

# JURNAL RESPIROLOGI INDONESIA

Majalah Resmi Perhimpunan Dokter Paru Indonesia  
Official Journal of The Indonesian Society of Respiriology



*The Correlation of Microsomal Epoxide Hydrolase (EPHX1) His139Arg Gene Polymorphism and Lung Cancer Incidence in H. Adam Malik General Hospital Medan*

*Differences in Levels of Human 1,3- $\beta$ -D-Glucan from Bronchoalveolar Lavage (BAL) Fluid between The Immunocompromised and Immunocompetent Groups Patients with Suspected Lung Cancer*

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*Risk Factors for Mortality of Patients with COVID-19 in RSJPD Harapan Kita, Jakarta*

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*The Effect of Roflumilast on Absolute Neutrophil Count, MMP-9 Serum, %VEP<sub>1</sub> Value, and CAT Scores in Stable COPD Patients*

*The Surfactant Protein D (SP-D) Serum Levels in Limestone Mining Worker*

*Gastro-Esophageal Reflux Is Not a Common Cause of Chronic Cough: A Singapore Case Series*

*Impact of Underweight on the Unsuccessful Treatment Outcome Among Adults with Drug-Resistant Tuberculosis: A Systematic Review*

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# An Evaluation of Short-Acting $\beta$ 2-Agonist Prescriptions and Associated Clinical Outcomes in Asthma Management in Indonesia – The SABINA Indonesia Study

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## Abstract

**Background:** Asthma is a chronic inflammatory disease; therefore inhaled corticosteroid (ICS) should become the cornerstone of asthma treatment. However, patient tends to rely on short-acting  $\beta$ 2-agonist (SABA) due to immediate symptom relief and underuse ICS which undertreats the underlying inflammation. As part of the study addressing multi-country SABA use IN Asthma (SABINA) III, we aimed to describe SABA prescription patterns and asthma-related clinical outcome in Indonesia.

**Methods:** Cross-sectional study in asthma patients ( $\geq 12$  years old) during August 2019 to January 2020. Disease characteristic, prescribed asthma treatment in the last 12 months prior to the study, and clinical outcomes were documented in a single visit and registered into an electronic case report form.

**Results:** Of 219 patients recruited, the average number of prescribed SABA was 4 canisters annually. SABA over-prescription ( $\geq 3$  canisters/year) was seen in 37% patients and more frequent in patients with moderate-to-severe asthma than mild case (40% to 17.9%). As much as 47.5% of patients had at least 1 severe exacerbation; and 7.3% of patients had  $\geq 3$  severe exacerbation in the past 12 months. Almost half of the patients (40.2%) were prescribed with oral corticosteroids (OCS). Overall, the well-, partly, and uncontrolled asthma symptom among patients were 41.6%, 37.4%, and 21%, respectively.

**Conclusion:** SABA over-prescription occurs in approximately one third of patients with asthma, especially among moderate-to-severe cases and almost half of patients with asthma experienced at least 1 severe exacerbation in the previous year. This highlights a public health concern and the need to improve asthma management by aligning with global recommendations including reducing SABA over-reliance in Indonesia. (*J Respir Indon* 2022; 42 (2): 121–8)

**Keywords:** asthma; SABA; over-prescription; exacerbation

## Evaluasi Peresepan B2-Agonis Kerja Singkat dan Keluaran Klinis Terkait pada Manajemen Asma di Indonesia – Studi SABINA Indonesia

### Abstrak

**Latar belakang:** Asma merupakan penyakit inflamasi kronik, sehingga kortikosteroid inhalasi (ICS inhaled corticosteroid) seharusnya menjadi inti pengobatan asma. Namun pasien cenderung mengandalkan  $\beta$ 2-agonis kerja singkat (SABA short-acting  $\beta$ 2-agonist) karena cepat menghilangkan gejala dan kurang menggunakan ICS, sehingga kurang menangani inflamasi yang mendasarinya. Sebagai bagian dari studi penggunaan SABA pada Asma multi-negara (SABINA SABA use IN Asthma) III, kami bertujuan menggambarkan pola peresepan SABA dan keluaran klinis terkait asma di Indonesia.

**Metode:** Studi potong lintang pada pasien asma ( $\geq 12$  tahun) Agustus 2019 – Januari 2020. Karakteristik penyakit, peresepan obat asma dalam 12 bulan sebelum kunjungan studi, dan keluaran klinis, dicatat pada satu kali kunjungan dan dimasukkan ke dalam formulir laporan kasus elektronik.

**Hasil:** Dari 219 pasien yang direkrut, rata-rata jumlah peresepan SABA adalah 4 canister per tahun. Peresepan SABA berlebihan ( $\geq 3$  canister/tahun) dijumpai pada 37% pasien, dan lebih sering pada asma sedang hingga berat dibanding asma ringan (40% dibanding 17,9%). 47,5% pasien mengalami sedikitnya 1 kali eksaserbasi berat dan 7,3% pasien mengalami 3 kali eksaserbasi berat dalam 12 bulan terakhir. Hampir setengah dari pasien (40,2%) mendapatkan resep kortikosteroid oral (OCS oral corticosteroid). Secara keseluruhan, pasien yang terkontrol baik, terkontrol sebagian, dan tidak terkontrol adalah 41,6%, 37,4% dan 21%.

**Kesimpulan:** Peresepan SABA berlebihan terjadi pada sekitar sepertiga pasien asma, terutama pada pasien asma sedang sampai berat dan hampir setengah dari pasien asma mengalami sedikitnya 1 kali eksaserbasi berat pada tahun sebelumnya. Hal ini menunjukkan masalah kesehatan masyarakat dan kebutuhan untuk meningkatkan tatalaksana asma selaras dengan rekomendasi global termasuk mengurangi ketergantungan SABA di Indonesia. (*J Respir Indon* 2022; 42 (2): 121–8)

**Kata kunci:** asma; SABA; peresepan berlebih; eksaserbasi

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## INTRODUCTION

Asthma is a common and potentially serious chronic disease that imposes a substantial burden on patients, their families and community. It causes respiratory symptoms, limitation of activity, and flare-ups which occasionally require urgent health care and may be fatal.<sup>1-3</sup> The prevalence of asthma varies between 7% in low-prevalence countries to >15% in other western societies.<sup>4</sup> According to Riskesdas 2018, the prevalence of asthma in Indonesia is 2.4%.<sup>5</sup>

The long-term goals of asthma management are to achieve good symptom control and to minimize future risk of exacerbations, fixed airflow limitation and side-effects of treatment.<sup>6</sup> Low-dose inhaled corticosteroids (ICS) is the cornerstone of asthma treatment.<sup>1,7</sup> For decades, the use of short-acting- $\beta$ 2-agonists (SABA) has been recommended as the first treatment step for symptomatic relief in patients across the spectrum of asthma.<sup>8</sup>

The use of inhaled SABA increased dramatically with the introduction of metered dose inhaler in the early 1960s.<sup>9</sup> In clinical practice, poor adherence to asthma medications, particularly ICS as maintenance therapy, is a major problem across all severities of asthma, leading to undertreatment of the underlying inflammation and higher risk of exacerbations.<sup>10</sup> The underuse of ICS, even in patients with mild asthma, is associated with severe asthma exacerbations and death.<sup>11,12</sup>

The Global Initiative for Asthma (GINA) provides internationally-accepted recommendations for asthma treatment and management.<sup>2</sup> In April 2019, GINA published new recommendations that might be considered the most fundamental change in asthma management in 30 years. For safety, GINA no longer recommends treatment of asthma in adolescents and adults with SABA alone. Instead, to reduce the risk of serious exacerbations, all adults and adolescents with asthma should receive either symptom-driven (in mild asthma) or daily ICS-containing treatment.<sup>13</sup>

With this knowledge, SABA overreliance is now an even greater concern. However, it will be

difficult to change this overreliance, linked to decades of patient behaviour and guidelines recommendation, SABA use for immediate symptom relief and as the first treatment for newly diagnosed mild intermittent asthma.<sup>7</sup> The description between the number of SABA and ICS prescriptions in relation to asthma management, health status and burden of illness has not been estimated in many countries. Our study was conducted to describe the treatment pattern of asthma patients in terms of SABA prescriptions, provide patient background characteristics and determine their correlation with asthma related clinical outcomes and asthma symptom control in Indonesia.

## METHODS

This observational cross-sectional study was part of the SABA use IN Asthma (SABINA), a series of global observational studies, which to evaluate prescriptions and clinical outcomes related to short-acting  $\beta$ 2-agonist use in asthma.<sup>14</sup>

The study took place at 5 sites and 5 satellite sites: RSUP Persahabatan Jakarta, RS Universitas Airlangga Surabaya, RSUD Saiful Anwar Malang, RS Universitas Sumatera Utara Medan, RSUD Budhi Asih Jakarta, RSUD Lawang Malang, RS Lavelette Malang, Puskesmas Kecamatan Cawang Jakarta, Puskesmas Kendal Kerep Malang and Klinik Aviati Jamin Ginting Medan. Approval was given by the ethics committees as follows: Research Ethics Committees of Fakultas Kedokteran Universitas Indonesia Jakarta, Research Ethics Committees of Rumah Sakit Universitas Airlangga Surabaya, Research Ethics Committees of RSUD Dr. Saiful Anwar Malang, Research Ethics Committees of Fakultas Kedokteran Universitas Sumatera Utara/ RSUP H. Adam Malik Medan, and Research Ethics Committees of Rumah Sakit Umum Budhi Asih Jakarta.

The asthma patients were consecutive patients, who attended the outpatient clinic at hospitals and primary care clinics during August



2019 – January 2020. The inclusion criteria included male or female patients aged 12 years or older; documented diagnosis of asthma as per medical records; have had  $\geq 3$  consultations with the HCP at study starting date; after full explanation, a patient or legal guardian must have signed an informed consent document. The exclusion criteria were patient with a diagnosis of chronic obstructive pulmonary disease or any other chronic respiratory diseases different from asthma; and an acute or chronic condition that, in the investigator's opinion, would limit the patient's ability to complete the questionnaires or participate in this study.

At study visit, patients were asked about their asthma symptom control (defined by the 2017 GINA assessment of asthma control). The HCPs were requested to complete study electronic case report forms recording specified information about patient characteristics, asthma severity and level of symptom control (per the 2017 Global Initiative for Asthma [GINA] recommendations), asthma prescribed treatment in the last 12 months and history of exacerbations.

Every patient was categorized by their SABA prescriptions in the previous 12 months prior to study visit. The definition of SABA over prescription has been harmonized across all SABINA studies based on British Thoracic Society guidelines and GINA recommendation in place at the time of study design, over-prescription SABA has been defined as  $\geq 3$  SABA canisters per year.<sup>14</sup>

Descriptive analyses (n, %) assorted patients according to baseline demographic and clinical characteristics including morbidity and parameters acquired from the GINA assessment of asthma control. The study was conducted in accordance with ethical principles that are consistent with the Declaration of Helsinki, ICH GCPs, GPP and the applicable legislation on Non-Interventional Studies and/or Observational Studies.

## RESULTS

Overall, 219 asthma patients (mean age 48.4 years, 76.6% female) were included. Most patients

(n=187 [85.8%]) were enrolled by pulmonologist and 31 patients (14.2%) by primary care physicians. The percentage of mild and moderate-to-severe asthma treated by primary care physician were similar (6% vs 8.3%). Patients treated by pulmonologist were mostly moderate-to-severe (78.9%) compared to mild ones (6.9%) (Figure 1 and Table 1). The never smoker (87.2%) and with 1–2 (48.9%) or no comorbidities (48.9%) were the dominant groups in this study. 96.3% patients had fully-reimbursed healthcare insurance (Table 1).

Table 1. Demographic, Lifestyle and Clinical Characteristics

| Demographic, Lifestyle and Clinical Characteristics                        | n (%)           |
|--|-----------------|
| Age (years); mean $\pm$ SD   | 48.4 $\pm$ 14.1 |
| $\geq 18$ –54 years  | 140 (63.9%)     |
| $\geq 55$ years  | 79 (36.1%)      |
| Gender   |                 |
| Female   | 168 (76.7%)     |
| Male   | 51 (23.3%)      |
| BMI (kg/m <sup>2</sup> ); mean $\pm$ SD                                    | 26.6 $\pm$ 5.1  |
| <18.5  | 7 (3.2%)        |
| $\geq 18.5$ –22.9  | 46 (21.0%)      |
| $\geq 23$ –24.9  | 39 (17.8%)      |
| $\geq 25$  | 127 (58.0%)     |
| Education level  |                 |
| Unknown  | 1 (0.5%)        |
| Primary school   | 27 (12.3%)      |
| Secondary school   | 34 (15.5%)      |
| High-school  | 98 (44.7%)      |
| University and post-university   | 59 (26.9%)      |
| Healthcare insurance/medication funding                                    |                 |
| Not reimbursed   | 8 (3.7%)        |
| Fully Reimbursed   | 211 (96.3%)     |
| Treating physician   |                 |
| Primary care physician   | 31 (14.2%)      |
| Mild asthma patients (GINA steps 1–2)                                      | 13 (6.0%)       |
| Moderate to severe asthma patients (GINA steps 3–5)                        | 18 (8.2%)       |
| Pulmonologist/Respiratory Physician  | 187 (85.4)      |
| Mild asthma patients (GINA steps 1–2)                                      | 15 (6.8%)       |
| Moderate to severe asthma patients (GINA steps 3–5)                        | 172 (78.5%)     |
| Number of missing values (classified as moderate to severe asthma patient) | 1               |
| Smoking status   |                 |
| Active smoker  | 3 (1.4%)        |
| Former smoker  | 25 (11.4%)      |
| Never-smoker   | 191 (87.2%)     |
| Number of co-morbidities   |                 |
| No co-morbidities  | 94 (42.9%)      |
| 1–2 co-morbidities   | 107 (48.9%)     |
| 3–4 co-morbidities   | 18 (8.2%)       |

Note=Data are presented as n (%), unless otherwise stated

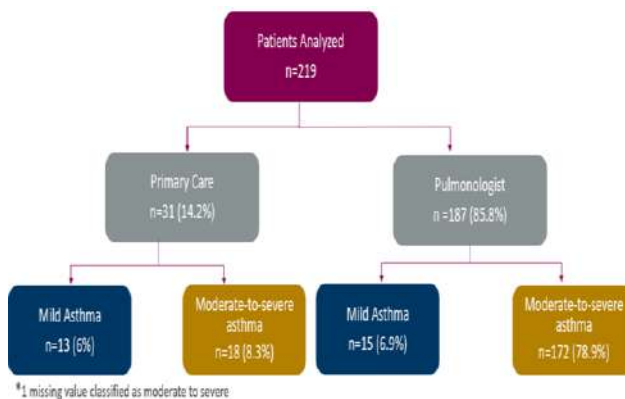


Figure 1. Patient disposition and study population by practice type and investigator-classified asthma severity

The average of asthma duration among participants was 25.7 years with percentage of GINA classification were step 1 (7.3%), step 2 (5.5%), step 3 (58.0%), step 4 (26.9%), and step 5 (2.3%) respectively.

Table 2. Asthma characteristics and clinical outcomes

| Asthma characteristics and clinical outcomes                    | n (%)       |
|---|-------------|
| Asthma duration years; mean±SD                                  | 25.7±17.5   |
| GINA classification   |             |
| Step 1  | 16 (7.3%)   |
| Step 2  | 12 (5.5%)   |
| Step 3  | 127 (58.0%) |
| Step 4  | 59 (26.9%)  |
| Step 5  | 5 (2.3%)    |
| Number of severe asthma exacerbations in the last year; mean±SD | 0.8±1.1     |
| Number of severe asthma exacerbations in the last year          |             |
| 0   | 115 (52.5%) |
| 1   | 60 (27.4%)  |
| 2   | 28 (12.8%)  |
| 3   | 8 (3.7%)    |
| 4   | 6 (2.7%)    |
| 5   | 1 (0.5%)    |
| >5  | 1 (0.5%)    |
| Asthma Symptom Control  |             |
| Well-controlled   | 91 (41.6%)  |
| Partly controlled   | 82 (37.4%)  |
| Uncontrolled  | 46 (21.0%)  |

Note=Data are presented as n (%), unless otherwise stated

As much as 47.5% of patients had at least 1 severe asthma exacerbation (defined as a deterioration in asthma resulting in hospitalization; or emergency room treatment; or the need for intravenous or oral corticosteroid for ≥3 days or a single intramuscular corticosteroid dose in the past 12 months) and 7.3% of patients had 3 or more severe exacerbations in the past 12 months.

Table 3. SABA prescriptions in the past 12 months

| SABA prescription in the past 12 months                                 | n (%)       |
|---|-------------|
| SABA monotherapy  |             |
| No  | 218 (99.5%) |
| Yes   | 1 (0.5%)    |
| SABA in addition to maintenance therapy                                 |             |
| No  | 85 (38.8%)  |
| Yes   | 134 (61.2%) |
| Total prescriptions in the last 12 months (canister); mean±SD           | 4.0±3.0     |
| Total prescriptions in the last 12 months (canisters) by groups (n=134) |             |
| 0   | 0 (0.0%)    |
| 1–2   | 46 (37.4%)  |
| 3–5   | 46 (37.4%)  |
| 6–9   | 20 (16.3%)  |
| 10–12   | 9 (7.3%)    |
| ≥13   | 2 (1.6%)    |
| Number of missing values  | 11          |
| All asthma patients - number of SABA canister prescribed (n=208)        |             |
| 0   | 84 (40.4%)  |
| 1–2   | 47 (22.6%)  |
| 3–5   | 46 (22.1%)  |
| 6–9   | 20 (9.6%)   |
| 10–12   | 9 (4.3%)    |
| ≥13 SABA  | 2 (1%)      |
| Mild asthma patients (n=28)   |             |
| 0   | 14 (50%)    |
| 1–2   | 9 (32.1%)   |
| 3–5   | 5 (17.9%)   |
| 6–9   | 0 (0.0%)    |
| 10–12   | 0 (0.0%)    |
| ≥13   | 0 (0.0%)    |
| Moderate to severe asthma patients (n=192)                              |             |
| 0   | 70 (38.9%)  |
| 1–2   | 38 (21.1%)  |
| 3–5   | 41 (22.8%)  |
| 6–9   | 20 (11.1%)  |
| 10–12   | 9 (5.0%)    |
| ≥13   | 2 (1.1%)    |
| Number of missing values  | 11          |

Note=Data are presented as n (%) unless otherwise stated.

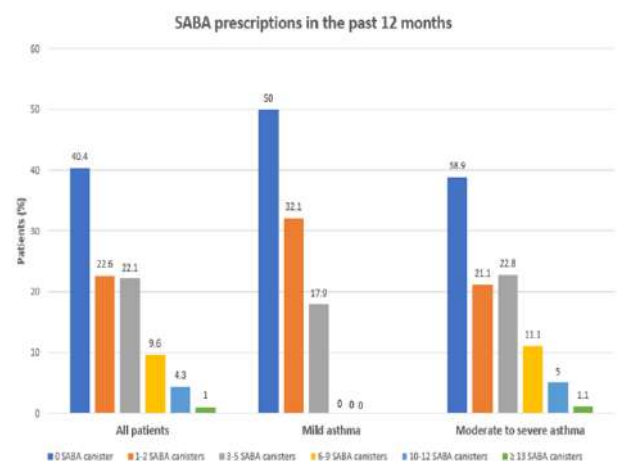


Figure 2. SABA prescriptions according to asthma severity

Of all asthma patients, 41.6% were well-controlled, 37.4% were partly controlled, and 21% were uncontrolled based on GINA 2017 criteria (daytime symptoms more than twice/week, any night waking due to asthma, reliever needed more than twice/week, and any activity limitation due to asthma) (Table 2).

Table 4. Other categories of asthma treatment in the past 12 months

| Treatment  | n (%)       |
|--|-------------|
| ICS  |             |
| No   | 199 (90.9%) |
| Yes  | 20 (9.1%)   |
| Total daily dose                                     |             |
| Low dose   | 15 (75%)    |
| Medium dose  | 5 (25%)     |
| High dose  | 0 (0.0%)    |
| Total use in the last 12 months (canisters); mean±SD | 2.0±1.8     |
| ICS/LABA (fixed dose combination)                    |             |
| No   | 13 (5.9%)   |
| Yes  | 206 (94.1%) |
| Total daily ICS dose                                 |             |
| Low dose   | 132 (64.4%) |
| Medium dose  | 68 (33.2%)  |
| High dose  | 5 (2.4%)    |
| Number of missing values                             | 1           |
| OCS treatment (short course)                         |             |
| No   | 131 (59.8%) |
| Yes  | 88 (40.2%)  |
| Total daily dose (mg/day); mean±SD                   | 14.0±8.2    |
| Number of days per prescription; mean±SD             | 4.4±3.3     |
| OCS long-term/maintenance                            |             |
| No   | 196 (89.5%) |
| Yes  | 23 (10.5%)  |
| Total daily dose (mg/day); mean±SD                   | 7.7±10.3    |
| Duration of use (days); mean±SD                      | 17.8±26.4   |
| OCS prescribed for any reason other than asthma      |             |
| No   | 203 (92.7%) |
| Yes  | 16 (7.3%)   |
| Antibiotics prescribed for asthma                    |             |
| No   | 118 (56.7%) |
| Yes  | 90 (43.3%)  |
| Number of missing values                             | 11          |

Note=Data are presented as n (%) unless otherwise stated.

SABA monotherapy prescription was not common in our study with only one patient prescribed with SABA alone, however 61.2% (n=134) of patients received prescriptions for SABA canisters on top of any maintenance treatment; of these patients, 62.6% were prescribed ≥3 canisters and 8.9% were prescribed ≥10 canisters. The mean

number of SABA canisters prescribed annually was 4 canisters. 37% of patients were prescribed ≥3 canisters of SABA (Table 3).

A greater percentage of patients with moderate to severe asthma (versus mild asthma) were prescribed ≥3 SABA canisters in the past 12 months (40%vs17.9%) (Figure 2).

Among all asthma patients, only 9.1% were prescribed with ICS and mostly using low dose of it. On the other hand, 94.1% patients were prescribed with ICS/LABA (fixed dose combination) (LABA = long-acting-β<sub>2</sub>-agonists); 64.4% low dose, 33.2% medium dose, and 2.4% high dose. Almost half of the patients (40.2%) were prescribed with a short course of oral corticosteroid (OCS). Antibiotics for the treatment of asthma were prescribed for 90 patients (43.3%) (Table 4).

## DISCUSSION

It is known that the prevalence of asthma in female is higher than in men.<sup>5,15</sup> In line with this fact, our study showed that 76.7% patients were female. According to SABINA (SABA use in Asthma) study in Germany, the prevalence of mild and moderate-to-severe-asthma patients in primary care was similar (48% vs 52%); while the prevalence of mild asthma in specialist care was much smaller than the moderate-to-severe patients (10% vs 90%).<sup>15</sup> The same patterns can be seen in our study. The percentages of mild vs moderate-to-severe asthma who visited a GP were 6% vs 8.3% (from all patients), and the numbers were 6.9% vs 78.9% in pulmonologist practice. It suggests that asthma patients with more severe symptoms were more likely to visit their specialist for management of their asthma. Almost all patients were recruited in government health care facilities, therefore 96.3% patients had healthcare insurance which fully reimbursed.

In this asthma observational cross-sectional study, approximately one-third (37%) of all asthma patients in Indonesia received over-prescriptions of SABA canisters, 22.1% were prescribed 3 to 5 canisters, 9.6% were prescribed 6–9 canisters,



4.3% were prescribed 10–12 canisters, and 1% were prescribed  $\geq 13$  canisters. This finding is consistent with other studies in a European population. It has been reported that the prevalence of SABA over-prescription was 30% in Sweden,<sup>16</sup> 38% in the United Kingdom,<sup>8</sup> 36% in Germany,<sup>15</sup> 15.9% in Taiwan,<sup>17</sup> and 29% in Spain.<sup>7</sup> The mean number of annual SABA canister prescriptions was 4 canisters. This is quite similar with data from European countries, e.g., 3.1 canisters in Italy, 1.6 in Germany, 3.3 in Spain, 1.9 in Sweden, and 4.2 in the UK and data from SABINA III study which showed 38% of patients were prescribed  $\geq 3$  SABA canisters.<sup>7</sup> Use of  $\geq 3$  SABA canisters/year is considered undesirable since it indicates over-reliance on SABA for the management of persistent symptoms, usually related to the underuse of ICS and other controllers.<sup>18</sup>

We also analysed the SABA over-prescriptions among asthma severity groups (Table 3). The SABA over-prescription in mild asthma patients was 17.9%, and 40% in the moderate-to-severe asthma group. This data suggest that SABA over-prescription is more pronounced in moderate-to-severe asthma patients, and most probably as add on to maintenance therapy. These results are similar with data in the UK (26% vs 58%) and Spain (22% vs 31%), but different with other European countries, such as Italy (9% vs. 9%), Germany (23% vs 14%), and Sweden (33% vs 29%).<sup>7</sup>

According to GINA 2021, there are 3 categories of asthma medications, including controller, reliever, and add-on therapies for patients with severe asthma. ICS is the only medication which is included into reliever and controller categories.<sup>19</sup> ICS act as topical anti-inflammatory agents in the bronchial passages, in particular, their ability to reduce eosinophilic inflammation within the airway with minor risk of any significant systemic exposure.<sup>20</sup> ICS has been shown to decrease the frequency of severe exacerbations, hospitalization, and death.

The growing concern about the negative effects of SABA has led to research into alternative treatments options for providing quick relief of

asthma symptoms either for occasional symptom relief or when symptoms indicating an approaching severe exacerbation. The anti-inflammatory reliever approach which contains combination of a rapid-onset bronchodilator and ICS has been shown to be highly effective in mild asthma, where it may be used without maintenance dosing, and in moderate to severe asthma with fixed daily dosing of the same combination as maintenance treatment.<sup>18</sup> Low dose ICS/formoterol as reliever in mild asthma and on top of ICS/formoterol regular daily treatment in moderate and severe asthma has become the preferred approach in the GINA report.<sup>19</sup>

Despite advances in disease understanding, asthma management guidelines and the availability of effective treatment, poor asthma control remains a major problem. Poor asthma control is associated with an increased risk of exacerbations, poor quality of life, reduced productivity for individuals and increased healthcare utilization. In a cross-sectional observational study in Australia, 17.6%, 35.5%, and 46.9% of participants had controlled, partially controlled and uncontrolled asthma, respectively.<sup>21</sup> Another study among Asia – Pacific countries reported that Singapore had the highest proportion of well-controlled asthma (14%), while India and China had the lowest (0% and 2.0%, respectively). Furthermore, the partly-controlled and uncontrolled asthma rates were 61% and 26%, respectively, in Singapore.<sup>22</sup> However, the asthma symptom control data in our study showed a different pattern. Overall, patients in Indonesia have control levels as follows, 41.6% well-controlled; 37.4% partially controlled and 21.0% uncontrolled.

Exacerbations of asthma are episodes characterized by a progressive increase in symptoms of shortness of breath, cough, wheezing or chest tightness and progressive decrease in lung function, that require a change treatment.<sup>19</sup> A report showed that the overall mean annual exacerbation (defined as a worsening of asthma requiring an ED/hospital admission or OCS treatment) rates per patient in the US and the UK were 0.16/year and 0.11/year.<sup>23</sup> The mean number of severe exacerbations in our study is 0.8 in the last 12

months, which is quite high compared to the study in the US or the UK. 47.5% of patients had at least 1 severe exacerbation; and 7.3% of patients had  $\geq 3$  severe exacerbations, in the past 12 months.

In spite of the fact that ICS/LABA was prescribed to a majority of the patients (64.4% low dose, 33.2% medium dose and 2.4% high dose) less than half of the patients had well-controlled asthma. There are some factors which may contribute to patients' asthma control level that was not addressed in this study, i.e., adherence to treatment which is essential to optimize the benefits of therapy.<sup>6</sup>

A short course of OCS was prescribed to 40.2% patients with average duration 4.4 days. OCS long-term treatment was prescribed to 10.5% patients and there were 7.3% patients received OCS for any reason other than asthma.

There were some limitations in our study. Data input into the electronic case report form relied on physicians; finding may be affected by misinterpretation of instruction, incorrect patient classification and differences in local treatment practices with GINA recommendations. In addition, SABA prescription data may not always reflect actual dose. Furthermore, the number of patients recruited in this study was relatively small and only 14.2% of patients were recruited by primary care, which is lower than expected as we were targeting an accurate representation of how asthma patients are being treated in Indonesia. As 85.8% of patients were treated by a pulmonologist, most likely we see here a "better case scenario".

## CONCLUSION

We have reported for the first time that SABA over-prescription occurs in Indonesia in over one third of all asthma patients, especially among moderate-to-severe patients and almost half of asthma patients experienced at least 1 severe exacerbation in the previous year. This highlights a public health concern and the need to improve asthma care by aligning with global recommendations including reducing SABA over-

reliance in Indonesia.

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