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Salbutamol Usage Pattern in Asthma Patients at Merdeka Public Health Center Palembang for the Period of January 1 – December 31, 2023

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Abstract

Salbutamol is a bronchodilator commonly used in the management of asthma, both in acute and chronic cases. As part of the Short-Acting Beta-2 Agonist (SABA) class, salbutamol is effective in relieving bronchospasms. The purpose of this study was to determine the rationality of drug use at the Merdeka Community Health Center Palembang. A drug utilization study was conducted at Merdeka Public Health Center Palembang in 2024. 96 patients meeting inclusion criteria. Drug use patterns were evaluated for dose rationalization, duration, frequency, contraindications, and interactions. Data analysis was performed using univariate methods. Sociodemographic characteristics showed that women were more prevalent than men (58.3%), with the most common age groups being pre-elderly and elderly (each 36.5%). All salbutamol doses (2–4 mg per administration) were appropriate (100%), with a duration of ≤3 days for all patients. The frequency of salbutamol administration of 3–4 times daily was found in 51% of cases, in line with recommendations. A total of 74% of patients received salbutamol with appropriate consideration of contraindications, while 26% received it despite contraindications, such as hypertension or hypertensive heart disease. Drug interactions were absent in 67.7% of cases, while antagonistic interactions, primarily with amlodipine, occurred in 17.3% of cases. The use of salbutamol at Merdeka Public Health Center Palembang mostly rational to drug use guidelines. However, attention is needed for contraindications and antagonistic interactions, especially with antihypertensive drugs. These findings can serve as a reference for improving asthma management and patient safety.

Keywords: Salbutamol, Asthma, Drug Utilization Pattern

1. Introduction

Asthma is a heterogeneous disease characterized by chronic airway inflammation and associated with reversible airflow limitation, respiratory symptoms, and hyperresponsiveness.[1–3] The diagnosis of asthma is supported by a history of respiratory symptoms such as shortness of breath, wheezing, coughing, and chest tightness that vary over time and in intensity, along with variable expiratory airflow limitation.[1,3] Asthma affects approximately 300 million people worldwide and causes around 1,000 deaths per day, making it a serious global health issue.[1] Data from the World Health Organization (WHO) shows that around 262 million people were affected by asthma in 2019, resulting in 455,000 deaths. Meanwhile, the prevalence of asthma in Indonesia was 2.4%.[4] The highest incidence occurred in low- and middle-income countries, where the main issues are inadequate diagnosis and treatment. However, most of these cases are preventable.[1]

Salbutamol is the first-choice Short-Acting Beta-2 Agonist (SABA) used for the treatment of asthma symptoms and is commonly administered in Emergency Departments.[2,3] Albuterol, also known as salbutamol, has been approved by the United States Food and Drug Administration (FDA) as a medication to prevent bronchospasm in patients with reversible obstructive airway diseases.[5] Drug utilization studies need to be conducted to assist in correcting and rationalizing prescriptions and to identify therapeutic shortcomings.[6] Due to the limited

research on salbutamol usage patterns and the importance of drug utilization studies, further research is needed to examine the pattern of salbutamol use in asthma patients. The aim of this study is to determine the usage pattern of salbutamol in asthma patients at Merdeka Public Health Center, Palembang, during the period of January 1 to December 31, 2023.

2. Method

This study uses a descriptive method in the form of a drug utilization pattern study. Sampling was conducted at Merdeka Public Health Center Palembang, starting from July to December 2024. The sample in this study includes all patients at Merdeka Public Health Center Palembang during the period of January 1 to December 31, 2023, who suffered from asthma and were given salbutamol treatment that met the inclusion and exclusion criteria. The inclusion criteria of this study are asthma patients who received salbutamol therapy and patients aged ≥ 18 years. The exclusion criteria of this study are patients with unreadable and incomplete medical records. The data used in this study are secondary data obtained from Merdeka Public Health Center Palembang using the total sampling method. The variables in this study are gender, age, drug dosage, duration of use, frequency of use, drug interaction, and contraindication accuracy. The determination of dosage accuracy is based on the number of salbutamol administrations per day expressed in milligrams. The determination of the accuracy of the duration of salbutamol use is based on the length of salbutamol use by asthma patients recorded in medical records. The determination of frequency accuracy is based on the number of salbutamol administrations per day, expressed as how many times per day. The determination of contraindication accuracy is based on asthma patients who received salbutamol and did not have drug hypersensitivity, uncomplicated premature labor or threatened abortion, ischemic heart disease, hypertension, diabetes, and hypertensive heart disease, as stated in the medical records. The determination of drug interaction accuracy is based on asthma patients who received salbutamol with other drugs and had synergistic interaction or no interaction. This study has obtained ethical eligibility from the Ethics Committee of the Faculty of Medicine, Sriwijaya University (334-2024).

3. Result

The study was conducted from September 27 to November 4, 2024. A total of 105 samples were collected, with 96 samples meeting the inclusion and exclusion criteria. Table 1 shows that females experienced asthma more frequently, with 56 patients (58.3%). The most common age groups among the patients were pre-elderly and elderly, totaling 35 patients (36.5%). In this study, all asthma patients received the correct dosage, amounting to 96 patients (100%). The dosages given to patients were 2 mg and 4 mg (Table 2). The prescribed duration of drug use for all patients was ≤ 3 days (100%, Table 3). Most patients were given salbutamol 3–4 times per day, totaling 49 patients (51%), followed by ≤ 2 times per day with 47 patients (49%), and > 4 times per day with 0 patients (0%).

Salbutamol was appropriately prescribed with regard to contraindications in 71 patients (74%, Table 5). However, salbutamol was also administered to patients with hypertension and Hypertensive Heart Disease (HHD), both of which are contraindications for its use.[7,8] A total of 24 patients (25%) had a contraindication of hypertension, and 1 patient (1%) had a contraindication of Hypertensive Heart Disease (HHD). In most cases, salbutamol showed no interaction with other drugs (67.7%, Table 6).

Table 1. Sociodemographic characteristics of patients

Sociodemographic Characteristics		Number (n)	Percentage (%)
Gender	Male	40	41.7
	Female	56	58.3
Age	Adult	26	27.1
	Pre-elderly	35	36.5
	Elderly	35	36.5
Total		96	100

Table 2. Usage pattern based on drug dosage

Drug Dosage	Number (n)	Percentage (%)
Correct dosage	96	100
Incorrect dosage	0	0
Total	96	100

Table 3. Usage pattern based on duration of use

Duration of Administration	Number (n)	Percentage (%)
≤ 3 days	96	100
> 3 days	0	0
Total	96	100

Table 4. Usage pattern based on frequency of administration

Frequency of Administration	Number (n)	Percentage (%)
≤ 2 times/day	47	49
3 – 4 times/day	49	51
> 4 times/day	0	0
Total	96	100

Table 5. Usage pattern based on contraindication appropriateness

Contraindication Appropriateness	Number (n)	Percentage (%)
Appropriate (no contraindication)	71	74
Inappropriate Contraindications		
1. Drug hypersensitivity	0	0
2. Uncomplicated premature labor or threatened abortion	0	0
3. Ischemic heart disease		
4. Hypertension	0	0
5. Diabetes	24	25
6. Hypertensive Heart Disease (HHD)	0 1	0 1
Total	96	100

Table 6. Usage pattern based on drug interactions

Interaction with Other Drugs	Number (n)	Percentage (%)
Antagonistic	38	17.3
Synergistic	33	15
Potentiation	0	0
No interaction	149	67.7
Total	220	100

Table 7. Usage pattern based on drug interactions

Variable	Appropriateness		Total
	Yes (%)	No (%)	
Dosage	100	0	100
Duration of Use	100	0	100
Frequency of Use	100	0	100
Contraindication	74	26	100
Drug Interaction	Synergistic: 15 No Interaction: 67.7	Antagonistic: 17.3	100

This indicates that, in general, the use of salbutamol is safe when combined with other therapies.

The pattern of salbutamol use in asthma patients at Merdeka Public Health Center Palembang during the period of January 1 – December 31, 2023, showed appropriate dosage, duration of use, and frequency. However, inappropriate contraindications and antagonistic drug interactions were still found in some prescriptions.

4. Discussion

Differences in hormones and the menstrual cycle may contribute to the higher prevalence of asthma in women compared to men. Asthma symptoms can also be worsened by increased levels of pro-inflammatory substances and inflammatory responses, which may be triggered by fluctuations in estrogen levels. Another mechanism that supports this finding is the decrease in FEV1 during the follicular phase of the menstrual cycle, which is associated with the occurrence of bronchoconstriction.[9,10] The study by Hayati et al. at the Cikarang Health Center, Bekasi Regency, showed consistent findings, revealing that the majority of asthma patients were female, totaling 13 patients (52%).[11] The study by Hasanah et al. also supports this finding, reporting that the majority of asthma patients were female, totaling 52 individuals (77.61%).[12]

Asthma tends to be more common in the pre-elderly and elderly age groups due to the decline in function and resistance that can occur at this stage of life, such as an increase in mucus glands in the bronchi, reduced elasticity of the lung parenchyma, thickening of the bronchial mucosa, and stiffness of the chest wall, which leads to a decreased ability to expand the chest wall and lungs.[13] Another study by Hayati et al. also found that the elderly (aged 46–65 years) were the most affected group, with a total of 7 individuals (28%).[11]

The dosage administered was appropriate, as the maximum single dose is 8 mg.[5] The National Formulary states that the salbutamol tablet formulation provided at Primary Healthcare Facilities is 2 mg.[14] The study by Hasanah et al. at Dr. Pirngadi Regional Hospital in Medan also found that asthma patients who were given salbutamol tablets at a dose of 4 mg, totaling 51 patients (100%) received the correct dosage.[12]

Excessive long-term use of salbutamol can lead to several negative effects, both clinically and physiologically. Salbutamol, a beta-2 adrenergic agonist, carries the risk of reducing beta-2 receptor sensitivity due to down-regulation, particularly with chronic use at high doses. This results in decreased drug effectiveness in relieving asthma symptoms and increases the release of pro-inflammatory cytokines such as IL-6 and IL-8, which worsen airway inflammation.[1,15] Prolonged use of SABA can also double the risk of hospitalization.[16] In addition, long-term use may lead to systemic side effects such as tachycardia, muscle tremors, and a higher risk of severe exacerbations. In clinical practice, uncontrolled use of salbutamol often leads to patient dependence on the medication, contributing to poor overall asthma control. Therefore, long-term asthma management strategies, such as the use of inhaler combinations with corticosteroids, are recommended to reduce reliance on salbutamol and improve clinical outcomes.[1,15]

In accordance with the absorption duration of salbutamol, which is 6–8 hours, the recommended frequency of administration is 3–4 times per day.[5] This finding aligns with the study by Hasanah et al. at Dr. Pirngadi Regional Hospital in Medan, which reported that asthma patients who received salbutamol treatment had an appropriate dosing frequency, with 51 patients (100%) receiving the correct frequency.[12] For patients who were administered salbutamol ≤ 2 times per day, this may be due to its use as a reliever and consideration of its potential side effects, such as drug resistance and exacerbation when used too frequently.[1,5] Therefore, it can be concluded that the frequency of administration was appropriate.

Salbutamol, as a β2-adrenergic agonist, is known to affect blood pressure by activating the sodium-chloride (NaCl) transporter in the distal renal tubules, leading to sodium retention and elevated blood pressure—especially in individuals with high salt intake or salt-sensitive hypertension. Animal studies have shown that salbutamol can trigger hypertension through this mechanism, which is particularly relevant in patients with poorly controlled blood pressure. Additionally, salbutamol can cause tachycardia and increase myocardial oxygen demand, potentially worsening cardiovascular conditions in patients with hypertension or heart disease. Antagonistic interactions with antihypertensive drugs such as amlodipine are also a concern, as they may reduce therapeutic effectiveness. A study by Tomlin et al. supports this, stating that salbutamol can increase the risk of heart failure by enhancing sympathetic nervous system activity, affecting vascular tone, and increasing the risk of hypertension through vasoconstriction and sodium retention. Routine use of salbutamol has also been reported to impair vascular function, making regular blood pressure monitoring essential in hypertensive patients to prevent cardiovascular complications.[17–19]

Antagonistic interactions were found in 17.3% of cases, involving drugs such as amlodipine, antacids, furosemide, and NSAIDs. Meanwhile, synergistic interactions occurred in 15% of cases with medications that support the therapeutic effects of salbutamol, such as corticosteroids, LABAs and ICS, fenoterol, and theophylline. This could potentially lead to adverse effects such as exacerbation of underlying cardiovascular conditions, reduced therapeutic efficacy, and increased healthcare burden due to complications or hospitalization.[20–22] These findings underscore the critical need for stricter prescription oversight and adherence to clinical guidelines in primary care settings. To improve asthma management and ensure the rational use of salbutamol, healthcare

providers should receive continuous education on guideline-based prescribing. Future research should explore the underlying reasons for irrational prescribing behavior, assess patient outcomes related to long-term salbutamol misuse, and evaluate the effectiveness of targeted interventions in reducing such practices.

5. Conclusion

Based on the research findings, it is known that the use of salbutamol in asthma patients at Merdeka Health Center, Palembang, was generally rational in terms of appropriate dosage, duration of use, frequency, and drug interactions.

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