Original Research

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The Application of Pranayama Yoga in Increasing Peak Expiratory Flow (APE) in Electronic Smoker Students at the Faculty of Medicine, Mulawarman University

Saprianti[1], Khumaidi[2], Iskandar Muda[3], Syahrun[4]

[1,2,3,4]Nursing Program, Faculty of Medicine , Mulawarman University, Indonesia

Corresponding author:saprianti066@gmail.com

phone number: +6281549461415

ABSTRACT

Background: Electronic Cigarettes (e-cegirette) are battery-powered electronic devices that do not burn tobacco leaves but use liquid liquids. E-cigarette consumption causes a negative impact on respiratory health, characterized by a decrease in APE and an increased risk of damage to lung function. The application of pranayama yoga techniques is one part of improving APE. APE examination uses tools, one of which is spirometry. Method: The study used a descriptive method with a case study approach, using three respondents of electronic smoking students from the Faculty of Medicine, Mulawarman University to perform Yoga Pranayama for three consecutive days in the afternoon. APE measurements were carried out before and after the intervention using spirometry and the data were analyzed distributisy frequency in the form of a table.Results: Prior to the Yoga Pranayama intervention, the average APE value of the respondents was in the range of 250–325 L/min. After the intervention, there was a gradual increase every day, with an average increase of 15–25 L/min on the third day. Respondents with fewer puffs per day showed a more significant increase in APE compared to respondents who had more puffing habits. Conclusion: Yoga Pranayama has been shown to be effective in increasing APE in e- cigarette students,

Keywords: *Pranayama Yoga, Expiratory Peak Flow (APE), E-Smoker, Lung Capacity.*

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1. INTRODUCTION

Electronic cigarettes (e-cigarettes) are battery-powered devices that vaporize a liquid containing nicotine and other chemicals such as propylene glycol and vegetable glycerin, without burning tobacco leaves. Although marketed as a safer alternative to conventional cigarettes, e-cigarettes still contain harmful substances that negatively affect the respiratory system (Moshe H et al., 2023). The World Health Organization (WHO) has not recommended e-cigarettes as a smoking cessation method since 2010 due to their harmful chemical content (BPOM RI, 2015).

In Indonesia, the prevalence of e-cigarette use has continued to rise. The Global Youth Tobacco Survey (GYTS) in 2019 reported an increase in youth smoking prevalence to 19.2% (GYTS, 2019). The 2023 Indonesian Health Survey (SKI) also showed a significant increase in active smokers, reaching 70 million people (Kemenkes, 2024).

E-cigarette use has been shown to impair lung function, including a decrease in Peak Expiratory Flow (PEF), a critical indicator of expiratory capacity. Research indicates that e-cigarette users have below-normal PEF values, signaling significant negative impacts on respiratory health (Febryanti, 2017; Hans, 2018). Nicotine in vape liquid increases endothelial permeability and damages goblet cells, leading to reduced expiratory function (Hans, 2018).

One effective intervention to improve PEF is the practice of yoga pranayama, a structured breathing technique that strengthens respiratory muscles, increases lung capacity, and enhances oxygen utilization (Karthik, 2014; Kumar V, 2023). Studies by Sukarno (2017) and Sepalanita et al. (2024) also support the effectiveness of pranayama in improving PEF among patients with respiratory disorders.

Lung function is typically evaluated using spirometry, a non-invasive and widely used tool to measure air volume and flow in the lungs. Spirometry is highly sensitive in detecting early changes in lung function, including those caused by e-cigarette use (Bakhtiar et al., 2017; Liu et al., 2023).

A preliminary study on students from the Faculty of Medicine at Mulawarman University revealed that some students were e-cigarette users but had never undergone spirometry testing or practiced pranayama. However, a few reported engaging in regular physical activity, such as jogging or going to the gym. This highlights the need for

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interventions such as yoga pranayama to raise awareness and improve respiratory function among e-cigarette–using students.

2. METHOD

The research design used is descriptive with a case study approach involving three respondents who met the inclusion criteria. This study was carefully designed to obtain spirometry test results in electronic cigarette smokers.

3. RESULT AND DISCUSSION

The respondents in this study were three respondents who had undergone Spirometry measurements before and after the implementation of Yoga Pranayama for three days from March 20-22, 2025 at the Faculty of Medicine, Mulawarman University with the following respondent characteristics:

Table 1. Respondent Characteristics

No	Respondents	Gender	Age (yrs)	Height/Body Weight (cm)
1	P1	L	21	157/53
2	P2	L	21	150/46
3	P3	P	19	173/70

Based on the results of table 4.2.1, the characteristics of respondents in the study above show that there are three respondents with gender consisting of one male and two females. The age of the respondents ranges from 19-21 years. The height of the respondents is relatively varied, between 150-173 cm. The weight of the respondents also varies, between 46-70 kg.

Table 2. Respondents' Electronic Smoking Habits

No	Respondents	Electronic Smoking Habits		
		Long	Frequency	Puff/day
1	P1	>1 year	Every day	65 puffs/day
2	P2	>1 year	Every day	70 puffs/day
3	P3	>1 year	Every day	110 puffs/day

Based on the results of table 4.2.2, the respondents' electronic smoking habits above show that all respondents have had electronic smoking habits for more than 1 year. They all smoke every day with varying frequencies, namely between 65-110 puffs/day.

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Table 3. Respondents' Health History

No	Respondents	Health History			
		Main Complaint	Current Diseases	Previous Diseases	Family Disease
1	P1	There isn't any	Hypertension	Hypertension	Hypertension
2	P2	There isn't any	Ambien, UTI	Ambien, UTI	There isn't any
3	P3	There isn't any	There isn't any	There isn't any	There isn't any

Based on table 4.2.3, the respondents' medical history above shows that most respondents do not have a significant medical history. Respondents P1 and P2 have a history of current illnesses such as hypertension, hemorrhoids, and UTI. A family history of illness such as hypertension was found in respondent P1.

Table 4. Respondents' Respiratory Health History

No	Respondents	Respiratory Health History			
		Cough and shortness of breath			
		Seldom	Sometimes	Often	Very often
1	P1	✓			
2	P2	✓			
3	P3	✓			

Based on table 4.2.4 respiratory health history above, all respondents have the same respiratory health history, namely experiencing coughing and shortness of breath. However, the frequency of coughing and shortness of breath experienced by respondents is the same, which is rare. This indicates that respondents have relatively mild respiratory symptoms. There is no significant difference in the frequency of coughing and shortness of breath among respondents. All respondents experience coughing and shortness of breath with the same frequency, which is rare.

The following will present the results of Peak Expiratory Flow before and after the application of Yoga Pranayama on electronic smokers at the Faculty of Medicine, Mulawarman University in three respondents, namely:

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Table 5. Peak Expiratory Flow Before and After

Application of Yoga Pranayama

No	Respondent Code	Frequency Peak Expiratory Flow (L/min)							
		Pre Intervention			Average Pre Intervention	Post Intervention			Post Intervention Average
		1	2	3		1	2	3	
1	P1	250	255	260	255	255	270	280	268
2	P2	250	260	260	256	260	270	285	271
3	P3	300	310	325	311	320	330	350	333

Based on the results of table 4.3.1 in the research above, it shows that Before the implementation of Yoga Pranayama, the highest Peak Expiratory Flow (PEF) value was 325 L/min, while the lowest value was 250 L/min, with an average of 278 L/min. After the intervention, there was an increase in the PEF value, where the highest PEF reached 350 L/min, the lowest PEF was 268 L/min, and the average increased to 317 L/min.

Table 6. Difference in Peak Expiratory Flow Before and After

Application of Yoga Pranayama

No	**Respondent Code**	**Frequency Peak Expiratory Flow (L/min)**		
		Day		
		1	**2**	**3**
1	P1	+ 5	+ 15	+ 20
2	P2	+ 10	+ 10	+ 15
3	P3	+ 20	+ 20	+ 25

Based on table 4.3.2. the difference in the average peak expiratory flow before and after the application of yoga pranayama. On the first day, the increase in peak expiratory flow ranged from 5-20 L/minute. On the 2nd day, the increase in peak expiratory flow ranged from 10-20 L/minute. And on the 3rd day, the increase in peak expiratory flow ranged from 15-25 L/minute.

4. CONCLUSION

Based on the results and discussion of the study titled "The Application of Yoga Pranayama in Increasing Peak Expiratory Flow (PEF) in Electronic Cigarette Smoking

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Students at the Faculty of Medicine, Mulawarman University", it can be concluded that Yoga Pranayama is effective in improving respiratory function. The main objective of this study was to assess the effectiveness of Yoga Pranayama in increasing Peak Expiratory Flow (PEF) among electronic cigarette–smoking students. The intervention, conducted over three consecutive days, showed a positive impact on PEF values. Prior to the intervention, PEF values ranged from 250 to 325 L/min, with lower values observed in female respondents. After practicing Yoga Pranayama, there was a significant increase, reaching up to 350 L/min, especially in male participants, who generally have larger lung capacity. On the first day of intervention, the PEF increased by approximately 2–20 L/min, followed by an increase of 10–20 L/min on the second day, and 20–25 L/min on the third day. These findings support the effectiveness of Yoga Pranayama as a non-pharmacological technique to enhance lung function in electronic cigarette users.

5. REFERENCES

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