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Relationship Between Asthma Therapy Types, Pulmonary Function, and Asthma Control in Primary Healthcare Facilities in Medan

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ABSTRACT

Introduction: Asthma is a chronic respiratory disease that affects millions globally. Effective asthma therapy is essential for improving pulmonary function and achieving asthma control. However, many patients remain uncontrolled despite treatment. This study aims to evaluate the relationship between asthma therapy types, pulmonary function, and asthma control in primary healthcare facilities in Medan.

Method: This retrospective descriptive study utilized medical records of asthma patients from May 2022 to May 2023 at several primary healthcare centers in Medan. Data collected included demographic characteristics, asthma therapy types (inhaler vs. inhaler + oral), pulmonary function (APE prediction), and asthma control levels. Chi-Square tests were performed to assess statistical associations.

Results: The study found that most asthma patients were female (83.3%) and over 50 years old (62.5%). Regarding pulmonary function, 73.0% of patients had an APE prediction of ⩾60%, indicating relatively good lung function. However, asthma control remained poor, with 68.8% of patients classified as uncontrolled. The majority of patients (68.8%) used inhalers as their primary therapy, while 31.2% received a combination of inhaler and oral medication. Statistical analysis showed no significant relationship between the type of asthma therapy and pulmonary function ($p = 1.000$), nor between the type of therapy and asthma control level ($p = 0.067$).

Conclusion: The study found no significant relationship between asthma therapy type, pulmonary function, and asthma control level. These findings suggest that other factors, such as therapy adherence, proper inhaler technique, and medication adjustments, may contribute to asthma control.

Keywords

Asthma, Therapy, Pulmonary Function, Asthma Control, Inhaler, Primary Healthcare.

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INTRODUCTION

Asthma is a frequently encountered disease that affects 1%–18% of the world's population. Asthma affects 235 million people worldwide and continues to increase up to 50% of the world's asthma incidence every decade, especially in low-income countries.[1] Asthma can affect all age groups but is most common in childhood, with 60% of adults with asthma and 50% of children with asthma failing to adequately control their condition. Currently, about 300 million people worldwide have asthma and will reach 400 million by 2025.[1-3]

A stepwise approach to asthma control is the cornerstone of controlling symptoms, preventing acute asthma exacerbations and improving lung function.[1] Many asthma cases are uncontrolled, despite evidence-based recommendations and evolving treatments. Uncontrolled asthma is characterized by daytime symptoms, requiring short-acting inhalers more than twice per week, limiting one's activities due to asthma, or waking up

during the night due to asthma attacks.[4] Asthma self-management includes advice and education on self-monitoring and a defined asthma management plan supported by professional review. Self-management is recognized as an effective method to improve asthma control and quality of life and reduce unscheduled consultations and hospitalizations across a wide range of demographic groups.[5] Although there are many evidence-based guidelines and effective treatments for the disease, many asthma patients still have uncontrolled symptoms.[6] The asthma population has between 47 - 57 % adherence which is lower than chronic diseases such as rheumatological or gastrointestinal diseases.[7] The exact cause and cure of asthma remain unclear. Fortunately, symptoms can be significantly controlled with proper asthma management.[8]

Tumour cell proliferation, apoptosis suppression, tumour-driven angiogenesis, metastasis, and DNA damage repair are significantly affected by EGFR activation. Thus, EGFR is a key target for cancer therapy, particularly in lung cancer. Chemotherapy and radiotherapy may be improved by inhibiting EGFR.[8] Thus, identifying cancer genotypes enables a more targeted approach for lung cancer treatment. The extracellular ligand-binding region of EGFR has been the target of a class of monoclonal antibodies since its discovery in 1962, blocking receptor activation and reducing its surface expression through antibody-induced receptor dimerisation. Additionally, EGFR is inhibited by small-molecule tyrosine kinase inhibitors (TKIs) via competition with ATP to attach to the intracellular tyrosine kinase subunit, suppressing the receptor's catalytic activity and downstream signalling pathways. TKIs have shown substantial antitumor efficacy in cancers characterized by EGFR overexpression.[8]

Inhaled medications are the cornerstone of pharmacological treatment of patients with asthma. The two main classes of inhaled medications are corticosteroids (ICS) and bronchodilators. There was wide diversity in the molecules in both classes. In addition, there is a wide variation in delivery systems. When prescribing a particular inhaler device, clinicians should consider a number of factors, including the ability to generate adequate inspiratory flow, the capacity to handle the device appropriately and, importantly, its coordination with inspiratory effort.[9,10]

METHOD

This descriptive, retrospective study was conducted at Puskesmas Tuntungan, Puskesmas Padang Bulan, Puskesmas Medan Johor, Puskesmas Bromo, and Puskesmas Amplas in Medan, Indonesia. This study focused on asthma patients who were treated at these health centres between May 2022 and May 2023. Data were collected by reviewing the prescriptions and medical records of patients with asthma to ensure a comprehensive view of the prescribed treatments and their associated patterns.

The study population consisted of patients with asthma who were diagnosed through anamnesis, physical examination, and diagnostic tests at participating health centres. The inclusion criteria were patients with asthma who received prescriptions during the study period and had complete medical records available for analysis. Patients with incomplete records or other comorbidities that could interfere with asthma treatment were excluded. Consecutive sampling was used, in which all eligible patients meeting the inclusion criteria were selected.

The sample size was calculated to be 48, based on a 1% proportion derived from the Riskesdas survey data for asthma prevalence in Medan. Data were extracted from patients' medical records, focusing on demographics, asthma diagnosis, and details of prescribed asthma medications, including type, dosage, and frequency. The data analysis was conducted using univariate analysis with SPSS version 23 to summarise the characteristics of asthma patients and patterns in asthma treatment.

RESULTS

Women were the most common asthma patients, with 40 patients (83.3%), and men had the lowest number of patients (8 patients, 16.7%). Then it was found that patients aged >50 years were 30 people (62.5%), patients aged 26-50 were 13 people (27.1%), and patients aged 17-25 years were 5 people (10.4%). Most patients were aged >50 years, with as many as 30 people (62.5%), and the least were patients aged 17-25 years as many as 5 people (10.4%). Patients with a normal BMI had the highest IMT (29 patients, 60.4%), and underweight

patients had the lowest IMT (2 patients, 4.2%). The highest level of education was high school (33 patients, 69%), followed by S1 (13 patients, 27%), junior high school, and D3 (1 patient, 2%).

Most patients with asthma were housewives (n = 21, 44%); self-employed (n = 10, 21%); civil servants (n = 9, 19%); retired civil servants and students (n = 2, 1%); and teachers, farmers, traders, and students (n = 1, 2%).

Table 1. Demographic Characteristics of Research Subjects

Demographic Characteristics	n = 48
Gender, n (%)	
Male	8 (16,7)
Female	40 (83,3)
Age, n (%)	
17-25	5 (10.4)
26-50	13 (27.1)
>50	30 (62.5)
BMI (%)	
Underweight	2 (4,2)
Normal	29 (60,4)
Overweight	17 (35,4)
Education	
Junior High	1 (2)
Senior High	33 (69)
Diploma	1 (2)
Bachelor's Degree	13 (27)
Job	
Bachelor Student	2 (4)
Self Employed	10 (21)
Housewife	21 (44)
Retired Civil Servant	2(4)
Teacher	1 (2)
Farmer	1 (2)
Trader	1 (2)
Civil Servant	9 (19)
Student	1 (2)

Table 2 Overview of Lung Function

Lung Function	(n=48)	(%)
APE ≥60% Prediction	35	73,0
APE <60% Prediction	13	27,0

The pulmonary function of asthma patients with an APE> 60% prediction was the most common, namely 35 people (73%), and the lowest pulmonary function of asthma patients was asthma patients who had an APE < 60% prediction, namely 13 people (27%) (Table 2).

Table 3. Overview of Asthma Control Level

Asthma Control Level	(n=48)	(%)
Fully and Partially Controlled	6	68,8
Uncontrolled	42	31,2

Table 4. Type of Drugs

Type of Drugs	(n=48)	(%)
Inhaler	33	68.8
Inhaler Oral	15	31.2

The highest level of asthma control was uncontrolled in 42 patients (68.8%) and the lowest level of control was fully and partially controlled in 15 patients (31.2%) (Table 3). The most common type of drug used was inhaler, with 33 patients (68.8%) (Table 4). The relationship between the type of asthma therapy and

lung function was found to have a p-value of 1.000; the p-value was greater than 0.05, indicating that there was no relationship between the type of asthma therapy and lung function (Table 5).

Table 5. Relationship between Asthma Therapy Type and Pulmonary Function

Therapy	APE				Pr	ci	p-value*
	≥60% prediction		<60 prediction				
	n	%	n	%			
Inhaler	24	72,0	9	28,0	1,023	0,373 – 2,800	1,000
Inhaler+Oral	11	74,0	4	26,0			
Total	35		13				

Notes: *Chi-Square test

Table 6. Relationship between Asthma Therapy Type and Asthma Control Level

Terapi	ACT				pr	Ci	p-value
	Fully and Partially Controlled		Uncontrolled				
	n	%	n	%			
Inhaler	22	66,7	11	33,3			
Inhaler+Oral	11	73,3	4	26,7	1,281	0,933 – 1,759	0,67
Total	6		42				

Notes: *Chi-Square test

The relationship between the type of asthma therapy and the level of asthma control was found to have a p-value of 0.067. The p-value was more significant than 0.05, indicating that there was no relationship between the type of therapy and the level of asthma control. The relative risk of uncontrolled asthma was higher than that of controlled asthma.

DISCUSSION

Based on the results of the study, women were the most common asthma patients, with 40 patients (83.3%), while men had the lowest number of patients (8 patients, 16.7%). This is in line with the American Lung Association data showing that among adults aged >18 years, 62% of women are more likely to experience asthma symptoms, and the prevalence rate is 35% higher than that in men. In addition, mortality due to asthma was higher in female patients. Data from the Centers for Disease Control and Prevention states that the prevalence of confirmed asthma is higher in adult women than in men. The reasons for the sex differences in asthma recurrence are unclear. Still, they may be related to immunologic and hormonal factors and/or differences in gender-specific responses to environmental or occupational exposures.[11] The mechanisms underlying gender differences in asthma prevalence are still being investigated but mainly refer to hormonal differences and differences in lung capacity.[11]

Most patients were aged >50 years, with as many as 30 people (62.5%), and the least were patients aged 17-25 years, with as many as 5 people (10.4%). This is in line with Andriani's research in the pulmonary clinic of Dr. M. Djamil Hospital, which says that most asthma patients are in the middle adult age group of 40-60 years.41 This study is also in line with Postma DS, 2007, which states that hormonal changes that occur in adulthood contribute to the development of asthma.[12] Estrogen and progesterone can affect the level of free cortisol, which causes a decrease in the amount of cortisol. A decrease in cortisol levels can cause narrowing of the bronchi, which in turn causes asthma attacks. Postma D research in 2007 reported that the hormone estrogen increases adhesion to endothelial cells in the blood vessels, and the combination of estrogen and progesterone hormones can increase the degranulation of eosinophils so as to facilitate the occurrence of bronchial asthma attacks.[12]

The highest level of education was high school, with as many as 33 patients (68.8%), followed by the S1 education level, with as many as 13 patients (27.1%), and the junior high school and D3 education levels, with as many as 1 patient (2.1%). This is in line with Dorevitch's research, which states that a person's education will affect their mindset: the higher a person's education, the better their thinking and behavior26.

The better knowledge an asthma patient has, both how to use drugs, the process of asthma, precipitating factors, and symptoms that arise, the better the level of asthma control tends to be.[13]

Normal BMI was the most common IMT (29 patients, 60.4%). This study is not in line with Andriani's research, which states that the IMT of most asthma patients is in the overweight & obese classification (49.2%), followed by normal weight (44.4%) and underweight (6.3%).[11] This study found that the IMT of patients with asthma was mainly classified as overweight. Sastre explained that obesity can cause asthma involving several factors such as genetic, hormonal, dietary, and mechanical.[14] This may occur because the risk factors for asthma are not only seen from BMI, but also according to PDPI Asthma, where there are risk factors for asthma, is an interaction between host and environmental factors. Host factors include genetic predispositions that influence the development of asthma, namely genetic asthma, allergies (atopy), bronchial hyperreactivity, sex, and race. Environmental factors can affect individuals with a predisposition to develop asthma, exacerbations, or persistent asthma symptoms. Environmental factors include allergens, workplace sensitization, cigarette smoke, air pollution, respiratory infections (viruses), diet, socioeconomic status, and family size.[2]

Most asthma patients were housewives (21 patients, 43.8%), self-employed (10 patients, 20.8%), civil servants (nine patients, 18.8%), retired civil servants and students (two people, 4.2%), and teachers, farmers, traders, and students (one person, 2.1%). This is not in accordance with Andriani's research in the pulmonary clinic of Dr. M. Djamil Hospital, which says that most (31.7%) asthma patients work as Civil Servants (PNS), followed by the work of Housewives (IRT) 20.6%, Etc. 14.3%, Laborers / Farmers and Retirees both amounted to 9.5%, Not working at 6.3% and 0% for traders and TNI / Polri.[11] According to PDPI Asthma, where there are risk factors for asthma, is an interaction between host and environmental factors. Environmental factors that cause asthma are allergens, work environment sensitization, cigarette smoke, air pollution, respiratory infections (viruses), diet, socioeconomic status, and family size.[2] The work environment of IRTs is exposed to cigarette and cooking smoke, which increases the risk of asthma.

The relationship between the type of asthma therapy and lung function was found to have a P-value of 1.000; the P-value was more significant than 0.05, which means that there was no relationship between the type of asthma therapy and lung function. The types of therapy observed in this study were inhalers and inhalers plus oral, where inhaler therapy uses a combination of inhaled corticosteroids and inhaled long-acting beta 2 agonists. This is in line with Ranushar's research that there is no significant relationship between asthma therapy methods and lung function with a p-value of 0.609.[15] This is also in line with Syafiaturrahma research, the combination of inhaled corticosteroids with long-acting beta 2 agonists does not make a difference to lung function values.[16]

The relationship between the type of asthma therapy and the level of asthma control yielded a p-value of 0.067, which was greater than 0.05, indicating that there was no significant relationship between the type of therapy and the level of asthma control. This finding is not consistent with Ridwan's study at Wahidin Sudirohusodo Hospital, which reported a significant relationship between therapy type and control level, with a p-value of <0.0001.[17] In that study, 9.3% of patients with asthma were fully controlled, 56.5% were partially controlled, and 34.3% were uncontrolled.

Similarly, Ranushar's study also found a significant relationship between therapy methods and asthma control levels, with a p-value of 0.001.[15] These results differ from the findings of this study, where the number of patients with uncontrolled asthma was higher than that of those who were fully or partially controlled. The researcher suspected that this may be related to the severity of bronchial asthma in patients who have not received an appropriate therapy dosage according to their asthma severity. The data obtained in this study indicated that some patients in primary healthcare facilities received the exact inhaler dosage each month without dose adjustments, either increasing or decreasing, based on their asthma severity.

According to GINA and PDPI guidelines, asthma patients should be monitored regularly to assess symptom control, risk factors, attack occurrences, and responses to treatment adjustments so that medication doses can be adjusted accordingly to asthma severity.[2] Another possible reason for the high number of uncontrolled asthma cases in this study was improper inhaler usage. Demographic factors, particularly

education level, could influence this, as a large proportion of the sample had only completed high school education. Dorevitch's study suggests that education influences cognitive patterns-higher education levels are associated with better thinking and behavioral patterns.[18] The better an asthma patient's knowledge about medication use, asthma pathophysiology, triggering factors, and symptoms, the more likely they are to achieve better asthma control.[13-18]

CONCLUSION

There was no significant association between the asthma therapy type and pulmonary function or asthma control levels. Despite treatment, a high proportion of patients remained uncontrolled. Factors such as treatment adherence, proper inhaler use, and dose adjustments based on asthma severity may play a crucial role in achieving better asthma control.

DECLARATIONS

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CONSENT FOR PUBLICATION

The Authors agree to be published in Journal of Society Medicine.

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The authors declare that there are no conflicts of interest.

AUTHORS' CONTRIBUTIONS

All authors significantly contributed to the work reported on execution, acquisition of data, analysis, and interpretation, or in all these areas. Contribute to drafting, revising, or critically reviewing the article. Approved the final version to be published, agreed on the journal to be submitted, and agreed to be accountable for all aspects of this work.

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