



INVITED REVIEW

Challenges faced in managing adult asthma: A perspective from Asian countries

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ABSTRACT

Asthma imposes a significant burden on the health system and patients' quality of life. Within Asia, there is large variability in several cultural, social and economic factors ultimately influencing the management of asthma. Differences in risk factors and asthma management practices across Asia make asthma a truly 'mixed-bag' phenomenon. With the advent of biological agents and the consequent emphasis on asthma phenotyping and endotyping, it is more important than ever to understand the diverse nature of asthma as a disease. This is a collaborative review within Asia to highlight the differences in management of adult asthma, and the local modifications that are made to international guidelines. This review paves the way for a future Asian collaborative network in asthma epidemiological research.

Key words: asthma, diagnosis, management, severe asthma, steroid.

INTRODUCTION

The global burden of asthma is enormous. More than 300 million people are affected by asthma and approximately 250 000 people die from it each year.¹ Asthma is a major global economic burden in terms of both direct and indirect costs.² Whilst the prevalence of asthma in the adolescent age group is over 20% in English-speaking countries such as Australia and North America, the prevalence is less than 5% in the Indian subcontinent and most of Asia.³ The true prevalence of adult asthma in Asia is unclear. From a review, the prevalence 'varied from 0.7% to 11%, but the asthma

definitions varied widely'.⁴ Diagnosis using objective testing was only used in one study and the rest used various questionnaires. Analysis of the World Health Organization (WHO) mortality database shows that in the past few decades, international asthma mortality has reduced significantly with better drugs and management strategies, although the trend has stalled in the last decade for many countries.⁵ In this WHO database, there was a clear trend of reduction in mortality rates in Hong Kong, Japan, Singapore and South Korea in the last 10 years.⁵ Mortality data from other parts of Asia are lacking. The authors' view is that if research into asthma-related mortality was holistic, there could be greater focus on problems which influence asthma mortality.

Therefore, can we rest on our laurels? Current evidence suggests we should not. First, many Asian countries are facing rapid urbanization, and the prevalence of asthma is also increasing, such as in Hong Kong and Japan. Second, many Asian countries still face high rates of asthma mortality and healthcare utilization, and are struggling with the rapidly increasing economic cost of asthma.⁴ The annual cost of management of non-severe asthma ranges from US\$ 261 in India,⁶ US\$ 604 in Singapore⁷ to US\$ 1528 in Japan.⁸ The annual costs of severe asthma are even higher at US\$ 334 in India,⁹ US\$ 2123 in Singapore⁷ to a staggering US\$ 4345 in Japan.⁸

Moreover, some countries are still dealing with issues such as poor access to medications, especially for patients in lower socio-economic classes and lack of implementation of best practices among healthcare professionals.

The aim of the article is to review asthma management in Asia with a specific focus on local challenges and strategies proposed to overcome them.

This review was developed under the umbrella of PRECISION. PRECISION is a multi-faceted programme, advancing clinical practice to fundamentally improve the quality and speed of care for people with severe asthma. The Asia-Pacific PRECISION Steering Committee members from India, China, Korea, Taiwan,

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Singapore, Japan and Hong Kong conducted a detailed search, each limited to the individual committee member's geographical area. Evidence published between 1990 and 2019 was obtained from search engines PubMed and Embase. Key words used during this search were: severe asthma, difficult asthma, incidence, prevalence, referral, stigma, access, oral steroids, policy, biologics and primary care. Only articles written in English language were included. In total 600 publications were found of which the committee members involved chose 70 articles, which were thought to be relevant by the individual members based on the depiction of local scenario or local data in the article. The data were compiled into a single manuscript which was reviewed by all the members authoring this review.

CHALLENGES IN OPTIMIZING ASTHMA CARE IN ASIAN COUNTRIES

In Asia, barriers to asthma care range from stigma of asthma diagnosis to preference of oral over inhaled therapy, prevailing misconceptions regarding steroid inhalers, belief in ultimate cure of asthma or alternate therapies, suboptimal treatment goals, inability to identify warning signs and non-adherence to treatment. These factors contribute to suboptimal asthma care, resulting in progressive airflow obstruction.¹⁰

Stigma of asthma diagnosis

The taboo about asthma may hamper social life and professional performance, and leads to significant morbidity and reduction in quality of life.¹¹ Stigmatization of the diagnosis of asthma definitely impairs asthma control. In some parts of Asia, asthma stigmatization is greater in populations with a lower literacy rate.¹² The stigma of an asthma diagnosis is higher in the paediatric age group, as seen from a study in China where parents of asthmatic children failed to understand the concept and importance of difficult-to-treat severe asthma.¹² There is however a decline in the perception of this stigma, as noted in a solitary study from India where the rates of discontinuation of asthma medication due to stigmatization have come down from 58% to 6% over a decade.^{13,14} In the same study, it was observed that the acceptance of a diagnosis of asthma has increased in recent times (42%) as compared to a decade ago (30%). Nevertheless, stigma is still a major concern in rural populations with lower socio-economic status, which may lead to a preference of oral medication over inhalation therapy.

Preference of oral/alternate therapy over inhaled therapy in Asia

Psychological effects of asthma such as depression and embarrassment contribute to the overall burden. Results from the Asia Pacific Asthma Insights in Management (AP-AIM) study revealed that almost 42% of patients reported a 'feeling of embarrassment' in using their inhalers.¹⁵ Similar findings have been observed in the REALISE study where almost half of the recruited

patients felt that using or even carrying an inhaler was considered as an impediment in their social lives.¹⁶ Even in the Indian context, use of inhalers has been thought to be a major barrier for marriage prospects, especially for females. This fact might have led to significant differences in the level of asthma control between males and females in India.¹⁰ Factors like these have led to the increasing use of alternate therapies other than allopathy in asthma.

Similarly, preference of oral therapies over inhaled medications has been a significant obstacle in achieving ultimate control of asthma. Even in a modern healthcare system like Korea, prescription of oral corticosteroids (OCS) without inhaled corticosteroids (ICS) was found in about 30% of all asthmatic patients in the analysis of the Korean Health Insurance Review and Assessment Service (HIRA).¹⁷ Among Asian asthmatic patients, Taiwanese parents and patients reported the highest rate of steroid phobia.¹⁸ Concerning statistics from the Indian arm of the AP-AIM study revealed that almost 70% of asthmatic patients used oral medications as controllers, whereas only 36% of patients used inhalers.¹⁵

In a study of 98 Chinese asthma patients from Hong Kong, almost 80% admitted using Chinese herbal remedies.¹⁹ As recently as 2013, up to 62% of Indian asthmatic patients had tried alternative medicine techniques to 'cure' their asthma. These therapies include 'saintly therapy', herbal medicine, fish therapy and acupuncture.¹³ Such therapies not only add to the economic burden of asthma, but also lead to further worsening of asthma due to the delay in diagnosis, risk of potential drug interactions and postponement of appropriate treatment.

Suboptimal treatment methods

In a large questionnaire-based survey on asthma from eight Asian countries, it was found that patients' expectations regarding asthma control were low and patients' perception of controlled asthma was not consistent with the Global Initiative for Asthma (GINA) definitions of asthma control.¹⁶ This disassociation was seen as a result of patients' perception that asthma control is generally focused on management of exacerbations and not on symptom control and prevention of such exacerbations.

Across the low-income regions of Asia, suboptimal clinical practices such as preference of reliever therapy over maintenance therapy are rampant. A study evaluating asthma prescriptions from the Indian pulmonology fraternity revealed that the combination of ICS + long-acting beta-agonist (ICS + LABA) was prescribed to asthmatic patients in only 41% of cases.²⁰ Other inhalers prescribed were low-dose ICS, single short-acting beta-agonist (SABA) on an 'as needed' basis and a SABA + ICS combination. A similar study performed in South Korea revealed that prescriptions of ICS were lower as compared to other modalities of asthma management.²¹ Fortunately, countries such as Japan have reported prescription rate of ICS or ICS + LABA reaching 99% in adult

asthmatic patients receiving treatment from allergologists and respirologists in Japan.²²

Non-adherence to inhaled medications

Non-adherence to asthma therapy has been observed to be a major issue resulting in the development of poorly controlled asthma. In a cross-sectional survey involving 4125 adult asthma patients in China, it was found that treatment non-adherence is a significant predictor of uncontrolled asthma.²³ Other predictors of non-adherence included lack of education, asthma duration >3 years and age \geq 45 years. Treatment adherence in an Asian population from six countries of varying income levels is significantly associated with better understanding of the disease process, improved inhaler techniques and with the improved acceptance rates of inhalation treatment. Reasons for non-adherence to treatment in the same study were related to patients' concerns regarding ICS treatment, preference of oral tablets and perception of greater safety of herbal medications.²⁴

ASTHMA TRIGGERS IN ASIAN COUNTRIES

Air pollution

Asthma triggers among Asian asthmatic patients have been studied in detail. Rapid urbanization and industrialization has increased pollution-related respiratory diseases in the last decade.²⁵ This link of air pollution, the incidence of asthma and increased risk of exacerbations have been demonstrated in studies from China,²⁶ Hong Kong,²⁷ Taiwan^{28,29} and South Korea.³⁰ While cities such as New Delhi and Beijing have been worst hit by air pollution, several government-led programmes have attempted to address the issue of air pollution.

The AIM study revealed that almost half of the asthmatic patients considered air pollution to be a trigger for their asthma.¹⁵ Other reported triggers included changes in the weather, exposure to strong odours, smoke from biomass fuel (especially wood smoke), tobacco smoke and consumption of iced drinks. In the Indian context, adult women cooking on biomass and household fuel have a higher risk of asthma exacerbations compared to women with exposure to less polluting fuels.

Sensitization to environmental allergen

Besides air pollution, sensitization to house dust mites has also been observed in Asian asthmatic patients.³¹⁻³³ A study from Singapore revealed that almost 78% of asthmatic patients had a positive skin prick test with the most common trigger being the house dust mite.³⁴ Furthermore, *Aspergillus* sensitization was associated with a greater number of exacerbations and higher requirement of OCS intake.³⁵ The estimates of prevalence of *Aspergillus* sensitization and allergic bronchopulmonary aspergillosis were roughly 2% in Chinese asthmatic patients,³⁶ whereas these estimates were higher in India^{37,38} with 7-20% of asthmatic patients thought to be affected.

These findings are different to reports in Western literature, and highlight the heterogeneity of asthma triggers across various geographic and economic regions in the world.^{15,18}

CHALLENGES WITH SEVERE ASTHMA MANAGEMENT IN ASIA

Definition and prevalence of severe asthma

Severe asthma is generally described as asthma which requires treatment with medications suggested in GINA guidelines for steps 4-5 asthma (high-dose ICS/LABA or leukotriene modifier/theophylline) for the previous year, or systemic corticosteroids for \geq 50% of the previous year to prevent it from becoming 'uncontrolled' or which remains uncontrolled despite this therapy.³⁹ Uncontrolled asthma is defined as poor symptom control (as noted by an Asthma Control Test (ACT) score < 20, Asthma Control Questionnaire (ACQ) > 1.5), having frequent exacerbations or patients with significant airflow limitation.

While a few Asian countries including China⁴⁰ and Japan⁴¹ have formulated region-specific definitions of severe asthma, a uniform Asia-wide definition is still lacking. A region-specific definition would be especially useful owing to the vast differences in triggers and burden of comorbidities in Asian asthmatic patients, as compared to the Western situation. A recently published report by GINA has made it clear that difficult-to-treat asthma and severe asthma need to be differentiated.⁴² Difficult-to-treat asthma is now defined as uncontrolled asthma despite the use of a higher level of medications such as GINA step 4 or 5 treatment (medium- or high-dose ICS/LABA plus the second controller, such as leukotriene receptor antagonists (LTRA), long-acting muscarinic antagonists (LAMA)) or OCS maintenance. If difficult-to-treat asthma still remains uncontrolled after the correction of modifiable factors, including adherence, inhaler technique and comorbidities, then the severe asthma diagnosis is confirmed.

The prevalence of severe asthma is between 5% and 10% of all asthmatic patients around the world.⁴⁰ Reports from Asian countries such as Japan,⁴¹ South Korea³⁰ and Singapore⁷ have estimated the prevalence of severe asthma among the total adult asthma population as between 7% and 11%. As different methods have been used to estimate the prevalence of severe asthma, it is hard to compare these estimates between countries. In addition, underestimation of asthma control by patients and physicians may lead to an underestimation of the true prevalence of severe asthma. Moreover, frequency of exacerbations should also be accounted for in the assessment of asthma control. However, good symptom control despite frequent exacerbations is often mistaken as controlled asthma.

Oral steroid use and asthma phenotype in Asia

Chronic OCS maintenance in severe asthma is associated with subsequent complications and increased mortality.⁴³ In analysis of data from 11 national severe asthma registries from European countries, OCS

maintenance ranged from 21% to 63%.⁴⁴ In Asian countries, given the higher preference of oral medications to inhalers, a large number of severe asthma patients take OCS as a maintenance treatment. The Indian arm of the AP-AIM study revealed that 89% of asthmatic patients had used OCS in the previous year. Average annual use of oral steroids has been estimated at 10.5 treatment episodes per patient.¹⁵ In the Korean Severe Asthma Registry, chronic OCS use was found to be 18% among those in GINA step 4 or 5 treatment levels⁴⁵ as compared to Taiwanese severe asthmatic patients, where the rate of OCS prescriptions in the previous year reached almost 50%.⁴⁶ While robust data regarding the ongoing use of OCS is lacking, it can be safely concluded that the burden of OCS use in our population is high. Such conditions warrant the need for phenotype-guided therapy and prescription of steroid-sparing medications in asthma.

The experts from the PRECISION group feel that in their experience there is optimal availability of controller medications such as ICS and LABA and this should result in ideal control in patients with mild to moderate asthma (GINA steps 1 to 3).

Tiotropium is now licenced for once daily maintenance use in asthma. Evidence from Asian countries such as Japan,⁴⁷ China^{48,49} and South Korea⁵⁰ supports the safe use of tiotropium as an add-on option in severe asthmatic patients, especially for patients with recurrent exacerbations already on ICS + LABA.

In non-eosinophilic asthma, there has been a recent surge in evidence regarding the use of macrolides. The efficacy is based on the anti-inflammatory effect of macrolides rather than the antibiotic effect. In the Asian context, a meta-analysis from China⁵¹ and a trial from Taiwan⁵² demonstrated the efficacy of macrolides in terms of reduction of exacerbations but failed to improve any lung function parameters.

In non-eosinophilic asthma and in patients not responding to biologic treatment, invasive bronchoscopic procedures such as bronchial thermoplasty is now approved by the Food and Drug Administration (FDA) and mentioned in the GINA Report. Careful patient selection, dedicated treatment expertise and support facilities are essential elements to consider in the safe and successful implementation of this treatment modality. As per current information, bronchial thermoplasty is available in India, Singapore,⁵³ Hong Kong and other cities in China, Korea⁵⁴ and Japan^{55,56} (Table 1).

Treatment of severe eosinophilic asthma

In Asian countries, the major challenge in asthma management is likely to be found in GINA steps 4 and 5 where more sophisticated tools and drugs may be needed.

Using these sophisticated tools, the inflammatory phenotype has to be determined, to enable the use of biologics targeting type 2 inflammation. Type 2 inflammation can be defined if blood eosinophils are $\geq 150/\mu\text{L}$, fractional exhaled nitric oxide (FeNO) is ≥ 20 ppb, sputum eosinophils are $\geq 2\%$ or there is evidence of allergic driven disease.⁵⁷ It has to be stressed here that GINA-guided treatment for asthma includes a stepwise

treatment approach consisting of effective and relatively cheaper medicines.⁵⁷ For severe asthma patients with evidence of type 2 inflammation, add-on treatment should be considered such as anti-IgE (omalizumab), anti-IL-5 (mepolizumab and reslizumab), anti-IL-5 receptor (benralizumab) or anti-IL-4 receptor alpha (dupilumab).

Changes in the diagnosis and the management of severe asthma pose several clinical practice hurdles in Asian countries. First, asthma is still regarded as a mild medical condition by some patients, physicians and health authorities. Therefore, it is important to emphasize that severe asthma is a disease with serious morbidity and mortality, and a significant economic burden needing special attention. Second, severe asthma needs to be diagnosed by performing various tests such as spirometry, FeNO, eosinophil count, IgE, Radioallergosorbent test (RAST), skin prick test among others, and managed with a systematic multidisciplinary approach in some cases. Thus, referral should be considered at any stage of managing uncontrolled and difficult-to-treat asthma. Severe asthma clinics should be equipped with the capacity to diagnose asthma and co-morbid diseases correctly and to assess phenotypes by the use of standardized diagnostic tests.⁵⁸ Standards of specialty clinics should be made based on the country's healthcare system and resources available. However, concerns remain that access to severe asthma clinics might be limited due to location or economic costs. Lastly, the new biologic agents for the treatment of severe asthma are very expensive compared to medicines such as ICS, LABA and LTRA. Lack of reimbursement by health insurance for biologics in many Asian countries makes it difficult for severe asthma patients to afford new biologic agents. Efforts should be made to reimburse the biologics treatment at least for those with a clinically significant treatment response. Funding and cost problems must be addressed to develop an effective strategy for the management of severe asthma.

STRATEGIES TO IMPROVE ASTHMA CARE IN ASIA

There is still significant unmet need in the treatment of asthma in Asia. Whilst most respiratory physicians and general practitioners would agree that asthma should be a national health priority in most countries, governments and healthcare systems prioritize funding to diseases of most urgent need. The process of priority setting is to select the most important healthcare needs for funding by considering the burden of disease and social impact on the society or nation.⁵⁹ The principles of priority setting include evaluation of disease burden, effectiveness of the proposed intervention, cost of the intervention, acceptability of the intervention and fairness. Burden of disease includes mortality, morbidity, quality-adjusted life-years (QALY), disability-adjusted life-years (DALY), magnitude of the problem and financial considerations. Factors being considered in the evaluation of interventions include the potential outcomes and impact, the resources and capabilities to execute changes, ability to continuously improve

Table 1 Challenges, consequences and proposed solutions for management of asthma in AP region

Sr. no	Identified challenge	Consequences	Proposed solutions
(1)	Stigma Stigma about asthma as a disease/taboo (embarrassment) of using inhaler devices	Impairs diagnosis, non-adherence to medications, use of alternate therapies, use of oral medications	Patient education and disease awareness
(2)	Lower treatment goals Low expectation regarding asthma control/non-compliance to therapy	Poor symptom control	Patient education about disease process and inhaler techniques, asthma management plan
(3)	Suboptimal clinical practice Inappropriate therapy/prescription of OCS/excess use of reliever medication	Inadvertent use leading to adverse effects	Establish uniform local treatment protocols for asthma/educate primary care physicians
(4)	Inappropriate diagnosis/management of severe asthma Regional differences in comorbidities and eosinophil counts Access to biologic medications	High use of OCS There may be higher eosinophil counts owing to helminthic [†] infestations, this may be confounding the phenotyping	Establish region-specific definitions/diagnosis charters Local data on baseline blood and sputum inflammation Collaboration with policy makers and payers for improved access
(5)	Variability of access to specialized care There might be easier access to newer therapy in private sector/organized healthcare systems/developed world vis-a-vis the unorganized healthcare systems or developing world	Suboptimal treatment due to lack of resources rather than lack of knowledge	Efforts to align governments and policy makers to establish asthma care as one of the priorities in the healthcare management plan

[†]The group believes that in asthmatic patients with a high eosinophil count not typically showing features of type 2 inflammation and in areas with high parasite load, a course of deworming may be done. An eosinophil count may be repeated and then the decision for starting biological therapy may be taken.

AP, Asia Pacific; OCS, oral corticosteroid.

during implementation, long-term sustainability, cost effectiveness and likelihood of acceptance of the intervention by stakeholders. Fairness is based on equality and equity and is considered because it is closely linked to the judgement and trade-off on the importance of a health need.

Asthma education, diagnosis and referral services

Most of the Asian countries have primary, secondary and tertiary sectors of their healthcare service. A patient diagnosed with severe asthma by a primary/secondary care physician should be referred early to a specialist in a tertiary healthcare setting. This ensures a confirmation of diagnosis and optimal management, resulting in improved asthma control. However, a large proportion of patients do not receive timely referral to specialist care and are subjected to multiple courses of oral steroids due to frequent exacerbations.^{60,61} Major barriers to timely care include the absence of a set of criteria for primary/secondary healthcare physicians for referrals to higher centres and limited access to tertiary care physicians. The lack of proper training for primary/secondary healthcare physicians in rapid and appropriate diagnosis of severe asthma also indirectly contributes to the delay in referrals. A recently published charter for asthma management has proposed referral criteria as follows⁶²: OCS use for >3 months, more than two courses of OCS treatment in the previous year, history of hospitalization for asthma in the

previous year or compromised lung function despite maximal standard therapy.

Education of primary/secondary physicians and patients regarding the warning signs and symptoms of severe asthma is crucial. Similarly, programmes such as 'oral steroid stewardship', which is a structured approach for preventing excessive OCS use across multiple levels of the healthcare system, will help in improving severe asthma referral rates.^{63,64} In India, institutions such as the Public Health Foundation of India have been involved with training of general physicians in various aspects of respiratory medicine, including asthma. For this purpose, e-learning online programmes have also been launched in Korea by the Korean Academy of Asthma, Allergy and Clinical Immunology (KAAACI) for training of primary care physicians dealing with management strategies of severe asthma. The Singapore National Asthma Programme (SNAP) was launched in 2001 for improving asthma control in the community. Different initiatives such as community education, decision support tools and self-management support were employed to improve asthma control in the population. During the course of the programme, it was found that the number of patients seeking asthma consultations at polyclinics increased by almost 31% and there was a significant improvement in the maintenance-to-reliever inhaler use ratio. Based on the SNAP, it can be concluded that a simple audit and a feedback programme can significantly improve the level of asthma management in a community.⁶⁵ A similar example is the

Finnish National Asthma Programme.⁶⁶ It focused on early diagnosis of asthmatic patients, early initiation and maintenance of ICS, self-management (action plan) and engagement of key stakeholders. Over 10 years (1994–2004), the programme reduced the rates of uncontrolled or severe asthma from 20% to 2.5% and reduced emergency visits and admission days by more than half. Moreover, it also reduced costs per patient per year by 36% (from €1611 to €1031) with potential savings of €128 million. One of the key contributors of the success of the programme includes leaders who engaged stakeholders on the ground (e.g. primary care practitioners) and change culture.

Implementation of such programmes in other parts of Asia will also be helpful in increasing awareness in asthma patients regarding various facets of their disease such as inhaler techniques, improving compliance and identification of triggers. Therefore, efforts need to be made for implementation of such government-led schemes for patient education and better management of severe asthma.

Financial burden of severe asthma and affordability issues

The overall financial burden of asthma is variable across Asia. For places which have achieved relatively low asthma mortality rates through successful implementation of widespread ICS use (e.g. Hong Kong, Japan, Singapore and South Korea), the next priority is likely be reduction of morbidity associated with asthma, particularly in the more severe group.⁵ In the severe asthma population, early identification and referral to specialist centres for optimization of treatment, building capabilities for advanced diagnostics and therapies, improving access to biologics and other costly treatments are needed. This requires cross-discipline collaboration and public-private partnerships. Hopefully, with research in 'omics', 'Big data' and artificial intelligence, we will soon be able to better predict these 'high risk for severe asthma' groups early in the course of disease, better predict response to treatment and pave the way for precision medicine.⁶⁷

Priorities for future collection of data should include establishing the magnitude of severe asthma in individual regions, at gaps in current management, and the benefits of new treatment modalities. This will promote awareness of severe asthma in the medical community. Availability of such data can also help governments in formulating asthma-centric public healthcare policies.

Availability of biologic agents for asthma

Biologic agents are indicated for a very small and niche population of severe asthmatic patients. Limited availability of new biological agents in Asia for this niche population is a concern. In India, the current scenario is that biological agents such as omalizumab and mepolizumab are available in the government healthcare sector through the Central Government Health Scheme (CGHS) and through the Army Medical Services. These agents are also available in the Indian private healthcare sector, but because of the high costs,

access is limited largely dependent on patients' financial means.

In Korea, omalizumab, reslizumab, mepolizumab and benralizumab are approved by the Ministry of Food and Drug Safety, are available for management of severe asthma but not yet covered by the national health insurance system, posing a barrier for their use. In Japan, omalizumab, mepolizumab, benralizumab and dupilumab are approved and the costs are covered by the public health insurance system. This has led to improved outreach of these agents and Japanese severe asthmatic patients are being treated with these biologics.⁴¹ The Taiwan National Health Insurance Administration also promotes a holistic approach towards severe asthma care and has covered almost 28% of asthma patients till 2016.⁶⁸ Setting up similar healthcare policies in other regions of Asia will surely improve the access for these biologic agents (Table 1).

CONCLUSIVE SUMMARY

While the challenges and priorities in asthma care may be different among various countries in Asia, we are united in our goal to reduce the overall burden of asthma across our region. We hope that this is the beginning of more collaborative epidemiological research in Asia. The authors propose development of a collaborative network between Asian countries to collectively work on common challenges in asthma management in this region.

Asthma management programmes which have been successful in small countries should be attempted in larger countries such as India and China. Due to the wide geographical and demographic variability of these countries, implementation of these programmes might be challenging. Stepwise execution and implementation of such programmes in smaller communities at first might be useful to overcome these barriers. Formulating asthma-centric healthcare policies by individual governments will be useful in improving the outreach and accessibility of newer asthma treatments. All these measures will ultimately improve the level of asthma control.

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Abbreviations: AP-AIM, Asia Pacific Asthma Insights in Management; FeNO, fractional exhaled nitric oxide; GINA,

Global Initiative for Asthma; ICS, inhaled corticosteroid; Ig, immunoglobulin; IL, interleukin; LABA, long-acting beta-agonist; LTRA, leukotriene receptor antagonist; OCS, oral corticosteroid; SABA, short-acting beta-agonist; SNAP, Singapore National Asthma Programme; WHO, World Health Organization

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