The Relationship Between Medication Adherence and Asthma Control in Asthma Patients at a Public Health Center in Padang, Indonesia

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ABSTRACT: Asthma is characterized by reversible swelling or narrowing of the airways. Low adherence can negatively affect the effectiveness of therapy, increasing asthma morbidity and mortality. The long-term goal of asthma treatment is to achieve and maintain controlled asthma, but this goal is still challenging for most patients. This study examines the relationship between medication adherence and asthma control in patients. This study is observational, with a cross-sectional approach conducted on 40 asthma patients who received treatment at a Public Health Center. Patient medication adherence was measured by Medication Possession Ratio (MPR) method and the level of control was measured by the Asthma Control Test (ACT) questionnaire. The results showed that most patients based on sociodemographic characteristics were female (80.0%), elderly group ≥60 years (45.0%), high school education (55.0%), and housewives (45.0%). The category of medication adherence was divided into 47.5% adherent patients and 52.5% non-adherent patients. The level of patient control was divided into fully controlled (2.50%), partly controlled (35.0%), and uncontrolled (62.5%). There was a significant relationship between adherence and asthma control (r=0,508; p<0,05). Improving patient medication adherence has the potential to improve asthma control levels.

Keywords: asthma; medication adherence; asthma control; Medication Possession Ratio (MPR); Asthma Control Test (ACT).

Introduction

Asthma is a chronic inflammatory disorder of the airways characterized by swelling and inflammation reversible spontaneously or with treatment [1]. Common symptoms often occur, such as wheezing, coughing, and shortness of breath, repeated at night or early in the morning due to blockage of the respiratory tract. Symptoms are episodic and can be caused by various triggers, such as irritants, specific allergens, and exercise [2].

Asthma is found in 1-18% of the population in developed and developing countries; around 300 million people worldwide have asthma and it is estimated that this will continue to increase to 400 million by 2025. Asthma occupies the top 10 causes of morbidity and mortality in Indonesia [3]. According to a report on the results of the National Basic Health Research, the prevalence of asthma in Indonesia reaches 2.4% of the entire population of Indonesia, and the prevalence of asthma in adults is higher than that of children. In West Sumatra, the prevalence of asthma reaches 2% in the population of all ages with the incidence of asthma recurrence in the 2nd position throughout Indonesia with a value of 66.2% [4].

The long-term goals in asthma treatment are to achieve and maintain control of asthma symptoms, achieve (nearly) normal pulmonary function test values, maintain normal daily activities and minimize the risk of progressive worsening of asthma symptoms, improve airflow limitation and minimize side effects of treatment [5]. Failure to achieve controlled asthma can affect the patient's quality of life and increase morbidity [6]. The level of controlled asthma is still challenging for most patients to achieve despite the availability of international asthma management guidelines and proven successful asthma therapy [7].

Asthma is said to be controlled if the daily symptoms of asthma are minimal (preferably absent), including attacks at night, do not interfere with daily activities and the need for relievers

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is minimal or absent [8]. Uncontrolled asthma can be caused by various factors, including the wrong diagnoses of asthma; poor inhaler technique; exposure to smoke; comorbid conditions, especially allergic rhinitis; responses to medication that can vary in individuals; and low patient medication adherence [9].

One of the most critical factors in treating chronic diseases such as asthma is patient medication adherence. Medication adherence can be seen from the patient's adherence to taking medication. Patient adherence to medicine is the first time compliance can be assessed related to the patient's attitude in meeting the availability of drugs that will be used to maintain the continuity of therapy in their treatment [10].

Adherence to asthma therapy tends to be low. Several studies in Indonesia report non-adherence to treatment in asthma patients ranging from 50% to 70% [7,11]. A low level of asthma medication adherence is associated with morbidity and mortality. Increased adherence significantly affects the improvement of lung function [12].

The high incidence of asthma recurrence in West Sumatra means that it is still challenging to achieve controlled asthma in patients. Adherence is essential in treating chronic diseases such as asthma that require long-term treatment. This study aimed to examine the relationship between the level of asthma medication adherence and the patient's asthma control.

Methods

Research Design

This study used an observational research design with a cross-sectional approach through data collection of patient prescription recapitulation and Asthma Control Test (ACT) questionnaires. The sampling technique used was purposive sampling. The research was conducted at the Pauh Public Health Center, Padang City, West Sumatra, Indonesia.

Patient Criteria

The inclusion criteria were asthmatic patients aged 18 years treated who had received asthma treatment (controller and reliever drugs) for at least one month. Meanwhile, the exclusion criteria were Patients suffering from Chronic Obstructive Pulmonary Disease (COPD) and other respiratory diseases.

Ethical Approval

This study obtained ethical approval from the Research Ethics Committee, Faculty of Medicine, Andalas

University Indonesia (No. 625/UN.16.2/KEP-FK/2022). Respondents were asked to fill in informed consent as evidence of willingness.

Research Instruments

The instrument in this study was an ACT questionnaire with five questions that had been tested for validity and reliability on 30 respondents. The results of the validity test obtained the calculated r value of 0.491 - 0.870 where the calculated r-value > r table (0.361), the results of the validity test obtained the estimated r value of 0.491 - 0.870 because the computed r-value > r table (0.361) so that all questions in the questionnaire were declared valid. The reliability test results showed that the value of Cronbach's alpha from the ACT questionnaire was 0.803, so it can be concluded that the ACT questionnaire questions are reliable because they have Cronbach's alpha values greater than 0.60.

Data Analysis

Adherence measurement is seen based on taking medication back by the patient using the Medication Possession Ratio (MPR) method. The calculation of MPR value is determined from patient visit data when taking the medication back for three months at the public health center. The MPR method classifies patients to be adherent if the MPR value is 80% and the patient is said to be non-adherent if the MPR value is <80% [10]:

$$\%MPR = \frac{A}{B} \times 100\%$$

Description:
A = Number of days as supplying drugs in a period of treatment
B = Number of days as supplying medications after taking the last drug

The patient's asthma control was measured using an ACT questionnaire with five questions. The ACT assessed the frequency of shortness of breath, night/early awakening, use of reliever medication, overall asthma control, and loss of productivity. Each question has five answer options with a score of 1 to 5, with a total score ranging from 5 to 25. The ACT questionnaire classifies the patient's clinical condition into fully controlled with a score of 25, partially controlled with a score of 20-24, and uncontrolled having a score of 19 [12].

The data obtained will be analyzed using the Spearman Rank correlation test using the SPSS program to determine the relationship between medication adherence

and asthma control in asthmatic patients at Pauh Public Health Center. The data is then presented in tabular form and conclusions are drawn based on the results of statistical test analysis

Result and Discussion

The study's results for the respondents characteristics (Table 1) found that the highest gender was female with 32 patients (80%). This result is the same as the study conducted by Ferliani where the most asthma sufferers by gender were women with 77 patients (61.6%) [7]. The mechanism underlying the sex differences in asthma prevalence is still being investigated but mainly refers to hormonal differences and differences in lung capacity. The influence of hormones on women is the increase in estrogen levels after puberty. High estrogen levels in the body are responsible for asthma exacerbations in women. Because of the anti-inflammatory action of estrogen, this hormone decreases TNF-α production and reduces IFN-γ expression and NK cell activity [13].

Characteristics of patients based on age were divided into three categories. The highest results were in the elderly (≥60 years), with as many as 18 patients (45%), followed by pre-elderly (45-59 years) and adults (18-44 years) with 11 patients (27,5%). These results follow the data for basic health research in West Sumatra for the highest asthma prevalence at 60 years and over. The

results of this study are also in line with Wahyudi Fadzila's research, which showed that most asthma cases were in the 56-65 year age range as many as ten patients (33.3%). The incidence of pulmonary disorders increases with age. This is because elderly patients experience a decrease in respiratory function and a decrease in work on the body's organs, making it easier for asthma attacks to occur [14]. The high incidence of cases in this age group is also caused by patients who have had asthma since childhood or adolescence, which has been ongoing [5].

The results showed that the most recent educational characteristics of patients were in senior high school with 22 patients (55%). Based on these results, patients can easily understand questions when filling out questionnaires, and high school education levels are also able to find information about how to prevent and avoid triggers of asthma attacks.

Most patients were housewives, with 18 patients (45%). The results of this study are the same as the research conducted by Aditya Sri Listyoko, which got the highest number of work asthma patients as housewives with six patients (40%) [6]. One of the triggering factors for asthma is the entry of allergens into the airways, stimulating a type 1 hypersensitivity reaction. There are two types of allergens, namely indoor and outdoor allergens. Indoor allergens come from the home environment that can affect asthma attacks such as dust, materials from household furniture used (pillows, carpets, mattresses),

Table 1. Sociodemographic characteristics of asthma patients

Respondents Data	Category	Patients (n=40)	Percentage (%)
Gender	Male	8	20
	Female	32	80
Age (Year)	Adult (18-44)	11	27,5
	Pre-elderly (45-59)	11	27,5
	elderly (≥60)	18	45
Education	Primary school	8	20
	Junior high school	3	7,5
	Senior high school	22	55
	Bachelor degree	7	17,5
Profession	Student	4	10
	Public/Private Servants	4	10
	Self-employed	11	27,5
	Pensioner	2	5
	Housewives	18	45
	other	1	2,5

Table 2. Medication adherence of asthma patient

Adherence	Number of patients (n=40)	Percentage (%)
Adherent (≥80%)	19	47,5%
Non-Adherent (<80%)	21	52,5%

furry pets (cats, dogs), and humidity that can create a habitat for fungi, mites, cockroaches, and bacteria. The high incidence of asthma in housewives from the results of this study is thought to have a relationship with indoor allergens as one of the triggering factors for asthma, where housewives have a high risk of exposure to indoor allergens when cleaning the house [15].

Based on the results from Table 2, most of the respondents in this study were not adherent in taking their medication back according to the schedule that should have been to the public health center with an MPR value <80%. About 21 respondents (52.5%) were found who did not adherent and 19 respondents (47.5%) were categorized as adherent in taking medication. This result is the same as that obtained by Gesnita Nugraheni (2022) where 68 patients (85%) had not fully adhered to treatment [16].

Low adherence was defined as the treatment failure the patient and health care provider agreed upon. Approximately 50% of adults and children on long-term asthma therapy have low adherence for at least some time [8]. Low asthma patient adherence is a significant cause of asthma attacks, poor asthma control, increased frequency of exacerbations and hospitalizations, high healthcare costs, and can increase the risk of death [17].

The research conducted by Sri Haryanti showed that the main factor causing the patient's non-adherence to treatment was that the patient felt that his asthma had been resolved. Hence, he stopped using the drug, which could cause the patient not to take the drug back to the health facilities on time [12].

Rizki Romadhon (2020) in the results of his research found that the most common factor causing non-adherence was patients forgetting to take their medication. The dominance of the number of patients in the elderly may have a relationship with the patient's forgetfulness in using drugs. At this age, there usually has been a process of degeneration of human organ functions, one of which is memory decline. Therefore, forgetting to use drugs in the elderly is a problem that is often conveyed by patients [18]. Another reason that may affect patient medication adherence is the distance of health facilities from homes related to transportation costs, causing patients to be lazy to check and retake drugs [19].

Several factors can cause low adherence; namely, patients have difficulty using inhalers, aggravating dosing regimens (several times a day), patients forget to take medication, the patient perception that medication is not needed, patients feel annoyed or angry because they have to use drugs every day. Patients worry about the side effects of drugs, and dissatisfaction with healthcare providers [8].

The ACT questionnaire has five questions with 5 possible answers related to how often asthma attacks interfere with daily activities and cause the patient to wake up at night, how often the patient experiences shortness of breath and used reliever medication, and how the patient thinks about his level of asthma control during the past 4 weeks. Based on Table 3, 25 patients (62.5%) had uncontrolled asthma, 14 patients (35%) had partial control, and only one had fully controlled asthma. Wulan Priscilla in his research at the Pulmonary Polyclinic of RSUP M. Djamil Padang also found higher rates of uncontrolled asthma patients by 59.4%, partially controlled at 35.4%, and fully controlled at 5.2% [20]. West Sumatra is ranked second in all provinces in Indonesia for the highest proportion of asthma recurrence, which shows that there are still many patients with uncontrolled asthma [4].

Uncontrolled asthma can be caused by various factors, including the presence of comorbidities (obesity,

Table 3. Patient asthma control level data

Adherence (Score)	Number of patients (n=40)	Percentage (%)
Fully Controlled (25)	1	2,5
Partial Controlled (20-24)	14	35
Uncontrolled (≤19)	25	62,5

Table 4. Relationship between adherence and asthma control

Patient's Adherence	Asthma Control Level			Correlation Coefficient	p (value)
	Fully Controlled	Partial Controlled	Uncontrolled		
Adherent	1	11	7	0,508	0,001
Non-Adherent	0	3	18		

bronchitis, COPD), continuous exposure to precipitating factors, poor medication adherence and the patient is not aware of symptoms as indicators of poor control [20]. Other factors, such as incorrect inhaler technique, medication side effects, anxiety, depression, and socioeconomic problems, can contribute to the patient's asthma control [8].

The goal of asthma treatment is to achieve and maintain controlled asthma. Fully controlled asthma has no symptoms during the day or night, no need for reliever medication, no asthma attacks, no limitation of physical activity and exercise, near normal lung function (VEP 1 and/or APE >80% predictive), and minimal drug side effects [3]. However, the ACT questionnaire did not include an assessment of pulmonary function and drug side effects. The level of asthma control should be assessed monthly in conjunction with visits to the public health center or other health facilities. In this study, 62.5% of patients had uncontrolled asthma. The high percentage of uncontrolled asthma suggested frequent asthma attacks in patients, which increased the need for reliever drugs and interfered with daily activities.

Based on the results from Table 4, it was found that there was a significant relationship between asthma medication adherence and asthma control with a value of p = 0.001 (p <0.05). The value of the correlation coefficient (r = 0.508) indicates the strength of the moderate correlation between the two variables with a positive relationship direction. The more adherent the patient is in undergoing treatment, the higher the level of patient asthma control.

The results of this study align with research that Wulan Prisilla has carried out, namely, there is a significant relationship between the regular use of inhaled corticosteroids and the level of asthma control in patients at the M. Djamil Hospital Polyclinic, Padang with p-value = 0.002 [20]. Sri Haryanti also reported that high patient adherence to medication would result in higher asthma control [12].

The study's results showed that adherence is one of the factors determining the success of treating chronic diseases such as asthma. Non-adherence to treatment regimens and re-taking drugs can be caused by inadequate patient knowledge and awareness about the disease. Patients must have a basic understanding of their disease and its treatment if we expect good adherence. Achieving adherence requires considerable effort from patients and health workers to control patients' asthma successfully. Patients must be well motivated and confident that their behavior will improve their health [21].

The role of health workers, especially pharmacists, such as providing counseling, conducting health promotion by providing brochures and pamphlets so that patients understand the disease and its treatment, providing tools such as a medication calendar that can be marked when the patient is already using the drug so that the patient is adherent in using the medicine so that the success of treatment with value parameters asthma control improved [18].

The weakness in this study is the causes of patient non-adherence and other factors that can cause poorly controlled asthma in patients have not been investigated in this study.

Conclusion

There is a significant relationship between medication adherence and asthma control (r=0.508; p<0.05). Improving patient medication adherence has the potential to improve asthma control levels.

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