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# How Coronavirus Disease 2019 Changed Dermatology Practice in 1 Year Around the World

## Perspectives from 11 Countries



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### KEYWORDS

• COVID-19 • SARS-CoV-2 • China • Italy • Spain • Peru • Brazil • South Africa

### KEY POINTS

- COVID-19 has affected the global dermatology workforce, as many dermatologists were redeployed to the frontlines, managed a broad array of COVID-19-associated dermatologic conditions, and adopted telemedicine practices.
- Globally, there are differences in the morphology and prevalence of COVID-19-associated skin lesions.
- Just as the pandemic unevenly impacted various communities across the world, the COVID-19 telemedicine expansion also widened the digital divide, exacerbating disparities among the dermatology patient population.

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## INTRODUCTION

When cases of a mysterious pneumonia debuted in Wuhan, Hubei province, China, in early December 2019, few people could have anticipated the outbreak's trajectory.<sup>1</sup> Within 2 weeks, scientists identified the responsible pathogen as a novel virus that is 96% identical to the bat coronavirus BatCoV RaTG13.<sup>2</sup> On January 13, 2020, the first case outside of mainland China was reported in Thailand, and 1 month later, the disease had swept across the world, impacting 36 countries in 6 continents.<sup>3</sup> As hospitalizations and deaths skyrocketed, the respiratory disease, later renamed coronavirus disease 2019 (COVID-19), exposed the ugly underbelly of societal inequities and threatened to collapse world economies and the sturdiest of health care systems. By March 11, 2020, the World Health Organization (WHO) declared COVID-19 a pandemic.<sup>4</sup>

Dermatologists have played an important role in the treatment of patients since the beginning of the pandemic. From redeployment onto the frontlines to managing cutaneous manifestations of COVID-19 and patients on biologics and immunosuppressants, dermatologists around the world rapidly adapted to overcome the unique challenges in their region. An international perspective of the unique trends, trials, and lessons learned can not only inform response to future challenges in the pandemic but also enhance quality of care.

In this article, we present an overview of the impact of COVID-19 on each region from an epidemiologic standpoint, followed by unique insights from local dermatologists on how the specialty has evolved over the past year (Figs. 1 and 2).

### China

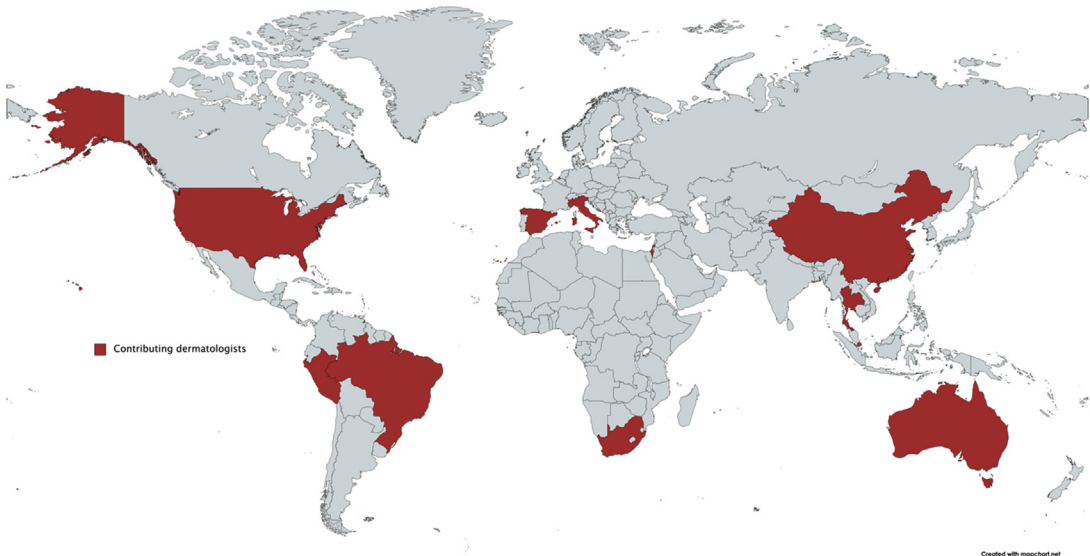
Although China was initially the pandemic epicenter, the nation has since managed to avoid many of the surges seen elsewhere. After the severe acute respiratory syndrome (SARS) outbreak, China implemented the "Regulations on Preparedness for the Response to Emergent Public Health Hazards," a mechanism allowing for rapid mobilization of resources in the event of a medical disaster.<sup>5</sup> The COVID-19 outbreak occurred just before Chinese New Year, when billions of residents travel home. The government announced a travel quarantine on January 23, 2020, in the Hubei province, affecting approximately 45 million people.<sup>5</sup> All public transportation was suspended and all outdoor businesses closed. Through a centralized effort on behalf of the government,

food, medicine, and supplies were deployed and distributed to all residents by community committees. As hospitals became overwhelmed in Wuhan, 2 emergency field hospitals with approximately 2400 beds and 10 mobile hospitals were constructed in 10 days.<sup>5</sup> In addition, other provinces dispatched multiple teams of over 42,600 medical staff to help frontline workers in Wuhan.<sup>5</sup>

Other measures such as the "grid closed management" allowed only 1 resident from each household to venture outside of the community every 2 days, and Health Code (a QR color code displaying the individual's health status) allowed for rapid contact tracing and isolation.<sup>5</sup> After 76 days, China lifted the lockdown and allowed Wuhan residents to return to work. As of February 1, 2021, there were 101,039 confirmed cases in China and 4826 deaths (case fatality rate 4.8%).<sup>6</sup>

In the heavily affected regions, dermatologists were redeployed to care for patients with COVID-19; others helped analyze COVID-19 swab tests and served as consultants at fever clinics.<sup>7</sup> Dermatologists also stepped into an educational role, guiding health care workers on how to manage and prevent skin injuries from personal protective equipment (PPE) and educating the public on knowing which types of skin disorders must be seen urgently.<sup>7,8</sup>

Skin manifestations of COVID-19 were not common during this time. In fact, only one multicentered study focused on cutaneous manifestations of Chinese patients infected with COVID-19. Of the 586 Chinese patients and 92 Italian patients in the study, 53 patients (7.8%) had new skin manifestations detected at admission or during hospitalization. Among the 53 patients, the most common skin finding related to COVID-19 was erythematous rash (70%), such as macular, papular, maculopapular, and erythema multiforme-like eruptions, followed by diffuse urticaria (26%) and scattered vesicular, varicelliform eruptions (4%).<sup>9</sup> In contrast to findings in Western nations but consistent with those seen in other Asian countries, there was a lack of chilblainslike lesions among SARS coronavirus 2 (SARS-CoV-2)-positive patients; this may be because pernio is quite common in the region during winter, so frontline physicians may have overlooked those lesions to focus on respiratory issues. Another explanation may be genetic differences among various populations. Lipoprotein A, a major player in thrombo-occlusive vasculopathy, and factor V Leiden mutations are lower among people of Asian descent compared with those of European descent.<sup>10</sup> These differences may partly explain



**Fig. 1.** Map of the international perspectives represented. In this article, 11 countries (China, Thailand, United States, Singapore, Australia, Spain, Israel, Italy, Brazil, South Africa, and Peru) contributed their insights on the impact of COVID-19 on the field of dermatology.

the lack of chilblainslike lesions among patients with COVID-19 in Asia.

Teledermatology was widely used throughout this period, and hospitals advertised telemedicine services on social media. At the Peking Union Medical College Hospital, 618 teleconsultations were received in the first week alone.<sup>11</sup> Most issues revolved around treatment adjustment of severe diseases (bullous pemphigoid, systematic lupus erythematosus, etc) and management of common, chronic, and refractory diseases (eczema, acne, dermatitis, etc). The incidence of pet-related dermatophytosis and irritant contact dermatitis also increased.<sup>12</sup>

Despite the overall success of teledermatology, its expansion exacerbated existing disparities. For instance, some patients with skin conditions

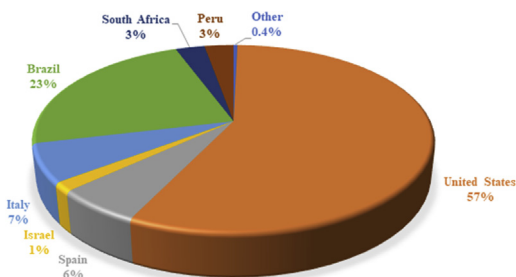
experienced delays in medication adjustment, which resulted in side effects, because they lived in rural areas with unreliable Internet connection or were more elderly with limited Internet literacy.

### Thailand

Thailand was the first country outside of China to report a new case of COVID-19 on January 13, 2020.<sup>3</sup> The number of cases increased exponentially until mid-April 2020, but a second wave emerged in mid-December 2020. As of March 18, 2021, there were 27,494 confirmed cases, 89 (0.32%) deaths, 26,377 (95.93%) recovered patients, and 61,791 vaccinated people as reported by the Department of Disease Control, Ministry of Public Health, Govt. of Thailand.<sup>13</sup>

Following the initial outbreak, the Thai government imposed the National Emergency Decree on March 26, 2020.<sup>14</sup> Travel restrictions, physical distancing, and working from home were mandated. Most hospitals discharged their inpatients and reassigned intensive care units and wards for COVID-19 cases. Outpatient departments also minimized their appointments to reduce hospital crowding and conserve PPE. Moreover, the Department of Disease Control widely broadcasted updated protocols on managing COVID-19 among health care professionals and the general population.

Many dermatologists in Thailand worked alongside frontline physicians, especially at designated areas, to screen potential COVID-19 cases. The



**Fig. 2.** Distribution of COVID-19 cases among the 11 countries as of March 31, 2021. The Other category includes Thailand, China, Singapore, and Australia. (Data from [www.worldometers.info/](http://www.worldometers.info/))

Faculty of Medicine Ramathibodi Hospital at Mahidol University is an advanced referral center in Bangkok and was converted into a pandemic response center (Ramathibodi Chakri Naruebodindra Hospital) for accepting COVID-19 cases referred from various regions. Dermatology consults decreased significantly, and all nonessential procedures were postponed. Apart from serving on the frontlines, dermatologists also educated their colleagues and patients regarding skin problems associated with preventive measures such as irritant contact dermatitis from hand hygiene and pressure-related symptoms due to PPE usage.

Dermatologists were often consulted for cutaneous problems in hospitalized patients with COVID-19 through in-person visits and inpatient teledermatology. At the Ramathibodi Chakri Naruebodindra Hospital, 5 of 218 (2.3%) COVID-19 cases manifested skin lesions, including maculopapular eruption ( $n = 3$ , 1.4%), urticaria ( $n = 2$ , 0.9%), and petechiae ( $n = 1$ , 0.5%). The findings are consistent with a previous study in Thai individuals but showed lower incidence than another study that used telephone interviews.<sup>15,16</sup> Unlike reports from other Western countries, there have been no reported chilblainslike lesions among SARS-CoV-2-positive Thai patients.<sup>17,18</sup> Thailand's tropical climate and/or genetic differences between racial groups may explain this discordance. Notably, clinicians were cautious about misdiagnosing dengue fever as COVID-19 because both can initially present with fever and petechiae and dengue is endemic in Thailand.<sup>18</sup>

The lack of adequate telecommunication infrastructure and unclear legal status of telemedicine rendered teledermatology challenging in Thailand.

Therefore, dermatologists mainly conducted telephone consultations for patients with a prior confirmed diagnosis to assess clinical progression. At present, the Ministry of Public Health is actively working to address technical problems and medicolegal liabilities. The significant challenges posed by the pandemic have served as a wake-up call for Thailand to improve its health care systems for the well-being of its current population and future generations.

### United States

With its leaders initially dubious about the gravity of the COVID-19 outbreak, the United States missed opportunities to act swiftly, allowing the coronavirus to gain a foothold since the country's first case on January 19, 2020, in Washington state.<sup>19</sup> Slow decision making, fueled in part by partisan politics, resulted in an overall decentralized response. One study showed that if the United States had enacted control measures just 1 week earlier, the nation could have prevented more than 35,000 COVID-19 deaths.<sup>20</sup> By April 7, 2020, New York surpassed Italy to become the global epicenter with 138,836 cases.<sup>21</sup> Eventually, poor coordination of containment measures, inability to conduct rapid testing on a grand scale, and tension to restart the economy catapulted the United States to the top as the nation with more cases and deaths than any other country in the world. As of March 31, 2021, more than 31 million people were infected and 564,399 died (Table 1).<sup>22</sup>

COVID-19 exploited existing inequities in the United States. Already disproportionately targeted

**Table 1**  
The COVID-19 landscape in 11 countries as of March 31, 2021

Region/Country	Date of First Case	Cases	Deaths	Case Fatality	Recovered
China	December 12, 2019 <sup>a</sup>	90,201	4636	5.14%	85,385
Thailand	January 13, 2020	28,863	94	0.33%	27,426
United States	January 20, 2020	31,109,108	564,399	1.81%	23,588,100
Singapore	January 23, 2020	60,381	30	0.05%	60,149
Australia	January 26, 2020	29,304	909	3.10%	26,288
Spain	January 31, 2020	3,284,353	75,459	2.30%	3,042,352
Israel	February 21, 2020	833,040	6203	0.74%	819,564
Italy	February 21, 2020	3,584,899	109,346	3.05%	2,913,045
Brazil	February 25, 2020	12,664,058	317,936	2.51%	11,074,483
South Africa	March 5, 2020	1,543,079	52,602	3.41%	1,469,565
Peru	March 6, 2020	1,540,077	51,801	3.36%	1,459,886

<sup>a</sup> Estimated date.

Data from [www.worldometers.info](http://www.worldometers.info).

by the virus, the elderly faced stricter lockdowns, loss of social support, and a digital divide.<sup>23</sup> Women were more likely to be underemployed and shoulder caregiver burden while facing increasing rates of domestic violence.<sup>24,25</sup> Blacks, Latinos, and Native Americans were approximately 3 to 4 times more likely to be hospitalized with COVID-19 and approximately 2 times more likely to die of COVID-19 than white, non-Hispanic individuals, whereas Asians and Asian Americans faced a surge of racist and xenophobic abuse.<sup>26–30</sup>

On the frontlines, a surge of critically ill patients and shortage of hospital staff required rapid reassignment of physicians to new roles. In the United States, dermatologists worked alongside internists in COVID-19 wards and described some of the initial cutaneous manifestations of COVID-19, including morphologies such as morbilliform, pernio-like, urticarial, macular erythema, vesicular, papulosquamous, and retiform purpura.<sup>31</sup> Pernio-like lesions were associated with a milder COVID-19 course, whereas retiform purpura were only seen in severe cases.<sup>31</sup> To further understand and characterize the relationship between the virus and skin, researchers in the United States created the American Academy of Dermatology COVID-19 and International League of Dermatologic Societies COVID-19 Registry to collate cases of COVID-19-associated cutaneous manifestations from around the world, with more than 2000 case entries from 52 countries by the end of March 2021.<sup>32</sup>

The pandemic also transformed dermatology practice in the United States. During the pandemic, teledermatology became the primary means of delivering care. In contrast, before the pandemic, only 15% of dermatologists worked in a practice that used telemedicine in 2016.<sup>33</sup> In response to the pandemic, the Centers for Medicare and Medicaid Services (CMS) and other private payers have also expanded telehealth coverage.<sup>34</sup> Coupled with findings that teledermatology is an effective and reliable means of care delivery, it is likely that telemedicine will remain a major feature of patient care in dermatology.<sup>35,36</sup>

Guidelines for how to provide treatment of patients living with other skin conditions during the pandemic evolved during the past year.<sup>37</sup> Initially, many dermatologists engaged in difficult conversations with their patients regarding the use of biologics in the setting of COVID-19 with limited data. It was not until December 2020 that the National Psoriasis Foundation released guidance for the management of psoriasis during the pandemic.<sup>38</sup> Patients with cutaneous T cell

lymphoma requiring photophoresis and those with psoriasis needing phototherapy experienced treatment disruptions. Patients at high risk for skin cancer also experienced delays in routine care.<sup>39</sup>

### Singapore

Singapore reported its first case on January 23, 2020.<sup>40</sup> Having learned from the SARS outbreak in 2003, Singapore instituted border control measures in the first week of January 2020. This swift response prevented the deluge of hospitalized patients with COVID-19 seen in other nations. After the SARS epidemic, Singapore created a disease outbreak plan called the color-coded Disease Outbreak Response System Condition (DOR-SCON), which raised national awareness of the necessity of coordinated efforts during an outbreak.<sup>41</sup> Therefore, residents were already more prepared and receptive to restrictions. In addition to border control, Singapore also scaled up rapid testing, contact tracing, and isolation to contain the pandemic. In April 2020, Singapore initiated the Circuit Breaker—a series of significantly stricter measures to curb widespread community transmission. In March 2021, Singapore has a case fatality rate of 0.05% and fewer than 20 new cases per day.

Many dermatologists volunteered to care for the acutely ill in COVID-19 wards, whereas others reduced in-person clinic sessions and turned to telemedicine. Teledermatology was a relatively new concept for Singapore in early 2020, and most patients, unaccustomed to this new platform, preferred face-to-face visits. To incentivize its usage, patients were offered fee reductions if they opted for teledermatology. According to dermatologists in Singapore, COVID-19-associated skin findings were uncommon. There were early case reports of maculopapular exanthem, skin conditions from prolonged PPE usage, and hand dermatitis, but chilblainslike lesions were rare.<sup>42</sup>

### Australia

Australia confirmed its first case in late January 2020.<sup>43</sup> Two months later, the country ordered a national lockdown and restricted all international, interstate and, in some cases, intrastate travel. With a population of 25 million divided into 6 states and 2 territories, Australia reported approximately 29,000 COVID-19 cases with 909 deaths (3% case fatality rate) at the time of writing, in early March 2021.<sup>44</sup> Victoria, the most severely affected state, had 4-fold the number of cases compared with other states and 75% of the fatalities.<sup>45</sup> Victoria's capital city, Melbourne, suffered a second wave

in late June 2020, resulting in 18,000 infections and more than 800 deaths.<sup>46</sup> In response, Victoria issued a second lockdown on July 9, 2020, that lasted for 112 days.<sup>47</sup> The lockdown, one of the world's strictest, involved curfews, closure of all schools and nonessential businesses, mask wearing, and travel restrictions. The aggressive measures allowed Melbourne to descend from a daily caseload of approximately 725 to zero cases in late October 2020.<sup>46,48</sup>

The experiences of dermatologists varied from state to state. Most in private practice used a mixture of telehealth and in-person visits, with the latter reserved for urgent cases. Before COVID-19, there were approximately 150,000 teler dermatology consultations in Australia per year.<sup>49</sup> In 2020, its usage increased by nearly 24-fold.<sup>50</sup> However, teler dermatology remains challenging because there are often technical issues, and it can be difficult to use with elderly and non-English-speaking patients. Telehealth was most useful in the follow-up of inflammatory skin diseases such as acne and psoriasis. Patients with skin cancer often had to attend face-to-face appointments for tissue biopsies after the initial teler dermatology assessment. One of the many advantages of teler dermatology was that it afforded patients in remote locations increased access to expert skin care. Ultimately, the shift to telehealth corresponded to a 32% drop in the number of samples sent for pathologic testing.<sup>51</sup> In Victoria, there was a 10% reduction in the number of cancer diagnoses throughout this period, leading to an estimated 2530 undiagnosed cancers.<sup>52</sup> Melanoma, in particular, had a 13% drop in diagnosis with an estimated 511 undiagnosed melanomas.<sup>52</sup> Dermatologists anticipate an increase in skin cancer diagnoses in 2021. Aside from an increase in hand dermatitis and mask-induced acne and rosacea, there are few reports of cutaneous manifestations in Australian patients with COVID-19. In addition, unlike many other countries, dermatologists were not deployed to the frontlines.

### **Spain**

Spain's first official case of COVID-19 was reported on January 31, 2020. Exactly 2 months later, there were more than 85,199 cases and 7424 deaths, surpassing that of mainland China.<sup>53</sup> During the height of the pandemic in late March 2020, Spain had a case fatality rate of 6.16%. Over the course of the year, the nation experienced 3 major waves of infection. The first wave marked the beginning of the pandemic, the second major wave occurred around early November,

and the third wave spiked around late January 2021.<sup>54</sup> At the time of writing (March 24, 2021), there have been a total of 3,183,704 confirmed cases and 72,258 deaths in Spain.<sup>54</sup>

Despite the creation of a Centre for Coordination of Health Alerts and Emergency in 2004, the pandemic exposed the fragility of Spain's governance, medical workforce, and health care delivery. In addition to understaffed and underresourced health services, Spain had the lowest nurse to patient ratio in the European Union.<sup>55</sup> Perhaps unsurprisingly, given the importance of regional autonomy in Spain, there was a lack of strong, centralized effort aimed at mitigating the pandemic.<sup>55</sup> Regional disparities were also pronounced when analyzed by socioeconomic characteristics; there was significant negative correlation between mean income and COVID-19 incidence rate.<sup>56</sup>

Dermatologists in Spain were mobilized to manage patients on the COVID-19 wards and included in treatment committees because their expertise on managing the cytokine storm and perspectives on immune function proved invaluable.<sup>57</sup> Dermatologists were also consulted on skin lesions associated with the novel virus. From an analysis of 375 patients in Spain with COVID-19 and unexplained skin findings, 5 major patterns emerged: pseudo-chilblains on acral areas, vesicular eruptions, urticaria, other maculopapules, and livedo or necrosis—each with associated demographics and prognoses.<sup>58</sup> Pseudo-chilblains and vesicular eruptions were associated with younger patients and better prognosis, whereas urticaria and maculopapular lesions were seen in older patients with more severe disease.<sup>58</sup> Livedoid or necrotic lesions were more variable but were typically seen in older patients and associated with a 10% mortality rate.<sup>58</sup> These patterns suggest the activation of multiple pathways in COVID-19 infection.

Unlike many of its counterparts, Spain had a robust teler dermatology program before the pandemic, with 25% of hospitals using teler dermatology in 2014.<sup>59</sup> Therefore, despite the associated challenges such as delayed diagnosis of skin cancers, dermatologists in Spain were overall more accustomed to this technology and welcomed it as a new means to facilitate patient care.<sup>60</sup>

### **Israel**

Following the first case of COVID-19 in Israel on February 21, 2020, the Israeli Ministry of Health implemented aggressive containment measures amid political unrest.<sup>61</sup> After these restrictions were relaxed in May 2020, Israel saw a viral

resurgence that forced the nation into a second lockdown in September 2020.<sup>62</sup> The nation entered its third lockdown in January 2021. At the time of writing in April 2021, there were 836,334 COVID-19 cases and 6309 deaths among the country's 9 million inhabitants.<sup>63</sup>

Israel managed the pandemic in the midst of a constitutional crisis. Members of parliament struggled to work cohesively, and an interim prime minister sometimes made critical decisions regarding the pandemic without consulting his cabinet.<sup>64</sup> At the same time, Israel's health care system was already under strain from lack of resources even before the pandemic.<sup>65</sup> To address the limited intensive care unit capacity and PPE shortages, Israel enforced travel restrictions, shuttered schools and nonessential businesses, and mandated local and national curfews. Sick contacts were traced through mobile phone surveillance. However, compliance with these measures came at a high price for many. A multiethnic country, Israel has a significant number of individuals living in poverty, particularly among the Arab and ultra-Orthodox Jewish populations.<sup>66</sup> These 2 communities experienced double the incidence of COVID-19 compared with groups of higher socioeconomic status.<sup>66</sup>

One unique aspect of Israel's COVID-19 management is the unprecedented efficiency of its vaccine rollout. The Israeli government approved the BNT162b2 COVID-19 vaccine (manufactured by Pfizer, Pfizer-BioNTech) and initiated the national immunization campaign on December 20, 2020. Individuals aged 60 years and older were prioritized, including nursing home residents, people at high risk due to medical conditions, and frontline health care workers.<sup>67</sup> Israel's 4 large, competing, nonprofit health plans also scheduled hundreds of thousands of vaccination appointments for their members in a short period. By February 2021, 84% of those aged 70 years and older had received both doses of the vaccine, and the ratio of patients with COVID-19 aged 70 years and older requiring mechanical ventilation to those younger than 50 years declined 67% from October–December 2020 to February 2021.<sup>68</sup>

COVID-19 also changed dermatology practice in Israel. At several medical centers, residents were redeployed to COVID-19 emergency departments. Outpatient clinics moved online, and although in-person visits were permitted for those needing phototherapy and/or urgent dermatologic care, many hesitated to attend their appointments. One study showed that among dermatologic patients in Emek Medical Center, more than 50% of patients stopped phototherapy treatment from March 1, 2020, to April 30, 2020, for fear of contracting

COVID-19.<sup>69</sup> During this time, teledermatology was widely used for nonurgent consultations, expanding access to care and facilitating new collaborations. A group of independent dermatologists from Israel and Canada also established the "International Dermatologists Fighting Coronavirus Together," a collective effort enabling rapid transfer of knowledge and insights among clinicians regarding COVID-19's impact on the skin.

### Italy

Although the country's first case of COVID-19 was officially registered in February 2020, Italy's patient zero may have been a young dermatology patient who presented with urticarial plaque-like dermatosis on the arms and a mild sore throat in November 2019.<sup>70</sup> The recent retrospective study confirmed the presence of SARS-CoV-2 in a biopsy done at that time, suggesting that the virus may have circulated surreptitiously for months before the first case was reported.<sup>70</sup>

Since then, the number of cases in Italy has soared exponentially. The hardest hit areas were initially in northern Italy, with Lombardy at the epicenter reporting the highest number of cases. As the medical and humanitarian emergency unfolded, it became clear that a shift from patient-centered to community-focused care was required to battle the pandemic. Stringent lockdowns were issued, and the Italian National Health Service expanded intensive care units and converted entire medical units into COVID-19 wards. At the time of writing (March 13, 2021), Italy has reported 3,164,484 cases, 100,459 deaths (3.2% case fatality rate), and 2,343,087 recoveries.<sup>71</sup>

Initially, dermatologists in Italy were redeployed to the frontlines, where they directly cared for patients with COVID-19 on the wards and in triage stations.<sup>72</sup> The biggest challenge was lack of PPE.<sup>73</sup> Before long, dermatologists were sought for their expertise on novel findings among coronavirus patients. The first reports of cutaneous manifestations of COVID-19 emerged from Italy. According to a study using data from 345 infected patients in Lombardy, the skin findings can be classified into 3 main groups: exanthems, vascular lesions, and other cutaneous manifestations.<sup>74</sup> Exanthems, characteristic of an early viremic phase, were the most common (67.3%)<sup>74</sup>; they included maculopapular rash, urticarial rash, vesicular rash, and erythema multiforme eruptions. Vascular lesions were the second most commonly reported and included vasculitic lesions in more severely affected patients and chilblains-like lesions.<sup>74</sup> The latter were mostly seen in young patients and



portended a good prognosis. The third group, other cutaneous manifestations, included alopecia (particularly telogen effluvium) and indirect cutaneous manifestations such as herpes simplex, zoster, and drug reactions. Aggravation of pre-existing skin conditions due to PPE and hand hygiene was also common.

Scarcely used before the pandemic, teledermatology became the new means of diagnosing, treating, and following up with patients. However, the quality of photographs was frequently inadequate and the lack of proper physical examination and dermoscopy made it difficult to diagnose pigmented and nonpigmented lesions.<sup>75</sup> Furthermore, second-order analysis such as biopsies and swabs could not be performed. Most impacted were dermatologic oncology patients. The diagnosis of skin cancers was delayed and surgical excisions were postponed, resulting in an increased incidence of advanced skin cancer with poorer prognoses.<sup>76</sup>

As the pandemic evolved, dermatologists adapted. Initially, dermatology consultations decreased drastically by 80% to 90% in Italy, and many private clinics closed.<sup>73</sup> By 2021, many dermatologists in Italy have been redeployed again, this time to administer COVID-19 vaccinations.

### **Brazil**

Brazil announced its first COVID-19 case on February 25 in Sao Paulo.<sup>77</sup> Since then, more than 12 million confirmed cases have been registered with more than 301,000 deaths.<sup>78</sup> At the height of the pandemic during the first wave, Brazil had a case fatality rate of 5.68%, likely due in part to a greater elderly population (13.5%).<sup>79</sup> Between September and December 2020, cases dipped slightly, but in January 2021, a new outbreak of SARS-CoV-2 variants erupted in the city of Manaus.<sup>80</sup> At the time of writing, in March 2021, Brazil is facing one of the worst waves in the pandemic yet, with more than 2000 deaths per day.<sup>80</sup>

COVID-19 spotlighted deep-rooted social, ethnic, and economic disparities. For instance, “favelas,” or low-income urban conglomerates, comprise a significant portion of the population in some regions, and these communities often lived in close quarters with little access to financial support or medical care.<sup>81</sup> The Brazilian health system consists of a public system that provides universal care to all residents and a private system funded by individual and corporate contributions. Most Brazilian inhabitants rely exclusively on the public infrastructure, which was already deficient before the pandemic.

During the first peak, many dermatology residents were redeployed to the frontlines. Beds for patients with skin disease were drastically reduced in favor of COVID-19 cases. At the University of São Paulo Medical School Hospital, the largest referral center in Brazil, a group of experienced dermatologists was fully dedicated to evaluating hospitalized patients with COVID-19 from April to July 2020. Linear blisters and ulcerations presenting in unusual pressure sites were a common finding in patients treated with prone ventilation. In Brazil, there was no evidence of specific cutaneous manifestations in critical patients that could definitively be attributed to SARS-CoV-2 infection.<sup>82</sup> Since then, a minority of mild cases demonstrating exanthema, urticaria, pruritus sine materia, vasculitis, and telogen effluvium have been observed and could arguably be related to COVID-19.<sup>3</sup>

Outpatient clinic visits dropped from March to August 2020 and then increased again until the current wave of infection as of March 2021. Interruption of dermatology referrals and a lack of medication for chronic and infectious diseases such as leprosy prevented quality care. Flares in patients with eczema, pemphigus vulgaris, psoriasis, and other diseases were common, leading to an increase in demand for hospitalization. The delay of surgical excisions and routine appointments also impacted proper diagnosis and treatment of cutaneous lymphoma, melanoma, and other skin cancers.

Teledermatology became an important tool, especially in the care of chronic patients in private clinics. Nevertheless, the lack of technological infrastructure in the hospital and patients' houses made it challenging for teledermatology to achieve popularity.

### **South Africa**

South Africa, the epicenter of Africa's outbreak, confirmed its first case on March 5, 2020.<sup>83</sup> Although only accounting for 5% of Africa's population, South Africa comprised 54% of total cases and 44% of deaths in the WHO African region by the end of 2020.<sup>84</sup> Although South Africa had a high infection rate, there was an unusually lower death rate compared with some European nations, likely due to early aggressive lockdown measures and a much younger average age. In December 2020, a more contagious new variant 501Y.V2 emerged. By March 12, 2021, the country with its population of 59 million had 1.53 million confirmed cases and 51,261 deaths.<sup>85</sup>

As a country that champions human rights, South Africa is a popular destination for asylum seekers and refugees. This already vulnerable

population was disproportionately impacted in the pandemic. In addition to already weakened social support and isolation, many foreign-born migrants in South Africa are business owners but most of their businesses are not considered for the Business Relief Fund because to qualify, the businesses must be majority South African owned.<sup>86</sup> Migrants who were employed in the formal sector were also not eligible to receive Unemployment Insurance Funds due to the electronic system's inability to recognize foreign passport numbers.<sup>86</sup> Patient populations such as those with human immunodeficiency virus and tuberculosis were also impacted because hospitals reduced nonurgent admissions and impeded access to chronic medications.<sup>87</sup>

Income-related health inequalities were also exacerbated. Approximately 84% of South Africans depend on an underresourced and overcrowded public health sector, whereas the rest are attended to by a private sector.<sup>88</sup> Huge disparities exist between the 2 tiers. During the height of the pandemic in 2020, the average COVID-19 test turnaround time in the private sector was 24 to 48 hours compared with 12 days in the public sector.<sup>89</sup> This difference had a major impact on patients who were admitted to the hospital, including patients with skin disorders, such as patients with pemphigus who had to remain in an isolation ward until the results were negative before they could begin pulse therapy.

Dermatologists took advantage of teledermatology and attended educational seminars on telemedicine. In March 2020, the government published a set of Telemedicine Guidelines to help practitioners navigate the unfamiliar realm of virtual consults.<sup>90,91</sup> In the beginning, live video was popular. Over time, the store-and-forward method of patients taking photographs to send to their dermatologists became preferred for its flexibility. Access to Internet and electronics remained a challenge in poorer communities, likely further accentuating disparities. The most common skin manifestations of COVID-19 seen in South Africa included urticaria, erythema multiforme-like lesions, and vasculitis, as well as papular, morbilliform, and vesicular eruptions. Chilblains ("COVID toes") were also common, although most reports came from Johannesburg in the winter and many were never tested for COVID-19. Hand dermatitis, perioral dermatitis, and postinflammatory hyperpigmentation in skin of color due to irritation from the N95 mask were also common.

## Peru

In the southern hemisphere, Peru confirmed its first case, a young man returning from Europe,

just days before the WHO declared COVID-19 a pandemic.<sup>92</sup> With growing international alarm, Peru closed its borders on March 16, 2020. By April 15, 2020, there were 11,475 cases and 254 deaths in the nation, with 8412 cases in Lima alone.<sup>92</sup> Since then, Peru has experienced 2 major waves of infection, and at the time of writing (March 3, 2021), 1,349,847 cases and 47,306 deaths (3.5% case fatality rate) have been reported.

Although Peru was lauded for rapidly implementing comprehensive control measures, the country's transmission rate remained high, and as of June 2020, Peru's mortality rates were among the highest internationally.<sup>93</sup> Together with the shortcomings of the Peru health care system, the pandemic exposed deeply ingrained gender, socioeconomic, and ethnic inequalities. For instance, limited oxygen supplies forced some relatives of patients with COVID-19 to buy oxygen at exorbitant prices on the open market, whereas those with fewer means had to do without.<sup>93</sup> The indigenous communities, which had already been ravaged by a dengue outbreak right before the pandemic, were more heavily impacted given challenges with maintaining sanitary conditions and lack of access to medical care.<sup>93</sup>

With the overwhelming number of COVID-19 cases and shortage of physicians, younger dermatologists were sent to the frontlines, where many encountered several COVID-19 skin manifestations, such as urticaria and morbilliform eruptions. In outpatient settings, the most common consultations were telogen effluvium, perioral dermatitis, and irritant contact dermatitis of the hands in addition to a significant number of chilblainslike cases. Teledermatology was widely used to manage common pathologic conditions such as acne, eczema, and mild to moderate psoriasis but was less suitable for evaluation of pigmented lesions. Those with pemphigus and other bullous diseases requiring close monitoring were often lost to follow-up, forcing some dermatologists to temporarily reopen their clinics for patients with severe skin conditions. Other aspects of dermatologic patient care remained the same. Dermatology consult services for endemic infectious diseases such as leishmaniasis remained robust in Peru. At the time of writing, in March 2021, most hospital-based dermatologists continue to rely on telemedicine.

## SUMMARY

COVID-19 knows no borders. During an international medical crisis, the global perspectives and insights from those in our field are invaluable. For

instance, the regional differences observed in regard dermatologic manifestations of COVID-19, such as pemio-like lesions, could provide insight into various pathogenic mechanisms of COVID-19. Furthermore, it seems that a hybrid of teledermatology and in-person visits may be most ideal to reduce contact and potential transmission while also ensuring timely diagnosis and treatment of urgent skin disorders. Although responses to the pandemic varied depending on government leadership, culture, and resources, the lessons learned and experiences of dermatologists during this time can serve as a guidepost to help our field address new challenges as cases continue to escalate in parts of the world.

### CLINICS CARE POINTS

- Dermatologists around the globe have played a significant role in the COVID-19 pandemic, from adopting teledermatology and restructuring clinics to serving on the front lines and identifying new skin manifestations of SARS-CoV-2 infection.
- COVID-19 has also impacted the care of dermatologic patients around the world, resulting in delays in skin cancer management and decreased usage of phototherapy for inflammatory diseases.

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