

## THE EFFECT OF DIAPHRAGMATIC BREATHING EXERCISE TECHNIQUE ON INCREASING OXYGEN SATURATION IN ASTHMA PATIENTS

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### ABSTRACT

This study aims to determine the effect of the Diaphragmatic Breathing Exercise technique on increasing oxygen saturation in asthma patients. This study uses a quantitative approach with the type of Pre-Experimental One Group Pre-Test and post-test research with the Paired Sample T-Test. The results showed that administering the Diaphragmatic Breathing Exercise technique can increase oxygen saturation in asthma patients before and after the intervention. The oxygen saturation value before being given the Diaphragmatic Breathing Exercise technique showed that the frequency of oxygen saturation of respondents was in the range of 90%-94%, amounting to 38 people (67.9%) with the category of mild hypoxemia and in the field of 75%-89% amounting to 18 people (32.1%) with the type of moderate hypoxemia with an average value of 89.61%. The oxygen saturation value after being given the Diaphragmatic Breathing Exercise technique showed that the frequency of oxygen saturation in the range of 95%-100% amounted to 49 people (87.5%) with the standard category and in the field of 90%-94% amounted to 7 people (12.5%) with the type of mild hypoxemia with an average value of 96.61%. It can be concluded that the Diaphragmatic Breathing Exercise technique affects increasing oxygen saturation in asthma patients.

Keywords: Asthma, Diaphragmatic Breathing Exercise, Oxygen Saturation

### INTRODUCTION

Asthma is classified as a chronic non communicable disease characterized by recurrent attacks according (Nolanda, 2019). In addition Asthma is generally characterized as a chronic inflammatory condition affecting the respiratory tract which causes increased bronchial reactivity in response to various stimuli. Penelitian Astriani et al., (2020); Junaidin & Irawan (2019) ini juga menyatakan terdapat peningkatan saturasi oksigen setelah diberikan intervensi meniup balon dan pernapasan bibir.

Meanwhile, according to GINA (Global Initiative for Asthma) (2022) asthma is a common and potentially serious chronic disease that places a heavy burden on patients, families and society. This causes respiratory symptoms, activity limitations and seizures (attacks) which sometimes require immediate medical attention and can be fatal if not treated immediately. The number of people suffering from asthma reaches more than 27%, more women than men, which only reaches 14%. For girls, asthma sufferers do not decrease because as they grow older, girls experience narrowing of the respiratory tract by up to 20%. However, currently the incidence of asthma is more common in men due to cigarette smoke pollution (Widyasari & Irdawati, 2023; Harsismanto et al., 2020; Padila et al., 2019; Primadyastuti, 2017). Asthma prevalence globally is the top five cause of death in the world. Global prevalence Asthma is the fifth leading cause of death in the world.

Globally it is estimated that there are around 262 million people in 2019 and there are 461,000 deaths from asthma. Most asthma deaths occur in low and lower middle income countries, where diagnosis and treatment of asthma is lacking (Xing et al., 2023; Muslina et al., 2022). The prevalence of asthma in Indonesia at the end of 2020 reached 12 million people or 4.5 of the total population of Indonesia (Kurniawan & Putri, 2024; Kemenkes RI, 2020). The prevalence of Asthma in Bali itself is 3.9% of the population with a cumulative number of Asthma sufferers of 20,560 sufferers and Buleleng Regency has an Asthma incidence rate of 3.8%, the vulnerable age for developing Asthma is 6.49%, aged 75 years and under from 1 year less susceptibility to Asthma by 0.92%.

Diaphragmatic Breathing Exercise is an exercise technique that involves utilizing the diaphragm muscle when inhaling air or inhaling through the nose and exhaling through the mouth. The main goal of this exercise is to enable individuals with Asthma who have difficulty with ventilation to achieve optimal, efficient, controlled, and effective ventilation (Astriani et al., 2021).

A preliminary study conducted by researchers on Wednesday 2 November 2022 at the Kubutambahan II Health Center from register data from August to October 2022 found that the number of Asthma patients visiting the Kubutambahan II Health Center was 65 people. Referring to the acquisition of interviews and observations carried out through measuring oxygen saturation in 5 people with Asthma, it was found that 4 people on average complained of shortness of breath and cough accompanied by a decrease in oxygen saturation namely in the first person with a decrease in oxygen saturation of 89%, in the second person and third person with a decrease in oxygen saturation of 90%, and in the fourth person with a decrease in oxygen saturation of 92%. While 1 other person complained of a slight cough but did not experience a decrease in oxygen saturation with oxygen saturation in the fifth person 97%.

The results of interviews conducted with nurses at Kubutambahan II Health Center, that Asthmatics control to the Health Center to get medicine for 1 month and Asthmatics can come anytime if the disease recurs, usually many Asthma patients to the Health Center come with complaints of shortness of breath and cough accompanied by a decrease in oxygen saturation. The handling and management carried out so far carried out by the Health Center for asthmatics is by treatment at the Health Center.

## **RESEARCH METHOD**

This study review includes studies carried out through Pre-Experimental research design with the type of design used is One Group Pre-Test & Post-Test using the Purposive Sampling method. This research study review did not include a control group for comparison purposes, but only focused on the treatment group. This study used data analysis techniques to test differences in oxygen saturation before and after Diaphragmatic Breathing Exercise using the Paired Sample T-Test test with Kolmogorov-Smirnov normality test to assess the normal distribution of data. In addition the data undergoes a marked rating test to further evaluate its distribution. Software Product and Service Solution (SPSS) application program with a confidence level of 95% ( $\alpha < 0.05$ ). The study sample of this study was patients who had Asthma in the Kubutambahan II Health Center Work Area as many as 56 respondents.

Data collection using observation sheets and to measure oxygen saturation through the use of Pulse Oximetry measuring instruments. Primary data were taken from respondents who experienced Asthma by conducting direct interviews and measuring oxygen saturation then continued with the administration of Diaphragmatic Breathing Exercise Techniques 5 to 10 minutes later after being given Diaphragmatic Breathing Exercise Techniques again oxygen saturation measurements were carried out. Diaphragmatic Breathing Exercise

technique is given 3-4 times a week for 3 consecutive weeks. The ethical review in this study was conducted by the Health Research Ethics Committee (KEPK) of the STIKes Buleleng.

## RESULTS

Table. 1  
Frequency Distribution By Age

Variabel	N	Mean	Min	Max	Std Deviation
Age	56	61.61	31	70	8.864

Referring to table 1 shows the distribution of respondent's frequency based on the age of 56 respondents proving the lowest age of 31 years and the highest age of 70 years with the average age of respondents is 61.61 years.

Table. 2  
Frequency Distribution By Gender

	Frequency	Percent (%)	Valid Percent	Cumulative Percent
Male	27	48.2	48.2	48.2
Famele	29	51.8	51.8	100.0
Total	56	100.0	100.0	

Referring to table 2 proves that the frequency distribution of respondent's based on gender of 56 respondent's, the majority of famele were recorded at 29 people (51.8%) and the remaining 27 people (48.2%) were male.

Table. 3  
Frequency Distribution By Education Level

	Frequency	Percent (%)	Valid Percent	Cumulative Percent
Elementary School	18	32.1	32.1	32.1
Junior High School	10	17.9	17.9	50.0
Senior High School	6	10.7	10.7	60.7
Diploma/Bachelor	4	7.1	7.1	67.9
Non School	18	32.1	32.1	100.0
Total	56	100.0	100.0	

Based on table 3 it proves that the frequency distribution of respondent's based on the education level of 56 respondent's with Asthma the majority have Elementary School (SD) and Non School education level namely 18 people each (32.1%) and the minority of respondent's have a Diploma/Bachelor education level of 4 people (7.1%).

Table. 4  
Distribution Of Normality Test Results  
Against Data That Has Been Obtained

Kolmogorov-Smirnov			
	Statistic	Df	Sig.
Pre-Test	.512	56	.310
Post-Test	.289	56	.310

Referring to table 4 it is found that the p value before and after therapy is 0.310. Thus the value of  $p > 0.05$ . It can be concluded that the data is normally distributed.

Table. 5  
Oxygen Saturation Of Respondent's  
Before Diaphragmatic Breathing Exercise

Category	Frekuensi	Percentage (%)
90%-94%	38	67.9
75%-89%	18	32.1
Total	56	100.0

Based on table 5 it is proven that from 56 respondent's before giving Diaphragmatic Breathing Exercise techniques the oxygen saturation of respondent's contained in the range of 90%-94% with the category of mild hypoxemia amounted to 38 people (67.9%) and oxygen saturation in the range of 75%-89% with the category of moderate hypoxemia amounted to 18 people (32.1%).

Table. 6  
Oxygen Saturation Of Respondent's Before Diaphragmatic Breathing Exercise  
In Asthma Patient's

	N	Mean	Min	Max	SD	95% CI
Pre-Test	56	89.61	80	94	3.831	88.58%-90.63%

Referring to table 6 proves that from 56 respondent's the results of the analysis obtained the average value of oxygen saturation before the Diaphragmatic Breathing Exercise technique was 89.61%, standard deviation 3.831. The lowest oxygen saturation value is 80% and the highest oxygen saturation value is 94%. For 95% confidence interval before therapy is 88.58%-90.63%. From this data proves that the average value of oxygen saturation in Asthma patients before therapy has mostly decreased.

Table. 7  
Oxygen Saturation of Respondent's  
After Diaphragmatic Breathing Exercise

Category	Frekuensi	Percentage(%)
95%-100%	49	87.5
90%-94%	7	12.5
Total	56	100.0

Referring to table 7 it is proven that from 56 respondent's after being given Diaphragmatic Breathing Exercise techniques respondents' oxygen saturation is in the range of 95%-100% with the normal category of 49 people (87.5%) and oxygen saturation in the range of 90%-94% with the category of mild hypoxemia of 7 people (12.5%).

Table. 8  
Oxygen Saturation Of Respondent's After Diaphragmatic  
Breathing Exercise In Asthma Patient's

	N	Mean	Min	Max	SD	95% CI
Post-Test	56	96.61	90	99	2.163	96.03%-97.19%

Based on table 8 proves that from 56 respondent's the results of the analysis obtained the average value of oxygen saturation after diaphragmatic breathing exercise technique was 96.61%, standard deviation 2.163. The lowest oxygen saturation value is 90% and the highest oxygen saturation value is 99%. For 95% confidence interval after therapy is 96.03%-97.19%. From this data shows average value of oxygen saturation after therapy has mostly increased.

Table. 9  
Pre-Test & Post-Test Analysis Results Using Computer Programs

	Mean	Std	Std Mean	Lower	Upper	T	Df	Sig.
Pre-test- Post-test	-7.000	2.629	.351	-7.704	-6.296	-19.929	55	.000

Table 9 proves that there is a substantial effect of the continuation of diaphragmatic breathing exercise technique intervention on increasing oxygen saturation in Asthma patients. The calculation results with a computer system show a p value of 0.000. These findings suggest that the p value is below the critical threshold of 0.05 for research significance. So it can be concluded which means showing the visible impact of the Diaphragmatic Breathing Exercise technique on increasing oxygen saturation among individuals diagnosed with Asthma in the work area of Kubutambahan II Health Center.

## DISCUSSION

### Characteristics of Respondent's in Asthma Patients

#### By Age

Based on table 1 that Asthmatics refer to the age in the work area of the Kubutambahan II Health Center from 56 respondent's with Asthma showed an average age of 61.61 years, respondent's who had the highest age of 70 years and the lowest age of 31 years. The age of respondent's who suffer the most from Asthma is in the age range of 61-70 years with a total of 40 respondent's, while the least suffering from Asthma is in the age range of 31-40 years with a total of 3 respondent's. Referring to the results of the study above, it can be concluded the older the respondent's automatically the lower the risk of experiencing Asthma.

The findings made Rosita et al., (2020) proving that the age of respondent's who experience Asthma is mostly aged 60-65 years and 66-70 years with 32 respondent's (64%) and 9 people (18%) respectively. This is because in old age it is difficult to diagnose Asthma. During this stage of life the immune system experiences a decrease in function due to decreased performance of immune organs such as the thymus gland. In the thymus gland there is a decrease in the size of the organ and a decrease in lung function. Physiological decline in lung function is related to the increasing age of the patient. This factor contributes decreased respiratory muscle strength, decreased elasticity of lung tissue, and increased chest wall muscle stiffness causing respiratory difficulties in individuals affected by this condition. As a result a decrease in the cough reflex and other reflexes will occur allowing an increase in acute infections of the lower respiratory tract. Increasing age will reduce lung function and produce  $\beta_2$  receptors as a result of which there will be a decrease in bronchodilators.

#### By Gender

The characteristics of respondent's refer to gender in the work area of Kubutambahan II Health Center most of the respondent's are female namely 29 people (51.8%), while those who are male are recorded 27 people (48.2%). Usually women will experience an increase in Asthma at the age of >40 years.

The findings of Ajul & Siswadi (2020) stated that the gender of respondent's who experienced Asthma was mostly female with 32 people (53.3%), while Asthma sufferers who were male amounted to 28 people (46.7%). The higher prevalence of Asthma in adult women than men can be attributed to the relatively smaller lung volume and capacity observed in women. Differences in lung size and airway characteristics between men and women have implications for oxygenation and make women more susceptible to Asthma.

Results of the findings implemented Utoyo & Nugroho (2021) the results showed that women have a risk of being more susceptible to Asthma. In 32 respondent's 20 people (62.5%) women suffered from Asthma.

### **By Education Level**

The characteristics of respondent's refer to the level of education in the work area of Kubutambahan II Health Center, respondent's with Elementary School education 18 people (32.1%), then Junior High School 10 people (17.9%), then High School 6 people (10.7%), then Diploma/Bachelor 4 people (7.1%) and Non School 18 people (32.1%). The results of the study above show that the majority of Asthma sufferers are at the level of Elementary School education and Non School. Referring to the assumption of researchers the higher a person's level of education automatically the smaller the risk of developing Asthma because the average who has higher education already knows knowledge about Asthma. Vice versa someone with low education will have a greater chance of developing Asthma because of lack of knowledge about Asthma.

The results of the above research are also seen from the data Kemenkes RI (2020) which states that the population with a low level of education is especially more at the level of elementary school education with a total of 44.6%, while those who do not finish elementary school 41.6%, residents with junior high school graduates as much as 40.8% and those who finish high school as much as 40.6%, the level of elementary education has a higher proportion than those who have a higher level of education.

### **Oxygen Saturation Level In Asthma Patients Before Diaphragmatic Breathing Exercise Technique Intervention In The Work Area Of Kubutambahan II Health Center**

The oxygen saturation value of Asthmatics in the work area of the Kubutambahan II Health Center from 56 respondent's before being given the Diaphragmatic Breathing Exercise technique proved that the frequency of oxygen saturation of respondent's was in the range of 90%-94% amounting to 38 people (67.9%) and in the range of 75%-89% amounting to 18 people (32.1%) with an average value of 89.61%.

Individuals diagnosed with Asthma experience difficulty breathing due to a narrowing in the airways, thus causing a decrease in oxygen diffusion resulting in a decrease in oxygen concentration in the bloodstream and a decrease in oxygen saturation will occur in clinical circumstances. The data above illustrates the level of oxygen saturation in individuals with asthma before being given Diaphragmatic Breathing Exercise techniques mostly experience mild hypoxemia and followed by some patients experience moderate hypoxemia. In addition to giving oxygen and inhalation nebulizer to reduce shortness of breath by increasing ventilation, it is also very important to give Diaphragmatic Breathing Exercise which can make it easier for people with asthma to reduce shortness of breath and increase oxygen saturation levels and make the airway effective.

### **Oxygen Saturation Level In Asthma Patients After Diaphragmatic Breathing Exercise Technique Intervention In The Work Area Of Kubutambahan II Health Center**

The oxygen saturation value of Asthmatics in the work area of the Kubutambahan II Health Center from 56 respondent's after being given the Diaphragmatic Breathing Exercise technique proved that the frequency of oxygen saturation contained in the range of 95%-100% amounted to 49 people (87.5%) and in the range of 90%-94% amounted to 7 people (12.5%) with an average value of 96.61%.

The data presented showed that the application of Diaphragmatic Breathing Exercise resulted in a significant increase in oxygen saturation levels among individuals with Asthma, that they were close to the standard range of SaO<sub>2</sub>. These findings show that the application of Diaphragmatic Breathing Exercise techniques has the potential to increase oxygen saturation levels by improving ventilation and optimizing the gas exchange process so that breathing becomes more effective.

However, there are still some respondent's who have not experienced an increase in oxygen saturation to normal, from the results of interviews conducted on 7 respondent's who did not experience an increase in oxygen saturation said this was due to their lifestyle choices that were less awake for example in male respondent's who claimed to have smoking habits. Likewise with female respondent's who said that there was no change in oxygen saturation because there were family members who smoked in the environment around the respondent. In addition the age factor also affects because as a person gets older, it can make changes in vital capacity and breathing patterns. So it can be concluded that 7 respondent's who did not increase oxygen saturation occurred due to a history of smoking and age factors.

From the results of the study conducted all respondent's were given intervention 3-4 times a week and most respondent's were able to provide an increase in oxygen saturation from moderate and mild oxygen saturation to normal oxygen saturation.

In line with the studies carried out Widjanegara et al., (2015); Oktaviani & Sutrisna (2021) which states that giving Diaphragmatic Breathing Exercise techniques as much as 3 times a week in addition to being able to reduce the frequency of asthma recurrence can also make oxygen saturation in asthma patients increase.

### **Analysis Of Increased Oxygen Saturation In Asthma Patients Before And After Diaphragmatic Breathing Exercise Technique Intervention In The Work Area Of Kubutambahan II Health Center**

The results of the analysis of the effect of Diaphragmatic Breathing Exercise on increasing oxygen saturation in Asthma patients using the Paired Sample T-Test show that the significance value of 0.000 ( $p = 0.000$ ) because the value of  $p = <0.05$  then the null hypothesis ( $H_0$ ) is rejected, thus the conclusion can be drawn that there is a significant (meaningful) influence between Diaphragmatic Breathing Exercise techniques on oxygen saturation in the data before and after treatment. According to researchers Diaphragmatic Breathing Exercise techniques can help patients improve ventilation and make gas exchange effective so that breathing becomes effective and patients can breathe smoothly so that oxygen saturation in asthmatics can increase.

According to a review of studies from Ryandayanti (2019) where this study study uses the pre-experimental design method through the design of one group pre-post test. Statistical analysis using paired t-test with a p-value of 0.000. With oxygen saturation before the intervention with an average of 91.10% and after the intervention with an average of 95.25%. The findings of this study suggest that the implementation of Diaphragmatic Breathing

Exercise has a significant impact on increasing the level of oxygen saturation in the bloodstream both before and after intervention among individuals diagnosed with Asthma.

## CONCLUSION

Based on the results of research and discussions that have been carried out on the effect of Diaphragmatic Breathing Exercise techniques on increasing oxygen saturation in asthma patients, it can be concluded that Diaphragmatic Breathing Exercise techniques can increase oxygen saturation in asthma patients.

## SUGGESTION

### For Nursing Practice

The results of these findings can be used as material to assist in the application of Nursing Care in Asthma sufferers especially Diaphragmatic Breathing Exercise techniques.

### For Further Researcher

The results of these findings can be used as a reference or description of information in the implementation of the next study related to the effect of Diaphragmatic Breathing Exercise techniques on increasing oxygen saturation in Asthma patient's.

### For Nursing Education

These findings contribute to existing scientific knowledge in the field of nursing about the effect of Diaphragmatic Breathing Exercise on increasing oxygen saturation in Asthma patients. Furthermore it can be fundamental knowledge in the relevant educational curriculum related to nursing service issues at the nursing education level.

### For Health Center

The results of these findings can be used as information for health service places in improving nursing services especially for Asthma patient's in the Kubutambahan II Health Center Work Area thus more optimally.

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