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Research article

An Analysis of Factors Affecting Medication Adherence and Disease Recurrence Rate in Asthma Patients

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Abstract

Medication adherence and disease recurrence rates in asthma patients greatly affect the patient's quality of life. Knowledge of factors that influence medication adherence and disease recurrence rates can significantly impact physical health and, consequently, patient quality of life. This study aims to identify factors that influence medication adherence and disease recurrence rates in patients with asthma. This study employed a descriptive analytical method with a multiple linear design. Data collection was conducted from July 5 to 30, 2025. Assessment of medication adherence was done by the Medication Adherence Report Scale (MARS) questionnaire and evaluation of disease recurrence rates using asthma recurrence questionnaires. The results of data analysis using multiple linear tests showed that factors influencing medication adherence in asthma patients were gender (29.35%), education (14.48%), and the triggers for relapse (21.34%). Factors that influence the rate of disease recurrence in asthma patients are education (17.5%), occupation (14.2%), and the triggers for relapse (76.1%). Based on the study's results, several factors similar to those influencing medication adherence and disease recurrence rates were identified, including education and the triggers for relapse.

INTRODUCTION

Asthma is a respiratory disease that significantly takes part in global morbidity and mortality [1]. Its prevalence has been steadily increasing each year. In 2015, approximately 358 million people worldwide were diagnosed with asthma, with 3.2 million deaths recorded [2]. By 2019, the number of asthma patients had reached 262 million, with 455,000 deaths [3]. According to World Health Organization (WHO) data in 2021, the number of individuals with asthma worldwide was estimated at 300 million, with 225,000 deaths were linked to the disease. The prevalence of asthma is projected to increase by 10% over the next decade [4].

In Indonesia, asthma ranks tenth among diseases contributing to morbidity and mortality. Its prevalence rose by 4.5%, or

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approximately 12 million patients, by the end of 2020 [3]. The prevalence and recurrence of asthma are higher in adults than in children [5]. The continuous rise in asthma prevalence and recurrence places a substantial burden on healthcare services and generates considerable economic costs due to the long-term treatment required [6,7]. Preventive measures are therefore essential, including proper asthma management and recurrence prevention. Treatment of asthma aims to control symptoms, achieve normal lung function, maintain daily activities, and minimize the risk of exacerbations, so that medication adherence is highly important for asthma patients [5].

Medication adherence in asthma patients refers to the regular practice of following treatment recommended by healthcare professionals [6]. However, adherence rates are reported as low [6,8]. Adherence rates among asthma patients are 23.4% in the United States, 34.8% in Italy, 24.9% in France, 29.2% in China, and 22% in South Korea [6]. In Indonesia, the adherence rate is approximately 57.4% [9]. Low adherence can be caused by multiple factors. Previous studies have identified determinants such as socioeconomic conditions, healthcare system-related aspects, and patient-related factors including gender, beliefs about medication, etc [9]. Poor medication adherence can lead to increasing morbidity and mortality [5]. Non-adherence in asthma patients is a significant obstacle to successful treatment and contributes to treatment failure and increases the risk of relapse in asthma patients which results in worsening conditions which increase the risk of death [10].

Relapse or recurrence in asthma refers to the reappearance of symptoms and discomfort previously experienced by patients, often triggered by specific factors. Relapse increases the risk of worsening health outcomes due to pulmonary exacerbations [3]. Data from the Indonesian Health Survey in 2023 reported an asthma recurrence rate of 58.3% [11]. High recurrence rates are influenced by various factors such as gender, occupation, allergen exposure, smoking history, and family medical history [4]. Frequent recurrence worsens disease severity, accelerates lung damage, and reduces patients' quality of life [12].

Based on these considerations, the present study aims to investigate the factors influencing medication adherence and disease recurrence in asthma patients.

METHODS

This study examined the factors influencing medication adherence and disease recurrence in asthma patients. The study population comprised all adult patients with asthma. Sampling was conducted by accidental sampling. A total of 58 respondents were selected based on inclusion and exclusion criteria. The inclusion criteria were: asthma patients aged ≥18 years, patients with a history of asthma for more than 2 years, patients undergoing regular treatment or health control at the clinic, and patients who were cooperative during data collection. The exclusion criteria were patients experiencing asthma recurrence during data collection, patients receiving inpatient medical care, and patients in medical emergencies.

Data collection was carried out after obtaining ethical approval from the Research Ethics Committee of the Institute for Research and Community Service, Universitas Muhammadiyah Pekajangan Pekalongan (No. 181/KEP-UMPP/VIII/2025). The research was conducted at the internal medicine clinic of RSI Siti Khodijah Pekalongan from 5–30 July 2025. Data were collected by having respondents complete research questionnaires directly. Two instruments were used: the Medication Adherence Report Scale (MARS) questionnaire to measure patients' medication adherence,

and a disease recurrence questionnaire to assess recurrence among asthma patients. The MARS questionnaire was validated and tested for reliability by Alfian et al. in 2017, with a validity score of 0.396 and a reliability coefficient of 0.803 and was declared valid and reliable for measuring medication adherence [13].

Data analysis was conducted through univariate and multivariate analyses. Univariate analysis was conducted using percentages for variables with categorical data and using the mean for variables with numeric data. Multivariate analysis was conducted using multiple linear regression to determine factors influencing medication adherence and disease recurrence rates in asthma patients. In this study, the α value used was 5% (0.05). The analysis test was conducted using the SPSS program.

RESULTS

The study included 58 asthma patients as respondents. The characteristics of the respondents are presented in Table 1. The majority of respondents were female (67.2%) and had completed senior high school (56.9%). Most were employed (70.7%), had a family history of asthma (65.5%), were non-smokers (67.2%), and reported 1–3 recurrence triggers (63.8%). Medication adherence was most commonly at a moderate level (36.2%), while disease recurrence was most frequently moderate (43.1%).

The analysis of variables associated with medication adherence among asthma patients was assessed based on the p-value obtained from statistical tests, as presented in Table 2. The variables correlated with medication adherence among asthma patients, including gender, age, education, employment status, family history, smoking history, and number of recurrence triggers. Based on chi-square analysis, the p-values were smaller than the significance level α (0.05), indicating that these variables were significantly correlated with medication adherence.

Table 2 also describes the variables correlated with disease recurrence. Statistically, chi-square analysis showed p-values ≤ 0.05, demonstrating that gender, education, employment status, family history, and number of recurrence triggers were significantly correlated with disease recurrence in asthma patients.

Although the bivariate chi-square tests indicated significant correlations between these variables and both medication adherence and disease recurrence, the multivariate analysis showed that not all variables remained as influencing factors. Multivariate analysis was performed with multiple linear regression to identify the factors most strongly associated with medication adherence and disease recurrence in asthma patients. The results of the multivariate analysis for medication adherence are presented in Table 3.

Based on Table 3, the R-square value for medication adherence was 0.351, indicating that gender, education, and the number of asthma-triggering factors accounted for 35.1% of the variance in adherence, while the remaining 64.9% was explained by other variables not included in the model. Statistical testing showed a p-value of 0.0001, confirming the regression model was significant and fit. The contribution of each predictor, derived from the positive coefficients, was as follows: gender (29.35%), education (14.48%), and number of triggering factors (21.34%).

For disease recurrence, the R-square value was 0.438, suggesting that education, occupation, and number of asthma-triggering factors explained 43.8% of the variance. The regression model was also significant (p = 0.0001). The relative contributions of the predictors were 17.5% (education), 14.2% (occupation), and 76.1% (number of triggering factors).

Table 1
Characteristics, Medication Adherence, and Disease Recurrence among the Respondents

Characteristics	n	%
Gender		
Male	19	32.8
Female	39	67.2
Education Level		
Elementary School	5	8.6
Junior High School	11	19
Senior High School	33	56.9
Higher Education	9	15.5
Occupation		
Employed	41	70.7
Unemployed	17	29.3
Family History of Asthma		
Yes	38	65.5
No	20	34.5
History of Smoking		
Smoker	19	32.8
Non-smoker	39	67.2
Number of Recurrence Triggers		
1-2 Triggers		
3-4 Triggers	27	46.6
≥ 4 Triggers	14	24.1
	17	29.3
Medication Adherence		
Low	17	29.3
Moderate	21	36.2
High	20	34.5
Disease Recurrence		
Severe	18	31
Moderate	25	43.1
Mild	15	25.9

The final model of factors influencing medication adherence and disease recurrence in asthma patients, based on the regression coefficients in Table 3, is presented in Figure 1. The final model of factors influencing medication adherence and disease recurrence in asthma patients. The model indicates that higher educational level and a greater number of asthma-triggering factors are associated with higher medication adherence. In contrast, the model of disease recurrence shows that being employed and having a greater number of triggering factors are associated with a higher risk of more frequent recurrence.

Table 2
Significance of the Correlation between Variables and Medication Adherence and Disease Recurrence in Asthma Patients

	Indicators	p value
Medication Adherence	Gender	0.018
	Age	0.024
	Education level	0.035
	Occupational status	0.035
	Family's medical history	0.045
	Smoking history	0.037
	Number of recurrences	0.018
Disease Recurrence Level	Gender	0.05
	Education level	0.0001
	Occupational status	0.05
	Family's medical history	0.05
	Number of recurrences	0.017

Table 3
Multivariate Analysis of Factors Influencing Medication Adherence and Disease Recurrence in Asthma Patients

	Variable	B Coefficient	Contribution (%)	R Square	Residual (Mean)	SD	Durbin-Watson	p value
Medication adherence	Constant	1.574		0.351	0.000	0.648	1.778	0.0001
	Gender	-0.462	29.25					
	Education	0.228	14.48					
	Number of recurrence triggers	0.336	21.34					
Disease recurrence	Constant	-0.204		0.438	0.000	0.569	1.730	0.0001
	Education	0.465	17.5					
	Pekerjaan	0.376	14.2					
	Number of recurrence triggers	0.201	76.1					

Medication adherence = 1.574 – 0.462 (gender) + 0.228 (education) + 0.336 (number of triggering factors)

Disease recurrence = –0.204 – 0.465 (education) + 0.378 (occupation) + 0.201 (number of triggering factors)

Figure 1
Final Model of Factors Influencing Medication Adherence and Disease Recurrence in Asthma Patients

DISCUSSION

In this study, the majority of respondents were female (67.2%). This finding is in line with Permatasari et al. (2023), who reported 80% of asthma patients were women. The high prevalence of asthma in women is associated with differences in hormone levels and lung capacity between men and women. In women, there is an increase in the hormone estrogen after puberty. High levels of estrogen in the body reduce TNF production and reduce NK cell activity in the immune system and hypersensitivity reactions in asthma patients. The majority of asthma patient respondents had a high school education (63.8%). The majority of high school education respondents in this study stated that patients could easily understand and complete questionnaires and find various information about asthma treatment and prevention of asthma recurrence [5]. The majority of respondents were employed (60.3%), had a family history of asthma (53.4%), had a history of not smoking (72.4%), and had 1-3 trigger factors (63.8%). The majority of medication adherence was in the moderate category (36.2%) and the disease recurrence rate was in the moderate recurrence category (43.1%).

Medication adherence remains a main challenge in asthma management [10,14]. Treatment of asthma aims relieve and control symptoms and reduce exacerbations due to asthma relapses. The

emergence of asthma relapse symptoms is associated with medication adherence. This study describes medication adherence in patients with asthma, the majority showing moderate adherence (36.2%). Research by Hometowska et al (2022) states that medication adherence in asthma patients is in the moderate category, around 50% [15]. Compliance is directly related to asthma relapses and quality of life in asthma patients [14]. Good medication adherence increases treatment success, reduces the risk of hospitalization, reduces the risk of morbidity and mortality, and improves quality of life [10]. Non-adherence to medication in asthma patients is a cause of asthma exacerbations [15].

Several factors influence and contribute to medication adherence, causing patients fail to take their medications regularly. This study describes the factors influencing and contributing to medication adherence based on a modeling of factors influencing medication adherence: gender, education, and the number of triggering factors, as depicted in Figure 1 above. Gender contributed 29.35% to medication adherence in asthma patients, while education contributed 14.48% to the number of triggering factors for relapse, and 21.34%.

Research by Dahlen et al. (2022) explains that gender is a factor influencing medication adherence in asthma patients. Gender is associated with asthma medication dispensing patterns and medication adherence. A higher proportion of asthma relievers are prescribed to male patients than to female patients. In general, female patients are prescribed fewer asthma medications than male patients. The number of prescriptions and the number of medications prescribed to male patients can influence medication adherence [16]. Research by Chowdhury et al. (2021) found that men have an increased prevalence of severe asthma, which is linked to increased environmental exposure, including dust, pollution, and cigarette smoke. This leads to higher medication adherence in men compared to women [17].

This present study unveiled that education is one of the factors contributing to medication adherence, namely by 14.48%. It found that higher education increases medication adherence in asthma patients. The level of education will influence a person's knowledge to overcome the disease and influence the perception of recovery, thus increasing medication adherence [18]. The factor that contributed to medication adherence in this study was the number of triggers for asthma relapses, amounting to 21.34%. In this study, the majority of asthma patients had 1-3 triggers, amounting to 63.8%. The study stated that someone who had a greater number of triggers for relapses had high medication adherence. Triggers for asthma relapses often occur mostly due to lifestyle (smoking habits, stress, increased body mass), environment and patient characteristics [19]. In general, medication adherence also influences the rate of disease relapses in asthma patients.

This study also analyzed factors contributing to the recurrence rate in asthma patients. The variables that significantly influenced the recurrence rate were education, occupation, and the number of triggering factors. Education contributed 17.5% to the relapse rate. Furthermore, occupation contributed 14.2% to the recurrence rate, and the number of triggering factors contributed 76.1%.

Education contributed 17.5% to the recurrence rate. Research by Salmi (2021) found that low education levels increased the risk of uncontrolled asthma recurrence [20]. Furthermore, the study also found that occupation contributed 14.2% to the risk of the recurrence. Occupation was associated with the level of physical activity in asthma patients. Increasing physical activity and exposure to occupational environments increased the risk of recurrence. Research

by Dewi et al. (2024) found that patients who engage in physical activity are at a 2.39-fold higher risk of asthma recurrence [3]. Increased physical activity is associated with increased oxygen demand. Asthma patients will experience asthma symptoms followed by an asthma attack if they engage in relatively strenuous activity [21].

Another factor that contributes to the recurrence rate is the number of triggers for asthma relapse. The number of triggers for recurrence is related and has a very large contribution to the relapse rate; the more triggers a patient has, the higher the recurrence rate. Common triggers for asthma in asthma patients include exposure to allergens, cigarette smoke, weather, physical activity, air pollution, respiratory tract infections, and psychological factors (stress) [21]. Research by Winugroho et al. (2025) stated that the triggers that often cause recurrences in asthma patients in Indonesia are allergic rhinitis (29.2%), exposure to cigarette smoke (13%), changes in weather (35%), and stress (10%) [22]. Respiratory tract infections cause inflammation, making the respiratory tract hyper-responsive, resulting in asthma attacks. Exposure to cigarette smoke results from the burning of tobacco containing various complex gas mixtures (hydrocarbons, polycyclic carbon dioxide, carbon monoxide, nicotine, and nitric oxide) which, when inhaled, will cause hyper-sensitivity symptoms and trigger asthma symptoms. Meanwhile, stress plays a role in regulating the functioning of the hypothalamus-pituitary gland, which lowers cortisol levels, thereby increasing hyper-responsiveness in the respiratory tract [21].

CONCLUSSION

This study identified key factors contributing to medication adherence and disease recurrence among asthma patients through multiple linear regression statistical tests. Factors contributing to medication adherence include gender, education, and the number of triggers for relapse. Meanwhile, factors influencing relapse rates include education, occupation, and the number of triggers.

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