

# Asthma control test (ACT): comparison with the accurate use of inhalers for the treatment among patients with asthma

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## Asthma control test (ACT): comparison with the accurate use of inhalers for the treatment among patients with asthma

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### Abstract

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**Background:** Asthma is a heterogeneous disease characterized by chronic inflammation of the respiratory tract. Pharmacological therapies that are often given by inhalation are Dry Powder Inhaler (DPI) and Metered-Dose Inhaler (MDI). According to the GLOBAL INITIATIVE FOR ASTHMA Asthma Control Test (ACT) is a questionnaire that can be used to measure the level of asthma control.

**Purpose:** To determine the relationship between the correct use of inhalers and the results of the Asthma Control Test (ACT) in asthma patients.

**Method:** The design of this study was an analytic survey with a cross-sectional approach. The parameter used were asthma control test questionnaires taken from primary data in the form of a survey. There were 126 total samples of respondents who met the inclusion criteria, namely asthma patients who used inhalers and underwent at least 3 months of treatment.

**Results:** Spearman correlation test was obtained  $p = 0.000$  which means that there is a significant relationship between the accuracy of inhaler use and the results of the asthma control test and a strong positive correlation coefficient of  $r = 0.667$  and, for the 95% confidence interval in this study, it was obtained (95%CI = 3.09-3.83).

**Conclusion:** There is a relationship between the correct use of inhalers and the results of the asthma control test (ACT) in asthma patients.

**Keywords:** Asthma; Asthma Control Test (ACT); Inhaler

### INTRODUCTION

Chronic respiratory tract inflammation is one of the diverse symptoms of asthma. Wheezing, shortness of breath, chest tightness, and a variable-intensity cough with restricted expiratory airflow are among the symptoms of asthma that frequently manifest (Global Initiative for Asthma, 2020).

According to the Global Initiative for Asthma states that approximately 1-18% of the population of respiratory diseases in various countries are asthmatics. According to the World Health

Organization (WHO) in 2016 there were about 399 million people in the world suffering from asthma. In Indonesia, the prevalence of asthma sufferers is calculated from the national average that is equal to (2.4%) where the highest prevalence is in the Province of DI Yogyakarta at (4.5%). Lampung Province is a province that looks quite low for asthma prevalence, namely ranked 31st. In 2018 the prevalence of Lampung Province was (1.60%). The highest prevalence in Lampung Province is Pringsewu

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Regency with a prevalence of (2.15%) (Basic Health Research, 2018).

Asthma pharmacological therapy is often used as a controlling drug, one of which is inhaled drugs, administration of drugs by inhalation can provide a rapid onset and fewer systemic side effects (Orellano et al., 2017; Misra et al., 2011). However, when using inhaled drugs, you must have skills so that the drug can be administered effectively (Global Initiative for Asthma, 2020). As for the way of administering inhaled drugs, you can use a Dry Powder Inhaler (DPI) or you can also use a Metered-Dose Inhaler (MDI) (Fadzila, 2018; Gomm et al., 2016). Determining the type of inhaler is also the most important determinant in determining the correct use of the inhaler. Previous research showed that of 30 people who were careful there were (56.7%) of 17 people using inhalers correctly (Pothirat et al., 2021).

When compared to people who are less comfortable with their inhaler, those with high levels of inhaler satisfaction have better asthma control, fewer cases of uncontrolled asthma, and fewer asthma symptoms overall (Plaza et al., 2018). In a study, it was discovered that asthma control and inhaler accuracy are related (Mikhail & Grayson, 2019).

Controlled asthma symptoms can be measured using the Asthma Control Test (ACT) questionnaire quickly to screen patients with poor asthma control. According to ACT is very useful and very important beneficial for the management and control of asthma (Global Initiative for Asthma, 2020). The ACT questionnaire describes daily activity disturbances as a

result of asthma, how often the patient complains of shortness of breath, whether there are symptoms at night, how often he uses spray/oral medication and how the level of asthma control is (Zhang et al., 2020). From previous studies, it was found that there is a relationship between the accuracy of using inhalers and whether or not asthma is controlled based on the ACT. There were (28.1%) of 9 patients with uncontrolled asthma and there were about (71.9%) of 32 asthma patients controlled when using the inhaler correctly (Zazuli et al., 2018). Clinic Harum Melati and Wisma Rini Hospital are the only Respiration Clinics and one of the hospitals in Pringsewu Regency, Lampung Province that already provides asthma treatment based on Global Initiative for Asthma international recommendations which are intended to represent Pringsewu Regency as a forum for research.

The association between the proper use of inhalers and the outcomes of the ACT among asthma patients in Pringsewu Regency, Lampung Province, is therefore a study that researchers are interested in performing.

## RESEARCH METHOD

This is an observational study for this investigation. This type of study uses a cross-sectional analytical survey methodology. To audit asthma cases, a prospective method is used. All asthmatic patients receiving care at the Harum Melati Clinic and Wisma Rini Pringsewu General Hospital in the province of Lampung made up the study's population.

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**Tabel 1 Demographic Characteristic of Respondents (N=126)**

Characteristics	Results
<b>Gender (n/%)</b>	
Man	35/27.8
Woman	91/72.2
<b>Age (n/%)</b>	
Baby (0-6 year)	0/0
Child (2-12 years)	5/4.0
Teenager (13-19 years)	10/7.9
Adult (20-65 years)	96/76.2
Elderly (>65 years)	15/11.9
<b>Inhaler (n/%)</b>	
Salmeterol and flutikason	43/34.2
Beclometason and formoterol	73/57.9
Flutikason	2/1.6
Budesonide and formoterol	8/6.3

The results of the sample characteristics are that most of the respondents are based on gender, that is, there are more women, as many as 91 people (72.2%) and men as many as 35 people (27.8%). at the age of adults (20-65 years) as many as 96 people (76.2%), and at the age of children the lowest score was 5 people (4.0%) in asthma patients. The highest age characteristics of asthmatics occurred in adults (20-65 years) as many as 96 people (76.2%), and at the age of children the lowest score was 5 people (4.0%) in asthmatic patients. Characteristics of respondents based on inhaler drugs for asthmatics that are most often used in asthma patients at the Harum Melati Clinic and Wisma Rini General Hospital, as many as 73 people (57.9%) used declomethasone/formoterol, which was higher than other types of inhaler drugs. and, the use of fluticasone which is the least or rarely used is 2 people (1.6%).

**Tabel 2. Types of Inhaler (N = 126)**

Inhaler Device	(n/%)
<b>DPI</b>	
Accuhaler	43/34.1
Nexthaler	9/7.1
Turbuhaler	8/6.3
<b>MDI</b>	
Pmdi	66/52.4

The frequency distribution of the type of inhaler that is often used in patients at the Harum Melati Clinic and RSU Wisma Rini is the MDI inhaler device of the pMDI type as many as 66 people (52.4%) followed by the DPI inhaler device

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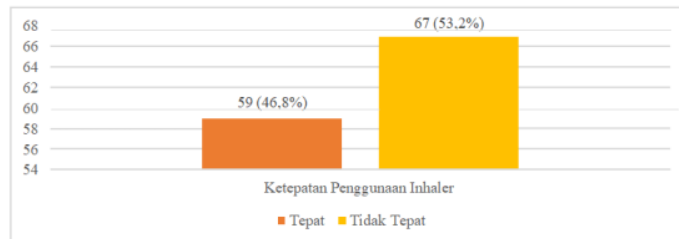
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of the accuhaler type which is 43 people (34.1 %) and the least used inhaler was 8 people (6.3%) namely the DPI device with the turbuhler type.



**Grafik 1 Frequency Distribution of Inhaler Usage Accuracy**

The results showed that the frequency of the correct use of inhalers was found that asthmatic patients used their inhalers incorrectly, namely 67 people or (53.2%). Meanwhile, only 59 patients (46.8%).

**Tabel 3. Asthma Control Test Frequency Distribution of Asthma Patients (N=126)**

ACT	Results (n/%)
Fully Controlled	44/34.9
Partial Controlled	52/41.3
Not Controlled	30/23.8

The results of the frequency distribution of the results of the Asthma Control Test (ACT) found that the partially controlled asthma was higher than the fully controlled patient. A total of 52 people or (41.3%) were partially controlled, for asthmatics who were fully controlled as many as 44 people or (34.9%) and asthmatics who were not controlled, namely 30 people or (23.8%).

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**Tabel 4. Distribution of Frequency of Use Inhaler Control and Asthma**

Device and Drugs of Inhaler	Correct use of Inhaler	Fully Controlled (n/%)	Partial Controlled (n/%)	Not Controlled (n/%)
<b>Accuhaler</b> Salmoterol/ Fluticasone	Correct	19/15.1	4/3.2	1/0.8
	Incorrect	1/0.8	7/5.6	11/8.7
<b>pMDI</b> Beclometasone/ Formoterol	Correct	16/12.7	8/6.3	1/0.8
	Incorrect	2/1.6	24/19.0	13/10.3
<b>pMDI</b> Fluticasone	Correct	1/0.8		
	Incorrect		1/0.8	
<b>Nexthaler</b> Beclometasone/ Formoterol	Correct	3/2.4	2/1.6	
	Incorrect		2/1.6	2/1.6
<b>Turbuhaler</b> Budesonide/ Formoterol	Correct	2/1.6	2/1.6	
	Incorrect		2/1.6	2/1.6

Obtained from tools and equipment. Inhaler drugs when using inhalers with the right technique, the results of the ACT are that many asthma sufferers who use the Accuhaler type inhaler with salmeterol/fluticasone drugs have higher accuracy in using the inhaler and can be fully controlled, namely 19 (15.1%) is not fully controlled. The lowest use and accuracy of the inhaler is the pMDI inhaler with the drug Fluticasone where there is only 1 (0.8%) asthmatic patients whose use of their inhaler and the results of their asthma control test are fully controlled.

**Tabel 5. Asthma control test (ACT): comparison with the accurate use of inhalers**

Inhaler	Fully Controlled (n/%)	Partial Controlled (n/%)	Not Controlled (n/%)	p-value	r	OR	95% CI
Correct	40/31.7	18/4.3	2/1.6	0.000	0.667	3.46	3.09-3.83
Incorrect	4/3.2	34/27.0	28/22.2				

There was a significant correlation between asthmatic patients the ACT results and proper inhaler usage. With the spearman test, the Harum Melati Clinic, Pringsewu and Wisma Rini RSU, Pringsewu Regency, Lampung Province, obtained OR = 3.46 and

then for the confidence interval or 95% confidence interval it was obtained (95% CI = 3.09-3.83). This indicates that there is a significant relationship between the accuracy of inhaler use and the outcomes of the asthma control test.

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## DISCUSSION

### The Distribution of Characteristics

In this study, there were differences in prevalence between male and female asthmatic patients at each year level. At the age of children (0-12 years) it was found that the prevalence of asthma was higher in boys, but after entering adolescence, at the age (20-65 years) the prevalence of asthma in women was higher.

This is in accordance with research conducted, It is explained that hormonal changes before and after puberty have an influence on changes in this pattern, especially the hormone estrogen (Chabra & Gupta, 2020). Most asthma is triggered by a hypersensitivity response, although genes and atopic history have an important role, but asthma expression itself is triggered by this response. Where alveolar macrophages are the main mediators in lung inflammation caused by allergies. In his research, Kaselman stated that female rat alveolar macrophages showed greater expression of the estrogen receptor alpha (ER- $\alpha$ ) than male rats. Expression of the M2 gene which results in an increase in eosinophils which is in line with impaired lung function. This causes a significant increase in the number of female asthmatics after puberty (Keselman et al., 2019).

### Frequency Distribution of Appropriate Use of Inhalers

In this study, the proportion of asthma patients using the inhaler incorrectly was higher than that of asthma patients using it correctly, with 67 people using the incorrect inhaler as opposed to 59 people using it correctly (46.8%). This is in accordance with the analysis of research conducted on 30 respondents that some of the respondents were right in using inhalers, namely 17 people (56.7%) (Fadzila, 2018). This study is different from the research conducted namely asthma patients who did not regularly use inhaled corticosteroids as many as 61 people (63.55%) and patients who regularly used inhalation as many as 35 people (36.5%) (Prisilla et al., 2016).

In this study, it was also found that the accuracy of using inhalers for asthmatics is not appropriate because there are several influencing factors, namely, because asthmatics when breathing, such as not

exhaling before and after using the inhaler, cannot hold their breath for about 5-10 seconds. Some asthmatics also forget to check the dose before using the inhaler, do not shake inhaler correctly specifically for pMDI users and forget to rinse your mouth after using the DPI inhaler device (Lorensia & Nathania, 2017).

Inhalation is a method of administering drugs topically to the lungs which produces high local concentrations in the lung with low systemic delivery. The inhalation method can cause systemic side effects. Accurate use of inhalers is the most important thing and needs to be considered in asthma patients in undergoing inhalation therapy, because it is closely related to the patient's quality of life in controlling the asthma and reduce the symptoms experienced (Bakhtiar & Tantri, 2019).

### Frequency Distribution of the Use of the Asthma Control Test (ACT)

In this study, the highest frequency for partially controlled ACT assessment was higher, namely 52 people (41.3%) and fully controlled patients as many as 44 people (34.9%) and the frequency in uncontrolled patients was 30 people (23.8%). This is in accordance with research conducted, which stated that the ACT questionnaire can be used to complete the examination and clinical assessment of asthmatic patients in determining the level of asthma control. 32.5% were fully controlled, 87 people (42.9%) were partially controlled, and 50 people (24.6%) were not controlled (Ramlie et al., 2014). Meanwhile, research conducted showed that from a total of 30 subjects, 90% of asthma patients had uncontrolled asthma (Widyastiwati et al., 2021) and according to 57 patients had uncontrolled asthma (59.4%). (Prisilla et al., 2016). Asthma control test (ACT) is a questionnaire that has been validated and can reflect changes in the level of control or not controlled. This questionnaire is easy to use and can monitor the level of asthma control.

Early introduction to changes in the level of asthma control and being self-detected by the patient is the most important thing, because can prevent severe acute asthma exacerbations. Early use of asthma can

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reduce disease morbidity and mortality. According to research conducted there were 46 people (81%) at the uncontrolled level, 11 people (19%) partially controlled and no patients with full control. International guidelines, asthma management to achieve and maintain control, is characterized by the absence of signs of symptoms at night and during the day, no visits to the hospital / doctor, minimal need for reliever medication, no restrictions on physical activity and exercise, lung function approaching normal and, no drug side effects (Haryanti et al., 2016).

#### 4 The Accuracy of Inhaler Use and Asthma Control Test (ACT) Results in Asthma Patients

In the results of this study using the Spearman correlation test in get that there is a relationship between the accuracy of using the inhaler with the 3 results of the Asthma Control Test (ACT) sig = 0.000 which means there is a significant relationship between the accuracy of the use of inhalers with the results of the asthma control test and a positive 2 relation coefficient of  $r = 0.667$  which means that there is a strong correlation between the accuracy of 3 the use of inhalers and the asthma control test, then OR = 3.46 which means that there is a risk of 3.46 times people who do not use If the inhaler is not correct, then the asthma is not controlled and then the confidence interval or 95% confidence interval for the correct use of the inhaler with the results of the asthma control test was obtained (95% CI = 3.09-3.83). In this study, there were 126 respondents of which 40 people using inhalers correctly had partial asthma control, namely (31.7%). 3

This study is different from the research conducted by Wahyudi Fadzilla, in 2018 which showed that there was a relationship between the accuracy of using inhalers and the results of the asthma control test, namely from 30 respondents who were correct in using their inhalers there were 17 people regularly using the inhaler correctly and the ACT was fully controlled, which was equal to (26.7%). This study is the same as the research 2 nducted by (Prisilla et al., 2016) which states that there is a relationship between the accuracy of using inhalers and the Asthma Control Test (ACT), namely, (71.9%) of 23 people have

controlled asthma and (28.1%) of 9 people have uncontrolled asthma. Research conducted, concluded that patients with higher MDI accuracy scores were positively correlated with their level 2 of asthma control. In this study, it was shown that the group of patients who used the MDI correctly had an ACT score of 18.22%. Meanwhile, those who use MDI incorrectly have a lower ACT score of 14.81% (Widyastiwi et al., 2021).

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Inappropriate use of inhalers can be associated with poor asthma control and increased frequency of visits to the ED. Improper use of inhaler devices reduces drug distribution and loss of drug effectiveness and it will lead 2 to poor asthma control rate as a result of therapy. In addition to inappropriate use of inhalers, several other factors that can affect the outcome of therapy are asthma exacerbations and patient compliance in using asthma medications (Widyastiwiet al., 2021).

#### CONCLUSION

The outcomes of the Asthma Control Test in asthmatic patients at the Harum Clinic are correlated with the proper usage of inhalers. The accuracy of utilizing the inhaler and the asthma control test are strongly correlated.

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