INTERNASIONAL CONFERENCE ON
MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE
VOLUME 3, No 1. Tahun 2025 , ISSN 3032-4408 (Online)
https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs

The Effect Of The Application Of Ballon Blowing Therapy On Oxygen Saturation In Children With Asthma In The Inpatient Room Of Denpasar

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Article history
Posted : 2025-09-19
Reviewed : 2025-10-17
Received : 2025-12-13

Abstract

Oxygen saturation can be an indicator to detect the severity of asthma attacks, so it is necessary to measure oxygen saturation to detect the severity of the disease, because it can be a sign in which the body has difficulty flowing oxygen to all cells, tissues, and organs. This study aims to analyze the effect of the application of Ballon Blowing therapy on oxygen saturation in children with asthma in the inpatient room of Hospital X Denpasar. This study uses the pre-experimental design involving 22 selected respondents using the total sampling technique. Respondents will be assessed their oxygen saturation before and after giving ballon blowing therapy using oxygen saturation and standard operating ballon blowing therapy procedures. The data analysis technique used is the Wilcoxon test. The results showed that there was a significant effect on respondents given interventions with a value of P-value 0,000 ($p < 0.05$) which means there was an influence on the application of ballon blowing therapy on oxygen saturation in children with asthma in the inpatient room of RS X Denpasar. The existence of significant differences before and after giving ballon blowing therapy to oxygen saturation in children with asthma shows that this breathing exercise can be done regularly at home to help reduce the frequency of the recurrence of asthma patients according to the health education that has beengiven.

Keywords: asthma, oxygen saturation, ballon blowing therapy

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INTRODUCTION

Asthma is a disease characterized by narrowing and inflammation of the respiratory tract, resulting in increased respiratory rate and decreased oxygen saturation. The existence of a very strong relationship shows that oxygen saturation can be an indicator to detect the severity of an asthma attack, so it is necessary to measure oxygen saturation to detect the early severity of the disease (Aini et al., 2024). Data from the Global Initiative for Asthma GINA in 2021 stated that more than 339 million people worldwide were diagnosed with asthma, which is expected to peak at 400 million in 2022. The prevalence of asthma in Indonesia is 2.4% across all ages, with an asthma incidence rate of 1.6% for children aged 1-4 years, with a relapse rate of 57.5% for all ages and 68.2% for children aged 1-4 years.

Asthma is treated using pharmacological therapy such as long-term and short-term asthma medication, while non-pharmacological therapy includes physiotherapy, asthma exercises, swimming, and blowing such as balloon blowing (Liani et al., 2024). Balloon blowing has good effectiveness, no side effects, is easy to do, inexpensive, and can be done anywhere compared to other non-pharmacological therapies. Balloon blowing therapy, when administered regularly, is very effective in asthma patients because it can increase the efficiency of the respiratory system, including ventilation, diffusion, and perfusion, and increase the strength of the patient's respiratory muscles, thereby maximizing lung recoil and compliance, thereby improving lung function (Liani et al., 2024).

Based on a preliminary study at Hospital X, data from observations and electronic medical records of 10 pediatric patients treated with asthma at Hospital X Denpasar, two children were treated with oxygen saturation <93%, six children were treated with oxygen saturation 93-95%, while two other children were >95% but with other severe complications such as rhonchi, wheezing, and increased respiratory frequency, so the researcher was interested in writing a study entitled "The Effect of Balloon Blowing Therapy on Oxygen Saturation in Asthma Patients in the Inpatient Room at Hospital X Denpasar.

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METHOD

This study was a pre-experimental study using a one-group pre-test and post-test design. The population was 372 asthma patients, with a sample size of 22 respondents. The sampling technique used was non-probability sampling with purposive sampling, resulting in respondents based on the researcher's wishes through inclusion and exclusion criteria. This research has been declared to have passed the ethical test by the Health Research Ethics Committee of STIKES Bina Usada Bali on March 7, 2025 with No: 093/EA/KEPK-BUB-2025. The research instrument used is The instrument in this study is the SOP for Balloon Blowing Therapy Exercises. The validity and reliability of the pulse oximeter instrument have been previously tested by the calibrator team of RS X Denpasar which is carried out annually with certification. Data collection was carried out at RS X Denpasar, from March 25 to April 25, 2025.

RESULTS

Based on the measurements, the following data was obtained:

Respondent Characteristics Based on Body Mass Index (BMI), Gender, and Temperature

Respondent characteristics, including body mass index (BMI), gender, and temperature, are outlined in Table 1.

Respondent characteristics		Frequency (f)	Presentation (%)
Body mass index (IMT)			
	18,5 – 22,9	16	72,72
	23 – 24,9	2	9,09
	25 – 29,9	4	18,19
Gender			
	Female	8	33,3
	Male	14	66,7
Teperature			
	≤37,5	22	100
	Total	22	100

In table 1, it can be seen that of the 22 respondents, most of them had a BMI of 18.5-22.9 (normal weight) as many as 16 people (72.72%), 25-29.9 (obese) as many as 4 people, and 23-24.9 (overweight) as many as 2 people. In the table above, children who suffered from

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asthma were mostly male as many as 14 people (66.7%), then female as many as 8 people (33.3%). In the table above, all children had a body temperature ≤37.5 (100%).

Oxygen Saturation in Children with Asthma Who Were Not Given Balloon Blowing Therapy in the Inpatient Room of X Denpasar Hospital

A description of oxygen saturation in children with asthma who were not given balloon blowing therapy in the inpatient ward of X Denpasar Hospital can be seen in Table 2.

Table 2. Oxygen Saturation in Children with Asthma Who Were Not Given Balloon Blowing Therapy

Variabel	**n**	***Min***	***Max***	***Mean±SD***
Pretest	22	95	96	95,55±0,51

Based on table 2, the results of oxygen saturation in children with asthma who were not given therapy were 95.55 (normal).

Oxygen Saturation in Children with Asthma Given Balloon Blowing Therapy in the Inpatient Room of X Denpasar Hospital

Table 3. Oxygen Saturation in Children with Asthma Given Balloon Blowing Therapy

Variabel	**n**	***Min***	***Max***	***Mean ± SD***
Posttest	22	96	98	97,36±0,73

Based on table 3, the results of oxygen saturation in children with asthma who were given therapy increased to 97.36 (normal).

Analysis of the Effect of Balloon Blowing Therapy on Oxygen Saturation in Children with Asthma in the Inpatient Ward of X Denpasar Hospital

The description of the effect of applying balloon blowing therapy on oxygen saturation in children with asthma in the inpatient room at X Denpasar Hospital owned by respondents can be seen in Table 4.

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Table 4. Analysis of the effect of applying balloon blowing therapy on oxygen saturation in children with asthma in the inpatient ward of X Denpasar Hospital

Oxygen Saturation	n	*Min*	*Max*	*Mean±SD*	*Z*	*P Value*
Pretest	22	95	96	95,55±0,51	-4,069	0,000
Posttest	22	96	98	97,36±0,73		

Based on the table above, the results of the Wilcoxon sign rank test obtained a p-value of 0.000 (p <0.05) with a Z value of -4.069 > (z table 1.96) which means the z value is above the critical value so it is concluded that hypothesis 1 (one) is accepted and Ho is rejected and has a moderate influence. The p-value from the results of the post-test analysis on respondents obtained 0.000, a value smaller than 0.05, which means there is an effect of the application of balloon blowing therapy on oxygen saturation in children with asthma in the Inpatient Room of X Denpasar Hospital. In this study, a normality test was not carried out because the data scale is ordinal.

DISCUSSION

Based on gender, it can be seen that the majority of children suffering from asthma are boys (14 people) (66.7%), followed by girls (8 people) (33.3%). Boys are at greater risk of developing asthma than girls. Boys have smaller airways relative to their lung volume, making them more susceptible to airway narrowing and asthma symptoms. By age 14, the prevalence of asthma is nearly twice as high in boys as in girls. However, by adulthood, the prevalence of asthma is higher in girls than in boys. The underlying reason for the link between gender and asthma is unclear. However, men's lungs are smaller than women's at birth and grow larger in adulthood (Prakoso et al., 2019). A similar study by Simamora et al. (2024) found a significant association.

Based on the Body Mass Index (BMI), most had a BMI of 18.5-22.9 (normal weight) as many as 16 people (72.72%), 25-29.9 (obese) as many as 4 people, and 23-24.9 (overweight) as many as 2 people. Decreased lung function and asthma are associated with individuals who have an underweight BMI. The adverse effects of asthma besides being overweight can also be from a low BMI. Underweight individuals also have poorer asthma

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control than those with a normal BMI. The higher the BMI, the lower the level of asthma control. Obesity impacts asthma, contributing to uncontrolled asthma and increasing inflammation, reducing lung function, and increasing gastroesophageal reflux, which can worsen asthma symptoms. Decreased lung volume is associated with a reduction in peripheral airway diameter, leading to impaired airway smooth muscle function (Andriani et al., 2019). A similar study conducted by Nurdin et al., 2021, found a significant relationship between BMI and asthma control. Excessive BMI and obesity

Based on body temperature, all children had a body temperature ≤37.5 (100%). Body temperature can affect oxygen saturation in children with asthma, especially during an asthma attack. High temperatures or temperature fluctuations can worsen asthma symptoms and decrease oxygen saturation. Conversely, maintaining a stable and comfortable body temperature can help keep oxygen saturation within the normal range in children with asthma (Yulia et al., 2019). A similar study was conducted by Hammad et al., (2022) entitled "Changes in Respiratory Rate and Body Temperature of Patients When an Asthma Attack Occurs". The results of the study showed that the respiratory rate during an asthma attack was 31, the median was 30, and the mode was 28 with an SD of 5.8. The patient's body temperature was an average of 37 C, the median value was 36.7, the mode value was 36.5 with an SD of 0.49.

Based on the results obtained, oxygen saturation in children with asthma who were not given therapy was 95.55 (normal category). In asthma patients, oxygen saturation before therapy can vary depending on the severity of the asthma attack. In mild asthma attacks, oxygen saturation may remain within the normal range (95-100%), but in moderate or severe attacks, oxygen saturation can drop below 95%, even below 90% or 85% in severe cases (Budhi et al., 2024). Several factors can influence oxygen saturation results, such as those measured while sitting upright in a chair being significantly higher than those measured while lying on the right or left side. Oxygen saturation values measured in five different body positions were significantly higher in women, individuals under 35 years of age, and those with a BMI below 25 kg/m2. Reduced lung volume may also explain the greater oxygen desaturation observed in the supine position. Compared with the sitting and lateral decubitus positions, the supine position causes a significant decrease in functional

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residual capacity (FRC) and expiratory reserve volume (ERV) (Samola et al., 2019). A similar study by Sitorus & Katharina (2019) showed a weak relationship between age and oxygen saturation (p-value 0.843) and no difference between gender and oxygen saturation (p-value 0.759). Another parallel study was conducted by Yosia (2022), the results of the study found a significant relationship between oxygen saturation and gender, however, another study conducted by Siti et al., (2020), the results of the study found no relationship between gender and oxygen saturation.

Based on the results obtained, oxygen saturation in children with asthma who received therapy increased to 97.36 (normal category). Asthma symptoms can be reduced by regularly practicing breathing techniques and exercises. The balloon blowing technique is one of many breathing relaxation methods. Balloon blowing works by opening the airway and causing the lungs to expand and deflate, thus improving lung expansion function. This occurs because distraction therapy opens up the airways in the lungs, reducing shortness of breath (Tunik et al., 2020). Repeated breathing exercises regularly can train the respiratory muscles, reduce the severity of respiratory disorders, and reduce symptoms of dyspnea, resulting in increased perfusion and repair of the alveoli, which can increase oxygen levels in the lungs, leading to increased oxygen saturation (Octaviani et al., 2023). A similar study was conducted by Lusiana et al. (2023), who measured oxygen saturation before administering breathing relaxation therapy using the balloon blowing technique in 61 samples with oxygen saturation ≤95%. The results of oxygen saturation measurements after administering breathing relaxation therapy using the balloon blowing technique in 45 samples with oxygen saturation 95%-100%.

Based on the results of the Wilcoxon sign rank test, a p-value of 0.000 ($p < 0.05$) was obtained with a Z value of -4.069 > (z table 1.96) which means the z value is above the critical value so it is concluded that hypothesis 1 (one) is accepted and Ho is rejected and has a moderate influence. The p-value from the results of the post-test analysis on respondents was obtained at 0.000, a value smaller than 0.05, which means there is an effect of the application of balloon blowing therapy on oxygen saturation in children with asthma in the Inpatient Room of X Denpasar Hospital. Changes in oxygen saturation stimulate peripheral chemoreceptors. These peripheral chemoreceptors transmit impulses to the

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respiratory control center to increase or decrease the respiratory rate in response to changes in oxygen saturation (Herman, 2023). However, several other factors influence oxygen saturation readings in patients, including hemoglobin (when oxygen concentration decreases, tissue flow decreases, resulting in decreased saturation, and hemoglobin levels), circulation (oximetry will not provide accurate readings if the area under the sensor experiences impaired circulation), and activity (excessive movement on the sensor side can interfere with accurate readings).

Balloon blowing is a breathing relaxation technique based on the principle of deep inspiration and prolonged expiration, with the mouth pursed. The aim is to help patients improve oxygen transport, control breathing patterns, reduce shortness of breath, increase respiratory muscle strength, reduce air trapped in the lungs, and improve chest cavity flexibility, thereby improving lung function (Pangesti & Dwi Kurniawan, 2022). A similar study was conducted by Setiawati & Rosmaini (2023), which found a relationship between anemia and low oxygen saturation levels with a p-value of 0.000. A similar study conducted by Hidayat et al. (2024) showed that balloon blowing therapy effectively reduced shortness of breath in asthma patients when performed for 3 days, with a frequency of 20 minutes per therapy. The average reduction in respiratory frequency was in the range of 21-23 breaths/minute and shortness of breath was reduced, and oxygen saturation gradually increased from 95% to 97-98%.

CONCLUSION(S)

This study, which examined the effect of balloon-blowing therapy on oxygen saturation in children with asthma in the inpatient ward of X Hospital, Denpasar, was not without its weaknesses and limitations. This limitation was that the researchers failed to control for several factors that influence the occurrence of asthma and oxygen saturation in patients, such as hemoglobin levels, medical history, family history of smoking, and activity.

Conflict of Interest

This research is research that is independently funded by the researcher so that the researcher does not have a conflict of interest with any party.

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Acknowledgment

The author would like to express his gratitude to the hospital which has given permission to collect research data and to all respondents who have agreed to be respondents in this research.

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