

# Exercise on Peak

*by* Cek Turnitin

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# Effect of Diaphragmatic Breathing Exercise on Peak Expiratory Flow (PEF) in Individual with Asthma

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## ABSTRACT

Asthma is a chronic airway disease caused by inflammation and resulting of hypersensitivity on the airway, in which it is rising several clinical symptoms of wheezing, shortness of breath, chest pain, cough varying over time, along with limited of the expiration airflow. As a result, asthma cause difficulties during expiration and responsible for the decreasing of the Peak Expiratory Flow (PEF). This study aimed to analyze the effect of diaphragmatic breathing exercise towards Peak Expiratory Flow of asthma patient during an acute episode. The research design is pre-experimental with one group pre-post-test with 20 samples which was collected by using purposive sampling method. This research was conducted in April 2017. The result of the study showed mean of PEF pretest was 73,05% and post-test was 77,67%. It can be concluded that diaphragm breathing exercises give impact to the PEF of asthma patients.

**Keywords:** diaphragmatic breathing exercises, peak expiratory currents, asthma

## INTRODUCTION

Asthma is a chronic disease of the airway caused by inflammation. Such condition causes hypersensitivity throughout the airway resulting in clinical symptoms of wheezing, shortness of breath, chest tightness and cough varying over time, and followed by the limitation of expiratory airflow (1). WHO reported there are 235 million people worldwide suffer from asthma. The rate is estimated to increase about 400 million cases by 2025. Asthma is a major problem for public health in many countries, especially for those 67 with low-income states<sup>1-3</sup>. Recently, research has stressed that some patients might have 68 clinical features of both asthmas, 69 particularly adult smokers with high reversibility of airflow obstruction and bronchial or 70 systemic eosinophilic inflammation<sup>4-5</sup>. According to Basic Health Research (Riset Kesehatan Dasar; Riksdag) in 2013, the prevalence of people with asthma in Indonesia has increased by 1%. The prevalence of asthma in Bali in 2013 was the sixth highest rank among another disease

which affecting 6.2 per 1000 population<sup>6</sup>. The data found at Emergency Room of Mangusada Badung Hospital stated that asthma was the highest-ranking disease and continues to increase since 2013 to 2015. The number of patients with asthma attacks respectively since 2013 to 2015 was 1.094, 1.112, and 1.512 people with major complaints of spasms breath.

The spasm breath in asthma patients results from the occurrence of airway obstruction. Hyperactivity reactions cause narrowing of the airways and will result in difficulties during expiratory<sup>7</sup>. The difficulties of expiration in asthmatic patients can be assessed objectively by measuring the value of PEF (Peak Expiratory Flow)<sup>8</sup>. The exercise that can be done to increase expiratory air is diaphragmatic breathing exercises<sup>9</sup>. Diaphragmatic breathing exercise is a breathing exercise performed with maximal inspiration through the nose, mainly focus on the abdominal movement, restricting the chest movement and exhale through the mouth, can improve the performance of the abdominal muscles that play a role in the expiratory process<sup>10</sup>. This study aimed to determine the effect of diaphragmatic breathing exercises on peak expiratory currents in asthma patients at the Mangusada Badung Hospital in 2017.

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## MATERIALS AND METHOD

The present study is a pre-test post-test pre-experimental research. The sample was sorted out of the population using purposive sampling method and 20 people met the inclusion criteria. This study was conducted from March to April 2017. Peak flow meter was used to measure the peak expiratory rate. The measurements prior to treatment (pre-test) were performed five minutes after nebulization and measurements after treatment (post-test) were performed five minutes after administration of diaphragmatic breathing exercises. The patients were given diaphragmatic breathing exercises in this study only once for six minutes.

## RESULTS AND DISCUSSION

Before the results of the study are presented, the characteristics of research subjects by sex, age, and height will be described in the following table.

**Table 1. Characteristics of Respondents by Sex**

Sex	Frequency (f)	Percentages (%)
Male	13	65
Female	7	35
<b>Total</b>	<b>20</b>	<b>100,00</b>

The result of the analysis was found that most respondents were male (13 respondents) (65%).

**Table 2. Characteristic of Respondents by Ages**

	Mean	SD	Min-Maks	95% CI
Ages	48,8	4,3	26-70	42,1 - 55,4

The mean of age of the asthmatic respondents was 48.8 years (95% CI: 42.1-55.4), the standard deviation was 14.3 years. The youngest respondent was 26 and the oldest was 70 years old. The 95% of interval estimation was believed that the mean age of asthma patients was between 42.1 to 55.4 years old.

**Table 3. Characteristics of Respondents Based on Height**

Variable	Mean	SD	Min-Mak	95% CI
Heigh	164,3	5,8	152 - 172	161,6 - 167

The average respondent height was 164.3 cm (95% CI: 161.6 - 167), with standard deviation was 5,77 cm. The lowest body height was 152 cm and the highest was 172 cm. The 95% interval estimation was believed that the average height of respondents is 161.6 to 167 cm.

The results of this study showed an average of PEF before treatment was 73.05%. This value indicates the PEF in asthma patients before the intervention was low or below the normal value of PEF (80-100%). The low PEF in asthma patients was triggered by airway obstruction<sup>11</sup>. The airway obstruction of the asthmatic patient was evoked by the spasm of the airway thus the patient had airflow disorder especially during expiration<sup>7</sup>. In addition, the declining rate of PEF was also influenced by patient's age. The more mature of a person may be more susceptible to have disruption at the respiratory system. Such condition will generate a disruption to the lung function including disturbance in the peak flow expiration of the patient.

The mean of PEF respondents after given diaphragmatic breathing exercise was 77.67%. The results of this study showed there was an improvement in PEF after obtaining respiratory training. A related study done by Natalia<sup>12</sup> suggest that breathing exercises may increase PEF in patients with asthma. The positive effect of PEF was related to the effectiveness of air released during expiration. The releasing of air during expiration can be maximized using respiratory muscles correctly, with diaphragmatic breathing exercises<sup>9</sup>, but still below to the normal PEF value, 80-100%. The minimum effect was related to the frequency of exercise that is only once for six minutes thus the increase of PEF did not reach the normal value of PEF.

The difference in means between PEF before treatment and after treatment was 4.61%. A paired sample t-test with p-value 0.001 ( $\alpha=0,05$ ) was performed to test the hypothesis, as a conclusion, diaphragmatic breathing exercise took effect on the peak expiratory flow in asthma patient at Emergency Department Mangusada Badung Hospital.

The results of this study indicated that diaphragmatic breathing exercises could take effect on the peak expiratory flow in patients with asthma who was experiencing obstruction or obstruction of the airway. The diaphragmatic breathing exercises maximized the release of air during expiratory by reducing intrathoracic

volume using abdominal muscles. The abdominal muscle was deflated and strongly pushing the abdomen inward, pushing the diaphragm in a resting state. This allows the releasing of air that exceeds the capacity during normal expiration in asthmatic patients.

The results of this study appear to be related to the theory that asthma patients have difficulty during exhaling, consequently, peak expiratory flow decrease and require extra strength to perform expiration. In normal circumstances, expiration is a passive process because it occurs due to elastic pulmonary shrinkage as inspired muscles relax without requiring muscle contraction or releasing of energy<sup>11</sup>.

Diaphragmatic breathing allows for active expiration to unload the lungs more fully and faster than expiration during normal breathing using the abdominal muscles. To perform active or forced expiratory, the abdominal muscles should contract to further reduce the volume of the thorax and lung. When the muscles of the abdomen are contracted, the intra-abdominal pressure is increasing, resulting in an upward force on the diaphragm, causing the diaphragm is lifted into the thorax cavity compared to the rest position. Therefore, the vertical size of the thorax cavity is shrinking and lung volume is decreasing<sup>13</sup>. Intra alveolar pressure is increased because the air inside the lungs is placed in smaller volumes<sup>14</sup>. The difference between intra-alveolar and atmospheric pressure becomes greater compared to the passive expansion, hence more air comes out of the lungs<sup>11</sup> resulting in an increase in peak expiratory flow<sup>15</sup>.

Related research that supports the results of this study is a study by Widarti<sup>16</sup> which states that diaphragmatic breathing can improve the quality of life of asthma patients because it can train people to breathe the proper way by using stomach breathing<sup>17</sup>. The effectiveness of diaphragmatic breathing exercises is also supported by related research conducted by Mayuni<sup>18</sup> which states that diaphragmatic breathing affects the vital capacity of the lungs in asthmatics.

The researchers agreed that diaphragmatic breathing exercises can help to train the asthma patients to breathe by prioritizing and maximizing the use of diaphragm muscles and abdominal muscles during respiration, where it can increase the air outflow, therefore such procedure can increase the peak expiratory flow in asthma patients. Such thing could minimize the carbon dioxide trapped

in the alveoli resulting in diffusion and respiratory failure. In addition, diaphragmatic breathing exercises are not only maximizing expiration and increasing peak expiratory flow but also maximizing inhalation of air during inspiration with the use of diaphragm muscles and abdominal muscles so that ventilation process runs optimally<sup>19</sup>.

## CONCLUSION

The conclusions from the result that the mean of peak expiratory flow prior to diaphragmatic breathing exercises was administered was 73.05% after given diaphragmatic breathing exercises were 77.67%. The diaphragm respiratory exercise plays a vital role to the peak expiratory flow with the difference in mean between PEF before treatment and after treatment was 4.61% with 2.26% of standard deviation and p-value (Sig. 2-tailed) 0.001 (p-value <0.05).

**Conflict of Interest:** All authors declare that there is no any conflict of interest within this research and publication including the financial agency.

**Ethical Clearance:** Obtained from the university committee and respondent agreement

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