Tanno et al. World Allergy Organization Journal (2021) 14:100515
http://doi.org/10.1016/j.waojou.2021.100515

WORLD ALLERGY ORGANIZATION JOURNAL

Open Access

Allergy and coronavirus disease (COVID-19) international survey: Real-life data from the allergy community during the pandemic

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ABSTRACT

Background: The COVID-19 outbreak brought an unprecedented challenge to the world. Knowledge in the field has been increasing exponentially and the main allergy societies have produced guidance documents for better management of allergic patients during this period. However, few publications so far have provided real-life data from the allergy community concerning allergy practice during the COVID-19 outbreak. Therefore, we proposed an international survey on the management of allergic patients during the current pandemic.

Methods: We performed an online survey undertaken to reach out the worldwide allergy community by e-mail and social media. The web-based questionnaire contained 24 questions covering demographic data from the participants, clinical practice during this period, and questions related to the new international classification and coding tools addressed for COVID-19. It was circulated for 8 weeks and had anonymous and volunteer context.

Results: Data are presented for 635 participants from 78 countries of all continents. Allergists with long-term professional experience were the main audience. As expected, we received many responses as "I have no data" or "I don't know" to the questions of the survey. However, most with more experience on managing allergic patients during the pandemic agreed that patients suffering from allergic or hypersensitivity conditions have no increased risk of contracting COVID-19 or developing SARS CoV-2. Also, participants mentioned that none of the allergy treatments (inhaled corticosteroids, allergen immunotherapy, biological agents) increased the risk of contracting COVID-19 infection including severe presentations.

Conclusion: The data presented are a starting point in the process of getting feedback on all the recommendations provided by the allergy societies; it could also be the basis of new strategies to support health professionals while new COVID-19 specific treatments and vaccines are being explored. The information here presented intends to be helpful to the community but represents a

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http://doi.org/10.1016/j.waojou.2021.100515

Received 17 September 2020; Received in revised from 17 January 2021; Accepted 22 January 2021
Online publication date xxx

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course of action in a highly specific situation due to the state of emergency, and it should be helpful to health systems.

Keywords: Allergy, Allergen immunotherapy, Asthma, Biological agents, Coronavirus, COVID-19, Inhaled steroids, Treatment, Prevention

INTRODUCTION

The COVID-19 pandemic

Dynamic trends of the COVID-19 pandemic

The current outbreak of the novel coronavirus disease 2019 (COVID-19), apparently began in Hubei Province of the People's Republic of China, with the first reports dated at the end of 2019. China bore the large burden of morbidity and mortality before February 2020. The epidemic has rapidly spread to other countries, and the World Health Organization (WHO) Emergency Committee declared a global health emergency on 30 January 2020. Europe became the epicentre of the epidemic in early April 2020, and due to the number of countries reporting cases, WHO considered the situation as a pandemic. The United States followed the trend of being considered the centre of the pandemic in March 2020. Due to the devastating numbers of hospitalizations and deaths in Latin American countries, WHO declared this region as the epicentre of the pandemic in early June. The case detection rate is increasing exponentially; in mid-July 2020 the number of COVID-19 cases surpassed 16 000 000 globally, with more than 650 000 deaths[1,2] (Fig. 1).

COVID-19 is due to an enveloped single-stranded large RNA virus named the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Observations so far suggest a mean incubation period of 5 days and a median incubation period of 3 days.[3] The proportion of individuals infected by SARS-CoV-2 who remain asymptomatic throughout the course of infection has not yet been definitely determined, but is likely to be more than two-thirds. In symptomatic patients, the clinical manifestations of the disease usually start after less than a week. The infection can progress to severe chest symptoms corresponding to pneumonia in 75% of patients.[3] The mortality rates range from 1% to above 5%.[4] Older patients with comorbid conditions have been associated with even higher mortality rates (up to 15%), suggesting particularly susceptible populations.[5] Although COVID-19 appears to have a milder course and less aggressive attack rate in children, the outbreak is spreading fast and deaths have been reported in all ages.

The COVID-19 pandemic drove state, local, and territorial public health agencies to enact emergency actions to protect and secure their nations' health. These agencies routinely make difficult decisions about how to respond effectively to the dynamic trends of the pandemic, such as implementing nonpharmacological interventions and addressing the needs of populations at-risk. Many public health actions have been taken in different countries and world regions in order to limit the transmission. These actions generally follow the recommendations issued by WHO, which aims are to: (i) interrupt human-to-human transmission including reducing secondary infections, preventing transmission amplification events, and preventing further international spread; (ii) identify, isolate, and care for patients early; identify and reduce transmission from the animal source; (iii) address crucial unknowns regarding clinical severity, diagnosis, magnitude of transmission and infection, treatment options; (iv) communicate critical risk and accurate information to all communities; (v) minimize the burden of the conditions related to the pandemic through multisectoral partnership.[6,7]

A combination of public health measures is crucial to prevent further spread at the international level, such as rapid identification, diagnosis and management of cases, identification and follow up of the contacts, infection prevention and control in health care settings, implementation of

health measures for travellers, awareness raising in the population and risk communication. Diagnostic testing for COVID-19 is critical to track the SARS-CoV-2, inform case management, understand its epidemiology and trends, and suppress transmission. In fact, the concern is higher in low- and middle-income countries, where health resources are limited and reduced means of testing hampers the diagnosis.[7]

Allergy & COVID-19: evidence-based data are missing

As in other fields, knowing what is effective requires scientific evidence. Yet, the evidence base that informs the actions of public health agencies and institutions in preparing for and responding to emergencies is limited and heterogeneous and fails to meet the needs of public health emergency preparedness and response.[8]

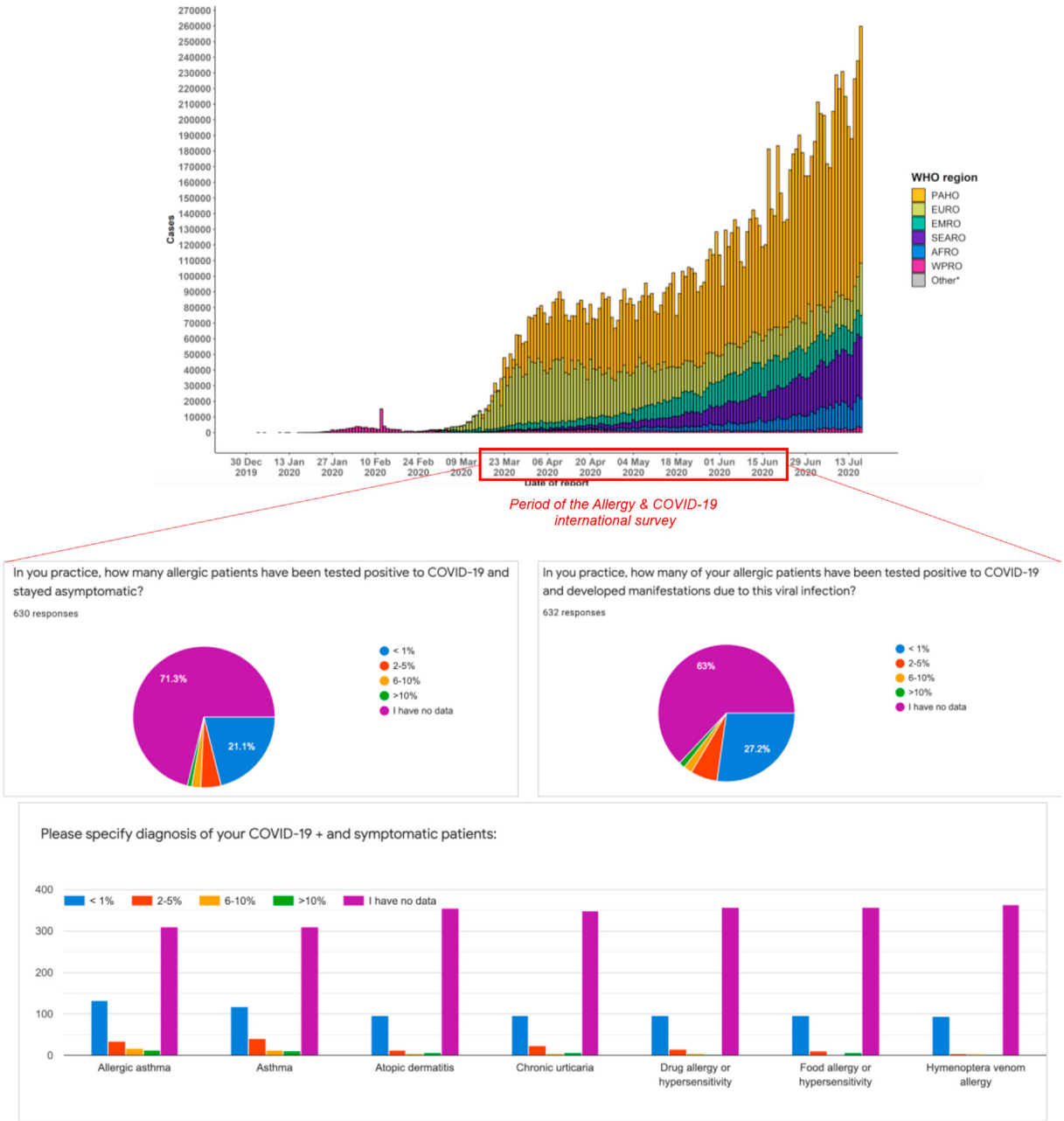

Fig. 1 World Health Organization report per region based on confirmed COVID-19 cases (18 July 2020) aligned with responses to the Allergy & COVID-19 international survey

Global Region	Country (N responses)	Total N° responses	Mean age (years)	Ratio women/ men	Specialty (%)	More than 20 years of professional experience (%)	% spending more than 15 h/ week with allergic diseases	Work setting (%)	Period of official lockdown (%)	Allergy practice during the COVID-19 pandemic (%)	Impressions of performing consultations through telemedicine (%) *(Total 549 responses)*
NA	USA (81) Canada (16)	97	59.8	0.9	Allergist (87.6) Clinical Immunologist (4.1) ENT (1.0) Paediatrician (1.0) Pulmonologist (1.0) Researcher (2.0) Other (3.0)	70.1	82.5	Private (54.6) Public (30.9) Both (14.4)	<4 weeks (1.0) 4–6 weeks (9.3) 6–8 weeks (16.5) >8 weeks (44.3) No official lockdown (11.3) The lockdown has not ended yet (17.5)	No changes in the schedule (8.2) Reduction of the schedule (20.6) Only emergency or specific cases (25.8) Stopped seeing patients, but use telemedicine (41.2) Stopped seeing allergic patients, but working with COVID-19 patients (1.0) Other (3.0)	Extremely effective (8.2) Good effectiveness (41.2) Acceptable effectiveness (43.3) Low effectiveness, but possible to use (5.1) Not at all effective (2.0)
LA	Argentina (24) Bolivia (1) Brazil (41) Chile (3) Colombia (6) Costa Rica (2) Dominican Republic (2) Ecuador (2) El Salvador (8) Guatemala (1) Honduras (2) Mexico (35) Panama (2) Paraguay (6) Peru (4) Uruguay (3) Venezuela (3)	146	50.9	0.8	Allergist (83.4) Clinical Immunologist (11.7) Paediatrician (1.3) Primary care (0.7) Pulmonologist (1.3) Researcher (0.7)	58.6	78.6	Private (42.0) Public (6.2) Both (51.7)	<4 weeks (2.0) 4–6 weeks (14.5) 6–9 weeks (15.8) >8 weeks (26.2) No official lockdown (11.0) The lockdown has not ended yet (30.3)	No changes in the schedule (2,7) Reduction of the schedule (33.1) Only emergency or specific cases (26.9) Stopped seeing patients, but use telemedicine (26.9) Stopped seeing allergic	Extremely effective (5.5) Good effectiveness (21.4) Acceptable effectiveness (53.8) Low effectiveness, but possible to use (13.8) Not at all effective (5.5)

										patients, but working with COVID-19 patients (2.7) Other (7.6)	
EU	Albania (1) Armenia (1) Austria (1) Belarus (1) Belgium (5) Bulgaria (8) Cyprus (1) Denmark (2) Estonia (1) Finland (1) France (57) Georgia (8) Germany (5) Greece (4) Hungary (4) Italy (70) Kazakhstan (3) Kosovo (1) Latvia (1) Lithuania (4) Montenegro (1) Netherlands (1) Poland (7) Portugal (19) Romania (15) Russian Federation (4) Serbia (4) Slovenia (2) Spain (19) Sweden (3) Switzerland (2) Turkey (13) Ukraine (3) United Kingdom (15)	287	52.2	1.7	Allergist (74.9) Clinical Immunologist (3.8) Dermatologist (2.1) ENT (2.4) Paediatrician (8.7) Primary care (0.7) Pulmonologist (4.9) Researcher (0.7) Other (1.7)	47.0	75.2	Private (25.0) Public (47.4) Both (27.5)	<4 weeks (0.3) 4–6 weeks (14.9) 6–10 weeks (33.8) >8 weeks (35.2) No official lockdown (2.8) The lockdown has not ended yet (12.9)	No changes in the schedule (2.4) Reduction of the schedule (20.2) Only emergency or specific cases (33.8) Stopped seeing patients, but use telemedicine (33.8) Stopped seeing allergic patients, but working with COVID-19 patients (7.3) Other (2.4)	Extremely effective (7.3) Good effectiveness (51.9) Acceptable effectiveness (26.4) Low effectiveness, but possible to use (11.8) Not at all effective (2.4)
AFR/ME	Algeria (2) Egypt (6) Iran (Islamic Republic of) (5) Israel (2) Kenya (5) Kuwait (1)	39	51.7	0.7	Allergist (53.8) Clinical Immunologist (12.8) ENT (10.2) Paediatrician (10.2) Primary care	51.2	66.7	Private (17.9) Public (33.4) Both (48.7)	<4 weeks (2.5) 4–6 weeks (25.6) 6–11 weeks (20.5) >8 weeks (23.1)	No changes in the schedule (0.0) Reduction of the schedule (43.6) Only emergency or	Extremely effective (0.0) Good effectiveness (35.9) Acceptable effectiveness (43.6) Low effectiveness, but possible to use

(continued)

Global Region	Country (N responses)	Total N° responses	Mean age (years)	Ratio women/ men	Specialty (%)	More than 20 years of professional experience (%)	% spending more than 15 h/ week with allergic diseases	Work setting (%)	Period of official lockdown (%)	Allergy practice during the COVID-19 pandemic (%)	Impressions of performing consultations through telemedicine (%) *(Total 549 responses)*
	Lebanon (5) Oman (1) Qatar (2) Saudi Arabia (4) South Africa (4) United Arab Emirates (1) Zimbabwe (1)				(2.5) Pulmonologist (5.1) Other (5.1)				No official lockdown (7.7) The lockdown has not ended yet (20.5)	specific cases (12.8) Stopped seeing patients, but use telemedicine (30.7) Stopped seeing allergic patients, but working with COVID-19 patients (0.0) Other (12.8)	(17.9) Not at all effective (2.5)
AP	Australia (6) Cambodia (1) India (15) Indonesia (6) Japan (10) Malaysia (1) Mongolia (2) Philippines (11) Democratic People's Republic of Korea (7) Singapore (2) Thailand (2) Viet Nam (4)	67	48.9	0.7	Allergist (50.7) Clinical Immunologist (4.5) Dermatologist (1.5) ENT (13.4) Paediatrician (17.9) Primary care (1.5) Pulmonologist (1.5) Researcher (7.5) Other (1.5)	47.7	50.7	Private (28.3) Public (40.3) Both (31.3)	<4 weeks (5.9) 4–6 weeks (5.9) 6–12 weeks (14.9) >8 weeks (44.7) No official lockdown (26.8) The lockdown has not ended yet (1.5)	No changes in the schedule (13.4) Reduction of the schedule (41.8) Only emergency or specific cases (8.9) Stopped seeing patients, but use telemedicine (28.3) Stopped seeing allergic patients, but working with COVID-19 patients (1.5) Other (6.0)	Extremely effective (5.9) Good effectiveness (14.9) Acceptable effectiveness (49.2) Low effectiveness, but possible to use (20.9) Not at all effective (8.9)

Table 1. Responders to the international survey, response rates, demographic characteristics and allergy practice during the COVID-19 pandemic (NA= North America, LA = Latin America, EU = Europe, AFR/ME = Africa and Middle East, AP = Asia Pacific)

Knowledge in the field has been increasing exponentially in the last year due to the needs of better understanding the many aspects of this pandemic. Although there is still no specific treatment for COVID-19, knowledge in the field is constantly evolving. Remarkable is the increase of the number of publications found when "COVID-19" term is searched in PUBMED®. It jumped up from 3 publications in 2019 to 32 992 documents by July 2020.[9] All the main allergy societies have been making efforts to promote better management of allergic patients during the pandemic by producing recommendations and guidance documents.[10–15] However, even with the incremental number of publications over the last months and the efforts of the allergy academies, few publications so far have provided real-life data from the allergy community concerning allergy practice during the COVID-19 outbreak.[16] Therefore, in order to provide real-life data from the allergy community and potentially support the implementation of evidence-based specific recommendations, we proposed an international survey on the management of allergic patients during the current pandemic.

MATERIAL & METHODS

The allergy community engagement: the allergy & COVID-19 international survey

We developed a web-based survey in English, to reach out to the allergy community worldwide. An online questionnaire was constructed using GoogleDocs®, enabling responses to be recorded in a unique database (Annex 1). We launched an introduction letter containing a link to the questionnaire unique to each participant. We received help from a number of relevant international and national societies, including World Allergy Organization (WAO), Italian Society of Allergology and Clinical Immunology (SIAIC), and French Association for Continuing Education in Allergology (ANAFORCAL) in distributing the survey among their members. The link directed respondents to a page explaining the purpose of the survey. The survey was disseminated by e-mail and social media. The online questionnaire was beta-tested and launched via Internet on 20 April 2020 and closed 8 weeks later (on 22 June 2020). A reminder was sent out after 4 and 7 weeks. The survey had anonymous and voluntary standard.

Of the 24 questions (Annex 1), 7 covered demographic data from the participants, 4 were related to clinical practice during this period, 12 covered data related to the management of allergic patients, including specific treatments such as allergen immunotherapy (AIT) and biological agents, and 1 related to the new international classification and coding tools addressed to COVID-19 morbidity and mortality data recording.

RESULTS

Giving voice to the allergy community during the COVID-19 pandemic

Surveying the international allergy community

Data are presented for 635 participants (Table 1) from 78 countries who completed the survey (Fig. 1). The countries were aggregated according to world regions: North America (NA), Latin America (LA), Europe (EU), Africa and Middle East (AFR/ME), Asia Pacific (AP) and across the global sample. As shown in Fig. 1 and Table 1, all global regions were represented in the survey. The proportion of respondents was lowest for AFR/ME (6.1%) and highest for EU (45.2%).

Ninety-seven percent (97%) of participants had long-term (>20 years) professional experience (Table 1); 74.1% of this group reported having more than 10 years of professional experience in allergic and hypersensitivity conditions; and nearly two-thirds (74.5%) spent more than 15 h per week seeing allergic patients.

Data related to participating countries, number of participants from each country, mean age of respondents, sex ratio, specialty, professional experience, percent of professionals who spend more than 15 h/week looking after patients suffering from allergic and hypersensitivity diseases, work setting, information related to the lockdown, and use of telemedicine are available in Table 1.

COVID-19 and allergy practice

Although some countries/regions did not adopt an official lockdown or were in lockdown at the

time of the survey, 58.5% of respondents reported an official lockdown for at least 6 weeks in their countries. As shown in Table 1, the practice of allergology varied widely, having general similar distribution of activities: 26.9% of participants carried on seeing patients frequently with reduction of the schedule, the same proportion stopped seeing patients but utilized telemedicine, and 25.9% decided to see only emergency or specific cases (AIT or biological agents' administration, for example). Allergy practice during the pandemic varied according to the region (or regions). The use of telemedicine was more frequent in NA (41.2%) and lower in AP (28.3%) during the period of the study. From overall 549 participants who used telemedicine, most considered it as having acceptable (43.7%) or good (29.9%) effectiveness (Fig. 2).

When asked about epidemiological data regarding allergic patients affected by COVID-19, most of the doctors reported having no data. However, 28.7% of the respondents mentioned allergic patients who tested positive with no COVID-19 symptoms and 37% reported allergic patients with symptomatic and proven COVID-19. Most of the participants reported less than 1% of symptomatic COVID-19 in patients affected by different allergic and hypersensitivity conditions (Fig. 3).

According to the majority of respondents, allergic patients were neither at risk of contracting COVID-19 (53.4%) nor for developing severe manifestations, including severe acute respiratory syndrome (SARS) (46.1%). Two hundred twenty-nine (36.1%) participants agreed that asthmatic patients are at risk of developing SARS. Questions regarding impact of anti-allergic (eg, biological) agents on COVID-19 prevalence were most commonly (58%) answered with "I have no data/I don't know". Although the survey showed many responses of "I don't know" to the questions presented in Table 2, 62.4% of participants found that allergy treatment had no impact on COVID-19 presentation. The proportion was lower for the experience regarding the risk of SARS and the use of these drugs: 46.8% for inhaled corticosteroids with or without long-acting beta agonist (LABA), 31.7% for AIT, and 11.5% for biological agents. In

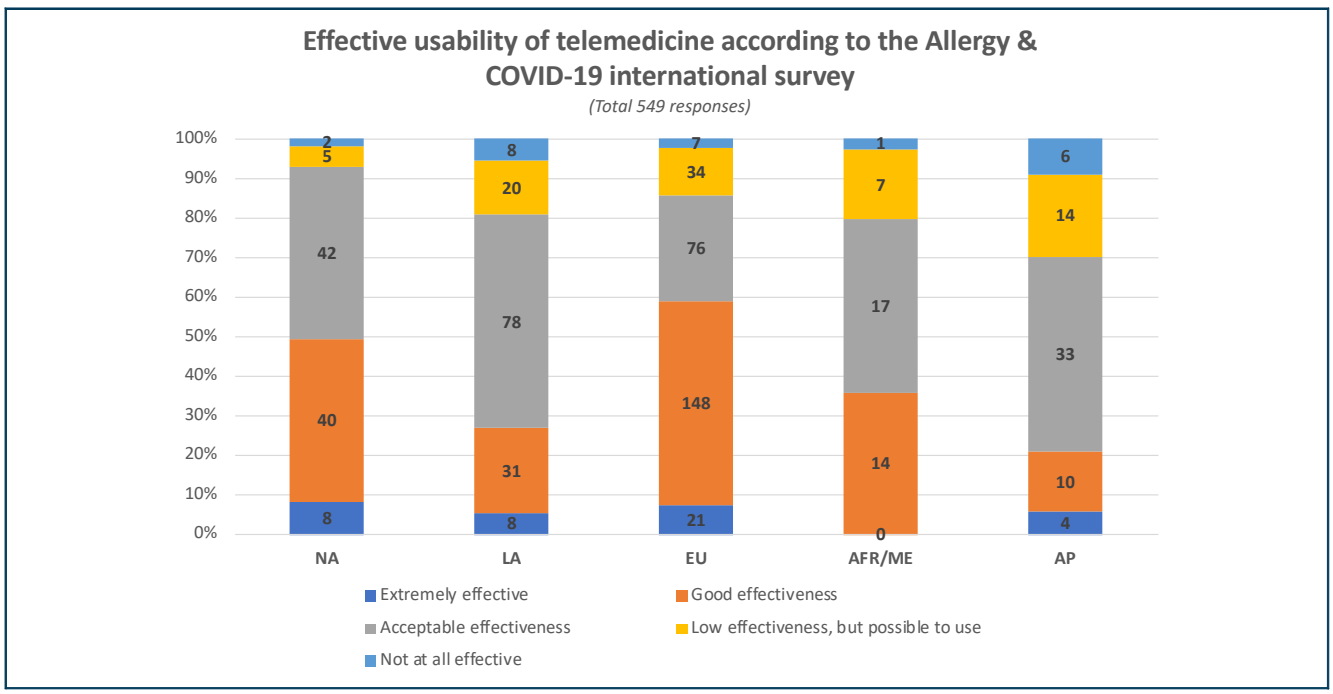

Fig. 2 Implementation and effectivity of telemedicine according to the Allergy & COVID-19 international survey (NA= North America, LA = Latin America, EU = Europe, AFR/ME = Africa and Middle East, AP = Asia Pacific)

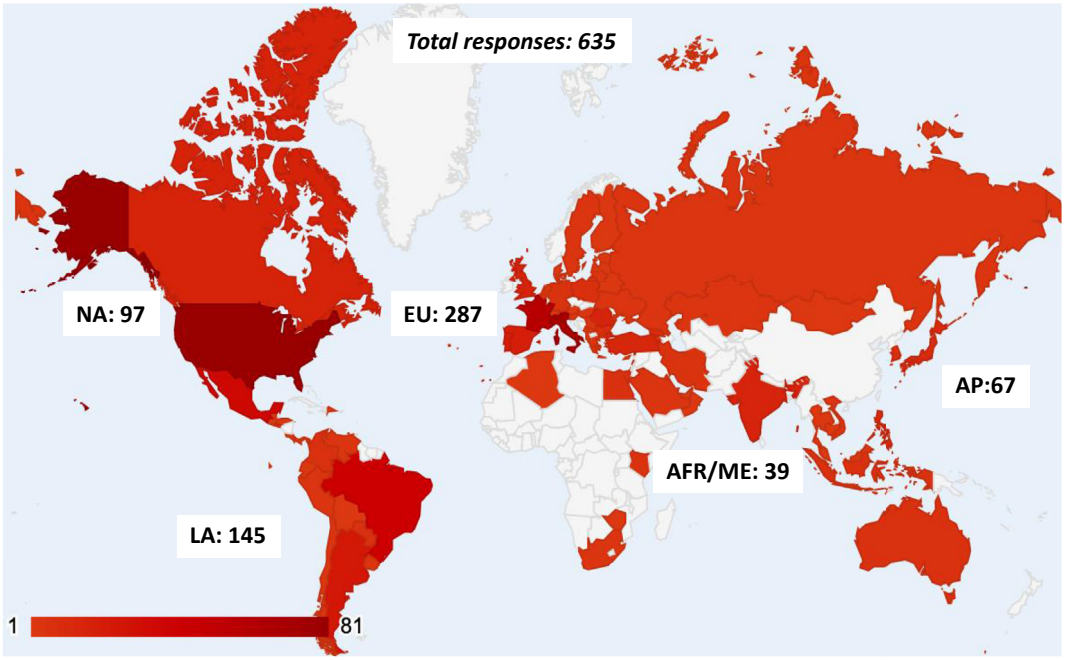

Fig. 3 Allergy & COVID-19 survey. Number of responses per world region (NA= North America, LA = Latin America, EU = Europe, AFR/ME = Africa and Middle East, AP = Asia Pacific)

general, the responses between world regions followed similar proportions (Table 2, Fig. 4).

From overall responses, 36.2% agreed that individuals with COVID-19 undergoing treatment with biological agents or AIT are not at risk of developing more adverse reactions due to these drugs; 4.3% disagreed with this statement; and 61.6% mentioned having no information (Table 2).

Three hundred and eight respondents (48.5%) were still not aware of the updates on the WHO International Classification (ICD)-10 and ICD-11 COVID-19 classification and coding, with significant regional differences.

DISCUSSION

Lessons from the field

The COVID-19 outbreak brought an unprecedented challenge to the world. It changed dramatically the landscape of how medicine was practiced, forcing fast and incremental adaptation of local, regional, and national health systems in order to follow the public health emergency responses to the dynamic trends of the outbreak. Facing the high contagious global pandemic, decisions were key in order to limit the transmission and provide quality care for allergic patients. This first worldwide survey assessing the real-life data from the allergy community provided a snapshot of how allergy is being practiced during the COVID-19 pandemic.

There is no doubt that specific actions have proven to be essential to prevent transmission such as social distancing, use of personal protective equipment, and specific personal hygiene measures such as washing hands. Elective healthcare visits and procedures were postponed by considering risk and benefits individually. Due to social distancing recommendations, most of the allergy community could benefit from e-health tools and implementation of e-consultations when possible.[17,18] The use of e-health tools had to follow national regulations. Clinicians considered telemedicine suboptimal, nonetheless adequate for the period of pandemic.

As far as we are dealing with a new virus with potential contagious and lethal pattern, knowledge in the field had to evolve quickly. However, as expected, the health professionals gained progressively more experience of dealing with allergic patients during this peculiar period. Although most of the respondents were experienced

Global Region	NA (N: 97) (%)	LA (N: 145) (%)	EU (N: 287) (%)	AFR/ME (N: 39) (%)	AP (N: 67) (%)	Total (N: 635) (%)
Are ALLERGIC patients more at risk of contracting COVID-19 infections?	Yes (1.0) No (54.6) I don't know (43.4) Other (1.0)	Yes (12.3) No (58.2) I don't know (26.1) Other (3.4)	Yes (0.7) No (58.2) I don't know (39.0) Other (2.1)	Yes (12.8) No (43.6) I don't know (35.9) Other (7.7)	Yes (20.8) No (25.4) I don't know (47.9) Other (5.9)	Yes (9) No (53.4) I don't know (34) Other (3.6)
Are ALLERGIC patients more at risk for severe symptoms of COVID-19, including SARS?	Yes (5.2) No (45.4) I don't know (48.4) Other (1.0)	Yes (14.5) No (52.4) I don't know (29.7) Other (3.4)	Yes (7.3) No (41.1) I don't know (48.5) Other (3.1)	Yes (20.5) No (25.6) I don't know (48.8) Other (5.1)	Yes (16.4) No (23.9) I don't know (55.2) Other (4.5)	Yes (9.9) No (46.1) I don't know (40.6) Other (3.4)
Are ASTHMATIC patients more at risk for severe symptoms of COVID-19, including SARS?	Yes (7.2) No (39.2) I don't know (51.5) Other (2.1)	Yes (32.4) No (37.2) I don't know (27.0) Other (3.4)	Yes (21.6) No (13.6) I don't know (61.7) Other (3.1)	Yes (35.9) No (17.9) I don't know (43.7) Other (2.5)	Yes (28.4) No (19.4) I don't know (49.3) Other (2.9)	Yes (23.3) No (36.1) I don't know (36.7) Other (3.9)
Are patients treated with INHALED CORTICOSTEROIDS (with or without LABA) less at risk of contracting COVID-19 infection?	Yes (6.2) No (24.7) I don't know (68.1) Other (1.0)	Yes (21.4) No (44.1) I don't know (33.1) Other (1.4)	Yes (20.6) No (13.6) I don't know (64.4) Other (1.4)	Yes (10.2) No (35.9) I don't know (51.3) Other (2.6)	Yes (10.5) No (26.8) I don't know (61.2) Other (1.5)	Yes (16.9) No (32.8) I don't know (48.3) Other (2.0)
Are patients treated with INHALED CORTICOSTEROIDS (with or without LABA) less at risk of severe symptoms of COVID-19, including SARS?	Yes (13.4) No (19.6) I don't know (66.0) Other (1.0)	Yes (35.2) No (25.5) I don't know (37.2) Other (2.1)	Yes (27.5) No (21.6) I don't know (49.2) Other (1.7)	Yes (17.9) No (30.7) I don't know (46.8) Other (5.1)	Yes (17.9) No (17.9) I don't know (62,7) Other (1.5)	Yes (24.7) No (21.7) I don't know (51.2) Other (2.4)
Are patients treated with ALLERGEN IMMUNOTHERAPY (AIT) less at risk of contracting COVID-19 infection?	Yes (2.1) No (25.8) I don't know (71.1) Other (1.0)	Yes (19.3) No (39.3) I don't know (40.7) Other (0.7)	Yes (6.3) No (33.8) I don't know (59.2) Other (0.7)	Yes (5.1) No (38.5) I don't know (53.8) Other (2.6)	Yes (5.9) No (22.4) I don't know (70.2) Other (1.5)	Yes (8.5) No (32.2) I don't know (57.8) Other (1.5)
Are patients treated with AIT less at risk of severe symptoms of COVID-19, including SARS?	Yes (4.1) No (17.5) I don't know (78.4) Other (0.0)	Yes (23.4) No (26.9) I don't know (48.3) Other (1.4)	Yes (9.0) No (23.3) I don't know (67.3) Other (0.4)	Yes (7.7) No (33.4) I don't know (56.3) Other (2.6)	Yes (4.5) No (20.9) I don't know (73.1) Other (1.5)	Yes (10.9) No (23.5) I don't know (64.6) Other (1.0)
Are patients treated with BIOLOGICAL AGENTS less at risk of contracting COVID-19 infection?	Yes (4.1) No (23.7) I don't know (72.2) Other (0.0)	Yes (8.3) No (35.2) I don't know (53.8) Other (2.7)	Yes (11.8) No (21.9) I don't know (63.5) Other (2.8)	Yes (7.7) No (30.7) I don't know (61.6) Other (0.0)	Yes (2.9) No (19.4) I don't know (76.2) Other (1.5)	Yes (8.8) No (25) I don't know (63.8) Other (2.4)
Are patients treated with BIOLOGICAL AGENTS less at risk of severe symptoms of COVID-19, including SARS?	Yes (7.2) No (18.5) I don't	Yes (17.9) No (21.4) I don't	Yes (14.9) No (21.9) I don't	Yes (10.2) No (17.9) I don't know	Yes (2.9) No (16.4) I don't	Yes (12.9) No (17.6) I don't know

(continued)

Global Region	NA (N: 97) (%)	LA (N: 145) (%)	EU (N: 287) (%)	AFR/ME (N: 39) (%)	AP (N: 67) (%)	Total (N: 635) (%)
	know (74.3) Other (0.0)	know (58.0) Other (2.7)	know (54.8) Other (3.1)	(69.3) Other (2.6)	know (79.2) Other (1.5)	(66.9) Other (2.6)
Are individuals with COVID-19 under treatment with BIOLOGICAL AGENTS or AIT at risk of developing more adverse reactions due to these drugs?	Yes (6.2) No (29.9) I don't know (63.9) Other (0.0)	Yes (5.5) No (40.0) I don't know (53.8) Other (0.7)	Yes (2.4) No (34.1) I don't know (61.1) Other (2.4)	Yes (10.2) No (17.9) I don't know (69.3) Other (2.6)	Yes (2.9) No (16.4) I don't know (79.2) Other (1.5)	Yes (4.3) No (32.6) I don't know (61.6) Other (1.5)
Are you aware of the updates on International Classification of Diseases (ICD)-10 and ICD-11 in order to have better COVID-19 coding?	Yes (38.2) No (61.8)	Yes (70.3) No (29.7)	Yes (52.3) No (47.7)	Yes (43.6) No (56.4)	Yes (49.3) No (50.7)	Yes (51.5) No (48.5)

Table 2. Responses of the Allergy & COVID-19 international survey according to the global regions, based on the experience of the allergy community

allergists, we observed a considerable percentage of responses of "I don't know" or "I have no data" across the questions of the survey. In fact, the responses covered a specific period of the pandemic as demonstrated in Fig. 3, and it is expected that the allergy community may gain more knowledge and experience in the field as science progresses and more data are generated.

WHO has been recommending the testing of symptomatic and asymptomatic subjects in order to map the real extent of the pandemic and the tailoring of preventive actions.[19] However, many areas in the world are experiencing a severe shortage of test supplies for healthcare workers and patients. This also may contribute to the "I have no data" responses since most of the questions of the survey inquired about patients with proven COVID-19.

Although the early published data demonstrated that asthma was not a strong risk factor for severe COVID-19 disease, the actual risk is not known and may evolve with additional data reporting.[20-22] In the survey, according to the experience of the participants, most agreed that patients suffering from allergic and hypersensitivity conditions are not at higher risk of contracting COVID-19 infection nor developing severe manifestations, such as SARS. Although the US Centers for Disease Control and Prevention (CDC) advises that "people with moderate to severe asthma may be at higher risk of getting sick from COVID-19. COVID-19 can affect your respiratory tract (nose, throat, lungs), cause an asthma attack, and possibly lead to pneumonia and acute respiratory disease",[23] more recent data indicate that allergic asthma may not be a potent risk factor, particularly when well controlled, but that non-allergic asthma may be a high risk factor.[24-26]

Because the development of manifestations and evolution of COVID-19 are highly dependent on the individual immune status and inflammatory response, some hypotheses have emerged regarding the allergic immune patterns (T2 inflammation mostly) and infection pro-inflammatory response (mainly T1). Allergy, atopy, or asthma, which can be considered the clinical hallmarks of the Th2 immune orientation, have been so far poorly investigated in COVID-19 patients, and often have not been included, or are under-represented, neither among risk factors for more severe evolution nor within the baseline recurrent clinical features of COVID-19 patients. Although we still do not have objective data to prove how this balance can impact the clinical pattern, respiratory allergies and asthma were not reported as risk factor for SARS-COV-2 infection.[16,24-29]

Asthmatic patients should continue their baseline treatment according to current asthma guideline-based recommendations. There is no evidence which contraindicates the use of nasal or inhaled corticosteroids in any case. Inhaled corticosteroids either alone or in combination with

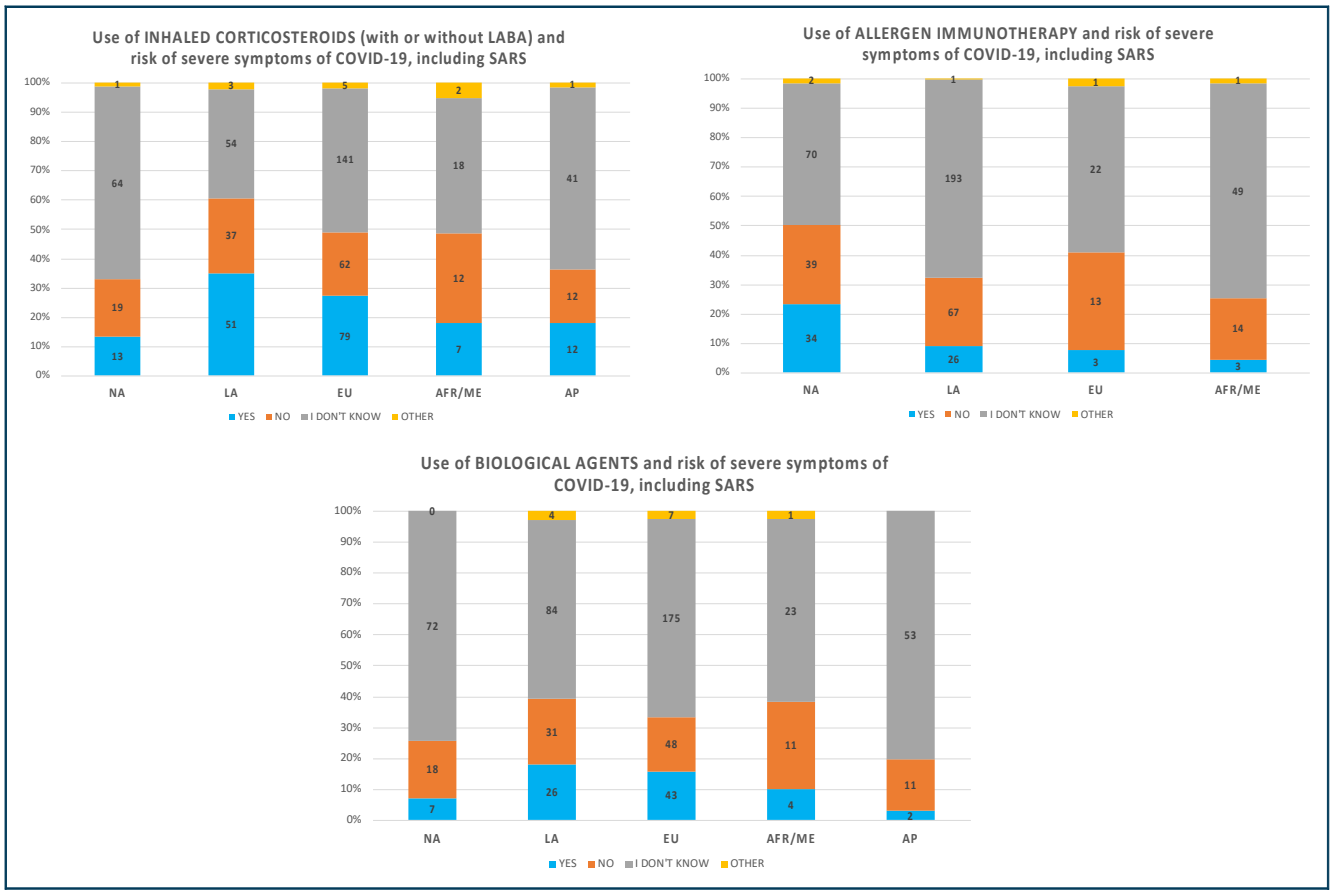

Fig. 4 Experience of participants of the Allergy & COVID-19 international survey: risk of severe symptoms and treatments used by the allergy community (NA= North America, LA = Latin America, EU = Europe, AFR/ME = Africa and Middle East, AP = Asia Pacific)

long-acting-beta agonists can be adjusted for cases of asthma exacerbation for both adults and children. For patients with asthma of any severity who are exhibiting worsening control or an acute exacerbation, the COVID-19 screening protocols should be followed in order to determine their risk.[10-13,30-32] Also, patients with allergic rhinitis and patients treated with AIT were advised to carry on their treatment.[33-36]

AIT and biological agents are valued treatment options for the care of many allergic and hypersensitivity conditions.[37] Their use or continuation should be assessed individually depending on the status of the patient and the stage of the treatment.[12,34-36,38-42] It is recommended to avoid starting AIT during the pandemic period, except for unusual cases of patients with unavoidable exposure to triggers that have resulted in anaphylaxis or asthma-related hospitalization and there is no other alternative treatment. For patients receiving injectable inhalant AIT for allergic rhinitis, the schedule can be adapted if needed, particularly if the patient is in the maintenance phase of the treatment.[10,34-36] In order to follow social distancing recommendations, it also has been recommended that switching the route of AIT from subcutaneous to sublingual, either temporarily or permanently, may be considered based on the expertise of the allergist.[38] The responses to the survey from those with experience on managing these specific treatments during the pandemic agreed that none of them increased the risk of contacting the infection or developing SARS. Our survey demonstrated that the majority (>60%) of the allergy community is not uniformed about official recommendations regarding the continuation of AIT and biological treatment, despite several position papers available on Pubmed to this matter.

Four main classes of biological agents are currently (July 2020) approved by the US Food and Drug Administration (FDA) and European

Medicines Agency (EMA) for allergic and hypersensitivity diseases. They are: anti-IgE (Omalizumab), anti-IL5 (Mepolizumab, Reslizumab), anti-IL4/13 (Dupilumab), and anti-IL5 R (Benralizumab).[37-39,43-53] In placebo-controlled trials with omalizumab, mepolizumab, reslizumab, and dupilumab in asthmatic patients, no risk of increased infection susceptibility, or immunosuppression was reported to date and, in the case of omalizumab, there is a possible anti-infectious effect.[12] Up to now, there has been no evidence suggesting that the immune response to SARS-CoV-2 should be impaired by the treatment of biologicals in allergic and hypersensitivity patients. In the absence of data that would indicate any potential harm, the therapies should be carried out during the COVID-19 pandemic in patients with clear indications for those who have had positive effect.[12]

The interaction between viral infection and the development or worsening of some drug hypersensitivity conditions has been studied over the last 20 years. Several groups reported the association between human herpesvirus 6 reactivation and some reactions, such as drug reaction with eosinophilia and systemic symptoms (DRESS). Viral infections also have been implicated in mimicking, triggering, or worsening cases of urticaria. Although drug hypersensitivity (11%) and urticaria (1.4%) have been self-reported in patients with COVID-19,[21] the majority of our respondents indicated that the infection may not be a facilitator for developing a higher proportion of adverse reactions to AIT and biological agents. Various drugs being used in different phases of the disease from SARS-CoV-2 seem to cause rare but potentially severe drug hypersensitivity reactions, mostly non-immediate reactions based on a limited number of case reports.[15]

Mortality and morbidity data are key parameters to guide public health actions, and are crucial in cases of public health emergencies. International counting measures are used to harmonize data and provide global epidemiology. The WHO International Classification of Diseases (ICD) is the foundation for the identification of trends and statistics globally and is the international standard for reporting diseases and health conditions, currently under global implementation.[54] It is the diagnostic classification standard used in the majority of world countries for reporting mortality and morbidity, supporting decision-making, observation of reimbursement and resource allocation trends, and keeping track of safety and quality guidelines.[55] Recently, the WHO Classification and Terminology Unit, proposed updates in the ICD-10[56] and ICD-11[57] COVID-19 related situations classification and coding.[7] Even with 48.5% of the survey participants not being aware of these updates, it is expected that overall awareness may increase due to the urgent need of using these international standards in the outbreak situation.

Remarkable was the implementation and success rate of telemedicine in different áreas during the pandemic. Although the concept of "remote" patient care has been around for decades, present circumstances have provided a grand impetus in that direction with a view to protecting both patient and caregiver. Additional advantages are cost-effectiveness, ability to extend access to specialty services, and potential to help mitigate the looming physician shortage. Although some disadvantages have emerged, such as the limited technological resources in certain world areas and the concern with security of patients' data, telemedicine services have been proved to be effective by the allergy community.

This study presents some limitations. The survey presented differential response rate by regional area. However, we considered the quality of responses received rather than their quantity, and, most important, we had geographical representation from all continents. Despite the specific response rate, the survey represented a unique opportunity to give voice to allergists from 78 countries. Although this did not affect our overall data analysis, it may underline the need for allergy specialty developments in the areas where the number of responders was low. The rate of responses may also have been affected by the dynamic changes on the geographical distribution of the pandemic. In some countries, notably China, the most populous nation in the world, we received fewer responses than might have been expected. We hypothesise that recipients may not have been able to access the survey due to national regulations prohibiting Google® accounts. Other factors which may have influenced the response rate include the difficulty in accessing the

online questionnaire and difficulties with the English language. Ideally, the best evidence-based study to access individual risk of developing COVID-19 upon SARS-CoV-2 infection for allergic and/or asthma patients would be large prospective multinational cohorts, which would require additional resources, organization, and time, and this was not the aim of the current study.

Keep fighting COVID-19!

A pandemic response during a global emergency is a highly atypical circumstance having considerable impact in many sectors of the society, and in the life of patients and health care professionals. We believe that more than providing a big picture of how allergy is being practiced worldwide during this highly specific situation due to the state of emergency, the data presented intend to be a starting point process of getting feedback for all recommendations provided by the allergy societies and the basis of new strategies to support health professionals while new treatments and vaccines to COVID-19 are being explored. The information here presented intends to be helpful to the community but represents a course of action during a highly specific situation due to the current state of the pandemic.

Abbreviations

AFR/ME: Africa and Middle East; AIT: Allergen immunotherapy; ANAFORCAL: French Association for Continuing Education in Allergology; AP: Asia Pacific; CDC: Centers for Disease Control and Prevention; DRESS: Drug Reaction with Eosinophilia and Systemic Symptoms; EMA: European Medicines Agency; EU: Europe; FDA: Food and Drug Administration; ICD: International Classification of Diseases; LA: Latin America; LABA: long-acting beta-agonist; NA: North America; SARS-CoV-2: severe acute respiratory syndrome coronavirus 2; WAO: World Allergy Organization; WHO: World Health Organization

Funding

Pascal Demoly and Luciana Kase Tanno received an unrestricted Novartis and MEDA/Mylan Pharma grants through CHUM administration. LKT received a research AllerGOS grant.

Contributions

The first and last authors contributed to the construction of the document (designed the study, analysed and interpreted the data, and wrote the manuscript). All the authors critically revised and approved the final version of the manuscript and agree to be accountable for all the aspects of the work.

Consent for publication

All the authors agree on publishing the submitted document.

Availability of data and materials

The raw data will be made available with the acceptance of the submitted manuscript.

Ethics approval

No ethical consent was required since this study does not involve human or animals. The presented survey has anonymous and volunteer standard.

Declaration of competing interest

The authors declare that they do not have conflict of interests related to the contents of this article.

Acknowledgements

The authors acknowledge the unrestricted grants received by Mylan, Novartis; the research grants APITHEM and AllerGos.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.waojou.2021.100515.

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ANNEX 1: **The Allergy & COVID-19 international survey questionnaire**

Country *

Age (years): *

[20 \/]

Gender *

- ( ) Male
- ( ) Female

What is your specialty? *

- ( ) Allergist
- ( ) Clinical immunologist
- ( ) Dermatologist
- ( ) Otolaryngologist
- ( ) Pediatrician
- ( ) Primary care physician/General physician
- ( ) Respiratory physician/Pulmonologist
- ( ) Rheumatologist
- ( ) Researcher working in the field of immunology
- ( ) Researcher working in the field of allergy
- ( ) Other:

How many years of professional experience do you have? *

- ( ) less than 1 year
- ( ) 1 to 5 years
- ( ) 5 to 10 years
- ( ) 10 to 20 years
- ( ) more than 20 years

How many hours per week do you spend with your patients with allergic diseases? *

- ( ) None
- ( ) Less than 5
- ( ) 5 to 10
- ( ) 10 to 15
- ( ) 15 to 20
- ( ) 20 to 25
- ( ) 25 to 30
- ( ) More than 30

Do you work: *

- ( ) in a private practice
- ( ) in the national health service (public university, public hospital, university hospital, research institution...)
- ( ) both
- ( ) Other:

How long is/was the official "lock-down" period in your country: *

- ( ) < 4 weeks
- ( ) 4-6 weeks

- ( ) 6-8 weeks
- ( ) > 8 weeks
- ( ) No official "lock-down" in my country

During the COVID-19 pandemic, you see allergic patients: *

- ( ) Every day, no changes in the schedule
- ( ) Frequently, but with reduction in the schedule
- ( ) Eventually, only emergency or specific cases (AIT or biological agents administration, for example)
- ( ) I stopped seeing patients, but use telemedicine
- ( ) I stopped seeing patients and don't use telemedicine
- ( ) I stopped seeing allergic patients, but working with COVID-19 patients
- ( ) Other:

If you are performing consultation through telemedicine, please let us know your experience

- ( ) Extremely effective
- ( ) Good effectiveness
- ( ) Acceptable effectiveness
- ( ) Low effectiveness, but possible to use
- ( ) Not at all effective

In you practice, how many allergic patients have been tested positive to COVID-19 and stayed asymptomatic?

- ( ) < 1%
- ( ) 2-5%
- ( ) 6-10%
- ( ) >10%
- ( ) I have no data

In you practice, how many of your allergic patients have been tested positive to COVID-19 and developed manifestations due to this viral infection?

- ( ) < 1%
- ( ) 2-5%
- ( ) 6-10%
- ( ) >10%
- ( ) I have no data

Please specify diagnosis of your COVID-19 + and symptomatic patients:

	< 1%	2-5%	6-10%	>10%	I have no data
Allergic asthma	( )	( )	( )	( )	( )
Asthma	( )	( )	( )	( )	( )
Atopic dermatitis	( )	( )	( )	( )	( )
Chronic urticaria	( )	( )	( )	( )	( )
Drug allergy or hypersensitivity	( )	( )	( )	( )	( )

Food allergy or hypersensitivity	( )	( )	( )	( )	( )
Hymenoptera venom allergy	( )	( )	( )	( )	( )

According to your experience, are allergic patients more at risk of contracting COVID-19 infections? *

- ( ) Yes
- ( ) No
- ( ) I don't know
- ( ) Other:

According to your experience, are allergic patients more at risk for severe symptoms of COVID-19, including SARS? *

- ( ) Yes
- ( ) No
- ( ) I don't know
- ( ) Other:

According to your experience, are asthmatic patients more at risk for severe symptoms of COVID-19, including SARS? *

- ( ) Yes
- ( ) No
- ( ) I don't know
- ( ) Other:

According to your experience, are patients treated with INHALED CORTICOSTEROIDS (with or without LABA) less at risk of contracting COVID-19 infection? *

- ( ) Yes
- ( ) No
- ( ) I don't know
- ( ) Other:

According to your experience, are patients treated with INHALED CORTICOSTEROIDS (with or without LABA) less at risk of severe symptoms of COVID-19, including SARS? *

- ( ) Yes
- ( ) No
- ( ) I don't know
- ( ) Other:

According to your experience, are patients treated with ALLERGEN IMMUNOTHERAPY (AIT) less at risk of contracting COVID-19 infection? *

- ( ) Yes
- ( ) No
- ( ) I don't know
- ( ) Other:

Are patients treated with AIT less at risk of severe symptoms of COVID-19, including SARS? *

- ( ) Yes

- ( ) No
- ( ) I don't know
- ( ) Other:

According to your experience, are patients treated with BIOLOGICAL AGENTS less at risk of contracting COVID-19 infection? *

- ( ) Yes
- ( ) No
- ( ) I don't know
- ( ) Other: