2)	20.90±3.51	21.14±3.77	0.200	0.655**
Smoking status				
None, n (%)	15	14	4.295	0.231*
History, n (%)	24	23		
Passive smoker, n (%)	0	3		
Active smoker, n (%)	8	4		
Therapy				
None	0	0	0.002	0,577*
Bronchodilator	13	12		
Corticosteroid	0	0		
Bronchodilator+Steroid	34	32		
Pre				
FEV_1 (liter)	1.03±0.37	1.02±0.39	0.154	0.696**
FVC (liter)	1.75±0.80	1.54±0.44	3.295	0.073**
FEV_1/FVC (%)	60.84±1.31	65.80±1.33	0.228	0.634**
FEV_1/FEV Predicted (%)	54.00±1.32	53.84±1.43	1.297	0.258**

*p-value <0.05 significantly difference, *Chi-square test, **independent T-test*

Table 2. Basic characteristic spirometry value of post and delta intervention

Variable	PLB group (n=47)	Placebo group (n=44)	x/t/u	p-value
	n (%) or Mean ± SD			
Post				
FEV_1 (liter)	1.10±0.42	1.02±0.96	0.321	0.572**
FVC (liter)	1.66±0.55	1.54±0.43	3.413	0.068**
FEV_1/FVC (%)	66.81±1.32	65.89±1.24	1.018	0.060**
FEV_1/FEV predicted (%)	57.89±1.58		0.444	0.507**
Delta				
FEV_1 (liter)	0.08±0.18	-0.01±0.09	2.784	0.099**
FVC (liter)	-0.03±0.09	-0.01±0.07	0.154	0.696**
FEV_1/FVC (%)	5.43±8.78	0.24±4.93	2.434	0.123**
FEV_1/FEV predicted (%)	4.42±8.78	-0.37±4.90	3.434	0.068**

**p-value <0.05 significantly difference, *Chi square test, **independent t test*

between the groups in term of delta of activity, impact, and total score.

There were no normal distribution of data on each of the delta, Mann-Whitney-U test was then used showing the delta of activity (p= <0.001), delta of impact (p= 0.001) and the delta of total (p= <0.001).

Discussion

Pulmonary exercise rehabilitation using PBL has effect on oxygen increase. It increases tidal volume and decreases respiratory rate so that the respiratory muscles work more effectively and decrease the workload of

breathing. This does not waste much energy and patient does not easily get tired. The procedure can be performed as daily activity and may increase the quality of life.[7]

The severity of COPD in this study based on Gold II and III. A systemic review conducted by Tsiliglanni et al[8], observed a significant relationship between the severity of COPD and quality of life. The severity of COPD caused by airway obstruction will affect the quality of life of patients with COPD without seeing how long he had been suffering from COPD.[9] Stage IV COPD stage marks the threshold finally deteriorating health status in parallel with decreased lung function which worsen the quality of life of patients.[10]

This study found the statistically significant difference in delta activity (p=<0.001), delta effect (p=0.001) and total delta (p=<0.001) between the PLB groups (n=47) compared to the placebo group (n=44), here the difference in the PLB group showed a

Table 3. Difference of score SGRQ between PLB group and placebo group

Variable	PLB group (n=47)	Placebo group (n=44)	t/u test	p-value (IK 95%)
SGRQ value				
Symptom score				
Pre therapy				
Mean ± SD	50.61 ± 2.00	46.63 ±2.05	0.073	0.788*
Median	58.60	46.99		
Post-therapy				
Mean ± SD	40.62 ± 2.09***	39.38 ± 2.14#	0.490	0.486*
Median	40.89	39.40		
Activity score				
Pre therapy				
Mean ± SD	38.10 ± 2.47	25.52 (0.00-67.29)	-2.600	0.009**
Median	35.62	17.81		
Post-therapy				
Mean±(Min-Max)	24.25 (0.00-93.37) ***$	26.77 (0.00-63.42) #	-1.069	0.285**
Median	18.08	23.33		
Impact score				
Pre therapy				
Mean ± SD	38.01 ± 1.45	27.06 ± 1.58	1.191	0.278*
Median	39.92	28.79		
Post-therapy				
Mean ± SD	26.07 ± 1.62***	26.50 ± 1.58#	0.419	0.519*
Median	27.68	27.50		
Total score				
Pre therapy				
Mean ± SD	39.99 ± 1.66	29.63 ± 1.49	0.177	0.675*
Median	41.13	30.10		
Post-therapy				
Mean ± SD	27.80 ± 1.63***	28.59 ± 1.46#	0.212	0.646*
Median	28.85	28.00		

*P-value <0.05 significantly difference * Independent T-test between PLB group and placebo group, **Mann-Whitney test between PLB group and placebo group, ***Paired T-test/Wilcoxon test between pre and post-therapy in PLB group, #Paired T-test/Wilcoxon test between pre and post-therapy in placebo group, $significantly difference (p=<0.001)*

a significant decrease in scores. There were no significant difference in the occurrence of delta symptom score (p=0.138) between the groups can be explained because of the PLB and the placebo group. The decrease in symptom scores before and after treatment was significantly different.

Roche et al[11], observed similar result with our finding by seeing an improved quality of life based on PLB Airways Questionnaire 20 (AQ20). AQ20 questionnaire has been deeloped to measure and calculate interference in daily activities and health-related quality of life (HRQOL) of patients with asthma or COPD. Other results were also similar to the present study showing the increase spirometry values of FEV1 (%) of 56.9 ± 9.4 be 57.9 ± 10.4 after the intervention. In the present study obtained FEV1 (%) 54.00 ± 1.32 PLB group became 57.89 ± 1.58.

Ramos et al[12], in a cross- sectional study on 16 patients with COPD GOLD I, II and III state that the exercise PLB for 8 minutes improvements in vital signs that was expressed by decrease of breath frequency, increased oxygen saturation, and a decrease in the average pulse. However, no change in blood pressure was found.

To prevent bias against change in the quality of life for COPD patients with SGRQ, this research, exluded data with potential confounder. According to Jones[13] the presence of comorbidity > 3 is associated with a worse quality of life compared with comorbides <3. Patients with cardiovascular disease had worse SGRQ score (45.8 ± 19.5) than those without (43.2 ± 19.2).

Conclusion

Pursed-Lips Breathing (PLB) improved the patients' quality of life with stable COPD and characterized by the decrease of SGRQ score.

Table 4. Difference of delta SGRQ score before and after therapy between PLB group and placebo group

Variable	PLB group (n=47)	Placebo group (n=44)	t/u test	p-value IK 95%
DeltaSGRQ				
Activity score				
Mean ± SD	9.99 ± 1.91	7.25 ± 1.37	2.239	0.138*
Median	8.47	2.26		
Activity score				
Mean ± SD	13.86 ± 1.83	-1.25 (-60.81-35.63)	-3.544	<0.001**
Median	11.18	0.00		
Impact score				
Mean ± SD	11.95 ± 1.60	0,56 (-38.62-20.17)	-3.218	0.001**
Median	11.71	1.3		
Total score				
Mean ± SD	12.19 ± 1.35	1.05 (-40.72-23.52)	-3.856	<0.001***
Median	12.31	1.10		

p-value<0.05 significantly difference

**Independent t-test between PLB group and the placebo group*

*** Mann-Whitney U test between PLB group and the placebo group*

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