The correlation between duration of Indonesian Asthma Gymnastics and Asthma Control Test Score among Persahabatan Hospital Asthma Club Members in Indonesia

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Abstract

Background: Indonesian Asthma Gymnastics (IAG) exercise has been associated with reducing asthmatic symptoms and increase lung function in asthmatic patient. This study aims to understand the correlation between the duration of IAG exercise and other factors that might affect to the Asthma Control Test (ACT) score amongst Persahabatan Hospital Asthma Club members.

Methodology: The data is obtained by asking 28 asthmatic Persahabatan Hospital Asthma Club members to answer two questionnaires, of which one is ACT questionnaire and their personal information questionnaire regarding their duration of exercise, age, gender and smoking history.

Results: The duration of IAG exercise, with median of 33 months (1-360), is significantly correlated by positive association with ACT score (P=0.022). Other factors that are significantly correlated as well with ACT score are age (P=0.020), also positively correlated, and gender (P=0.002) with males having better ACT score than females. Smoking history does not exhibit a significant correlation with ACT score (P=0.816) as there is no subject who is an active smoker.

Conclusion: IAG does not trigger exercise-induced bronchoconstriction (EIB) in asthmatic patient. The addition of duration of joining IAG does not improve the value of post-exercise peak expiratory flow rate (PEFR). Age and gender are interrelated in affecting PEFR post-exercise. Smoking history of people who have long quit smoking and increased body mass index (BMI) does not affect PEFR value post-exercise.

Key words: Indonesian Asthma Gymnastics Duration; Asthma Control Test; Asthma Control

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Introduction

Asthma is one of the major non-communicable disease that affects high -, middle - and low - income countries; moreover, it is inclined to be mortal in middle - and low -income countries and remain among the world's biggest probblem. WHO predicted that currently there are 235 million people who suffer from asthma.[1] Most of the asthma sufferers are children.

In Indonesia, Asthma is not as prevalent compared to

the high-income countries such as United States or England. The prevalence of asthma in Indonesia is 13/1000 according to a 1995 survey, and parallel to the world's trend as, children are the most affected group. The prevalence of asthma in Indonesian varies from 2.1% to 22.2%, but researcher on the bases of different research concluded that ~10% is the mean prevalence of asthmatic children in Indonesian. Urban area such as Jakarta (16.4%) has higher prevalence compared to the rural area (4.3%) and less urban area (6.5%).[2]

Asthma as a chronic disease affects its sufferer for a long period, and its symptoms such as chest tightness, chest pain, shortness of breath, wheezing and coughing could create a negative impact on the sufferer's quality of life. Physical, psychological, and social aspect of the sufferers could be upset due to their asthma burden. Asthma could also limit the sufferer's daily activity. A survey in Australia suggested that 12% of people with asthma could not go to work or school due to their asthma. In children, it is reported that 20% of children with asthma are not able to ride bicycle, participate in organized sport, play with animals, or play longer at school with their friends. Such burden to children would made significant impact on their mental state by leading them to feel angry, frustrated and socially isolated. Moreover, other study also suggested that asthma could lead to depression and anxiety for adults with asthma.[3]

Asthma Control Test (ACT) is a questionnaire that can be utilized as a tool for asthmatic patient to self-evaluate the level of asthma control in order to detect poor control of asthma. The test uses questions that has score for each question based on the answers. It is accepted and generally used all over the world, including in Indonesia.[4]

Besides taking drugs that are beneficial for asthma, the right exercise that suits the asthma patient fitness index is also helpful, for it is proven to reduce the symptoms of the asthma sufferers and improve their lung function.[5] In Indonesia, there is a customized exercise created by Yayasan Asma Indonesia (YAI) that is meant for asthmatic patient. This exercise is called the Indonesia Asthma Gymnastics (IAG). IAG has the ability to strengthen the respiratory muscles and improve the respiration process efficiency.[6]

This intrigues researcher to find the correlation between the duration of IAG exercise and ACT score. Hopefully, this research could help promoting IAG exercise as a management for asthmatic patient by providing scientific data.

Methodology

This research was done from 31st July 2017 to 11th July 2018. The data collection was conducted on every Sunday when the Persahabatan hospital Asthma Club Members gather for IAG exercise for three months from March to May 2018 in Gedung Asma Persahabatan hospital, Jakarta.

Cross-sectional survey is applied on this research. The subjects who are asthmatic people joined in Persahabatan hospital Asthma Club were asked to fill two questionnaires in order to obtain their ACT score, for dependent variable, and age, sex and smoking history and IAG exercise duration, which are independent variables.

ACT is a standardized five questions questionnaire that is used to assess one's asthma control. Each questions has a point from 1-5. The ACT score is obtained by summing up all the scores in the questionnaire. The score 0-19 is translated to poorly controlled, 20-24 is partially controlled and 25 is well controlled. The duration of IAG will be included from the subject's first time doing IAG exercise for once a week to the date that the data was collected, and it is defined in months. Should the subject has not exercised for four weeks consecutively, the duration starting period will be taken from after the subject does the regular IAG exercise again without missing any exercise for more than four weeks.

Age (years) and gender are stated by the subject in the questionnaire, were confirmed by their nationality card during the data collection. For smoking history, it was categorized into three: non-smoker, former smoker and active smoker. Non-smoker is for a person that never had smoked cigarette in all his lifetime or had smoked less than 100 cigarettes and have quitted smoking. Former smoker is a person who currently stop smoking for more than 5 years at the time of the data collection, but have had more than 100 cigarettes. Active smoker is a person that currently is still smoking and had more than 100 cigarettes before.

The sample frame is calculated using Cochrane's formula, with P1, expected proportion in population, based on Yunus F, et al. (2002) study which pointed the subjects' lung function score that were improved by IAG is 75% (0.75).7 From there, the minimum sample size is 18.75, and it is rounded to 19.

The final data is collected using Microsoft Excel, and then analyzed using SPSS version 24 software. The data was analyzed for normality using the Shapiro-Wilk test as the data is less than 50. In order to evaluate the correlation between the duration of IAG, age, gender, and history of smoking with ACT score,

Bivariate analysis was used for the numerical data and Independent Test analysis was used for nominal data.

Results

Patient Demographics

There are 28 data that were collected, which can be recapitulated in Table 1. The data were tested for distribution normality using the Shapiro-Wilk test, for the total of the data is less than 50. The data that have normal distribution are presented in mean ± SD, and data that do not exhibit normal distribution are presented in median (min-max).

Correlation between Duration of IAG and ACT score

The two variables are analyzed using Spearman's correlation test, which resulted in a significant correlation with $p < 0.005$, seen in Table 2. After that, the two data are plotted into a scatterplot graph in Figure 1 with $r2 = 0.065$ that shows positive correlation between the variables.

Correlation between Age and ACT Score

The two variables are tested for their correlation using Spearman's test (Table 3) and turned into a scatterplot graph (Figure 2) as well. The result is both variables are significantly ($p = 0.020$) and positively ($r2=0.145$) correlated.

Correlation between Gender and ACT Score

From the subjects data, 79% of them were female, while the male only accounted for 21% of the total subjects. For the ACT score, the data was collected using the ACT questionnaire and it is used for all the correlations in this research.

The data are tested for their correlation using the nonparametric test, specifically with the Mann-Whitney U test. The correlation test resulted in a significant correlation between the gender and ACT Score of Persahabatan hospital's Asthma Club members ($p = 0.002$).

Correlation between Smoking History and ACT Score

The majority of the subjects are non-smokers (82%), few are former smokers (18%) and none of them (0%) are active smoker. Like all the other correlations, the ACT score was obtained using the ACT questionnaire about their control level of asthma.

To identify the correlation between the two data, nonparametric test was utilized in the process. Again, the Mann-Whitney U test was used to reveal that there is insignificant correlation between Smoking History and ACT Score amongst Persahabatan hospital's Asthma Club Members with $p = 0.816$.

Discussion

The Correlation between Duration of IAG and ACT Score

The idea of doing exercise for asthmatic patient has two different sides of outcomes: one being beneficial for the disease itself by well-improving the asthma and the other could be disadvantageous through inducing an attack (EIA). Both of the results could emerge as the patient performs exercise and other kind of physical activity, but it is determined by several

Table 1: Demographics characteristics of study cases

Variable	Value n	%
Gender		
Male	6	21
Female	22	79
Age (years old)		
Mean ± SD	58 ±11.8	
Range	37 - 83	
Smoking History		
Non-smoker	23	82
Former Smoker	5	18
Active Smoker	0	0
Duration of IAG (month)		
Median	33	
Range	1 - 360	
ACT Score		
Median	20	
Range	12 - 23	

Table 2: Subject's Duration of IAG and ACT score

Variable	N	Median (Min-Max)	p value*
Duration of IAG (months)	28	33 (1-360)	0.022
ACT score (n)	28	20 (12-23)	

* Correlation is considered as significant at $p < 0.05$ (2-tailed test)

determinants such as intensity of the exercise and air temperature.[8] In this research, the benefit of exercise is the idea that is taken into focus. Particularly, studying the correlation between the duration of IAG exercise that had been done by the members of Persahabatan hospital's Asthma Club, ranging from 1 to 360 months, and their score of Asthma Control Test which hypothetically are proportionally correlated. From the 28 data that are gathered from the conduction of this study, the median for duration of IAG is 33 months, and for the score of ACT is 20, varying from as low as 12 to as great as 23.

From this research, it is learned that duration of IAG is significantly and positively correlated with ACT score ($p = 0.022$; $r^2 = 0.065$). This result suggests that members of Persahabatan hospital's Asthma Club Members who have been engaging IAG exercise in longer period have higher score of ACT, which translates to better control of asthma. The efficacy of exercise itself in general has been known to be positive in improving asthma control. A study conducted by Dogra S, et al. in 2010 which trials adults on doing regular exercise for 12 weeks, after doing 12 weeks of regular exercise in advance, found that regular exercise in adults can significantly improve asthma control, especially aerobic exercise.9 IAG exercise that is done regularly had been proven as well to significantly reduce asthma symptoms, the use of bronchodilator, and blood eosinophil count while increasing the VO2 peak, PEFR and FEV_1/FVC ratio after done regularly for 18 weeks.[7] The significant correlation of higher ACT score in members that have done longer IAG exercise duration is in accordance to the IAG exercise done regularly every week by the Persahabatan hospital's Asthma Club members whom in average had been doing 68 weeks of IAG exercise that uses aerobic exercise movements as one of their movement sets. Aerobic exercise which is included in the IAG exercise does not only capable on improving asthma control but also improving fitness level, VO2 peak and total treadmill time in adults and young adults.[10,11]

Other Factors Affecting ACT Score

Besides the duration of IAG, several other factors were studied as well for their correlation with ACT score. This research includes age, gender and smoking history of Persahabatan hospital's Asthma Club members that were subject to the study. However, some other factors such as compliance to drug inhaler device was not included in the study.

Age and gender are found to be the factors that are significantly correlated to ACT score ($p < 0.05$). Smoking history, however, is not significantly correlated to ACT score in this study ($p > 0.05$).

The result from Spearman's correlation between age and ACT score has suggested that the two variables' correlation is significant ($p = 0.020$; $r^2 = 0.145$). Furthermore, the scatterplot graph between both data in this research indicates that they are positively correlated, which implies that ACT score is better as the subject is older. This result shows a mismatch with Talreja N. et al finding that alludes otherwise. They compared almost 400 elder asthmatic patients whom age were above 65 years old to about 2,500 young asthmatic patients whom between 18-64 years old in the United States. The study stated that asthma control both short and long term are worse in elderly asthmatic patients when compared to the young asthmatic patients; moreover, the elders had less knowledge about asthma mitigation which is attributed to become a possible factor for their lower asthma control.[12]

To understand the discrepancy between this study's finding with Talreja N's study, there is a notable feature that could create this circumstance, which is the difference in subjects that were studied. In Talreja N's study, he compared two different age groups, which are the elder group (>65 years old) and the younger group (18-64 groups).[12] While in this study, the age was not grouped. Supposed the subject was grouped, there are 9 subjects in the elder group and 19 subjects in the younger group, where the discrepancy between the two categories total subject number makes the population to be significantly uneven. The data was compared linearly between the two variables, which are the age and the ACT score.

Busse, et al. gave another evidence that caused elderly to have lower asthma control. It was discovered that elders showed higher level of inflammation markers in their sputum. The level of sputum's neutrophil, eosinophil, IL-6, IL-8 and other inflammation proteins which could potentially be the mark for higher airway inflammation in the elderly compared to the young; beside, the asthma control

Table 3: Subject's Age and ACT Score

Variable	N	Value	p value*
Age, mean ± SD, years	28	58.6 ±11.8	0.020
ACT score, median, (n)	28	20 (12-23)	

* Correlation is considered as significant at p < 0.05 (2-tailed test)

level was also worse in the elderly.[13]

After the gender data of Persahabatan Hospital's Asthma Club members was calculated for its correlation with the ACT score, it can be acknowledged that there is a significant correlation between the two variables (p = 0.002). Most of the subjects in this study are female which accounts for 75%, and there are only 7 males that is 25% of the subjects. Despite the fact that less male was involved in this study, they have better ACT score compared to their female counterparts. The average ACT score for male is 21.7, which is categorized as partially controlled. Female, on the other hand, exhibits an average ACT score of 18.4 that means the average female subjects were uncontrolled. Thus, female has worse asthma control compared to male in this study.

However, this finding contravenes with other studies which established that there is no significance between gender and asthma control.[14,15] One study by Dursun AB and colleagues directly studied the correlation between gender and ACT score in which they conclude there is no impact on gender to the ACT score and clinical characteristics in asthmatic adults.[14] Nevertheless, there is also a report that concludes females, the majority of subject population in this study, to have worse asthmatic symptoms such as cough with sputum, tightness in chest, shortness of breath, and nocturnal asthmatic symptoms to that of males which explains why female subjects had worse ACT score average compared to the males subjects.[16] Moreover, females have worse perception of asthma control which makes them more anxious towards their disease.[17]

There are also factors that can affect gender differences impact on asthma control. Torchyan AA conducted a study in Saudi Arabia that investigated gender-related factors that could contribute in asthmatic adults' asthma control. He found that there

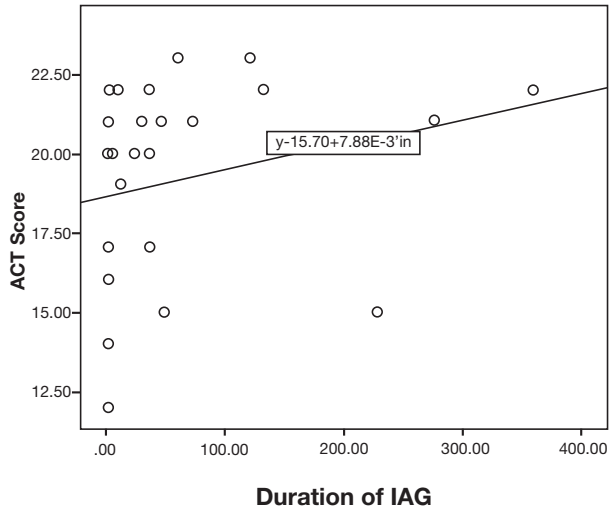

Figure 1: Pribadi IU, et al

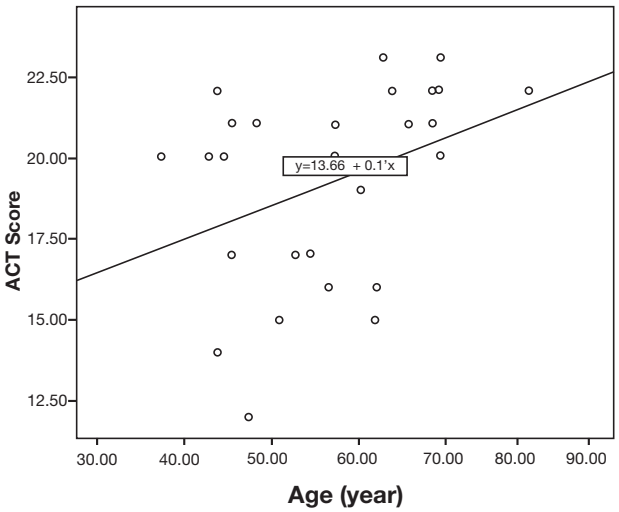

Figure 2: Pribadi IU, et al

is a difference between the factor associated with the gender and asthma control. Males is attributed to higher level of stress, confidence interval and consumption of tobacco smoking while females are associated with unemployment and more obese.[18]

The last factor that is analyzed for its correlation is smoking history. The outcome indicates that the correlation between the variables in this study is insignificant (p = 0.816). The smoking history is categorized into three groups: non-smoker, former smoker, active smoker. The insignificance between the two variables could be accepted because according to two different studies by Boulet, et al. and Tiotiu A., et al. have suggested that only active smokers show poorer asthma control to the rest of the group, whilst there is no difference of asthma control result between the non-smoker and former smoker

groups.[19,20] Amidst the subject that are taken into this research, none of them are active smoker; all subjects are non-smoker and former smoker.

Conclusion

This study can be concluded as follows: (1) The duration of IAG exercise has significant correlation with ACT score (p=0.022; r^2= 0.065). The two variables also exhibit a positive correlation, where subjects who have longer duration of IAG exercise have better ACT score. (2) As the subjects are older, they display more superior ACT score just as age and ACT score is positively correlated (p= 0.020; r^2= 0.145). Males have better ACT score compared to females, for the two variables are also significantly correlated (p= 0.002). Smoking history, however, is insignificantly correlated with ACT score as there is no active smoker subject involved. (3) Amongst the members of Persahabatan Hospital's Asthma Club, the median of their ACT score is 20, with a minimum score of 12 and a maximum score of 23. On the other words, the median of asthma control amid Persahabatan hospital's Asthma Club is categorized as partially controlled.

To ensure a more excellent result respecting to the effect of IAG exercise to asthma control, a cohort study is recommended to produce an accurate duration of IAG exercise that could improve ACT score. Furthermore, other affecting factors of asthma control such as occupation, education, allergy history and drug compliance should be considered to be included in the next study.

Based on the studies that have been made in regard to the benefit of IAG exercise and this study itself, IAG exercise is endorsed for asthmatic people as a management in order to improve their asthma control and quality of life.

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