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THE EFFECT OF ASTHMA GYMNASTICS ON PEAK EXPIRATORY FLOW AMONG ASTHMA PATIENTS

Erik Kusuma*, Dwining Handayani, R.A. Helda Puspitasari, Ayu Dewi Nastiti
D3 Nursing Study Program, Faculty of Nursing, Universitas Jember, Jl. Kalimantan Tegalboto No.37, Krajan Timur, Sumbersari, Jember, Jawa Timur 68121, Indonesia
*erikkusuma.akper@unej.ac.id

ABSTRACT

Asthma is a chronic inflammation that results in bronchospasm and bronchoconstriction that cause weakness of the respiratory muscles, resulting in a decrease in respiratory ability. One of the efforts to correct these disturbances is made by doing asthma gymnastics. Objective: This study aims to identify the influence of asthma gymnastics on the peak expiratory flow among asthma sufferers. Method: This type of research was a pre-experiment with a pretest-posttest design. The sample in this study is composed of 31 asthma patients selected using the total sampling technique. Data analysis using paired t-test with α significant level of 0.05. Results: As a result of the asthma exercise, the Peak Respiratory Flow (PEF) increased to 304 lt/min from 208 lt/min before the exercise (p 0.000 < 0.05). There was an effect of asthma gymnastics on peak respiratory flow among asthma patients at the Asthma Polyclinic of Bangil Hospital. Conclusions: Regular asthma gymnastics can improve breathing ability, as indicated by peak respiratory flow, and improve the quality of life of asthma sufferers.

Keywords: asthma gymnastics; asthma patients; peak expiratory flow

INTRODUCTION

Asthma is a chronic airway disease that is a health problem in various countries around the world. Asthma can be mild and does not interfere with activities, can also be sedentary and interfere with activities, which has an impact on decreasing productivity and quality of life. Bad air quality and changes in people's lifestyles are thought to be the causes of increasing asthma sufferers. The air around us has been polluted by various pollutants. 70–80% of air pollution comes from vehicle exhaust gases, while the air pollution caused by industry ranges from 20-30% (Herawati et al., 2023). Based on the results of Basic Health Research in 2018, the prevalence of asthma was 4.5%. Age 25–34 has the highest prevalence of asthma at 5.7%, and <1-year-olds have the lowest prevalence of asthma at 1.5%. Based on data from SIRS in 2018, the prevalence of asthma in outpatients based on age was highest in ages 25–44 (24.05%), and the lowest prevalence in ages 0-6 days was 0.13% (Wijaya et al., 2020). From the medical record data of Bangil Hospital, it is known that the patients who visited asthma at the Asthma Polyclinic in 2018 averaged 31 patients per month. Results of a preliminary study on Wednesday, January 10, 2023, measured the Peak Expiratory Flow (PEF) with a peak flow meter on 6 gymnasts, who, before doing asthma gymnastics, averaged 215 l/min, and after participating in gymnastics, it increased to 225 l/min.

Asthma occurs due to the interaction between host factors and the milieu. Host factors include genetic asthma, allergies (atopy), hyperactivity bronchi, sex, and race. Environmental factors affect the tendency to develop asthma, exacerbations, or cause persistent asthma symptoms. Environmental factors include allergens, sensitization work environment, cigarette smoke, air pollution, respiratory infections (viruses), diet, status socio-economy, and the size of the family (Santino et al., 2020). Asthma sufferers experience muscle spasms that can cause shortness of breath, difficulty during expiration, decreased lung capacity as well as physical conditions that will be weakened (Jaakkola et al., 2019). On examination, it was found that there was an obstruction

airway, the use of long breaths and breathing aids during expiration, and the existence of wheezing. Weakness in the respiratory muscles can also occur due to shortness of breath and restriction of activity (Kusuma et al., 2022).

One of the management of asthma that can be cultivated is to maintain a healthy lifestyle and asthma gymnastics that train the respiratory muscles. Muscle training breathing can improve respiratory muscle function, reducing the degree of disturbance breathing, increasing tolerance to activity, and lowering dyspnea symptoms. The results of the study showed that after participating in asthma gymnastics regularly, patients with asthma get several benefits, namely the frequency of asthma attacks is reduced, The use of medication is reduced, and asthma symptoms become mild. Based on the above presentation, researchers are interested in researching the influence of gymnastics asthma on the peak expiratory flowof asthma sufferers at the Asthma Polyclinic of Bangil Hospital.

METHOD

The research design used in this study was a pre-experiment with a pre-post test method in one group, also known as a one-group pre-post test design. This type of research aims to establish a causal relationship by involving a group of subjects. In this particular study, the subjects were given an intervention in the form of asthma gymnastics, and their Peak Expiratory Flow (PEF) was measured before and after the intervention. The research was conducted in March–April 2023 at the Asthma Polyclinic of Bangil Hospital. The population studied consisted of all asthma patients at the Asthma Polyclinic of Bangil Hospital, totaling 31 people. The sample for this study included all 31 asthma patients, using a sampling technique known as total sampling, where the sample size equals the population size. The data collection process in this study provided an intervention/treatment in the form of asthma exercises. Researchers measured Peak Expiratory Flow Rate (PEFR) using a peak flow meter before and after asthma exercises for 6 weeks. The measurement results were recorded on an observation sheet. The data was then processed using a bivariate analysis technique, the paired T-test, to determine whether there was a difference in breathing ability before and after performing asthma exercises.

RESULTS AND DISCUSSION

Table 1.
Respondent characteristics (n= 31)

Respondent characteristics	f	%
Age		
25-30	2	6,5
31-35	3	9,7
35-40	5	16,1
41-45	5	16,1
46-50	16	51,6
Gender		
Male	14	45,2
Female	17	54,8
Work		
Civil servants	2	6,4
Farmer	9	29
Fisherman	6	19,4
Private Employees	6	19,4
Housewives	8	25,8

Respondents' breathing ability was measured based on Peak Expiratory Flow (PEF) before and after participating in asthma exercises. From 31 respondents, the lowest PEF score pre-exercise was 140 (L/min) and the highest PEF score was 280 L/min, with an average PEF value of 208 L/min. Meanwhile, the PEF score after participating in asthma exercises ranged from the lowest at 200 L/min to the highest at 400 L/min, with an average of 304 L/min. The results of the cross-tabulation showed that all respondents (100%) experienced an improvement in their breathing ability.

Table 2.
Peak Expiratory Flow (PEF) Average Before and After Asthma Gymnastics

Asthma Gymnastics	N	Max	Min	Std Dev	PEF Average
Before	31	280	140	27.092	208
After	31	400	200	59.092	304

Table 3.
Cross-tabulation of Asthma Gymnastics with Peak Expiratory Flow (PEF)

	PEF						Total
	Increase		Settled		Decreased		
	f	%	f	%	f	%	
Asthma Exercise	31	100	-	-	-	-	100
Total	31	100	-	-	-	-	100

To determine the effect of asthma exercises on breathing ability, asthma patients at the Asthma Polyclinic of Bangil Hospital were tested, and the data was analyzed using the paired t-test statistic with a significance level of 0.05 (Table 4).

Table 4.
The Effect of Asthma Gymnastics on Peak Expiratory Flow (PEF) in Asthma Patients

Asthma Exercise	PEF Average	t	*p-value*
Before exercise	208	- 10,999	0,000
After exercise	304		

Table 4 shows that the average PEF score of respondents before gymnastics is 208 l/m, while after gymnastics, the average is 304 l/m. Thus, the average increase in PEF value between before and after gymnastics is 95 l/m. The results of the statistical analysis indicate that asthma exercises have an effect on the peak expiratory flow(PEF) of asthma patients at the Asthma Poly of Bangil Hospital, with a significance value (p) = 0.000 (<0.05).

Peak Expiratory Flow (PEF) Before Doing Asthma Gymnastics

The results of the study showed that most of the respondents were aged 46 – 50 years, were female, and worked as farmers. The prevalence of asthma is influenced by many factors, including age, gender, and type of work. Lung function changes with increased age. Pulmonary function increases in volume and reaches its maximum at 19-21 years, after which the pulmonary function value continues to decrease with age (Munir et al., 2016). Therefore, with increasing age, susceptibility to diseases, including respiratory disorders such as asthma, will increase (Kusuma, 2021). Gender also affects the prevalence of asthma. In adulthood, the incidence of asthma is higher in women than in men. Mature women are more susceptible to asthma attacks because adult women are prone to stress (Astuti, 2022). Stress activates the sympathetic and parasympathetic nervous systems, causing the release of the hormones epinephrine and norepinephrine. Adrenergic receptors located in T cells and B cells further activate the humoral immunity response by releasing inflammatory

mediators such as interleukin (IL)-4, IL-5, IL-13, and histamine from mast cells. Stimulation of the parasympathetic nervous system causes the release of the neurotransmitter acetylcholine. Acetylcholine, along with inflammatory mediators, causes bronchoconstriction and mucus secretion in the airways (Putri et al., 2020). Additionally, women's lungs were found to have twice as many leukocytes called ILC2 as men. ILC2 serves to initiate a series of inflammatory responses in the airways (Permatasari, 2015).

Work also affects asthma. Strenuous activity causes asthma sufferers to be unable to tolerate the fatigue they feel. When the body is tired due to the physical activity carried out, it will compensate by breathing faster to obtain more oxygen for the benefit of metabolism (Bebasari & Azrin, 2017). People with asthma who experience fatigue will quickly show signs of asthma recurrence. For farmers, it is not a light job because they are required to pursue harvest targets, both in terms of time and production amount. However, physical activity cannot be avoided due to economic concerns. In this case, asthma sufferers indeed have to adjust to work, ensuring their rest time is sufficient and not at the expense of their body.

Peak Expiratory Flow (PEF) After Doing Asthma Gymnastics

Asthma patients who participate in asthma gymnastics regularly all experience Improvement of respiratory ability. Indonesian Asthma Gymnastics is a series of gymnastics that aims to train and strengthen muscles breathing to make it easier for asthma sufferers to breathe and expectorate (Sahat et al., 2017). Gymnastics asthma increases the capacity of asthma people to carry out daily activities, improves breathing ability and efficiency of respiratory muscle work, and increases blood flow to the lungs so that more oxygenated blood flow, slower and more efficient breathing, reducing the rate of decline of the pulmonary faa, and shorten recovery time (Dewi et al., 2023). The manifestation is in the form of increased tolerance for exercise, reduced relapse, decreased depression and anxiety, improvement in lung function, and a decrease in the risk of premature death (Herlambang et al., 2022). Changes in the respiratory system that occur as a result of exercise include increased ventilation as a result of the increase in tidal volume and breath frequency, the occurrence of increased ventilation efficiency, i.e. the amount of air that is ventilated at the level of the same oxygen consumption will be lower in trained people. Skeletal muscles Active ones get more oxygen from the respiratory muscles, and more lung volume in trained people (Rachmah & Kusmiati, 2022). Exercise has a reciprocal relationship with respiration. Gymnastics Regular asthma will increase the efficiency of the respiratory system, improve work respiratory muscles, physical freshness or the body's ability to make adjustments to the physical burden given to him in the form of work carried out daily, and does not cause excessive fatigue, because the diffusion capacity of the person trained is greater than untrained people.

The Effect of Asthma Gymnastics on the Peak Expiratory Flow among Asthma Patients

Asthma gymnastics affect the Peak Expiratory Flow (PEF) of asthma patients at the Asthma Polyclinic of Bangil Hospital. The average PEF score of respondents before gymnastics was 208 l/m, while after gymnastics the average was 304. The average increase in PEF value before and after gymnastics is 95 l/m. This result strengthens the research of Sudrajat & Nisa (2016) where asthma gymnastics which is done routinely can increase lung function ($p = 0.001$). Changes in the respiratory system that occurred as a result of the exercise, including an increase in ventilation per minute as a result of increased tidal volume and breathing frequency, increased ventilation efficiency, i.e. the amount of air that is ventilated at the same level of oxygen consumption will

lower in trained people (Kartikasari et al., 2019). Active skeletal muscles get more oxygen than many of the respiratory muscles, and the lung volume is greater in a trained person (Handayani, 2023).

Asthma gymnastics trains asthma sufferers with several sessions including a practice session of inhalation and exhalation with expiratory two counts longer than inspiration (Puspitosari, 2020). This exercise aims to train how to breathe well . The other session is to flex the breathing muscle, which facilitates breathing and expectation. The main session is an aerobic session that uses large muscles to train the cardiovascular system and deep respiration to distribute blood supply (Stoodley et al., 2019). The results of this study are in line with the theory that the practice of asthma gymnastics has a good influence on improving breathing ability. Asthma gymnastics can increase respiratory muscle strength because causes stimulation of the vasomotor center in the brainstem which triggers an increase in arterial pressure and increased pulmonary ventilation. Improved breathing ability is marked by an increase in PEF scores after doing asthma gymnastics, Thus asthma sufferers who want to participate in gymnastics will be able to breathe well, able to maintain controlled asthma, and have a better quality of life.

CONCLUSION

Asthma gymnastics is one of the methods of treating asthma is carried out in the form of an exercise group (exercise group) which aims to improve the ability of respiratory muscles and remind capacity and efficiency of the respiratory process. Regular asthma gymnastics will raise Peak Expiratory Current (PEF).

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REFERENCES

Astuti, L. W. (2022). Gambaran Arus Puncak Ekspirasi Pada Penderita Asma Di Wilayah Kerja Puskesmas Mujur: Description of Peak Expiratory Flow in Asthma Patients in the Working Area of the Mujur Health Center. Public Health and Safety International Journal, 2(01), 35–41. https://doi.org/10.55642/phasij.v2i01.141

Azhar, A.H., & Berawi, K.H. (2015). Hubungan Rutinitas Senam Asma terhadap Faal Paru pada Penderita Asma. Majority, Volume 4, No. 9, 103-7. Retrieved from http://repository.lppm.unila.ac.id/236/1/khairunnisa%20berawi4.pdf.

Bebasari, E., & Azrin, M. (2017). Korelasi Lama Senam Asma dengan Faal Paru pada Pasien Asma yang Mengikuti Senam Asma. Jurnal Ilmu Kedokteran, 10(1), 17. https://doi.org/10.26891/JIK.v10i1.2016.17-23

Dewi, S. K., Lutiyah, L., Martini, E., Hamidah, E., Alamsyah, A. Z., Feresia, S., & Salsabila, S. (2023). Pengaruh Senam Asma Terhadap Kekambuhan pada Penderita Asma di Wilayah

Kerja Puskesmas Muka Kabupaten Cianjur. MAHESA : Malahayati Health Student Journal, 3(4), 1139–1147. https://doi.org/10.33024/mahesa.v3i4.10245

Handari M. 2014. Hubungan Antara Sebelum dan Setelah Mengikuti Senam Asma dengan Frekuensi Kekambuhan Penyakit. Jurnal Kesehatan, Surya Medika, Yogyakarta.

Handayani, R. (2023). Pelatihan Senam Asma Menuju Desa Sehat. JURNAL ComunitÃ Servizio : Jurnal Terkait Kegiatan Pengabdian kepada Masyarakat, terkhusus bidang Teknologi, Kewirausahaan dan Sosial Kemasyarakatan, 5(1), 1202–1209. https://doi.org/10.33541/cs.v5i1.4695

Hening A. 2015. Perbedaan antara Frekuensi Serangan Asma Sebelum dan Setelah melakukan Senam Asma.Skripsi. UNS. Surakarta.

Herawati, I., Sudaryanto, W. T., Salatina, A., Nikmah, R. N. F., & Murtama, A. D. (2023). Pengaruh Gerakan Senam Asma Terhadap Penurunan Frekuensi Sesak Napas Pada Klub Asma Di RSUP Surakarta. Jurnal Pengabdian Masyarakat, 2(2), 31–38. https://doi.org/10.30640/abdimas45.v2i2.1682

Herlambang, T. M., Maryono, Anasril, Bustami, & Amiruddin. (2022). Efektivitas Senam Asma untuk Meningkatkan Fungsi Paru Penderita Asma di rumah Sakit Umum Daerah Cut Nyak Dhien Meulaboh. Syntax Literate ; Jurnal Ilmiah Indonesia, 7(5), 6105–6114.

Jaakkola, J. J. K., Aalto, S. A. M., Hernberg, S., Kiihamäki, S.-P., & Jaakkola, M. S. (2019). Regular exercise improves asthma control in adults: A randomized controlled trial. Scientific Reports Nature Research, 9(12088), 1–11. https://doi.org/10.1038/s41598-019-48484-8

Kartikasari, D., Jenie, I. M., & Primanda, Y. (2019). Latihan Pernapasan Diafragma Meningkatkan Arus Puncak Ekspirasi (APE) dan Menurunkan Frekuensi Kekambuhan Pasien Asma. Jurnal Keperawatan Indonesia, 22(1), 53–64. https://doi.org/10.7454/jki.v22i1.691

Kusuma, E. (2021). The Effect of Buteyko Breathing and Asthma Exercise on Asthma Symptoms among Patients with Asthma. The Indonesian Journal of Health Science, 13(2), 189–195.

Kusuma, E., Nastiti, A. D., Puspitasari, R. A. H., Handayani, D., Zahroh, C., & Asri, Y. (2022). Implikasi Teknik Pernapasan Buteyko terhadap Kontrol Asma: Literature Review. Jurnal Keperawatan, 14(S3), 874–884.

Munir, S. M., Bebasari, E., & Azilla, Uci Tama. (2016). Gambaran Faal Paru pada Pasien Asma yang Melakukan Senam Asma dengan yang Tidak Melakukan Senam Asma. Jom FK, 3(1).

Nur, Akbar, Muhammad Amin, Muhammad Saji in, and Kusnanto. 2019. “Gambaran Arus Puncak Ekspirasi (PEF) Dan Kontrol Asma Pada Pasien Asma” 10 (3): 193–98.

Permatasari, V. D. (2015). Pengaruh Senam Asma terhadap Fungsi Paru (KVP & FEV1) pada Wanita Asma di Balai Kesehatan Paru Masyarakat (BKPM) Semarang. Jurnal Kesehatan Masyarakat Indonesia, 10(2), 65–80.

Puspitosari, D. P. (2020). Pengaruh Senam Asma terhadap Peningkatan Arus Puncak Ekspirasi (APE) dan Peningkatan Kualitas Hidup pada Komunitas Madupahit di Bapelkes Wilayah Semarang. Skripsi. Universitas Muhammadiyah Surakarta.

Putri, R. C., Primayanti, I. D. A. I. D., Handari, L. M. I. H., & Griadhi, I. P. A. (2020). Perbedaan Arus Puncak Ekspirasi (APE) pada Wanita Usia Produktif Penderita Asma yang Mengikuti Senam Asma. Sport and Fitness Journal, 8(2), 84–90. https://doi.org/10.24843/spj.2020.v08.i02.p11

Rachmah, S. N. N., & Kusmiati, M. (2022). Pengaruh Senam Asma terhadap Pengurangan Frekuensi Serangan Asma pada Dewasa: Scoping Review. Medical Science, 2(1).

Russo, Marc A., Danielle M. Santarelli, and Dean O'Rourke. 2017. "The Physiological Effects of Slow Breathing in the Healthy Human." Breathe 13 (4): 298–309. https://doi.org/10.1183/20734735.009817.

Sahat, C. S., Irawaty, D., & Hastono, S. P. (2017). Peningkatan Kekuatan Otot Pernapasan dan Fungsi Paru Melalui Senam Asma Pada Pasien Asma. Jurnal Keperawatan Indonesia, 14(2), 101–106. https://doi.org/10.7454/jki.v14i2.316

Santino, T. A., Chaves, G. S., Freitas, D. A., Fregonezi, G. A., & Mendonça, K. M. (2020). Breathing exercises for adults with asthma. Cochrane Database of Systematic Reviews, 2020(3). https://doi.org/10.1002/14651858.CD001277.pub4

Stoodley, I., Williams, L., Thompson, C., Scott, H., & Wood, L. (2019). Evidence for lifestyle interventions in asthma. Breathe, 15(2), e50–e61. https://doi.org/10.1183/20734735.0019-2019

Sudrajat, N. U. H., & Nisa, K. (2016). Efektifitas Senam Asma untuk Meningkatkan Fungsi Paru Penderita Asma. Majority, 5(4), 112–116.

Usman, Isnaniyah, Eva Chundrayetti, and Oea Khairsyaf. 2015. "Faktor Risiko Dan Faktor Pencetus Yang Mempengaruhi Kejadian Asma Pada Anak Di RSUP Dr. M. Djamil Padang." Jurnal Kesehatan Andalas 4 (2): 392–97. https://doi.org/10.25077/jka.v4i2.260.

Wijaya, I. K. A., Mertha, I. M., & Rasdini, I. G. A. (2020). Senam Asma dan Arus Puncak Ekspirasi pada Pasien Asma. Jurnal Gema Keperawatan, 13(2), 111–119.