

# *Pulmonary Rehabilitation for Asthma Patients in Indonesia:*

## *A Literature Review*

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### Abstract

**Introduction:** Asthma is a chronic respiratory disorder characterized by airway inflammation and obstruction, significantly impacting the quality of life (QoL) and economic productivity in Indonesia. While pharmacological management remains the primary approach, Pulmonary Rehabilitation (PR) is increasingly utilized as a vital non-pharmacological supplement. **Method:** This literature review synthesized research from databases including PubMed, Web of Science, and Google Scholar through December 2025. The analysis focused on adult populations ( $\geq 15$  years) and evaluated PR components such as breathing exercises, aerobic training, and education. **Results:** Eight studies involving 189 patients were reviewed. The findings consistently show that PR interventions—particularly breathing techniques like Pursed Lip, Diaphragmatic, and Buteyko methods—significantly improve lung function, respiratory muscle strength, and QoL. Aerobic exercises like HIIT and asthma-specific gymnastics also showed positive outcomes in asthma control. **Conclusion:** PR serves as a holistic, patient-centered intervention that reduces the national disease burden in Indonesia. While breathing exercises and education are well-integrated, intensive physical modalities like cycling and strength training remain underutilized and require further investigation regarding their safety and efficacy in the Indonesian clinical context

**Keywords:** Pulmonary Rehabilitation, Asthma Rehabilitation, Asthma, Quality of Life, Exercise Capacity

### 1. INTRODUCTION

Asthma is a respiratory disorder defined by chronic inflammation and the narrowing of the airways, leading to obstruction of airflow and heightened bronchial hypersensitivity to various stimuli [1–3]. Clinical manifestations commonly include coughing, wheezing, and dyspnea, symptoms that are often exacerbated by sources such as allergens or viral infections [1,4]. While asthma is manageable, its high prevalence and acute exacerbations impose a significant public health burden, leading to frequent emergency department visits and substantial reductions in the quality of life for sufferers [5]. Indonesian Health Survey reported a total national prevalence of 850,000 asthma cases [6]. Significantly, West Java recorded the highest prevalence, contributing approximately 20% of the total number of asthma sufferers across the country.

The substantial disease burden of asthma directly impacts the Activity Daily Lives (ADL) and Quality of Life (QoL). Patients with poorly controlled asthma frequently experience compromised QoL, encompassing negative effects across physical, emotional, occupational, and social domains [7,8]. Furthermore, the consequences of poorly controlled asthma cases extend beyond the individual patient to their surroundings and the wider economy [9,10]. Specifically, the necessity of working while symptomatic (presenteeism) among asthma patients contributes to a significant financial burden on society due to lost productivity [11].

Asthma management in Indonesia currently employs a two-pronged approach: pharmacological and non-pharmacological therapy. Management protocols are primarily based on the Global Initiative for Asthma 2024 guidelines, utilizing a stepwise approach tailored to the patient's age [5]. In recent years, asthma management in Indonesia has increasingly supplemented with non-pharmacological therapies. Pulmonary Rehabilitation (PR) is one of non-pharmacological therapy, including exercise training, education, and lifestyle modification, all aimed at improving the physical condition, breathing control, and psychological well-being of patients [12,13]. Furthermore, PR is well-suited to the Indonesian context as it can be implemented independently at the community or individual level, which significantly benefits the patient's psychological state [14].

Pulmonary Rehabilitation demonstrates significant effectiveness in managing asthma symptoms. Experimental studies conducted on groups of asthmatic patients in Indonesia consistently show positive outcomes. Prior to intervention, these participants typically experienced reduced lung function resulting in dyspnea and lower quality of life. Physical activity and breathing exercise could decrease respiratory rate in asthma and control the frequency of asthma attacks [15–17].

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DOI : 10.35451/jkf.v9i1.3734

Received : June 25, 2026, Accepted: October 20, 2026, Published: October 30, 2026

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## **2. METHOD**

The purpose of this review is to synthesize current literature regarding the role of pulmonary rehabilitation in managing asthma. The framework of this review is built upon a multidimensional understanding of patient requirements and rehabilitation standards. PR is viewed as a comprehensive management, including Breathing Exercise, Cycling and Walking Exercise, Strength Training and Patient Education. By utilizing these standardized definitions, this review synthesizes existing research to provide a clear overview of the current landscape of pulmonary recovery.

### ***Search strategy and data sources***

To ensure a comprehensive synthesis of the evidence, a broad search was conducted across several key databases through December 2025, including Web of Science and PubMed. This search targeted literature focusing on patient populations with asthma, specifically examining their needs within the context of pulmonary rehabilitation. To capture gray literature and emerging research, supplemental searches were performed via Google Scholar and Neliti. Furthermore, citation search was conducted from 2020 through 2025 to identify the most recent developments in the field and ensure the inclusion of contemporary perspectives.

The search was conducted using a combination of key terms and Medical Subject Headings (MeSH) related to “asthma”, “pulmonary rehabilitation”, “pulmonary outcomes”, “physical capacity”, and “quality of life”. Additionally, the bibliography of identified studies and previous reviews were manually screened to uncover further relevant research that may not have appeared in the initial database results.

### ***Eligibility Criteria***

This literature review involves adult populations (15 years or older) diagnosed with asthma. Included studies specifically evaluated pulmonary rehabilitation programs—breathing exercise, cycling and walking exercise, strength exercise, and education—compared against standard care or no intervention. The analysis prioritized findings related to pulmonary function, functional capacity, and quality of life. Methodologically, the scope was limited to randomized controlled trials (RCTs) and pre-posttest design. Conversely, research was excluded if it focused primarily on non-asthma conditions or investigated isolated treatments like pharmacology without a structured rehabilitation component. Additionally, the review was restricted to English and Indonesian language publications with accessible data on the specified outcomes.

### ***Citation screening***

The selection process involved an independent screening of titles and abstracts by two researchers (NN and AN) to identify relevant literature. In cases where eligibility was unclear, the studies were promoted to a full-text review. Any discrepancies regarding the inclusion of specific articles were resolved through discussion with a third researcher (WOR) to ensure a consensus-based selection.

Data extraction process was employed to capture key study characteristics, such as publication details, geographical location, research objectives, and methodological frameworks. Beyond basic demographics and study designs, this review prioritized an in-depth analysis of pulmonary rehabilitation and patient outcomes. To maintain the integrity of the original findings, data coding was conducted independently by two researchers (NN and AN), ensuring that concepts were analyzed within their original context by reviewing the entirety of each study.

### 3. RESULT

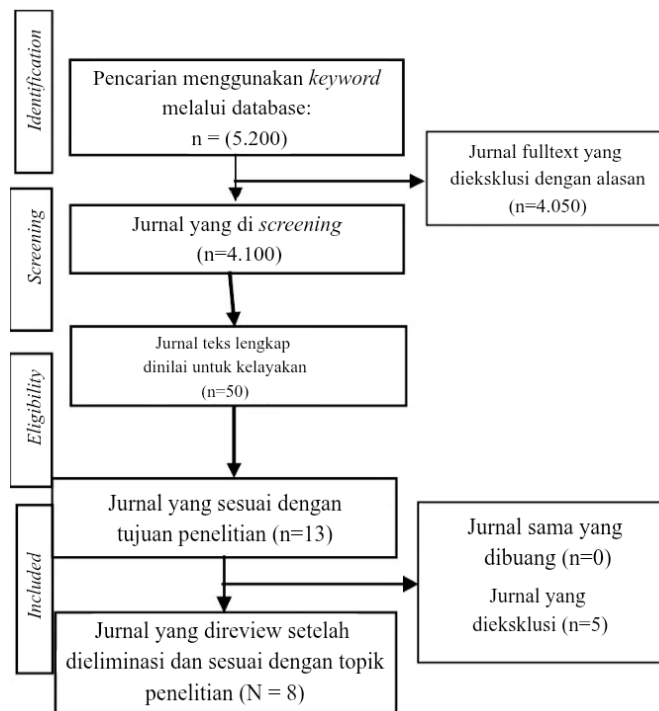


Table 1. Characteristic Study

| Author                      | Intervention                                                                              | Population | Age (Years) | Outcome                                                                                    |
|-----------------------------|-------------------------------------------------------------------------------------------|------------|-------------|--------------------------------------------------------------------------------------------|
| Firdausi et al 2022 [18]    | Treatment : Incentive Spirometry<br><br>Control Group : Diaphragmatic breathing exercises | 19         | 18-40       | - Asthma control status (ACT)<br>- Quality of life (SGRQ)<br>- 6-MWT<br>- Spirometry tests |
| Herlambang et al, 2022 [19] | Treatment : Aerobic-Asthma Exercise<br><br>No Control Group                               | 30         | 16-32       | - Peak Expiratory Flow Rate (PEFR)<br>- Quality of life.                                   |
| Amanati et al, 2023 [20]    | Treatment : Aerobic-Asthma Exercise<br><br>No Control Group                               | 19         | 35-66       | - Asthma Control Test (ACT)<br>- Vital Capacity                                            |
| Rifki et al 2023 [21]       | Treatment : HIIT<br><br>No Control Group                                                  | 21         | 17-40       | - FVC<br>- ACQ<br>- FEV1<br>- VO2 maks<br>- Asthma Control                                 |
| Jaya 2024 [22]              | Treatment : Diaphragm Breathing Exercise<br><br>No Control Group                          | 37         | 15-55       | - Respiratory rate<br>- Oxygen Saturation                                                  |

|                                |                                                                      |    |       |                                                          |
|--------------------------------|----------------------------------------------------------------------|----|-------|----------------------------------------------------------|
| Laily et al 2025<br>[23]       | Treatment: Aerobic-Asthma exercises and Buteyko breathing techniques | 33 | 15-18 | - Asthma Control Test (ACT)<br>- Pulse Rate              |
|                                | No Control Group                                                     |    |       |                                                          |
| Napitupulu et al 2025<br>[24]  | Treatment : Deep Breathing Exercise                                  | 30 | 20-50 | Asthma Control Test (ACT)<br>Skala Borg                  |
|                                | No Control Group                                                     |    |       |                                                          |
| Arisdiani et al., 2025<br>[25] | Treatment : Education related Pursed Lips Breathing                  | 30 | 18-50 | - Respiratory Rate<br>- Peak Expiratory Flow Rate (PEFR) |
|                                | No Control Group                                                     |    |       |                                                          |

#### 4. DISCUSSION

This literature review explores the role of pulmonary rehabilitation in Indonesia as a comprehensive intervention model. The finding contributes to the evidence base for delivering asthma-specific intervention through pulmonary rehabilitation. Analysis of seven studies involving 189 asthma patients revealed that while PR programs improve lung function, reduce exacerbation, quality of life. This finding also provides an essential update on how PR programs perform in clinical practice in Indonesia.

In Indonesia, most asthma interventions focus on breathing techniques, such as Pursed Lip Breathing, Diaphragmatic Breathing, and the Buteyko method. Among non-pharmacological treatments, these breathing exercises are recognized as having the highest level of clinical evidence [5,16,26]. A systematic review by Burge et al indicated that breathing exercises consistently enhance health-related quality of life, supporting their implementation as a standard intervention for individuals with asthma [27]. Diaphragmatic training programs improve respiratory muscle function by applying resistance to the diaphragm and supporting inspiratory muscles [28,29]. Moreover, the Buteyko method facilitates respiratory regulation by combining periods of reduced ventilation with specific breath-holding pauses. This approach aligns with standard physiotherapy intervention designed to stabilize breathing patterns in patients presenting with chronic hyperventilation symptoms. These breathing methods offer a practical way to make Indonesian asthma care more holistic and patient centered.

Research regarding the effectiveness of cycling and walking for asthma management in Indonesia is limited. This suggests that asthma care in Indonesia has not yet prioritized these specific forms of exercise. The other possible reason is because of a patient's fear of experiencing exercise-induced bronchoconstriction (EIB) [3]. However, some RCT research showed significant impact on lung function and quality of life [30–32]. Vilanova-Pereira et al conducted a RCT involving 144 adults with asthma utilizing Nordic Walking (NW) combined with education sessions [31]. The NW performed for one hour over eight weeks, resulting in significant improvements in lung function and quality of life. In patients with chronic respiratory diseases, Circuit training resulted in clinically significant spirometric gains and symptomatic improvement across participants [33]. These results suggest that walking and cycling is a safe, practical, and scalable approach to pulmonary rehabilitation for asthma patients. Furthermore, Akaras and Güzel recommend that walking or cycling should be performed for 20- 30 minutes daily at an intensity 60%-80% VO<sub>2</sub>peak [34].

Research specifically addressing strength training for asthma in Indonesia remains limited. However, a recent study by Rifki et al explored the use of High-Intensity Interval Training (HIIT) [21]. The existing literature suggests that 30 minutes of strength training effectively enhances peripheral muscle strength and functional capacity [35–37], which improves exercise tolerance and activity in daily living. However, Lo Bello et al found that participants with moderate-to-severe asthma, supplementing strength training does not seem to yield superior quality-of-life outcomes [38]. The possible reason for lack of significant differences is both study groups utilized endurance training, which is already well-established gain beneficial in asthma. Additionally, the use of the Borg Scale to monitor exercise intensity rather than objective measures of muscle strength, potentially impacting the result. Therefore, it is recommended that Indonesian health professionals integrate both endurance and strength exercises for better functional results, despite the reliance on simple, low-cost equipment.

Education for asthma has been extensively implemented in Indonesia, however research focusing on its impact on patients with asthma remains limited. A study by Arisdiani et al evaluated the effectiveness of asthma education in enhancing respiratory quality [25]. Data from the 30 participants demonstrated a significant improvement in respiratory function. These positive outcomes may be contributed to the specificity of the materials regarding pursed lips breathing technique. Current health guidelines recommended that family involvement in educational activities leads to a better understanding of asthma management [39–41]. The education materials should ideally encompass healthy eating, vaccines, and intervention for mild symptoms at home. This leads to fewer missed school or workdays and fewer breathing problems during the day. Moreover, GINA emphasizes that asthma education is a very important part of Pulmonary Rehabilitation [5].

A limitation of our study is limited RCT study design, thus future research should prioritize RCT for methodological rigor over simple pre-post test designs. There is significant gap in Indonesia specific research regarding the effectiveness of cycling and walking, therefore future studies should investigate the safety and efficacy of this intervention. While education is recognized as a crucial program, further research should identify the most effective delivery methods for Indonesian families to ensure better home-based management of mild symptoms.

Overall, we found that PR serves as a vital non-pharmacological supplement to standard asthma care in Indonesia. Current evidence highlights that breathing exercises significantly improve lung function, respiratory muscle strength, and patient quality of life. While pharmacological management remains, the primary approach following GINA guidelines, PR offers a holistic, patient-centered method to reduce the national disease burden. However, while education and breathing techniques are well-integrated, more intensive physical modalities like cycling, walking, and strength training remain underutilized in the Indonesian clinical context.

## 5. CONCLUSION

Pulmonary Rehabilitation (PR) is vital non-pharmacological intervention to standard asthma care in Indonesia. The evidence highlights that structured interventions—particularly breathing exercises such as the Buteyko method, Diaphragmatic breathing, and Pursed Lip breathing—significantly improve lung function, respiratory muscle strength, and the overall quality of life for patients. While education and breathing techniques are currently well-integrated into the Indonesian clinical context, more intensive physical modalities like cycling, walking, and strength training remain underutilized. This gap is often attributed to a lack of prioritized care in these areas and patients' fear of experiencing exercise-induced bronchoconstriction. To reduce the national disease burden effectively, future research should prioritize Randomized Controlled Trials (RCTs) to investigate the safety and efficacy of these underused physical interventions and identify the most effective delivery methods for family-based asthma management. Overall, PR offers a holistic, patient-centered approach that effectively complements pharmacological management under GINA guidelines.

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