

# Time for a new language for asthma control: results from REALISE Asia

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**Purpose:** Asthma is a global health problem, and asthma prevalence in Asia is increasing. The REcognise Asthma and Link to Symptoms and Experience Asia study assessed patients' perception of asthma control and attitudes toward treatment in an accessible, real-life adult Asian population.

**Patients and methods:** An online survey of 2,467 patients with asthma from eight Asian countries/regions, aged 18–50 years, showed greater than or equal to two prescriptions in previous 2 years and access to social media. Patients were asked about their asthma symptoms, exacerbations and treatment type, views and perceptions of asthma control, attitudes toward asthma management, and sources of asthma information.

**Results:** Patients had a mean age of 34.2 ( $\pm 7.4$ ) years and were diagnosed with asthma for 12.5 ( $\pm 9.7$ ) years. Half had the Global Initiative for Asthma-defined uncontrolled asthma. During the previous year, 38% of patients visited the emergency department, 33% were hospitalized, and 73% had greater than or equal to one course of oral corticosteroids. About 90% of patients felt that their asthma was under control, 82% considered their condition as not serious, and 59% were concerned about their condition. In all, 66% of patients viewed asthma control as managing attacks and 24% saw it as an absence of or minimal symptoms. About 14% of patients who correctly identified their controller inhalers had controlled asthma compared to 6% who could not.

**Conclusion:** Patients consistently overestimated their level of asthma control contrary to what their symptoms suggest. They perceived control as management of exacerbations, reflective of a crisis-oriented mind-set. Interventions can leverage on patients' trust in health care providers and desire for self-management via a new language to generate a paradigm shift toward symptom control and preventive care.

**Keywords:** asthma control, attitudes, perception

## Introduction

Asthma is a global health problem and afflicted 334 million people worldwide in 2014.<sup>1</sup> It is more pronounced in parts of Asia, with 107 million sufferers in Southeast Asia and Western Pacific Region.<sup>2,3</sup> Asthma also presents an economic cost: directly from hospitalization, treatment, and health care resources and indirectly from time lost from work, absenteeism, and premature death. In 2006, annual per patient direct cost of treatment ranged from USD108 to USD1,010 and constituted about 13.0% of the per capita GDP of countries in the Asia-Pacific.<sup>4</sup> The cost of uncontrolled asthma was estimated to be 1.51 times that of the controlled disease<sup>4</sup> and highlighted the need for better disease management if countries were to rein in the burden of caring for asthma patients.

The 2012 REcognise Asthma and LInk to Symptoms and Experience (REALISE) survey was the largest appraisal of asthma patients in Europe.<sup>5</sup> It showed that asthma control remained poor, and many patients perceived their asthma to be controlled and not serious despite the presence of symptoms and exacerbations. Furthermore, the optimal levels of asthma control achieved in clinical studies were often not replicated in real-life studies.<sup>6</sup> Real-life studies revealed that asthma control when assessed according to international guidelines, such as the Global Initiative for Asthma (GINA),<sup>7</sup> was poor, and this was attributed to a complex interaction of guidelines and disease-, patient-, and doctor-related factors. Many patients felt least informed about the meaning of asthma control.<sup>6</sup>

While the overall prevalence of asthma in the Asian adult population (<5%) was lower than that in European populations, temporal studies of asthma prevalence in several developed Asian countries revealed a rising trend.<sup>8</sup> Asthma control in Asia remained low despite the availability of efficacious treatments. Earlier Asian studies of asthma patients were conducted through face-to-face or phone interviews and mainly addressed the burden of disease and patient's reactions to exacerbations.<sup>9–11</sup> Where available, results showed that patients often overestimated their level of control and the situation has not improved in recent years.<sup>9</sup> Earlier studies, including REALISE, used guidelines such as GINA to determine the level of control and did not seek the patient's view of asthma control. This study, REALISE Asia, focused on patients' perceptions of asthma control and their attitudes toward the disease and its treatment in an accessible, real-life adult Asian population. It used an online survey to seek eligible respondents from validated consumer panels who used social media to broaden the coverage and reach to the patients.

## Materials and methods

### Study design

REALISE Asia was a quantitative, online questionnaire-based survey, which used a similar methodology as REALISE.<sup>5</sup> The questionnaire from REALISE compared asthma symptoms and indicators of acute exacerbations across guideline-defined control levels<sup>7</sup> and treatment types, investigated patients' perceptions of asthma and attitudes toward asthma management, and identified that their sources of information had been cognitively tested and contained many validated elements. Our study's working group, consisting of practicing physicians and respiratory specialists, made revisions to the original questionnaire (permission granted, see [Supplementary material](#)), taking into consideration the

local context (eg, the use of Weibo in People's Republic of China) and asking the patients what the term "well-controlled asthma" meant to them. A field-test of the questionnaire was carried out with ten respondents per country prior to the survey. The results were analyzed, and minor amendments to the questionnaire were made for clarity.

### Survey population

Recruitment was done via a simple random sample of individuals aged 18–50 years from validated consumer panels<sup>12</sup> in People's Republic of China, Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, and Taiwan. Email invites were sent to these individuals between December 2013 and March 2014 asking them to complete a 30-minute online questionnaire ([Supplementary material](#)). As there were no hospital/physician associations or referrals, approvals from institutional review boards were not required. The survey was conducted according to the International Chamber of Commerce/ European Society for Opinion and Market Research (ICC/ESOMAR) International Code on Market and Social Research,<sup>13</sup> which sets out ethical principles for the conduct of market research. Patient informed consent was also obtained from each respondent.

The sample size was based on factors, including population size and implementation cost, within 4%–8% error margin at 95% confidence level.<sup>14</sup> The inclusion criteria were patients aged 18–50 years who were diagnosed with asthma, given greater than or equal to two asthma-related prescriptions in the past 2 years (to ensure that patients have active asthma), and had used social media. Respondents who were employed; had relatives employed in the health care, pharmaceutical, advertising, or market research industries; or had taken part in health care-related market research in the past 3 months were excluded.

### Data collection

Respondents were allowed to answer the questionnaire once. Data quality checks included confirming responses and weeding out unusual or illogical answers. Questions were designed to sieve out inconsistent or fraudulent responses, and some items were repeated for consistency and verification. Responses in the local language were interpreted and translated back to English. The working group reviewed and approved the translated materials.

### Data analysis

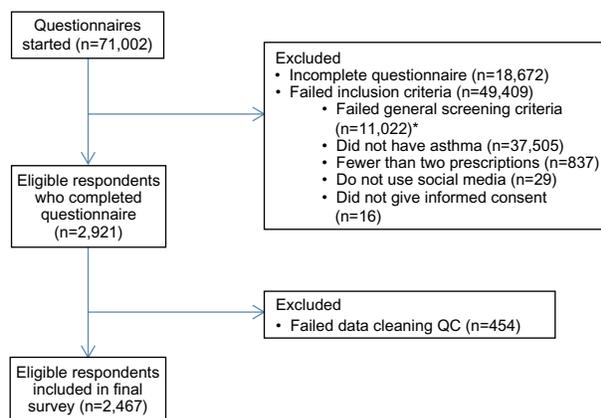
Responses to the questionnaire were analyzed for the total eligible population. Answers relating to asthma symptoms and indicators of acute exacerbations were analyzed by

GINA-defined control levels<sup>7</sup> and treatment type. Symptoms assessed were daytime asthma symptoms, night waking, activity limitation due to asthma, and reliever use<sup>15</sup> during the past 7 days, and indicators were corticosteroids and antibiotics use, days off work, emergency department (ED) admissions, and hospitalizations. Perceptions assessed were asthma control (controlled/uncontrolled) and seriousness and concern of disease (on a 4-point scale). Attitudes were assessed on the patient's agreement (on a 4-point scale) to statements on asthma. Patient's views (in text) of asthma control were categorized by key messages and information sources by the frequency of selection. Tests of statistical significance were performed with Fisher's exact test.<sup>16</sup>

## Results

### Demographics and clinical characteristics

A total of 71,002 individuals started the questionnaire. Of them, 49,409 who did not meet the inclusion criteria and 18,672 who did not complete the survey were excluded. The most common exclusion reason was that they did not have asthma (75.6%, n=37,505). Among the eligible respondents, 454 failed data quality checks and were excluded. The final analysis set contained 2,467 patients (Figure 1). The largest group was from People's Republic of China (32.4%), followed by South Korea (20.3%) and Taiwan (12.2%). Table 1 presents their demographic and clinical characteristics. The mean age of asthma patients was 34.2 ( $\pm$ 7.4) years. Both sexes were equally represented. They had been diagnosed with asthma for 12.5 ( $\pm$ 9.7) years. Nine of ten patients were taking medication for their asthma, and 35.3% of them used a reliever and 16.5% used a controller. About 11.5% of the patients were current smokers.



**Figure 1** Survey flowchart.

**Note:** \*Works or knows someone in related industry or took part in market research survey in the past 3 months; or age is not between 18 years and 50 years.

**Table 1** Demographics and other clinical characteristics

Demographics and clinical characteristics	Number of patients (N=2,467)
Sex, n (%)	
Female	1,141 (46.3)
Male	1,326 (53.7)
Mean age (standard deviation), years	34.2 (7.4)
Age range, years, n (%)	
18–25	345 (14.0)
26–30	475 (19.3)
31–35	624 (25.3)
36–40	436 (17.7)
41–45	424 (17.2)
46–50	163 (6.6)
Country or area, n (%)	
People's Republic of China	800 (32.4)
South Korea	500 (20.3)
Taiwan	300 (12.2)
Hong Kong	200 (8.1)
Singapore	200 (8.1)
Indonesia	166 (6.7)
Malaysia	151 (6.1)
Philippines	150 (6.1)
Years since asthma diagnosis, n (%)	
0–9	959 (38.9)
10–19	632 (25.6)
20–29	345 (14.0)
30–39	117 (4.7)
40–49	19 (0.8)
Unknown/not sure	395 (16.0)
Current smokers, n* (%)	284 (11.5)
Comorbidities, <sup>†</sup> n (%)	
High BP/hypertension	711 (31.7)
Depression	466 (20.8)
Rheumatoid arthritis	398 (17.7)
Diabetes	309 (13.8)
Heart disease	223 (9.9)
COPD	122 (5.4)
Cancer	16 (0.7)
Treatment type, <sup>‡</sup> n (%)	
None	302 (9.1)
Reliever/rescue inhaler	1,171 (35.3)
Controller inhaler	549 (16.5)
Oral treatment (pill)	789 (23.8)
TCM/TKM	250 (7.5)
Others	257 (7.7)

**Notes:** \*Number of patients, n=1,075; <sup>†</sup>multiple selection allowed, number of responses, n=2,245; <sup>‡</sup>multiple selection allowed, number of responses, n=3,318.

**Abbreviations:** BP, blood pressure; COPD, chronic obstructive pulmonary disease; TCM, traditional Chinese medicine; TKM, traditional Korean medicine.

### Asthma control and symptoms

Using the GINA-defined criteria,<sup>7</sup> 17.8% (440), 32.5% (802), and 49.7% (1,225) of patients had controlled, partially controlled, and uncontrolled asthma, respectively (Table 2). In the week before the survey, 38.2% of patients experienced asthma symptoms for >2 days, 64.2% indicated that symptoms interfered with their normal activities, and 71.2% had night awakenings due to asthma. Of the 1,887 patients who

**Table 2** Asthma symptoms and indicators of exacerbations overall and by GINA-defined control levels<sup>7</sup>

	Overall (N=2,467)	GINA-defined asthma control		
		Controlled (n=440)	Partially controlled (n=802)	Uncontrolled (n=1,225)
% of total respondents	100	17.8	32.5	49.7
Asthma symptoms (past 7 days)				
Daytime asthma symptoms, n (%)				
None	530 (21.5)	347 (78.9)	177 (22.1)	6 (0.5)
2 days or less	995 (40.3)	93 (21.1)	584 (72.8)	318 (26.0)
>2 days	942 (38.2)	0	41 (5.1)	901 (73.6)
Activity limitation due to asthma, n (%)				
None	882 (35.8)	440 (100)	398 (49.6)	44 (3.6)
≥ 1 day	1,585 (64.2)	0	404 (50.4)	1,181 (96.4)
Night waking, n (%)				
None	710 (28.8)	440 (100)	253 (31.5)	17 (1.4)
≥ 1 day	1,757 (71.2)	0	549 (68.5)	1,208 (98.6)
Reliever needed for symptoms, n (%)				
Not used <sup>a</sup>	949 (38.5)	377 (85.7)	400 (49.9)	172 (14.0)
Two times or less	665 (27.0)	63 (14.3)	335 (41.8)	267 (21.8)
>2 times	853 (34.6)	0	67 (8.4)	786 (64.2)
Acute exacerbations (past 12 months)				
Oral steroid use for worsening asthma, n (%)				
Not used	664 (26.9)	234 (53.2)	285 (35.5)	145 (11.8)
≥ 1 course	1,803 (73.1)	206 (46.8)	517 (64.5)	1,080 (88.2)
Days off work/education, n (%)				
None	839 (34.0)	273 (62.0)	361 (45.0)	205 (16.7)
≥ 1 day	1,628 (66.0)	167 (38.0)	441 (55.0)	1,020 (83.3)
Antibiotic use for an asthma-associated condition, n (%)				
Not used	580 (23.5)	193 (43.9)	231 (28.8)	156 (12.7)
≥ 1 course	1,887 (76.5)	247 (56.1)	571 (71.2)	1,069 (87.3)
Emergency department visit due to asthma, n (%)				
None	1,520 (61.6)	372 (84.5)	612 (76.3)	536 (43.8)
≥ 1 visit	947 (38.4)	68 (15.5)	190 (23.7)	689 (56.2)
Overnight hospitalization due to asthma, n (%)				
None	1,650 (66.9)	417 (94.8)	650 (81.0)	583 (47.6)
≥ 1 stay	817 (33.1)	23 (5.2)	152 (19.0)	642 (52.4)

**Note:** <sup>a</sup>580 patients did not own a reliever inhaler.

**Abbreviation:** GINA, Global Initiative for Asthma.

owned a reliever inhaler, 45.2% used it greater than or equal to two times during the same period. In the year prior to the survey, 38.4% of patients visited the ED and 33.1% were hospitalized for asthma. Most (76.5%) patients required greater than or equal to one course of antibiotics to treat health problems related to asthma and 73.1% had greater than or equal to one course of corticosteroids for worsening asthma during the past year. Two of three patients missed work because of asthma. Patients with controlled asthma also experienced acute exacerbations in the previous year. They were mostly treated with antibiotics (56.1%) or oral corticosteroids (46.8%).

### Asthma symptoms and indicators of exacerbations by treatment types

Table 3 shows the asthma symptoms and indicators of acute exacerbations by treatment types. Patients who were

prescribed reliever-only or controller-only inhalers tended to have less symptoms compared to those on multiple therapies. Similar results were also obtained for the indicators of exacerbations. About four to five of ten patients who were prescribed relievers had used them greater than two times a week.

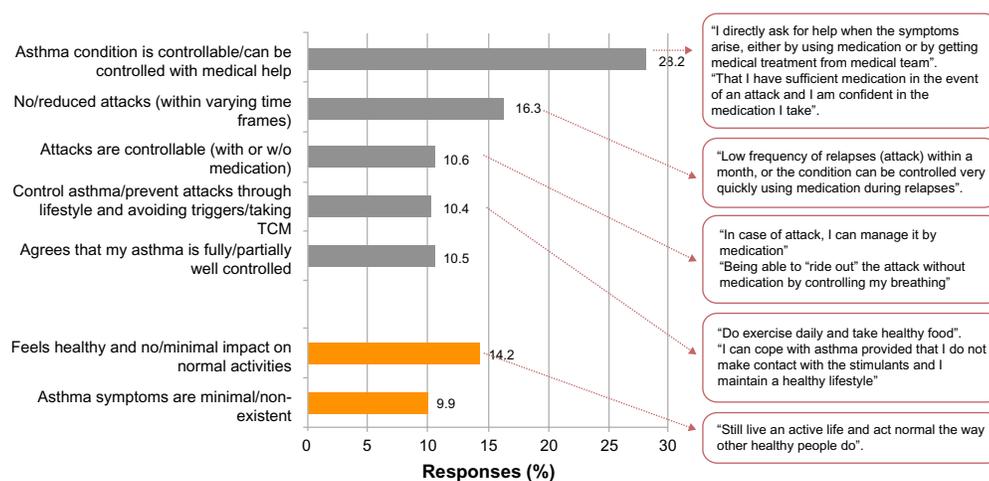
### Patients' perceptions of asthma

Figure 2 describes the patients' view of asthma control. Two-thirds of patients related control to managing attacks: attacks are controllable with medical help (28.2%), no or reduced attacks (16.3%), prevention of attacks through medicines (10.6%), or lifestyle modification, eg, avoidance of triggers (10.4%). About 24.1% saw it as minimal symptoms or impact on normal activities. Figure 3 relates the patients' perception of asthma to their condition as defined by the GINA<sup>7</sup> guidelines.

**Table 3** Asthma symptoms and indicators of exacerbations by treatment types

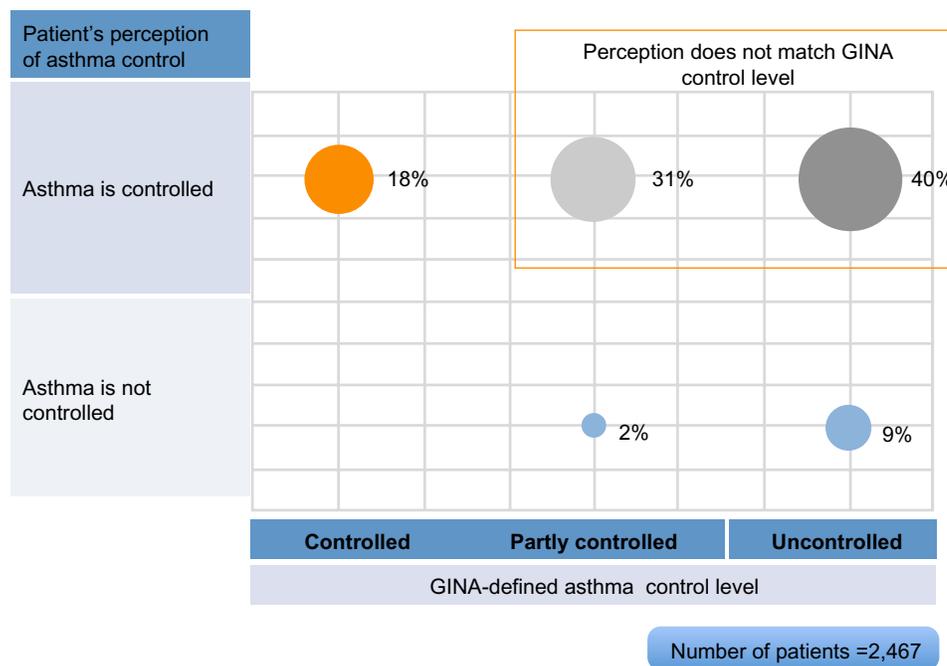
	Reliever inhaler only (n=415)	Controller inhaler only (n=74)	Reliever and controller inhalers only (n=246)	Oral pills plus inhaler(s) (n=538)
Asthma control and symptoms (past 7 days)				
GINA-defined control level, n (%)				
Controlled	60 (14.5)	12 (16.2)	24 (9.8)	43 (8.0)
Partially controlled	148 (35.7)	23 (31.1)	79 (32.1)	164 (30.5)
Uncontrolled	207 (49.9)	39 (52.7)	143 (58.1)	331 (61.5)
Daytime asthma symptoms, n (%)				
None	79 (19.0)	15 (20.3)	33 (13.4)	52 (9.7)
≥ 1 day	202 (48.7)	33 (44.6)	106 (43.1)	252 (46.8)
≥ 3 days	134 (32.3)	26 (35.1)	107 (43.5)	234 (43.5)
Activity limitation due to asthma, n (%)				
None	143 (34.5)	27 (36.5)	68 (27.6)	140 (26.0)
2 days or less	177 (42.7)	26 (35.1)	118 (48.0)	250 (46.5)
>2 days	95 (22.9)	21 (28.4)	60 (24.4)	148 (27.5)
Night waking, n (%)				
None	118 (28.4)	19 (25.7)	60 (24.4)	93 (17.3)
≥ 1 day	297 (71.6)	55 (74.3)	186 (75.6)	445 (82.7)
Reliever needed for symptoms, n (%)				
Not used	85 (20.5)	26 (35.1)	41 (16.7)	78 (14.5)
Two times or less	176 (42.4)	17 (23.0)	82 (33.3)	217 (40.3)
>2 times	154 (37.1)	31 (41.9)	123 (50.0)	243 (45.2)
Acute exacerbations (past 12 months)				
Oral steroid use for worsening asthma, n (%)				
None	142 (34.2)	20 (27.0)	78 (31.7)	56 (10.4)
≥ 1 course	273 (65.8)	54 (73.0)	168 (68.3)	482 (89.6)
Antibiotic use for an asthma-associated condition, n (%)				
Not used	105 (25.3)	25 (33.8)	59 (24.0)	59 (11.0)
≥ 1 course	310 (74.7)	49 (66.2)	187 (76.0)	479 (89.0)
Emergency department visit due to asthma, n (%)				
None	274 (66.0)	52 (70.3)	136 (55.3)	270 (50.2)
≥ 1 visit	141 (34.0)	22 (29.7)	110 (44.7)	268 (49.8)
Overnight hospitalization due to asthma, n (%)				
None	283 (68.2)	55 (74.3)	159 (64.6)	279 (51.9)
≥ 1 stay	132 (31.8)	19 (25.7)	87 (35.4)	259 (48.1)

**Abbreviation:** GINA, Global Initiative for Asthma.

**Figure 2** Perceptions of asthma control.

**Notes:** Supplementary material: Q1. Asthma sufferers have different definition ideas of what asthma control means to them. Please tell me what you think this phrase "well-controlled asthma" means to you? Data are shown as percentage of respondents, n=2,275.

**Abbreviations:** TCM, traditional Chinese medicine; w/o, without.



**Figure 3** Perception of vs GINA-defined asthma control.

**Note:** Data are shown as percentage of respondents, n=2,467; those who perceive that their asthma is controlled, n=2,198, and those who perceive that their asthma is not controlled, n=269.

**Abbreviation:** GINA, Global Initiative for Asthma.

When asked about their asthma, 89.1% of patients felt that it was under control and 81.5% felt that it was not serious (Table 4). Patients with uncontrolled asthma also felt no differently (cf, 81.6% and 70.1%, respectively), but were more concerned about their condition than those with controlled asthma (58.7% vs 21.6%). For patients who experienced acute exacerbations requiring a visit to the ED or hospitalization, a smaller percentage compared to the overall population felt that their asthma was under control (83.5%, 82.5% vs 89.1%)

or not serious (70.2%, 66.8% vs 81.5%). A higher percentage of them were also concerned about their asthma (60.3%, 63.3% vs 45.6%).

## Attitudes toward asthma and its management

Table 5 shows the patient's attitudes toward asthma in daily life. They felt that they should fit in with people around them (88.7%) and did not want to be labeled as sick (85.0%) or

**Table 4** Patients' perceptions of asthma by GINA-defined control levels<sup>7</sup> and indicators of acute exacerbations

	Overall (N=2,467)	GINA-defined asthma control			Indicators of acute exacerbations		
		Controlled (n=440)	Partially controlled (n=802)	Uncontrolled (n=1,225)	Oral corticosteroids (n=1,803)	Emergency department visits (n=947)	Hospitalizations (n=817)
Perception of asthma control,* n (%)							
Not controlled	269 (10.9)	7 (1.6)	36 (4.5)	226 (18.4)	233 (12.9)	156 (16.5)	143 (17.5)
Controlled	2,198 (89.1)	433 (98.4)	766 (95.5)	999 (81.6)	1,570 (87.1)	791 (83.5)	674 (82.5)
Perception of asthma seriousness, <sup>†</sup> n (%)							
Not serious	2,011 (81.5)	421 (95.7)	731 (91.1)	859 (70.1)	1,405 (77.9)	665 (70.2)	546 (66.8)
Serious	456 (18.5)	19 (4.3)	71 (8.9)	366 (29.9)	398 (22.1)	282 (29.8)	271 (33.2)
Concern about asthma, <sup>‡</sup> n (%)							
Not concerned	1,342 (54.4)	345 (78.4)	491 (61.2)	506 (41.3)	890 (49.4)	376 (39.7)	300 (36.7)
Concerned	1,125 (45.6)	95 (21.6)	311 (38.8)	719 (58.7)	913 (50.6)	571 (60.3)	517 (63.3)

**Notes:** \*Supplementary material: Q24a. Would you consider your asthma to be well controlled? Controlled = yes; not controlled = no; <sup>†</sup>supplementary material: Q13. How serious do you consider your asthma to be at the moment? Serious = very serious, fairly serious; not serious = not very serious, not at all serious; <sup>‡</sup>supplementary material: Q15. To what extent are you concerned about your asthma? Concerned = very concerned, fairly concerned; not concerned = not at all concerned.

**Abbreviation:** GINA, Global Initiative for Asthma.

**Table 5** Patients' attitude toward asthma in daily life

	Overall (N=2,467)	GINA-defined asthma control <sup>7</sup>		
		Controlled (n=440)	Partially controlled (n=802)	Uncontrolled (n=1,225)
Patients who strongly agree or tend to agree with the following statements,* n (%)				
It is important that I fit in with people around me	2,189 (88.7)	401 (91.1)	724 (90.3)	1,064 (86.9)
My doctor knows what is best for me and I try to follow what (s)he says	2,141 (86.8)	395 (89.8)	708 (88.3)	1,038 (84.7)
Do not label me as a person who is sick	2,096 (85.0)	406 (92.3)	712 (88.8)	978 (79.8)
I see myself as healthy and fit	1,729 (70.1)	361 (82.0)	603 (75.2)	765 (62.4)
I just get on with my life, I do not think about my asthma	1,704 (69.1)	347 (78.9)	578 (72.1)	779 (63.6)
I am not like other people with asthma	1,575 (63.8)	317 (72.0)	514 (64.1)	744 (60.7)
I worry about what my asthma will be like in 10 years	1,493 (60.5)	188 (42.7)	423 (52.7)	882 (72.0)
I live for today, rather than worry about tomorrow	1,484 (60.2)	285 (64.8)	475 (59.2)	724 (59.1)
I have no time to think about my health as other things are more important	1,074 (43.5)	225 (51.1)	301 (37.5)	548 (44.7)
Patients who strongly agree or tend to agree with the following statements, <sup>†</sup> n (%)				
I feel embarrassed using my asthma inhaler in front of others	1,162 (52.5)	140 (40.2)	328 (44.5)	694 (62.0)
I find it a real nuisance having to use my inhaler	1,189 (48.2)	187 (42.5)	363 (45.3)	639 (52.2)
I feel embarrassed carrying my asthma inhaler around with me	1,294 (47.1)	177 (31.8)	357 (40.9)	760 (56.7)
I ignore my doctor's instructions about when and how often to take my medication (inhaler)	895 (36.3)	101 (23.0)	246 (30.7)	548 (44.7)
I find my inhaler difficult to use	766 (31.1)	109 (24.8)	216 (26.9)	441 (36.0)

**Notes:** \*Supplementary material: Q2. To what extent do you agree or disagree with the following statements? Agree = tend to agree, strongly agree; <sup>†</sup>supplementary material: Q39. To what extent would you agree with the following statements? Agree = tend to agree, strongly agree.

**Abbreviation:** GINA, Global Initiative for Asthma.

think about their asthma (70.0%). They also trusted their doctors and followed their instructions to manage their condition (86.8%). These percentages were similar across all the control levels. More patients with well-controlled asthma felt healthy and fit compared to those with uncontrolled asthma (82.0% vs 62.4%,  $P<0.01$ ). They viewed their condition as different from sufferers with uncontrolled asthma (72.0% vs 60.7%,  $P<0.01$ ). When asked if they were worried about their condition in 10 years, more patients with uncontrolled asthma agreed compared to patients with controlled asthma (72.0% vs 42.7%,  $P<0.01$ ).

About half of all patients agreed with statements that having inhalers was embarrassing or a nuisance. Patients with uncontrolled asthma, in particular, felt that it was an embarrassment (62.0%) or nuisance (52.2%) to use an inhaler or even carry one (56.7%) in public.

### Attitudes toward controller inhalers

Most patients (52.8%) were aware of the need to use controller inhaler regularly to control their asthma. When asked about their controller inhalers, 19.9% of patients identified them correctly, 31.3% incorrectly, and the rest did not know. Figure 4 shows the frequency of controller inhaler usage in the week prior to the survey. About 13.9% of patients used it daily and 42.8% used it on some days. Of those who answered correctly, 30.0% used them daily compared to 16.7% who

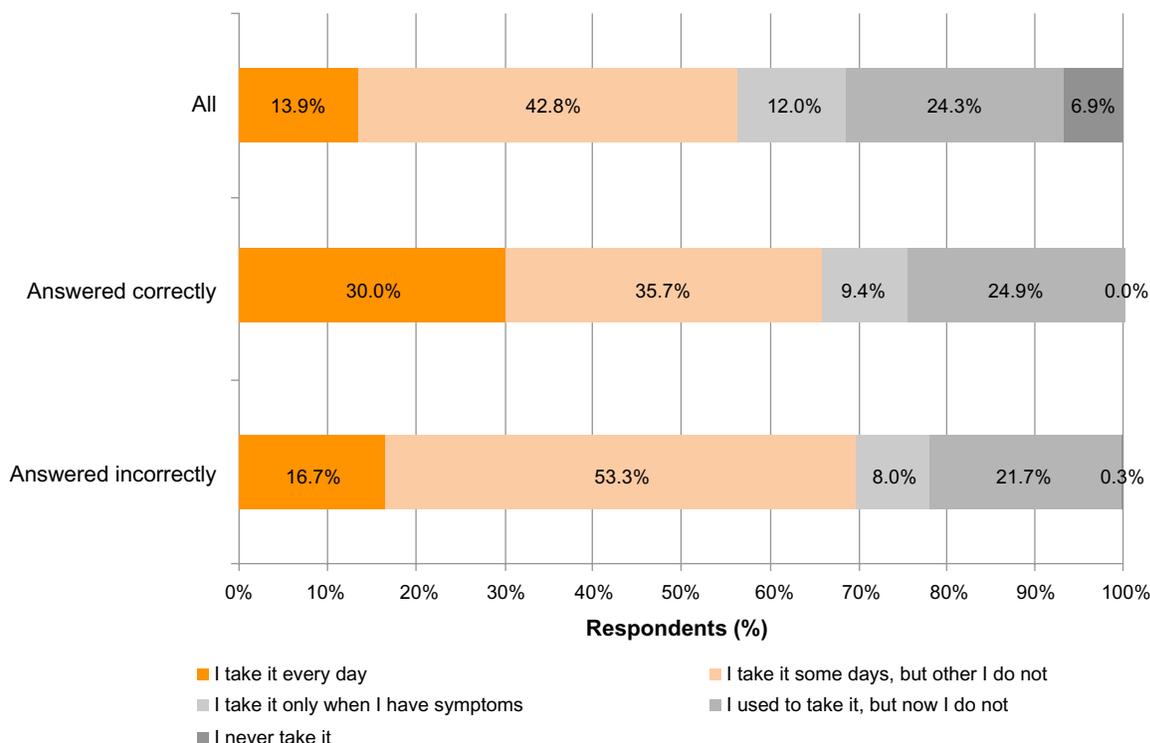
could not ( $P<0.01$ ). The 14.1% of patients who correctly named their controller inhalers had controlled asthma compared to 6.0% of those who could not ( $P<0.01$ , Figure 5).

### Sources of asthma information

Nine-tenths of patients actively looked for information about asthma and one-third, at least once a week. Patients searched for information on asthma attack prevention, what makes asthma worse or can trigger attacks and what to do in an event of an asthma attack. Figure 6 shows the sources of asthma information. Online sources and health care professionals (HCPs) were cited in 42.5% and 38.4% of the responses, respectively. Health care professionals were considered trustworthy information sources and consisted of respiratory specialists (57.3% of patients), family physicians/general practitioners (37.6%), and internal medicine specialists (33.2%). Other sources of information include health websites (38.6%), online health forums (35.9%), friends (32.2%), and family (29.5%).

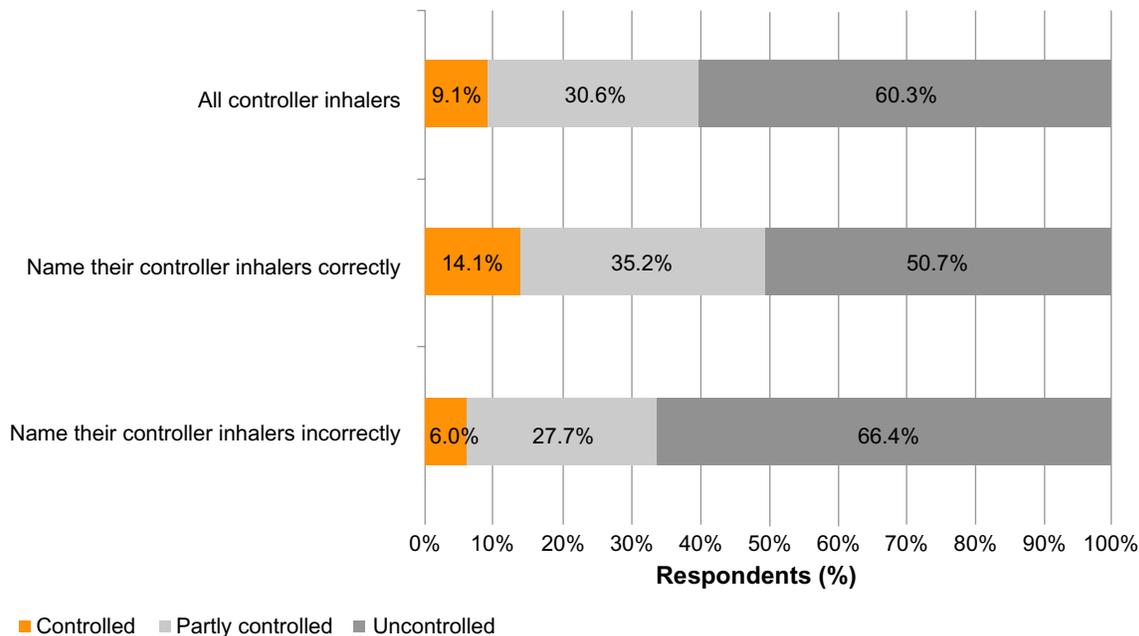
### Discussion

Our study showed that patient knowledge of asthma control and inhaler medication is low. Our patients viewed asthma control as being able to manage or relieve the exacerbations or attacks instead of preventing them. This was seen in the way they understood the concept of asthma control and reflected in



**Figure 4** Frequency of use of controller inhalers.

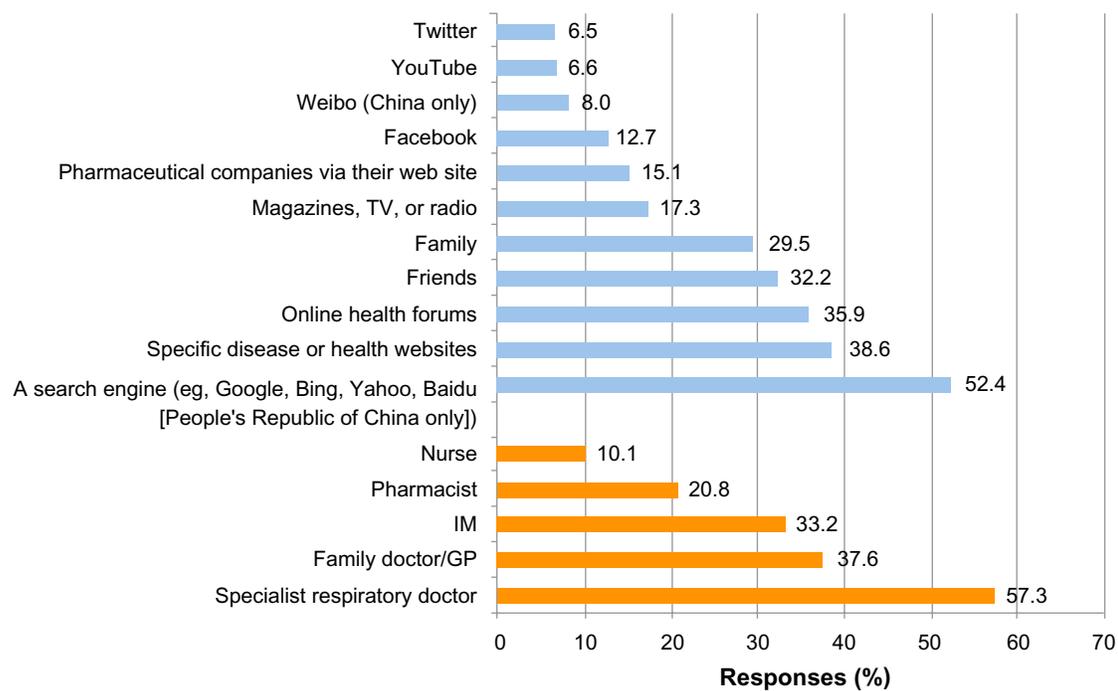
**Notes:** Supplementary material: Q36. Which statement best describes how you take your regular asthma treatment? This is your controller inhaler, which is usually brown, orange, red, purple, or pink; data on frequency of use are shown as percentage of respondents who use controller inhalers, n=1,072; those who correctly identified their inhalers, n=213, and those who incorrectly identified their inhalers, n=336. In all, 523 respondents could not identify their controller inhalers.



**Figure 5** Knowledge of controller inhalers.

**Notes:** Supplementary material: Q35i. Which of the following treatments do you currently take to help manage your asthma? (multiple selection of treatments allowed); supplementary material: Q35ii. Name of medication. Base: all respondents who are currently taking controller inhaler for managing asthma, as specified. If a respondent gives multiple names for controller inhaler, all the names for the controller inhaler must be correct = answered correctly; Otherwise = answered incorrectly. A list of controller inhalers (by country) was used to check if the name of medication provided by the respondent is correct; data are shown as percentage of respondents who use controller inhalers, n=1,072; those who correctly identified their inhalers, n=213, and those who incorrectly identified their inhalers, n=336. In all, 523 respondents could not identify their controller inhalers.

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**Figure 6** Sources of asthma information.

**Notes:** Supplementary material: Q42i. If you were to look for information about asthma, which of the following would you use to help look for information on asthma? Respondents may choose more than one option; data are shown as percentage of total responses, n=2,265.

**Abbreviations:** IM, internal medicine; GP, general practitioner.

their medication usage: reliever users outnumbered controller users by 2:1. In addition, about half the reliever users had a high frequency of use (greater than two times per week). This suggested that the level of control could have been underestimated and the prescribed therapy was inadequate, not taken, or not appropriate. Asthma management was crisis-oriented through the widespread use of oral corticosteroids and antibiotics and emergency care – ED visits or hospitalization. Despite this, most patients held on to the belief that their asthma was not serious and under control. As a result, the level of control remained low and <one-fifth of our patients achieved GINA-defined controlled asthma.

Many patients were concerned about their condition, especially those who had experienced acute exacerbations. The knowledge of controller inhalers was low, and only one-fifth of users could correctly identify their medication. Although they understood the preventive value of the inhaler and those who use it required the least hospitalizations or ED visits, many did not use it daily citing embarrassment and nuisance as reasons for not using them. Addressing these issues could improve treatment adherence as patients who correctly identified their inhaler medication had better asthma control.

Many patients expressed confidence in their HCPs and followed their instructions. HCPs are, thus, well placed to

help their patients resolve issues about their disease and its management. A study of patient–physician communication and patients’ knowledge about asthma in Italy<sup>17</sup> showed that 28.5% of general practitioners did not encourage patients to express doubts, expectations, or concerns and that 36.9% were unlikely to involve the patient in asthma management. Our patients used social media and searched online for information, and their enquiries revealed a desire to self-manage their asthma. The Internet provides an excellent opportunity to augment the delivery of asthma management information through online channels, such as search engines, health-related websites, and health forums.

Our survey relied on patients’ responses to the online questionnaire. These responses could not be clinically verified, and some patients might have inaccurately recalled certain events. Our respondents were patients who used social media and may not represent the cross-section of the asthmatic population. Compared to other Asian studies<sup>9–11</sup> that utilized face-to-face or phone interviews, the lower average age (34.2 years vs 40.5–45.0 years) and smaller female representation (46.3% vs 54.0%–57.5%) reflect the younger, male-predominant online population of our patients. REALISE<sup>5</sup> patients also had a lower average age. However, clinical findings such as daytime symptoms

or seeking help at EDs was consistent with these studies (38.2% vs 23.9%–57.8% and 38.4% vs 40.0%–42.7%, respectively).<sup>5,9–11</sup> Our study population and that of REALISE<sup>5</sup> also had higher percentages of patients with controlled asthma (18%–20% vs 2%–3%).<sup>7–9</sup> These two populations could have better access to asthma information and put them at an advantage compared to the general asthma population. Segmentation of patients could provide further insights of their attitudes on asthma control, given the disparities in socioeconomic status of patients in different countries of multicultural Asia.

## Implications of results for asthma management policy and practice

Our study revealed a crisis-oriented approach to asthma management: high reliever and oral corticosteroid use, ED visits, and hospitalizations. This mind-set is similarly evident in how patients understand the concept of well-controlled asthma. Asthma management strategies need to evolve from relief to prevention. As patients are not always able to understand asthma control, HCPs are best positioned to educate patients on their condition, address the perception discrepancy, help patients overcome their anxieties, and influence their attitudes toward treatment. Patient education, however, needs a new language to promote a shared understanding of asthma control between patients and physicians.

## Conclusion

Patients consistently overestimate their level of asthma control rather than what their clinical symptoms suggest. This discrepancy may be due to the patients' perception that asthma control is about managing exacerbations instead of achieving a predefined level of symptom control. Patients also expressed concern about their asthma and sought information on how to manage their condition. Interventions to address patients' perception of asthma control and attitudes toward the use of controller inhalers can leverage on their confidence in their HCPs and desire for better self-management. A new language to communicate the guideline-defined asthma control and promote the preventive use of controller medication is needed.

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## Author contributions

All the authors were involved in conceptualizing the study design, drafting the article, or revising it critically for important intellectual content, and all the authors approved the final version to be submitted for publication. All the authors have full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

## Disclosure

The authors received honoraria from Mundipharma for their participation in the REALISE Asia Working Group meetings and discussions. Professor Price has board membership with Mundipharma and also received speaker fees, grants, and unrestricted funding support from Mundipharma. Professors Liam and Yunus and Associate Professor David-Wang and Assistant Professor Tan are members of the Asia-Pacific Advisory Board of Mundipharma. Professors Cho and Yunus and Associate Professor David-Wang and Assistant Professor Tan received speaker fees from Mundipharma in the past. Assistant Professor Tan received conference sponsorship from Mundipharma. Dr Neira is an employee of Mundipharma. The authors have no other conflicts of interest in this work.

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