

Systematic Review: Evaluating the Effectiveness of Self-Management Strategies in Reducing Asthma Exacerbation Frequency Among Patients

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Abstract

Introduction: Asthma, a long-term inflammatory condition, is characterized by constriction of the airways and heightened sensitivity, resulting in symptoms such as coughing, difficulty breathing, chest constriction, and wheezing. In Indonesia, asthma prevalence stands at 5% of the total population, equating to approximately 12.5 million individuals affected by the disease.

Objectives: In this systematic review, several exclusion criteria were applied. Articles were eliminated if they were not published in international journals or fell outside the 2018-2023 time period. The review also disregarded studies that did not investigate self-management interventions utilizing media, involved participants beyond the 12-22 age range, lacked accessible full texts, were duplicate entries, employed non-RCT methodologies, or were deemed non-scientific in nature.

Methods: A systematic review approach was adopted for this research, following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol. In December 2023, the investigators performed a literature search using the query "Asthma And Self Management" in both Google Scholar and PubMed databases. To ensure the studies included were relevant and of high quality, the researchers applied pre-established inclusion and exclusion criteria during the article selection process.

Results: The critical appraisal evaluation revealed that all eight articles were of high quality. These articles are presented in a tabular format, encompassing details such as the researcher's name and publication year, article title, methodology, research objectives, intervention, and outcomes. The review examines the efficacy of implementing self-management strategies for individuals with asthma to reduce asthma recurrences.

Conclusions: This systematic review demonstrates that self-management interventions have a positive impact on individuals with asthma by reducing the frequency of exacerbations and associated treatment costs. Multiple studies have corroborated these findings, albeit with varying research durations. Longer intervention periods are associated with more substantial effects. While the media utilized for self-management interventions remain consistent, the outcomes of these interventions may exhibit variability.

Keywords: Self-management, Reduction in frequency of asthma recurrence, Asthma, Randomized Control Trial, PRISMA.

Introduction

Asthma is a chronic inflammatory disorder of the airways characterized by narrowing, hyperresponsiveness, and obstruction that leads to recurrent symptoms such as coughing, breathlessness,

chest tightness, and wheezing [1]. According to the World Health Organization, approximately 300 million individuals worldwide were affected by asthma in 2018, with the number continuing to rise annually. In Indonesia, asthma affects about 5% of the population, which equates to roughly 12.5 million people. Data from 2018 revealed that 1,017,290 individuals in Indonesia suffered from asthma, placing it among the top ten causes of morbidity and mortality in the country [2].

Recurrent asthma symptoms commonly include wheezing, shortness of breath, chest constriction, and coughing, particularly during early morning hours. The condition can be triggered by both endogenous and exogenous factors. Endogenous factors involve antigen-antibody reactions, whereas exogenous triggers include environmental allergens such as dust, powder, and animal dander. Other contributing factors include respiratory infections caused by influenza viruses and mycoplasma pneumonia, exposure to cold or fluctuating temperatures, air pollutants such as carbon monoxide and cigarette smoke, chemical irritants, fragrances, and even psychological stressors like fear, anxiety, and fatigue [3]. Among these, allergen exposure plays a particularly crucial role, especially in patients with IgE-mediated hypersensitivity, often leading to recurrent asthma attacks.

Consequently, effective self-management practices are essential to reduce the frequency and severity of asthma exacerbations. Self-management empowers patients to take an active role in monitoring and controlling their condition through strategies such as trigger avoidance, medication adherence, and recognizing early warning signs of exacerbation. The primary goal of self-management is to improve patients' quality of life, enabling them to perform routine activities without significant limitations [4–6]. Given that asthma remains a chronic condition with no complete cure and multiple potential triggers, consistent and informed self-management is vital in preventing recurrent attacks and maintaining long-term control over the disease [7].

Objectives

This systematic review excluded studies that were not published in international journals or between 2018-2023, did not examine self-management interventions utilizing media, involved participants outside the 12-22 age range, lacked full-text availability, were duplicates, employed non-RCT designs, or were not scientific in nature. The initial literature search conducted in Google Scholar and PubMed databases yielded 1,173 articles. Following the identification and screening processes, 8 articles were determined to meet the established inclusion and exclusion criteria.

Methods

This research adopts a systematic review methodology based on the **Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)** guidelines, ensuring transparency, rigor, and reproducibility throughout the review process [1]. The study commenced with the formulation of a well-defined **PICO framework**, which served as the foundation for identifying and selecting relevant studies. The PICO components are as follows: **P (Population)** – individuals diagnosed with asthma; **I (Intervention)** – implementation of game-based self-management strategies aimed at improving asthma control and patient adherence; **C (Comparison)** – absence of similar interventions or use of conventional asthma education and management methods; and **O (Outcome)** – reduction in the frequency and severity of asthma exacerbations, along with improvements in self-efficacy and overall quality of life [2].

A comprehensive **literature search** was conducted using the keywords “Asthma” AND “Self-Management”, with a specific focus on studies that incorporated interactive or game-based educational

tools designed to enhance self-management behaviors among asthma patients [3]. The search was performed in **December 2023**, utilizing reputable electronic databases such as **Google Scholar** and **PubMed** to ensure broad coverage of both peer-reviewed and open-access studies [4].

The selection process followed a **multi-stage screening procedure**. Initially, duplicate studies were identified and removed. Subsequently, the titles and abstracts of the remaining articles were screened for relevance based on the inclusion criteria [5]. Studies were included if they (1) involved human participants diagnosed with asthma, (2) evaluated a form of game-based or digital self-management intervention, (3) reported measurable outcomes related to asthma control or exacerbation reduction, and (4) were published in English within the last ten years [6]. Studies focusing on non-asthma populations, animal studies, or those lacking measurable outcomes were excluded [7].

Full-text reviews were then conducted for the shortlisted studies to assess their methodological quality and relevance to the research objectives [8]. Data extraction focused on key study characteristics, including author information, year of publication, sample size, intervention type, duration, outcome measures, and main findings [9]. Any disagreements between reviewers during the selection or extraction process were resolved through discussion to ensure consensus [10].

Finally, all eligible studies were critically appraised to evaluate their quality, risk of bias, and contribution to understanding the effectiveness of game-based self-management interventions for asthma [11]. The synthesized findings aim to provide evidence-based insights into the potential of gamified approaches in enhancing patient engagement, adherence to treatment, and reduction in asthma exacerbations, thereby contributing to improved clinical outcomes and patient empowerment [12-15].

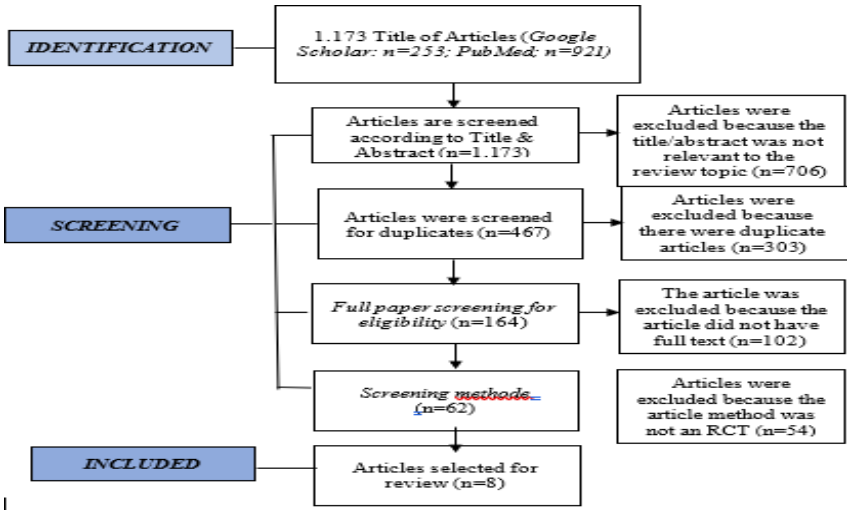


Figure 1 Schematic Representation of Article Selection Process Following PRISMA 2020 Guidelines

Results

The identification and screening process yielded 8 articles, which were subsequently subjected to a critical evaluation to assess the appropriateness of the research methodologies employed. The assessment employed the CASP JBI 2020 (Critical Appraisal Skills Program 2020) tool. Since this systematic review adopted a randomized controlled trial (RCT) methodology, a questionnaire comprising 13 items was applied to assess the caliber of each investigation. The quality rating system

categorized articles as follows: 100-80% was considered good, 79-50% was deemed adequate, and less than 50% was classified as poor based on the critical assessment results.

The quality assessment process determined that all eight studies were of superior caliber. These studies are subsequently displayed in a table format, encompassing information such as the authors' names and publication dates, study titles, research methods, study aims, interventions, and results. Numerous research efforts have investigated novel methods for enhancing asthma self-care through the use of digital technologies, educational initiatives, and organized interventions.

A randomized controlled trial (RCT) was performed by Landesberger et al.⁵ (2023) to assess the effectiveness of the APOLLO application, which was created to support individuals suffering from pollen-induced allergic rhinitis and asthma. The app incorporated game-like features and offered users up-to-date pollen information from Bavaria, Germany. For a period of 60 days, participants utilized the app on a daily basis to monitor their allergy symptoms, with the results displayed through indices and visual representations. Approximately two-thirds of the study participants (N=46) stated that they felt more knowledgeable about their allergies and pollen levels, while more than 80% expressed contentment with the app's user interface and indicated they would suggest it to others.

A pragmatic, decentralized randomized controlled trial (RCT) was conducted by Silberman et al.⁶ (2022) to evaluate a digital asthma self-management (DASM) program for adults in the United States. The study, which lasted 24 months and included 900 participants, compared a group using the DASM intervention to a control group. The researchers examined two primary outcomes at the one-year mark: the costs associated with acute asthma care and the changes in Asthma Control Test™ scores. This investigation aimed to shed light on the potential advantages of implementing digital tools for managing asthma.

Rhee et al.⁷ (2021) conducted research to evaluate the effectiveness of a peer-led asthma self-management education initiative for adolescents aged 12–17 years (N=259) residing in urban areas across three U.S. cities. The program consisted of educational sessions held at a day camp, with subsequent bi-monthly follow-ups over a 12-month period. Peer leaders effectively conveyed 85–95% of asthma knowledge and skills information but omitted 14% of psychosocial content compared to adult educators, who covered all material. The PLASMA intervention group showed high content and time adherence (94%–97.6%) during educational sessions, although follow-up communication rates were superior in the attention control group.

In their study, Poowuttikul and Seth⁸ (2020) underscored the significance of smartphone health apps in improving asthma self-care. Their analysis revealed that these digital tools, including devices for tracking inhaler usage, led to better adherence to medication regimens, improved overall well-being, and potentially lowered medical expenses. These technological solutions offer promising avenues for asthma management across various demographic groups.

A randomized controlled trial was performed by Kohler et al.⁹ (2020) to compare the effectiveness of an online asthma self-management program (eAEP) with a traditional clinic-based program (pAEP). The study revealed that participants in the eAEP group demonstrated notable improvements in their asthma knowledge. Their Asthma Knowledge Test (AKT) scores increased significantly from an initial 41.57 (SD = 5.63) to 45.82 (SD = 3.84) upon completion of the program ($p < 0.001$). These knowledge gains continued to grow, reaching 47.20 (SD = 3.78) after the pAEP was completed. Although participants in the pAEP group also showed improvements in their AKT scores.

A study by Schneider et al.¹⁰. (2019) investigated the effectiveness of an asthma management application designed specifically for teenagers. The research involved a 20-participant trial lasting three months. The application was designed to assist users in tracking their asthma condition, provide reminders for peak flow measurements, and enhance communication with medical professionals. Although participants acknowledged the app's usefulness in managing their condition, various external elements hindered its regular usage. The adolescents in the study proposed changes to enhance the app's appeal to their age group.

A study by Sazlina et al.¹¹ (2019) investigated the viability of an assisted asthma self-management initiative incorporating visual action plans. The research evaluated asthma control at 1, 3, and 6-month intervals, along with additional outcomes such as adherence to medication, asthma attacks, and hospital admissions. After six months, the number of participants with well-controlled asthma rose from 30.4% to 64.4%. The study also observed substantial decreases in severe asthma episodes, emergency department visits, and hospitalizations. These improvements resulted in estimated cost savings of RM15,866.22 (USD 3,755.36) for 59 participants over the half-year period.

Finally, Harris et al.¹² (2019) created a self-management intervention for teenagers based on theoretical principles, utilizing the COM-B model. The initiative incorporated theater workshops for all students in grades 7 and 8, along with specialized self-management sessions for asthmatic individuals. Information was gathered at the start and at 3, 6, and 12 months following the intervention. The study's outcomes were intended to guide public health policies, with plans to share the results at conferences and with local health authorities.

Discussion

An analysis of eight studies examining the impact of self-management on asthma recurrence revealed that self-management significantly reduces the frequency of asthma episodes while also lowering overall treatment costs. Studies by Sazlina et al [14], Schneider et al [15], and Silberman et al [16] reported that self-management interventions are practical and easily applicable for individuals with asthma and their families, as the required tools and resources are portable and accessible at any time.

Self-management has been shown to enhance family knowledge regarding asthma care, with more than 80% of participants reporting improved understanding of asthma management techniques. Sazlina et al [14] demonstrated that structured action plans significantly improve patient and caregiver awareness of symptom control and medication use. Similarly, Schneider et al [15] observed that mobile app-based self-management programs increased patient confidence and engagement in daily asthma care.

Evidence further suggests that self-management promotes independence among asthma patients, particularly in identifying triggers and implementing preventive strategies to reduce recurrence. Silberman et al [16] highlighted that digital self-management interventions improved adherence to treatment protocols and facilitated timely decision-making during symptom exacerbations. Improved adherence to self-management practices was consistently observed when compared to baseline levels.

Overall, the findings indicate that self-management not only enhances knowledge but also improves the quality of life and clinical outcomes of asthma patients. By providing clear guidance on medication schedules, trigger avoidance, and symptom monitoring, self-management programs play a critical role in reducing asthma recurrence and supporting long-term disease control for patients and their families [14–16].

Conclusion

This systematic review shares a common focus with previous research on utilizing self-management interventions for asthma patients. These interventions have shown beneficial effects for individuals with asthma, as they lead to a decrease in the frequency of asthma episodes. Furthermore, they contribute to reducing the financial burden associated with asthma treatment. The study also revealed variations in outcomes between adolescent and adult participants or control groups. Notwithstanding these variations, the overall results indicated that interventions focused on self-management were successful in reducing the frequency of asthma exacerbations across all cohorts.

Conflict of interest: Nil

Reference

1. Astriani, N. D., Ariana, P. A., Dewi, P. S., Heri, M., & Cita, E. E. 2020. PKM: Pelatihan Relaksasi Nafas Ballon Blowing untuk Meningkatkan Saturasi Oksigen Pada Warga Desa Bungkulan Singaraja. *Jurnal Pengabdian Multidisiplin*, 1-7.
2. Dwipayanti, P. I., & Siswantoro, E. 2020. Asthma Self Management Education Terhadap Perilaku Pencegahan Kekambuhan Asthma. *Journal of Ners Community* Vol 12 No 2, 214-219.
3. Harris, K., Mosler, G., & Grigg, J. 2019. Theory- Based Self-Management Intervention to Improve Adolescents Asthma Control: A Cluster Randomised Controlled Trial Protocol. *BMJ*, 1-7.
4. Kohler, B., Kellerer, C., Schlutz, K., Wittmann, M., Atmann, O., Linde, K., . . . Schneider, A. 2020. An Internet-Based Asthma Self-Management Program Increases Knowledge About Asthma. *Deutsches Arzteblatt International*, 64-71.
5. Landesberger, V., Grenzebach, K., Schreiber, F., Nowak, D., Goger, M., Oppel, E., . . . Heinze, S. 2023. Conception and Pilot Testing Of Self- Management Gealth Application for Patients Health Application for Patients With Pollen- Related Allergic Rhinitis and Allergic Asthma the APOLLO App. *Scientific Reports*, 1-7.
6. Mahardika, H., & Widiati, A. 2023. Penerapan Terapi Blowing Ballon Untuk Mengurangi Sesak Napas Pada Pasien Asma Di Rumah Sakit Dr. Gondro Suwarno Ungaran. *Jurnal Ilmiah Ilmu Keperawatan*, 338-341.
7. Niespodziana, K., Borochova, K., Pazderova, P., Schlederer, T., Astafyeva, N., Baranovskaya, T., Valenta, R. 2020. Toward Personalization of Asthma Treatment According to Trigger Factor. *Journal of Allergy and Clinical Immunology*, 1529-1534.
8. Oktaviani, K., & Sutrisna, M. 2021. Diaphragm Breathing Exercise Influence On Bronchial Asthma Attacks In Bengkulu City. *Jurnal Vokasi Keperawatan* Vol. 4 No. 2, 394-405.
9. Poowuttikul, P., & Seth, D. 2020. New Concepts and Technological Resources in Patient Education and Asthma Self-Management. *Clinical Reviews in Allergy & Immunology*, 1-19.
10. Rahman, T., Saha, D., & Ta'adi. 2019. The Effect Chest Physiotherapy On Changes Respiratori Rate (Rr) In Asthma Patients In Patut Patut Patju Hospital West Nusa Tenggara. *International Journal of Allied Medical Sciences and Clinical Research*, 631-637.
11. Rahmawati, N. D., Hilmi, I. L., & Salman. 2023. Review Analisis Efektifitas dan Resiko Tokositas Aminofilin Pada Pengobatan Penyakit Asma. *Journal Of Pharmaceutical And Science* Vol. 6 No. 1, 95-99.
12. Rhee, H., Grape, A., L. T.-B., Wicks, M., Sloand, E., & Butz, A. 2021. Fidelity of a Peer-Led Asthma Self Management Intervention and Its Attention Control in A Multi-Site Study of Urban Adolescents. *Res Nurse Health*, 195-205.
13. Santino, T. A., Chaves, G. S., Freitas, D. A., Fregonezi, G. A., & Mendoca, K. M. 2020. Breathing Exercises for Adults with Asthma . *Cochrane Database of Systematic Reviews* 3(3), 908-920.
14. Sazlina, S. G., Lee, P. Y., Cheong, A. T., Hussein, N., Pinnock, H., Salim, H., . . . Khoo, E. M. 2019. Feasibility of Asupport Sel-management with A Pictorial Actions Plan to Improve Asthma Control.

Primary Care Respiratory Medicine, 31-40.

15. 15.Schneider, T., Baum, L., Amy, A., & Marisa, C. 2019. I Have Most Of My Asthma Under Control and I Know How My Asthma Acts: User's Perceptions Of Asthma Self-Management Mobile App Tailored For Adolescents. Health Informatics Journal , 342-353.
16. Silberman, J., Sarlati, S., Harris, B., Bokhari, W., Boushey, H., Chesnutt, A., Lee, R. A. 2022. A Digital Approach to Asthma Self-Management in Adults: Protocol for A Pragmatic Randomized Controlled Trial. Centempory Clinical Trials, 1-9.