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REVIEW ARTICLE

Physical exercise is a non-pharmacological method to manage asthma in peoples with asthma: Systematic review

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Abstract

Asthma is a chronic inflammatory disease of the airways that affects over 250 million people worldwide and is responsible for approximately 455,000 deaths annually. Characterized by variable expiratory flow and respiratory symptoms such as persistent cough, wheezing, shortness of breath, and chest tightness, asthma can significantly hinder daily activities and quality of life. While pharmacological treatments are essential for managing asthma, non-pharmacological interventions, including physical activity, nutritional changes, and psychological support, play a crucial role in alleviating symptoms and enhancing overall well-being. Aerobic training, in particular, has been shown to provide health benefits that are dose-dependent, improving the quality of life for asthma patients. Despite the potential benefits of physical activity, individuals with asthma may experience exercise-induced bronchoconstriction, which can trigger symptoms during exertion. Historically, patients were advised to avoid exercise; however, recent studies suggest that regular exercise can improve fitness levels and reduce exacerbations in asthmatics. This review highlights the importance of integrating structured physical activity into asthma management strategies for peoples who often face challenges related to obesity and inadequate asthma control. Regular moderate-intensity aerobic exercise can enhance lung function, improve asthma control, oxygen uptake, immune function, antioxidant capacity, and reduce septum eosinophil and fractional exhaled nitric oxide and promote social engagement, making it essential for asthmatics to remain active. Individuals with asthma can participate in exercises like those without the condition, aiming for 20-30 minutes of activity 2-3 days a week. It's important to consult a healthcare provider before starting any exercise program and to use beta-2 agonists if experiencing exercise-induced bronchoconstriction.

Introduction

Asthma is a chronic inflammatory disease of airways characterized by variable expiratory flow, respiratory symptoms, and exacerbations that can lead to hospitalization or even death globally, over 250 million people are affected by asthma and in 2019, and it was responsible for approximately 455,000 deaths (Kostakou et al., 2019). Common symptoms include a persistent cough, particularly at night, wheezing during exhalation and sometimes inhalation), shortness of breath and chest tightness, which can hinder deep breathing (Vos et al., 2020).

To alleviate asthma symptoms, various non-pharmacological interventions can be employed (Tong, 2024). Physical activity, particularly aerobic training, is emphasized for its health benefits and the health benefits of exercise appear to be dose-dependent to enhance the quality of life for patients (Miller et al., 2016). Nutritional interventions advocate for diets rich in fruits and vegetables, along with antioxidant supplementation. Additionally, psychological interventions are recognized as essential tools for addressing the emotional challenges associated with asthma (Clemente et al., 2023).

While physical exercise is recommended to combat obesity and reduce the risk of various diseases it can also trigger asthma symptoms through exercise-induced bronchoconstriction, and physical deconditioning related to obesity can cause dyspnea and exercise limitations that may mimic asthma symptoms (Oudjedi & Aissa, 2020). Despite these challenges, regular aerobic exercise has been shown to provide significant health

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benefits for healthy individuals, prompting interest in its potential advantages for asthma patients (Jaakkola et al., 2019).

Historically, individuals with asthma were advised by healthcare providers to avoid physical exercise, but recent studies suggests that physical activity can enhance fitness levels and overall wellness in asthmatics , reduce the incidence of exacerbation, and serve as a valuable adjunct therapy in asthma treatment potentially decreasing corticosteroid use, although its effectiveness in controlling asthma remains debated (Panagiotou et al., 2020). Research indicates that peoples with asthma experience a notably poor health-related quality of life, primarily due to factors such as advanced age, insufficient physical exercise, and inadequate asthma control; therefore, future initiatives in asthma care should focus on developing effective strategies that not only improve asthma management and encourage regular physical activity among patients, particularly the elderly, to enhance their overall health outcomes (Jarab et al., 2023). This review aims to highlights the benefits of physical exercise in managing and controlling asthma symptoms in individuals with asthma.

Methods

This systematic review used a systematic search, were employed, electronic database searching and hand-searching. The electronic databases search included PubMed, Web of Science, Scopus and literature reports. All databases were searched from beginning of March first 2024. Due to meeting the eligibility criteria (See Figure 2) 14 articles was selected for this systematic review.

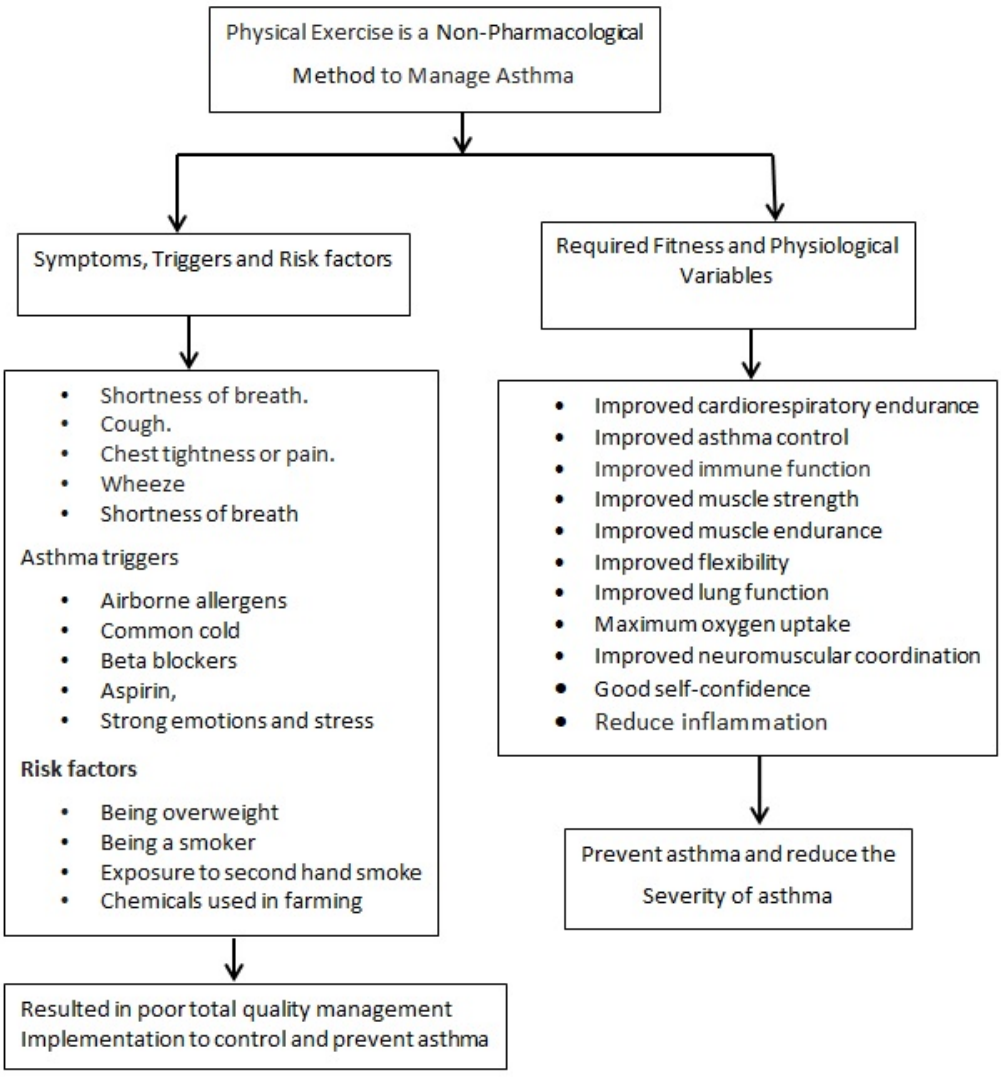

Figure 1. Conceptual frame work.

Articles with Moderate physical exercise intervention for children and adults of asthmatic people were relevant in search the process. To ensure literature saturation, the reference lists of included studies or relevant reviews identified through the search was scanned.

Studies that are conducted on children and adults of asthmatic peoples included in this review. Only studies published in English language with physical exercise interventions were included for this systemic review. Studies that are on healthy subjects, athletes, articles published before 2002, poster presentations and dissertations were excluded from this systemic review. This systematic review followed the PRISMA guidelines.

Outcome Measurements and Results of the Study

Lung function, Asthma control, Respiratory muscles and pulmonary function, Oxygen uptake, Pathophysiological, Bronchoconstrictive component of the diving reflex, Sputum eosinophil and fractional exhaled nitric oxide, Antioxidant capacity and pulmonary function, Bronchi hyper activity and aerobic capacity and indices of spirometer measurements were assessed in the studies. The details for each outcome measure and results in the studies are shown in Table 1.

Exercises Prescription for Person with Asthma

Asthma significantly affects adults' quality of life across social, emotional, physical and occupational domains, necessitating improved follow-up care and patient education to mitigate disease progression and achieve optimal therapeutic outcomes (Kharaba et al., 2022). Bronchial asthma in adults is linked to a significant decrease in physical activity levels compared to healthy individuals, which is often accompanied by a lower perceived health status. This observation supports the idea that physical exercise could serve as a potential pathway to improve care outcomes for individuals with asthma (Van't Hul et al., 2016). Moderate exercise training has been associated with reductions in pulmonary and systemic inflammation, bronchial hyper-responsiveness, and exercise-induced bronchoconstriction. These improvements positively affect the clinical condition of asthma patients, leading to enhanced quality of life (de Lima et al., 2023). Studies indicate that physical exercises can improve cardiopulmonary fitness and are generally well-tolerated among individuals with asthma. Consequently, patients with stable asthma should be encouraged to engage in regular exercise training without the fear of exacerbating their symptoms (Chandratilleke et al., 2012).

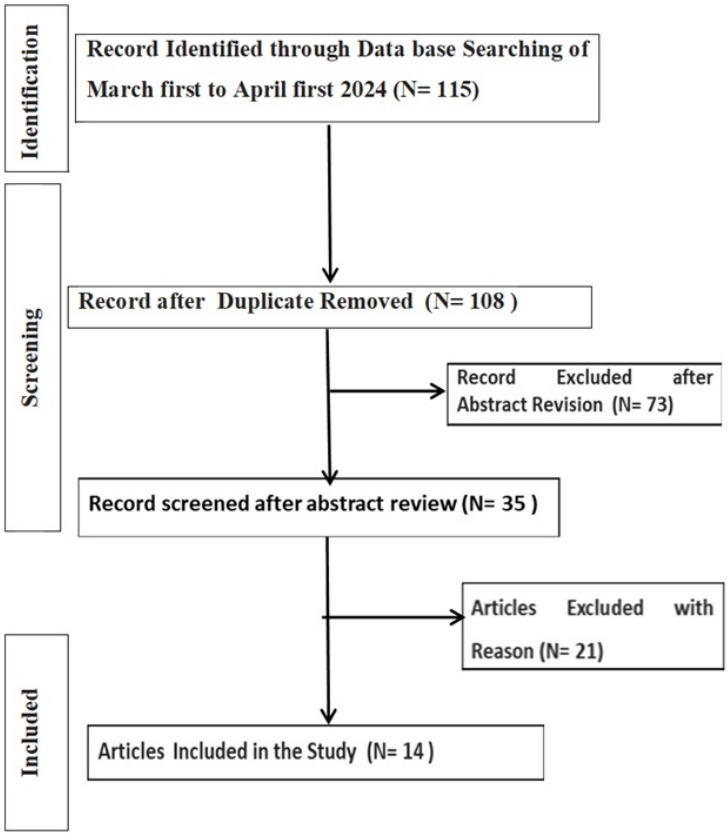

Figure 2. Screening and selection of studies.

Table 1
Basic characteristics and benefits of exercises in person with asthma in the included literatures.

Author and year	Study Design	Study Participants	Intervention	Outcome measures	Key Results
Ang et al., 2023	RCT	Adults with asthma (n=1137)	Aerobic exercises	Asthma control and quality of life	Improve asthma control and quality of life
Evaristo et al., 2020	RCT	Adults with Asthma aged 30-65 yrs (n=54)	Treadmill/Aerobic exercises for 40 minutes per session, twice a week, for 12 weeks	Asthma control	Improvement in asthma control
Farid et al., 2005	RCT	Patients with Asthma (n=36)	Aerobic exercises for eight weeks	Pulmonary function	Improved Pulmonary function
Xiang et al., 2024	RCT	Adults with asthma (n=333)	Inspiratory muscle training	Respiratory muscles and pulmonary function	Enhance Respiratory muscles and pulmonary function
Chandratilleke et al., 2012	RCT	Children with asthma (n=260)	Aerobic exercises for 20 minutes per session, twice a week, for four weeks	Oxygen uptake and cardiopulmonary fitness	Improve Oxygen uptake and cardiopulmonary fitness
De Lima et al., 2023	RCT	Adults with asthma	Aerobic exercises with high intensity	Pathophysiological variables	Improve Pathophysiological variables
Fanelli et al., 2007	RCT	Children with asthma (n=38)	Aerobic exercises	Lung function	Improve in lung function
Greenfield et al., 2023	RCT	Old women with asthma aged 49 yrs	Open water swimming/Aerobic exercises	Bronchoconstrictive component of the diving reflex.	Improved immune function
Jaakkola et al., 2019	RCT	Adults with asthma age 16-65 yrs (n=131)	Aerobic exercises for 20 minutes per session, three times per week, for 24 weeks	Asthma control,	Improves asthma control
Mendes et al., 2011	RCT	Patients with asthma (n=68)	Aerobic exercises for three months	Sputum eosinophil and fractional exhaled nitric oxide	Reduces sputum eosinophil and fractional exhaled nitric oxide
Moeini et al., 2018	RCT	Adults males with asthma (n=30)	Aerobic exercises	Antioxidant capacity and pulmonary function	Increase antioxidant capacity and pulmonary function
França-Pinto et al., 2015	RCT	Patients with asthma aged 20-59 yrs (n=43)	treadmill /Aerobic exercises for 35 minutes per session, twice a week, for 12 weeks	Bronchi hyper activity and aerobic capacity	Increase VO_2 maximum and aerobic power
Meyer et al., 2015	RCT	Adults with asthma (n=21)	Aerobic exercises for 60 minutes per week, for 12 months	VO_2 maximum	Increase VO_2 maximum
Beggs et al., 2013	RCT	Patients with asthma aged under 18 yrs (n=262)	Swimming / Aerobic exercises	VO_2 maximum	Improved VO_2 maximum

RCT: Randomized control trial; n: Number of participants; yrs: Years

Physical activity is a vital component of asthma management, making it essential to keep individuals with asthma as active as possible. This involvement not only promotes social engagement but also allows them to participate in physical and sports activities alongside healthy individuals (Sýkorová, 2022). Aerobic exercise interventions have been shown to improve asthma control and quality of life during both acute and chronic response phases (Ang et al., 2023). Engaging in regular moderate-intensity aerobic exercise for at least 20 minutes, two to three times a week over four weeks, has been proven to enhance lung function and quality of life in asthmatic patients, with swimming and treadmill training being recommended as suitable exercise options (Wu et al., 2020). The literature suggests that full lung expansion can significantly reduce bronchial resistance, indicating that prolonged exercise can benefit lung function. Therefore, regular aerobic exercise should be recommended for all asthma patients due to its overall health benefits (Bacon & Platts-Mills, 2020).

Historically, exercise was viewed as a contradiction for individuals with asthma, as it was believed to trigger or worsen acute asthma attacks. However, scientific evidence now supports that appropriate exercise training can effectively enhance respiratory function and exercise capacity in asthma patients. Combining breathing exercises with aerobic activities and yoga may offer additional benefits for improving lung function in adults with asthma (Xing et al., 2023). Structured physical exercise protocols should be encouraged as they can serve as a synergistic therapeutic option alongside regular pharmacologic treatments, making exercise prescription an essential component of asthma management (Privitera & Privitera, 2023; Refaat & Gawish, 2015).

Physical exercise can improve the symptoms and quality of asthma patients (Zhu et al., 2022). Particularly, Aerobic training decreases exercise-induced bronchospasm, and improves aerobic capacity and quality of life in asthmatic people (Silva et al., 2010). However, it is essential to consider individual factors such as patient characteristics, family history, environmental influences, and the duration of the disease when designing exercise programs. Customizing interventions to address specific physical and mental health conditions, while carefully considering exercise intensity, frequency, and duration, is crucial for optimizing treatment outcomes (Xing et al., 2023). Additionally, aerobic training has been shown to improve antioxidant capacity and pulmonary function in asthma patients, with the enhancement in lung function attributed to the increased antioxidant capacity resulting from aerobic interventions (Moeini et al., 2018).

The American College of Sports Medicine and the Centres for disease control and prevention recommend that adults engage in at least 150 minutes of moderate-intensity aerobic activity or 75 minutes of vigorous aerobic activity each week, along with muscle-strengthening exercises twice a week. Following the FITT principle ''frequency, intensity, time, and type'' can help design and implement a safe, effective, and enjoyable exercise program (Pescatello et al., 2013). Individuals with asthma can participate in various types of exercise similar to those without the condition, with a recommended program of at least 20-30 minutes of activity 2-3 days per week at 60% VO_2peak or 80% of maximal walking speed, along with strength training at 70% of one-repetition maximum for 2-3 sessions weekly; those experiencing exercise-induced bronchoconstriction should use beta-2 agonists 15-30 minutes before exercising and consult a healthcare provider before starting a regular training regimen (Sumartiningsih & Charng, 2017).

Swimming is particularly beneficial for individuals with asthma, offering several advantages, including improving immune function and suppression of the bronchoconstrictive component of the diving reflex (Greenfield et al., 2023). Recommendations for asthmatics engaging in swimming include maintaining proper water purification levels, avoiding dry and cold areas of the pool, managing air quality, and monitoring of water exercises while avoiding excessive submersion or diving; swimming can reduce the intensity, duration, and frequency of bronchospasm episodes, enhance respiratory capacity, strengthen respiratory muscles and promote better motor, psychological, and social development, although contraindications may arise from inadequate facilities, improper medication management, and insufficient class supervision (de Vasconcellos & do Nascimento, 2023). Overall, regular physical training significantly improves maximum oxygen uptake, physical fitness, neuromuscular coordination, and self-confidence in individuals with stable asthma, encouraging them to participate in regular exercise without fear of exacerbating their symptoms (Chandratilleke et al., 2012).

Table 2
Recommendations of the FITT model for people with asthma/ Asthma FITT Principle.

	Aerobic exercises	Resistance exercises	Flexibility exercises
Frequency	3-5 days/week	2-3 days/week	Greater than 2-3 days/week, more effectively if daily
Intensity	Start with moderate intensity (40-59% of FRC or of Vo2 R). if well tolerated , increase after one month to 60-70% of FRC or VO_2 R	Force; 60-70% of 1 RM for those who start exercising with weight; 80% for those who have been doing it for some time. Resistance; < 50 of 1 RM	To the point of feeling tightness or mild discomfort
Duration	Gradually increase up to at least 40 min per day	Strength: 2-4 series, 8-12 repetitions resistance; < 2 series, 15-20 repetitions.	10-30 a duration for static stretch; 2-4 repetitions of each exercise
Type	Aerobic activity using the major muscle groups (walking, running, etc.)	Weight lifting machine, free weights or natural load exercise	Static and dynamic elongation and PNF techniques

1RM: Maximum single repetition; FCR: Reverse heart rate; PNF: Proprioceptive neuromuscular facilitation; FITT-VP: Frequency–intensity-type-Total volume progression (Privitera & Privitera, 2023).

Exercise Reduces Asthma Symptoms

Individuals with stable asthma should be encouraged to engage in regular exercise training that aligns with their capabilities, without the fear of exacerbating their symptoms (Chandratilleke et al., 2012). By improving overall physical activity levels, a greater number of asthma patients may achieve better disease control and reduce their dependence on pharmaceutical treatments. This shift not only enhances health outcomes but also presents economic benefits (Nyenhuis et al., 2022). To maintain or increase activity levels while managing asthma, it is essential to identify triggers for exercise-induced asthma, take pre-treatment medication 15 to 30 minutes before exercising, and incorporate a proper warm-up and cool-down routine to effectively manage symptoms (American College of Sports Medicine, 2013).

Regular exercise plays a crucial role in asthma management by decreasing airway inflammation and alleviating symptoms. It strengthens lung function, increases endurance, and builds tolerance to activities that typically induce breathlessness, such as climbing stairs (Fanelli et al., 2007). Physical training has been shown to reduce airway inflammation in asthmatics (Pakhale et al., 2013) and lower inflammatory proteins, which enhances airway responsiveness during physical exertion (Mendes et al., 2011). Furthermore, consistent physical activity improves lung capacity, facilitating more efficient oxygen utilization and reducing the effort required for everyday breathing. Stronger muscles enhance overall body efficiency in daily tasks, while improved cardiovascular fitness boosts heart conditioning, blood flow, and oxygen delivery (Garber et al., 2011; Morton & Fitch, 2011). To further this understanding, well-designed studies are urgently needed to explore the interrelationship between physical activity, airway inflammation, lung function, and clinical outcomes, as well as the impact of interventions that promote a physically active lifestyle among individuals with asthma (Panagiotou et al., 2020).

Procedures to Help Individuals with Exercise-Induced Asthma Engage in Physical Exercises

Exercise-induced bronchoconstriction occurs due to change in lung physiology from water loss, temperature shifts, and irritant exposure, which arise from increased minute ventilation and the respiratory systems demand to heat and humidity air during intense exercises (Kippelen et al., 2018). Patients with exercise-induced asthma often find themselves restricted from engaging in physical activities due to the severity of their pulmonary dysfunction (Carlsen & Carlsen, 2002). To mitigate these symptoms, it is recommended that individuals warm up for 5 to 10 minutes before exercising, starting with a slow walk and gradually increasing the intensity over 3 to 5 minutes (American College of Sports Medicine, 2013; Pescatello, 2014). Implementing an appropriate warm-up strategy that includes exercises close to peak oxygen consumption or maximal heart rate may serve as a short-term, non-pharmacological alternative to reduce symptoms (Stickland et al., 2012).

Despite these precautions, asthma symptoms may still arise during exercise, even after the use of bronchodilators. In such cases, it is advisable to slow down and consider using quick-relief medication, such

as Albuterol, while consulting a healthcare provider if breathing difficulties persist. Early diagnosis and effective preventive and maintenance therapy can significantly decrease episodes of exercise-induced asthma (EIA), allowing patients to remain active and participate in sports (Tan & Spector, 2002). To ensure optimal effectiveness, it is crucial to take prescribed asthma medication approximately 15 to 30 minutes before exercising. Additionally, breathing through the nose during workouts can help regulate breathing, and taking short rest breaks may be beneficial. If symptoms begin to manifest, slowing down the activity is essential for managing the condition effectively (Pescatello, 2014).

Conclusion

Exercise is a vital component of asthma management, significantly improving quality of life for individuals with the condition. Regular moderate-intensity aerobic exercise can enhance lung function, improve asthma control, oxygen uptake, immune function, antioxidant capacity, and reduce septum eosinophil and fractional exhaled nitric oxide and promote social engagement, making it essential for asthmatics to remain active. Individuals with asthma can engage in various exercises similar to those without the condition, following a program of 20-30 minutes of activity 2-3 days per week. It's essential to consult a healthcare provider before starting a training regimen and to use beta-2 agonists if experiencing exercise-induced bronchoconstriction.

Authors' Contribution

Study Design: KZ; Data Collection: KZ; Statistical Analysis: KZ; Manuscript Preparation: KZ, MZ.

Ethical Approval

The systematic review does not require ethical approval.

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Competing Interests

None declared.

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