

**PERCEPTIONS, ATTITUDES, AND PRACTICES
OF ASTHMA PATIENTS AND COMMUNITY
PHARMACISTS TOWARDS THE USE OF OVER-
THE-COUNTER SHORT-ACTING BETA-2
AGONISTS AT COMMUNITY PHARMACIES OF
MALAYSIA: A MIXED METHODS APPROACH**

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UNIVERSITI SAINS MALAYSIA

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by

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LIST OF SYMBOLS

a	Kruskal Wallis test
b	Mann-Whitney test
*	Significantly associated ($p < 0.05$)

LIST OF ABBREVIATIONS

A	Agree
ACQ	Asthma Control Questionnaire
ACT	Asthma Control Test
D	Disagree
GINA	Global Initiative for Asthma
HBM	Health Belief Model
ICS	Inhaled corticosteroids
JEPeM	Jawatankuasa Etika Penyelidikan Manusia
LABA	Long-acting beta-2 agonists
N	Neutral
NS	Non-significantly associated
SA	Strongly agree
SABA	Short-acting beta-2 agonists
SCT	Social Cognitive Theory
SD	Strongly disagree
TPB	Theory of Planned Behavior
UK	United Kingdom
US	United States

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**PERSEPSI, SIKAP, DAN AMALAN PESAKIT ASMA DAN AHLI
FARMASI TERHADAP PENGGUNAAN OVER-THE-COUNTER SHORT-
ACTING BETA-2 AGONISTS DI FARMASI KOMUNITI MALAYSIA:
PENDEKATAN KAEDAH GABUNGAN**

ABSTRAK

Prevalens global asma berada pada 262 juta orang. Short-acting beta-2 agonists (SABA) biasanya digunakan untuk lega asma, tetapi kebimbangan tentang penggunaan berlebihan, terutamanya disebabkan oleh ketersediaan bebas di kaunter (OTC) mereka di Malaysia, telah timbul. Kajian ini mengkaji persepsi, sikap, dan amalan pesakit asma serta ahli farmasi komuniti terhadap penggunaan SABA di farmasi komuniti Malaysia. Pendekatan kaedah campuran serentak telah digunakan, melibatkan kajian kualitatif dan kajian kuantitatif. Analisis tematik telah dijalankan untuk kajian kualitatif, manakala data kuantitatif analisis menggunakan ujian Mann-Whitney dan ujian Kruskal-Wallis. Temu duga telah dijalankan dengan 11 pesakit asma dan 12 ahli farmasi komuniti, dan 303 respons telah diperoleh daripada soal selidik. Pesakit menilai kawalan asma mereka berbeza dari profesional kesihatan. Komunikasi yang berkesan dan pendidikan asma telah ditekankan sebagai penting untuk mengatasi jurang ini. Penggunaan inhaler SABA yang betul, pendidikan berpusatkan pesakit, dan tunjuk ajar secara praktikal ditekankan. Cabaran aksesibiliti dan kos dengan inhaler SABA telah dinyatakan, bersama dengan isu seperti masa menunggu yang panjang dan pengalaman penjagaan kesihatan yang tidak menyenangkan yang mempengaruhi kepatuhan terhadap ubat. Kebimbangan tentang kesan sampingan inhaler SABA juga mempengaruhi kepatuhan. Selain itu, ahli farmasi

komuniti menekankan teknik inhaler yang betul, mematuhi jadual dos, pendidikan pesakit, dan peningkatan kesedaran. Kepatuhan pesakit dianggap penting untuk kawalan asma yang optimal. Ahli farmasi komuniti dilihat sebagai penting dalam memberi nasihat, memantau asma, dan memastikan kepatuhan. Dengan mempromosikan penggunaan inhaler SABA yang betul, ahli farmasi dapat meningkatkan keselamatan komuniti. Aspek kuantitatif kajian ini mendapati bahawa ahli farmasi kebanyakannya bersetuju bahawa kawalan asma yang baik berkait rapat dengan gejala yang minima (83.8%). Kebanyakan mengakui kemungkinan kesan sampingan inhaler SABA (73.9%). Banyak mengajar pesakit tentang teknik penggunaan inhaler (93.7%) dan menawarkan panduan tentang penggunaan yang selamat. Sesi pemantauan tambahan (75.6%), kaunseling lanjutan (73.6%), dan pemantauan pembelian inhaler SABA (45.2%) dilihat sebagai pendukung untuk penggunaan yang selamat bagi inhaler SABA. Halangan termasuk ketidaktahuan pesakit tentang perkhidmatan farmasi (73.6%), sekatan masa (68.3%), dan beban kerja yang berat (56.2%). 26.9% daripada peserta mempunyai persepsi yang 'baik' mengenai kawalan dan pengurusan asma, manakala 40% daripada mereka mempunyai persepsi risiko yang 'baik' terhadap penggunaan selamat inhaler SABA. Sebaliknya, hanya 4.3% daripada ahli farmasi komuniti menunjukkan amalan yang 'lemah' berkaitan dengan penggunaan inhaler SABA. Secara ringkasnya, kajian ini menekankan bahawa pesakit asthma dan ahli farmasi komuniti merasakan kawalan asthma yang baik membawa kepada gejala minimal dan pengurangan keperluan untuk inhaler SABA. Komunikasi yang berkesan, pendidikan yang menyeluruh, dan teknik yang betul untuk menggunakan inhaler SABA dikenal pasti sebagai faktor penyokong bagi penggunaan inhaler SABA yang selamat. Sebaliknya, halangan untuk penggunaan yang selamat termasuk penurunan ulasan asthma dan ketiadaan sistem pemantauan di farmasi komuniti.

**PERCEPTIONS, ATTITUDES, AND PRACTICES OF ASTHMA
PATIENTS AND COMMUNITY PHARMACISTS TOWARDS THE USE OF
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APPROACH**

ABSTRACT

The global prevalence of asthma stands at 262 million people. Short-acting beta-2 agonists (SABA) are commonly used for asthma relief, but concerns about their overuse, especially due to the over-the-counter (OTC) availability in Malaysia, have arisen. This study investigated perceptions, attitudes, and practices of asthma patients and community pharmacists towards the use of SABA at community pharmacies of Malaysia. A concurrent mixed methods approach was utilized, involving both a qualitative study and a quantitative study. Thematic analysis was conducted for the qualitative study, while the quantitative data were analyzed using the Mann-Whitney test and Kruskal-Wallis test. Interviews were conducted with 11 asthma patients and 12 community pharmacists, and 303 responses were obtained from questionnaire responses. Patients assessed their asthma control different from healthcare professionals. Effective communication and education from healthcare providers were highlighted as crucial for bridging this gap. Proper SABA inhaler use, patient-centric education, and hands-on demonstrations were emphasized. Accessibility and cost challenges with SABA inhalers were noted, along with issues like long waiting times, unfavorable healthcare encounters, concerns about SABA inhalers

side effects affecting medication adherence. On the other hand, community pharmacists stressed correct inhaler techniques, adhering to dosing schedules, patient education, and raising awareness. By actively promoting proper SABA inhaler use, pharmacists could significantly enhance patient outcomes and community safety. The study's quantitative aspect revealed that pharmacists largely agreed that good asthma control correlated with minimal symptoms (83.8%). Most acknowledged possible SABA inhaler side effects (73.9%) and many (93.7%) educated patients on inhaler techniques. Additional follow-up sessions (75.6%), extended counseling (73.6%), and monitoring SABA inhaler purchases (45.2%) were seen as facilitators to safe use of SABA inhalers. Barriers included patient unawareness of pharmacy services (73.6%), time constraints (68.3%), and heavy workloads (56.2%). There were 26.9% of participants held 'good' perceptions regarding asthma control and management, while 40% of them had 'good' risk perceptions toward the safe use of SABA inhalers. Conversely, only 4.3% of community pharmacists demonstrated 'poor' practices concerning the use of SABA inhalers. In summary, this study highlighted that asthma patients and community pharmacists perceived that good asthma control led to minimal symptoms and reduced requirement for SABA inhalers. Effective communication, comprehensive education, and correct techniques for using SABA inhalers were identified as facilitators for the safe use of SABA inhalers. Conversely, barriers to safe usage included a decrease in asthma reviews and the absence of a monitoring system in community pharmacies.

CHAPTER 1

INTRODUCTION

1.1 Asthma

The history of asthma dates back to 2697 B.C. when ancient Chinese citizens recorded both diagnoses and prescriptions for the condition (Veith, 2019). According to the Global Initiative for Asthma (2019), asthma is defined as a condition characterized by respiratory symptoms that vary in intensity and frequency over time, including wheezing, shortness of breath, chest tightness, and coughing, coupled with variable airflow limitation (Global Initiative for Asthma, 2019). During an asthma attack, bronchial smooth muscles constrict, and bronchial tissue swells, leading to mucus secretion and infiltration of inflammatory cells such as eosinophils, monocytes, mast cells, and neutrophils into the bronchial submucosa (Holgate, 2008; Robinson, 2004). Airway hyperresponsiveness and persistent airway inflammation often accompany asthma (Global Initiative for Asthma, 2019). Exercise, allergen exposure, irritants, changes in weather, and viral respiratory infections are some of the triggers of asthma attacks (Global Initiative for Asthma, 2019, 2021; Vernon et al., 2012). Symptoms and airflow obstruction can vary in severity and change over time, with some patients experiencing spontaneous remissions or requiring medication, while others may not experience symptoms for weeks or even months at a time (Humbert et al., 2007). Despite this, asthma can be fatal and costly to both individuals and society, particularly during sporadic flare-ups (Humbert et al., 2007). Comorbidities such as rhinitis, rhinosinusitis, gastroesophageal reflux, obesity, sleep apnea, depression, and anxiety are commonly associated with asthma (Global Initiative for Asthma, 2019, 2022; Tay & Hew, 2018).

The probability that respiratory symptoms are caused by asthma is higher if they first occur during childhood, if there is a history of allergic rhinitis or eczema, or if there is a family history of asthma or allergies (Burgess et al., 2007; Global Initiative for Asthma, 2019, 2022). Although these characteristics are not specific to asthma, they are associated with the condition (Global Initiative for Asthma, 2019). The likelihood of a patient having asthma increases if they experience severe night-time and early morning symptoms, variable symptoms in terms of duration and severity, or symptoms triggered by viral infections, allergens, exercise, changes in weather, or irritants such as smoke, car exhaust fumes, or strong odors (Global Initiative for Asthma, 2019, 2022).

Asthma control has two essential domains: the control of asthma symptoms and the future risk of adverse outcomes (Global Initiative for Asthma, 2019). The integrity of lung function is an important measure to assess the future risk of adverse outcomes (Global Initiative for Asthma, 2019; Ma et al., 2015). Table 1.1 presents an outline of the assessment of asthma symptoms control (Global Initiative for Asthma, 2022).

Table 1.1 Assessment of asthma symptoms

Assessment of asthma symptoms control in the past four weeks	Level of asthma symptom control		
	Well-controlled	Partly controlled	Uncontrolled
1. Daytime asthma symptoms more than twice per week.	None of these	Once to twice of these	Three to four times of these
2. Nocturnal awakenings due to asthma.			
3. Reliever use more than twice per week.			
4. Activity limitations due to asthma.			

There is often a discrepancy in how healthcare experts and patients perceive asthma control, as reported by various studies (Global Initiative for Asthma, 2019; Haughney et al., 2004; Horne et al., 2007). To discern various levels of symptom control accurately, validated tools like the Asthma Control Questionnaire (ACQ) and Asthma Control Test (ACT) are available (Jia et al., 2013; Schuler et al., 2016). Research by Van Dijk et al. (2020) supported the use of these tools, showing that ACQ and ACT scores are significantly associated with lung function and asthma-related quality of life (Van Dijk et al., 2020). In five European countries (France, Germany, Italy, Spain, and the United Kingdom (UK)), more than half of the patients with asthma did not have well-controlled asthma (Demoly et al., 2009; Menzies-Gow & Chiu, 2017). In Europe, 45% of patients who participated in the REcognise Asthma and Link to Symptoms and Experience

(REALISE) study did not have well-controlled asthma based on ACT scores (Menzies-Gow & Chiu, 2017; Price et al., 2014). Despite these objective measurements, a significant proportion of patients (64.7% in Europe and over 80% in the REALISE study) reported that their asthma was controlled (Demoly et al., 2009; Price et al., 2014). In contrast, patients who believed their asthma was not well-controlled, despite their ACT scores being satisfied, may have been subjected to unnecessary treatment due to misinterpretations of their asthma control status. Consequently, they could have been exposed to adverse effects resulting from the overuse of medication (Menzies-Gow & Chiu, 2017).

1.2 Asthma prevalence

Asthma prevalence refers to the percentage of the general population currently affected by asthma. It was projected that approximately 262 million people worldwide suffered from asthma in 2019 (The Global Asthma Report, 2022).

However, as many people experience intermittent symptoms, it is typically necessary to evaluate them over a predetermined period as these symptoms may not be presented on the day of the study. Even when evaluating the prevalence of asthma during the same period, various organizations may publish different data, likely due to differences in analytical methods or scales (Asher et al., 2020).

In 2003, the prevalence of medically diagnosed asthma in adults in Australia was 12.2%, which was nearly twice the number of diagnoses made in 1990 (7.5%) (Asher et al., 2020; Wilson et al., 2006). In contrast, Italy had 6.6% of current asthma sufferers from 2007 to 2010 (De Marco et al., 2012; Asher et al., 2020). In Sweden, there were 11.6% instances of asthma in 2006, and 12.0% of those cases had recurrent wheezing (Backman et al., 2014). Besides, it was reported that 14.2 million (5.8%) individuals in France, Germany, Italy, Spain, and the UK suffered from asthma in 2006 (Demoly et al., 2009). In the United States (US), the prevalence of asthma cases in 2001 was estimated to be 6.5% (Bang et al., 2005). In the year 2015, China documented 4.5 million adult asthma cases (Huang et al., 2019). In Japan, it was reported that about 8% of adults had asthma in 2005 (Akasawa et al., 2007; Lundbäck et al., 2016). Also, a total of 5% of Vietnamese adults had been diagnosed with asthma by a physician in 2007 (Lâm et al., 2011; Lundbäck et al., 2016). Salim et al. (2021) recorded around 4.5% of adult asthma cases in Malaysia (Salim et al., 2021).

In France, Germany, Italy, Spain, and the UK, approximately 50.4% of asthma patients experienced not well-controlled asthma (Demoly et al., 2009). In the US alone, approximately 58% of uncontrolled asthma cases were recorded among adults with asthma (Stanford et al., 2012). In China, 49.46% of asthma patients had well-controlled asthma (Su et al., 2014). There were 30% of uncontrolled asthma cases and 63% of partly controlled asthma cases in Malaysia (Thompson et al., 2013). Another Malaysian study showed that 38% and 21% of asthma patients had partly controlled and uncontrolled asthma respectively (Isa et al., 2020). Moreover, about 56.3% of adults had mild intermittent asthma, whereas 8.3% had severe persistent asthma in Malaysia that led to

13.2% of hospitalizations and 12% of emergency visits to the hospitals (Zainudin et al., 2005).

1.3 Healthcare system of Malaysia

Malaysia currently operates a public-private healthcare system that is dichotomous in nature (Ahmad, 2019; Quek, 2014). It is acknowledged as a low-cost healthcare system that offers universal and comprehensive services, with approximately 65% of the population receiving care from the public sector (Ahmad, 2019; Quek, 2014). Despite this, only 45% of all registered doctors and even fewer specialists work there (25-30%) (Quek, 2014). The public sector is heavily subsidized, and patients pay only nominal fees for access to both outpatient care and hospitalization (Quek, 2014). The rural health service, a significant division in the services sector, operates under government supervision, providing essential infrastructure and human resources while the Minister of Health oversees the deployment of healthcare professionals to diverse centers, including rural clinics, district hospitals, and tertiary specialist hospitals nationwide (Quek, 2014). These rural health services are connected to major hospitals in each state and city through a special referral system, which enables efficient primary healthcare coverage (Quek, 2014).

In contrast, the private sector mainly comprises private clinics and community pharmacies (Hamidi et al., 2021; Wong, 2001). Private clinics are established by general and family physicians who choose to opt-out and open their own clinics (Quek, 2014). Traditional healers in the private healthcare industry, including practitioners of Chinese medicine, ayurvedic medicine from India, and Malay traditional medicine, also prescribe traditional medicines as part of their practices (Hamidi et al., 2021). Approximately 25% of the population receives care from the private sector, which is served by around 55% of

all registered doctors, who operate on a self-pay, fee-for-service basis (Chee, 2008; Quek, 2014). However, third-party payment systems such as health insurance programs are increasingly being used as well (Chee, 2008; Quek, 2014). Healthcare professionals seeking better-paying and more prestigious institutions are increasingly joining private tertiary healthcare services (Lee, 2017).

1.4 Asthma medications

Asthma medications are mainly comprised of three categories. The first category is controller or preventer medications, which are used to decrease airway inflammation, symptom control, and prevent future asthma exacerbations (Global Initiative for Asthma, 2019). For patients with mild asthma, a low dose inhaled corticosteroids (ICS)-formoterol is the recommended maintenance treatment (Global Initiative for Asthma, 2019; Muneswarao et al., 2019). The second category is quick-reliever medications that are prescribed as needed to relieve bronchoconstriction and acute symptoms immediately (Murphy, 2007). Short-acting β_2 -agonists (SABA) and long-acting β_2 -agonists (LABA) are examples of asthma relievers. The third category is add-on therapy for severe asthma patients with persistent symptoms and exacerbations. In such cases, a high dose ICS and a LABA are recommended (Global Initiative for Asthma, 2019). The selection of a medication, device, and dose should be based on an evaluation of symptom control, risk factors, patient preference, and practical considerations like cost, the device's usability, and adherence for each patient (Global Initiative for Asthma, 2019). It is also essential to monitor the effectiveness of treatment and any adverse effects associated with it (Global Initiative for Asthma, 2019).

As soon as an asthma diagnosis is made, ICS-containing controller medication should begin for the optimum result (Global Initiative for Asthma, 2019). Lung function improves more rapidly when a low dose ICS is initiated early in asthma patients than when symptoms have been present for more than two to four years (Busse et al., 2008; Lange et al., 1998). According to Busse et al. (2008), patients who got budesonide as the controller medicine utilized significantly fewer additional asthma treatments (Busse et al., 2008). Early controller medication and early removal from sensitizing agent exposure boost the likelihood of early recovery in patients with occupational asthma (Baur et al., 2012).

Among asthma reliever medicines, SABA is the most potent and rapid-acting bronchodilator (Murphy, 2007). SABA relievers are categorized under Group C items (medicines that can be dispensed by pharmacists without prescription) in Malaysia (Laws of Malaysia, 2013). It relaxes bronchial smooth muscles, increases airflow rapidly within three to five minutes, and its effects last from four to six hours (Barnes, 2007; Urso, 2010). The inhaled route is preferred for administering SABA due to its faster onset and fewer side effects (Urso, 2010; Williams & Rubin, 2018). Salbutamol and terbutaline are grouped under the SABA category of asthma medicines (Murphy, 2007). Besides, SABA can cause dose-related side effects such as muscle tremors, tachycardia, and hypokalemia (Andrzejowski & Carroll, 2016; Murphy, 2007).

Salbutamol was created from ephedrine, a refined component of the Chinese medicinal Ma Huang, which has been used for more than 5000 years to treat bronchitis, Hay fever, and asthma (Andrzejowski & Carroll, 2016; Scheindlin, 2003). Salbutamol is typically administered by metered-dose inhalers, but it can also be taken orally, intravenously, or inhaled using a nebulizer or dry powder inhaler (Skoner, 2000). Following inhalation, salbutamol particles are distributed throughout the mouth, upper

airways, and lower airways; the location of distribution is mostly influenced by the size of the particle (Williams et al., 2011). The bulk of salbutamol inhaled through any device settles in the mouth and is absorbed through the buccal mucosa, where it is subjected to first-pass liver metabolism (Andrzejowski & Carroll, 2016). In practice, peak plasma concentration after a single inhaled dose happens at 10 minutes, while maximum bronchodilation happens between 12 and 15 minutes (Carroll & Lenney, 2007).

Government medical practitioners were most likely to prescribe inhaled SABA as the first-line treatment option (Loh & Wong, 2005). In the year 2012, Thamby et al. (2012) stated that salbutamol is the most prescribed medicine in Malaysia (Thamby et al., 2012). Moreover, a recent study from Malaysia claimed that asthma medications that are commonly prescribed at primary health clinics included ICS, inhaled SABA and LABA, oral steroids, and theophylline (Cheong et al., 2021).

Till the year 2018, as-needed SABA monotherapy was the preferred option for the first step (mild asthma) of asthma treatment (Global Asthma Network, 2018). However, from the year 2019 onwards, SABA monotherapy was no longer recommended, even with mild asthma patients. Instead, a low dose of ICS-formoterol was suggested for symptomatic relief (Global Initiative for Asthma, 2019). This is because patients who are overusing SABA relievers and underusing preventer medication will increase the likelihood of developing uncontrolled asthma (Azzi et al., 2019; Janson et al., 2020; Murphy, 2007). Furthermore, asthma patients who receive SABA monotherapy have an increased risk of asthma exacerbations (Kaplan et al., 2020, 2021). Asthma exacerbation is asthma worsening that requires an antibiotic and/or short-term oral corticosteroid (OCS) treatment and/or asthma hospitalizations and/or accident and emergency department (A&E) visit (Cabrera et al., 2020).

1.5 Community pharmacists and asthma management

Community pharmacies, also known as retail pharmacies, play a crucial role in the delivery of healthcare services (Hamidi et al., 2021; Hedima et al., 2021). These pharmacies serve as health centers where patients can receive clinical interventions, medical examinations, drug reviews, treatment for acute illnesses, medical counseling, and medication provision (Puspitasari et al., 2009). With most of these facilities located near towns, they typically offer extended hours and are accessible to all members of the community (Hamidi et al., 2021). In Southeast England, a survey of individuals aged 18-34 revealed that approximately 69.9% of respondents preferred to use a pharmacy near their place of work, while 77.8% preferred a pharmacy that was opened in the evenings (Gammie et al., 2016). Similarly, in Uganda, community pharmacies were favored over government providers for intramuscular contraception due to the shorter waiting times, convenience, and respectful treatment received from community pharmacists (Akol et al., 2014; Melton & Lai, 2017).

Community pharmacies in the US offer prescription drug dispensing, medication counseling, and chronic illness management. More than half of these pharmacies are typical chain pharmacies, mass merchandisers, and supermarkets (Christensen & Farris, 2006). The new Medicare prescription drug benefit plan paid pharmacists in the US for certain enrolments (Christensen & Farris, 2006). In the UK, National Health Service (NHS) pharmaceutical services are delivered by privately owned community pharmacies under contract (Noyce, 2007). These pharmacies provide enhanced pharmaceutical services, including the administration of methadone, support programs for patients to quit smoking, participation in healthcare campaigns, chlamydia tests, and other services (Noyce, 2007). On the Isle of Wight in England, community pharmacists delivered nearly

10% of influenza vaccinations, and most patients were pleased with the convenience and timeliness of the service they received, compared to the outpatient department (Melton & Lai, 2017; Warner et al., 2013). In Australia, community pharmacies improved asthma management by providing patient-tailored therapy and health education related to asthma (Saini et al., 2011). Patients are also satisfied with the community pharmacists' delivery of opioid substitution therapy (Lea et al., 2008; Melton & Lai, 2017).

Community pharmacists are often seen as the most approachable healthcare professionals in the community (Community Pharmacy Benchmarking Guideline, 2015). As a result, they frequently encounter patients with various health conditions (Anderson et al., 2009; Eades et al., 2011). Patients view pharmacists as trustworthy consultants on personal health issues, reliable suppliers of medical supplies, and strong allies of the medical community (Benrimoj & Frommer, 2004; Benrimoj & Roberts, 2005). When patients cannot obtain all the information they need from their doctors, they turn to pharmacists for medical advice, which enables pharmacists to influence medication adherence (Du Pasquier & Aslani, 2008). In Hungary, 40% of respondents consulted pharmacists before making decisions, while 44% inquired about the effects of over-the-counter medicines before making a purchase (Major & Vincze, 2010). In England, some patients did not believe that their conditions warranted a visit to the general practitioner, while others sought advice from community pharmacists because they perceived that general practitioners were inaccessible, and they would be referred to a physician if necessary (Tucker & Stewart, 2015).

In Malaysia, a community pharmacy is a premise with at least one pharmacist holding a Type A license issued under the Poison Act 1952 who can dispense medicines by both retail and/ or wholesale (Community Pharmacy Benchmarking Guideline, 2015).

On the other hand, pharmacists can dispense Group C poisons without prescription in community pharmacies according to the Poison Act 1952 (Laws of Malaysia, 2013; Ooi, 2015). Malaysians (10.3%) preferred community pharmacies over clinics and hospitals due to their easy accessibility (Hamidi et al., 2021; Wertheimer, 2015). This was shown as Malaysians visited community pharmacies 31 times a year (Hamidi et al., 2021). Furthermore, 51.6% of Malaysians purchased their medicines from community pharmacies (Chua & Sabki, 2011). Because of this, community pharmacists have expanded their basic health services in recent years to include early identification of general health issues, health education, and health counseling services, in addition to providing non-prescription drugs and nutritional supplements in Malaysia (Bahri, 2016; Hamidi et al., 2021; Saw et al., 2015).

In Malaysia, some community pharmacists offer over-the-counter weight loss products and programs, as part of their expanded service offerings (Eades et al., 2011; Verma et al., 2018). Meanwhile, community pharmacists provide specialist guidance on various health conditions, such as hypertension, diabetes mellitus, and non-pharmacological management, in addition to conducting screening tests like blood pressure checks, glucose testing, and cholesterol monitoring (Chua et al., 2013). Despite this, Malaysian community pharmacists faced limited opportunities to screen and fill prescriptions, as they received fewer than 14 prescriptions per week compared to community pharmacists in developed nations (Benrimoj & Roberts, 2005; Chua et al., 2013).

Community pharmacists are equipped with knowledge and are easily accessible, making them well-suited to run chronic disease management programs such as asthma care (Boulet et al., 2002; Haahtela, 2002; Saini et al., 2004). Research has shown that

asthma patients desire greater involvement from their pharmacists in managing their condition, with many expressing interests in lung function monitoring (Panvelkar et al., 2010). In Australia, the asthma care model implemented in community pharmacies resulted in reduced daily salbutamol use, improved asthma control, and increased patient knowledge (Saini et al., 2004). Qualified pharmacists conducted clinical evaluations, provided focused therapies, performed routine monitoring, and offered follow-up services to asthma patients in this model (Panvelkar et al., 2010). Denmark provided an inhaler technique assessment service for patients who refilled their asthma inhaler prescriptions in community pharmacies, which were publicly funded (Kaae & Sporrang, 2015). However, in Malaysia, while 82% of pharmacists acknowledged the importance of counseling on asthma-related issues, only 33.3% of them offered inhaler technique advice regularly (Akram et al., 2018).

Community pharmacies allow patients to purchase over-the-counter medications for mild illnesses without a prescription, making healthcare more convenient (Fingleton et al., 2016). To be approved by the United States Food and Drug Administration (FDA), over-the-counter medications must have a positive benefit-risk ratio, be at low risk for abuse or misuse, be easily understandable by the public, and have proper labelling (Marathe et al., 2020). However, concerns about the misuse of over-the-counter medications from community pharmacies cannot be overruled (Wazaify et al., 2006).

The Poison Act of 1952 in Malaysia categorizes non-prescription medicines as Group C items, and their sale requires documentation, including the sale date, name of the drug, and active ingredients, among other details. Failure to comply with these requirements could lead to a maximum penalty of RM5,000, a maximum prison sentence of two years, or both. Moreover, all medications must undergo registration with The Drug

Control Authority (DCA) before production, importation, marketing, or dispensing to ensure their compliance with rigorous examination standards and eligibility for a license (Mathialagan, 2012).

Misuse of over-the-counter medications can occur when they are taken at a higher dose or for a longer period than recommended (Hughes et al., 2001; O'Brien, 2005). In the UK, analgesics were the most abused non-prescription drugs, with a lifetime prevalence of non-prescription drug addiction estimated to be 19.3% (Fingleton et al., 2016). Similarly, in the US, around 3.1 million individuals have misused over-the-counter medications at least once in their lives (Gonzales et al., 2011; Marathe et al., 2020). Misuse often occurs due to a lack of awareness of the potential pharmacological, psychological, economical, and physiological effects of over-the-counter medication misuse (Cooper, 2013; Ylä-Rautio et al., 2020). Patients are also less likely to discuss their over-the-counter medications with their doctors, and the absence of drug monitoring programs may exacerbate the issue of over-the-counter medication misuse (Sansgiry et al., 2017; Schifano et al., 2021).

The overuse of over-the-counter SABA inhalers is a concerning issue that requires attention. A significant proportion of asthma patients overuse SABA inhalers that were purchased over-the-counter from community pharmacies (Amirav & Newhouse, 2020; Bateman et al., 2021; Bjermer, 2014). To tackle this problem, community pharmacists should be cautious when dispensing SABA inhalers (Adsley, 2019). Additionally, effective counseling sessions with patients by pharmacists can improve the safe and efficient use of asthma medications (Bridgeman & Wilken, 2021).

1.6 Perceptions, attitudes, and practices

In this study, the terms "perceptions," "attitudes," and "practices" are defined as follows:

- (i) Perceptions: Understanding or beliefs of the respondents about a phenomenon, which is shaped by their previous experiences (Loh et al., 2023; McDonald, 2011; Rasul et al., 2021).
- (ii) Attitudes: The tendency of the respondents to react positively or negatively towards a certain idea, object, or situation (Balan, 2021; Loh et al., 2023).
- (iii) Practices: All aspects related to the accessibility, use, and effects of medications, as well as the utilization of human resources to provide pharmacy services, at both individual and population levels (Scahill et al., 2017).

1.7 Problem statement

The severity of asthma pertains to the level of treatment needed to achieve effective control of the disease, while asthma control refers to the reduction or elimination of asthma symptoms through medication (Taylor et al., 2008). According to the GINA report (2022), if SABA is used more than twice a week, patients should start or increase their controller therapy (Song et al., 2022). Additionally, research suggested that patients who used three or more SABA canisters per year may be over-reliant on SABA (Amin et al., 2020).

Overusing SABA canisters has been the subject of extensive research in recent years because of the increased risk of asthma exacerbation and asthma-related death (Price et al., 2014; Suissa et al., 2000). Furthermore, unsupervised asthma exacerbation can lead

to hospitalization, lung function impairment, and decreased quality of life (Bai et al., 2007; Luskin et al., 2014; Muneswarao et al., 2019). Surprisingly, SABA overuse had been reported by 38% of asthma patients in the US and 30% in Sweden (Bloom et al., 2020). In Taiwan, 15.9% of asthma patients had been identified as SABA over-users (Wang et al., 2021). Although Portugal had only 1.9% of SABA over-users, they used an average of 13 inhalations per day (Sá-Sousa et al., 2018).

Several reasons may drive asthma patients to purchase SABA over-the-counter. According to Campbell et al. (2000), most asthma patients preferred to take control of their asthma management and requested SABA over-the-counter. They also perceived regular follow-up visits as unnecessary for obtaining reliever inhaler prescriptions (Campbell et al., 2000). Additionally, patients claimed that their interactions with healthcare professionals were unsatisfactory, leading them to purchase SABA medicines over-the-counter (Baggott et al., 2020).

The problem of medicine overuse may escalate if SABA inhalers can be purchased without a prescription (Muneswarao et al., 2019; Reddel et al., 2017). Furthermore, individuals who purchased SABA inhalers over-the-counter were more likely to require urgent asthma reviews (Reddel et al., 2017). This is concerning, given that asthma patients who obtained SABA inhalers without follow-up visits had a three-fold higher risk of developing uncontrolled asthma compared to those who received their inhalers after medical consultations (Gibson et al., 1993). The over-the-counter accessibility of SABA inhalers in Malaysian community pharmacies raises concerns about potential misuse. A recent study conducted in Asian countries, including Malaysia, has shown that 7.7% of asthma patients bought SABA over-the-counter, with 32.8% purchasing ≥ 3 canisters

(Wang et al., 2023). Particularly, a total of 9.0% of patients had purchased SABA inhalers over-the-counter, and 43.9% of them had purchased ≥ 3 inhalers in Malaysia (Ban et al., 2023). Those in primary care had higher SABA purchases compared to specialist care (12.3% vs. 6.7%) across severities (Wang et al., 2023). Notably, 33.9% and 38.6% of over-the-counter SABA purchasers had partly controlled and uncontrolled asthma, respectively (Wang et al., 2023). Therefore, understanding how asthma patients perceive and manage their symptoms, SABA use, and asthma, in general, is an important research question that needs to be addressed (Reddel et al., 2017).

Patients seeking relief from asthma symptoms often turn to community pharmacists as their first point of contact (Khanal et al., 2016; Smith et al., 2007). In addition to dispensing SABA inhalers, community pharmacists have an important role to play in monitoring and advising patients on their asthma management (Taqi et al., 2021; Turcotte et al., 2022). Also, community pharmacists perceive that their roles should not be limited to dispensing medications but also practicing a patient-centered approach (Edmunds & Calnan, 2001; Kritikos et al., 2010). Understanding the perceptions and practices of community pharmacists can provide valuable insight into the factors contributing to SABA overuse, allowing for the identification of potential solutions to address this issue.

Owing to the scarcity of literature on perceptions, attitudes, and practices toward SABA use in Malaysia, this study aimed to explore these aspects from the perspectives of asthma patients and pharmacists in community pharmacy settings.

1.8 Significance of the study

The availability of SABA inhalers over-the-counter in Malaysian pharmacies increases the risk of medicine misuse and treatment failure. Some patients view SABA inhalers as 'life savers' and take them to prevent asthma attacks, as they are satisfied with the quick relief effects produced by the inhalers (Azzi et al., 2022). Moreover, many SABA over-users overestimate their level of asthma control, likely due to differing perceptions about their conditions and treatments (Azzi et al., 2022; Blakeston et al., 2021; Cole et al., 2013; Huurne et al., 2017). Patients' attitudes towards asthma and treatments strongly influence the successful implementation of effective asthma self-care (Bosley et al., 1995). Understanding how patients perceive and utilize SABA inhalers, often considered as 'life savers,' is crucial for identifying issues related to over-reliance and overuse.

Understanding the perceptions and practices of community pharmacists towards the use of SABA inhalers is crucial. Overprescribing by general practitioners has been identified as a contributing factor in drug abuse, and the medical community must take accountability for its part in misuse and dependency (Butler & Sheridan, 2010; Hoppe et al., 2020). Community pharmacists are well-positioned to recognize, resolve, and mitigate any issues that may arise throughout the dispensing process and result in unfavorable circumstances for patients (Chen et al., 2005). Recognizing the role of community pharmacists in mitigating issues during the dispensing process is the key to preventing adverse outcomes for patients. This study seeks to bridge the gap in understanding both patient and pharmacist perspectives, offering valuable insights for healthcare professionals and policymakers.

The findings of this study could play a pivotal role in the enhancement of asthma management in Malaysia. By gaining a comprehensive understanding of asthma patients' and community pharmacists' perspectives, the study aimed to contribute to the development of targeted interventions, informed guidelines, and improved support mechanisms by addressing the challenges towards effective asthma management and safe use of SABA inhalers (Cheong et al., 2021). Also, providing more support to the end-users of asthma medication could be achieved. Ultimately, this research has the potential to positively impact the overall landscape of asthma care, ensuring safer and more effective use of SABA inhalers within the Malaysian healthcare system.

1.9 Research questions

- (i) What do asthma patients perceive and how do they feel about the safe use of SABA inhalers in community pharmacy settings?
- (ii) What are the perceptions and practices of community pharmacists regarding the safe use of SABA inhalers and overuse?
- (iii) What are the facilitators and barriers that contribute to and hinder the safe use of SABA inhalers by patients in community settings?

1.10 Aim and objectives

Aim:

To investigate the perceptions, attitudes, and practices of both asthma patients and community pharmacists towards the safe use of SABA inhalers in community pharmacies of Malaysia.

Objectives:

- (i) To investigate asthma patients' perceptions of asthma control and factors that influence it, as well as effectiveness of asthma management.
- (ii) To assess the attitudes of asthma patients towards asthma management and the use of SABA inhalers.
- (iii) To explore the perceptions of community pharmacists regarding good asthma control, SABA usage among asthma patients, as well as the factors that influence the safe use of SABA inhalers among asthma patients.
- (iv) To determine community pharmacists' perceptions and practices towards SABA usage at community pharmacy settings in Malaysia.

1.11 Overview of the thesis

This thesis aimed to investigate the perceptions attitudes, and practices of asthma patients and community pharmacists towards the safe use of SABA inhalers in community pharmacies of Malaysia. The study utilized a concurrent mixed methods approach, which was conducted for the first time in the country.

Chapter 1 introduces the research problem statement and explains how the study can benefit society.

Chapter 2 consists of a comprehensive literature review covering various aspects related to the perceptions and attitudes of asthma patients, as well as the perceptions and practices of community pharmacists towards the use of SABA.

Chapter 3 presents the general methodology adopted for the design and implementation of the study, including the research design, study setting, study

participants, and data sources. Also, it outlines several possible theoretical frameworks to explain the qualitative findings of this study.

Chapter 4 focuses on a qualitative study that explores the perceptions and attitudes of asthma patients towards the use of SABA in community settings in Malaysia.

Chapter 5 reports the perceptions and practices of community pharmacists towards the safe use of SABA inhalers in community pharmacies in Malaysia.

Chapter 6 presents the findings of a quantitative study that examines the prevalent perceptions and practices of community pharmacists regarding the safe use of SABA inhalers in community pharmacy settings in Malaysia.

Chapter 7 provides a triangulation of results in two parts. The first part offers a comparison between the perceptions of community pharmacists and asthma patients regarding the use of SABA in community settings in Malaysia. The second part involves a triangulation of results between the qualitative and quantitative studies that involve community pharmacists.

Chapter 8 summarizes the outcomes of the mixed methods approach and presents several recommendations to improve asthma management in Malaysia.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents a comprehensive review of empirical research on the perceptions, attitudes, and practices of asthma patients and community pharmacists regarding the utilization of SABA. The chapter is organized into three sections. The first section establishes the context of the study by exploring previous literature on the perceptions, attitudes, and behaviors of asthma patients regarding the use of SABA. The second section focuses on studies that examine the over-the-counter use of SABA from the perspective of asthma patients. The third section reviews the perceptions and practices of community pharmacists concerning the use of SABA.

2.2 Section one: perceptions and attitudes of asthma patients

The overuse of SABA has been linked to an increased risk of asthma exacerbation, hospitalization, and death (Bateman et al., 2021; Bloom et al., 2020; Johnston & Edwards, 2009; Muneswarao et al., 2019). Research suggests that using three or more canisters of SABA inhaler in a year (equivalent to an average of 1.6 puffs per day) increases the risk of flare-ups, while using 12 or more canisters per year (equivalent to an average of 6.6 puffs per day) increases the risk of asthma-related death (Stanford et al., 2012; Suissa et al., 1994). There are various reasons why individuals with asthma overuse SABA, including the perceived immediate relief compared to preventers, prolonged usage leading to the belief that it is safe, and its availability over-the-counter in some countries.

Understanding patients' perceptions, attitudes, and behaviors towards a specific healthcare issue is crucial in developing effective disease management strategies (Haughney et al., 2007). In order to comprehensively tackle the issue of SABA overuse in healthcare, it is imperative to consider the implementation of well-structured and far-reaching national-level campaigns and strategic initiatives. These efforts should take into account the multifaceted factors contributing to the overuse and devising appropriate interventions to raise awareness, educate both healthcare providers and patients about alternative treatment options, promote responsible medication practices, and foster a culture of informed decision-making in managing respiratory conditions, all of which collectively contribute to ensure optimal and sustainable healthcare outcomes (de las Vecillas & Quirce, 2023). However, despite previous campaigns, SABA overuse remains an ongoing risk. Therefore, this chapter's first section provides a systematic review of the perceptions and attitudes of asthma patients towards the use of SABA.

2.2.1 Eligibility criteria

The systematic review included original research articles written in English and published between January 2000 and February 2023, reporting on the perceptions and attitudes of asthma patients regarding the use of SABA. The review was not restricted to particular study designs, but excluded commentaries, letters to the editor, review articles, and conference proceedings.

2.2.2 Information sources and search strategies

This systematic review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021). The literature search employed Boolean operators such as "AND" and "OR" to

combine the keywords, which included *perception, belief, perspective, knowledge, understanding, attitude, respond, behavior, practice, short-acting β 2-agonist, SABA, terbutaline, reliever, salbutamol, and albuterol*. The search strategies were outlined in Table 2.1 and were implemented across various databases, such as Scopus, PsycINFO, CINAHL, and the Cochrane database, in addition to PubMed. These subject-specific and multidisciplinary databases were chosen due to their accessibility and availability of publications on life science and biomedical subjects (Williamson & Minter, 2019). To avoid missing information, relevant study reference lists were also examined to identify associated articles. Figure 2.1 represents the selection and screening process for eligible studies. The search encompassed articles published between 2000 and February 2023. This study had been registered with PROSPERO with registration ID CRD42022351313.