

ORIGINAL PAPER

Dermatology

The effect of the COVID-19 pandemic on dermatology consultation requests from adult and paediatric emergency departments

Neslihan Demirel Ögüt^{1,2} | Gülsün Hazan Tabak¹ | Duygu Gülseren¹ |
Başak Yalıcı-Armağan¹ | Neslihan Akdoğan¹ | Sibel Doğan¹ | Gonca Elçin¹ |
Ayşen Karaduman¹ | Sibel Ersoy Evans¹

¹Department of Dermatology and Venereology, School of Medicine, Hacettepe University, Ankara, Turkey

²Department of Dermatology and Venereology, Uşak University Training and Research Hospital, Uşak, Turkey

Correspondence

Neslihan Demirel Ögüt, Department of Dermatology and Venereology, Uşak Training and Research Hospital, Hacettepe University, Ankara, Turkey.
Email: neslihandemirel459@gmail.com

Funding information

The authors did not receive any funding sources.

Abstract

Aim: This study aimed to determine the characteristics of dermatology consultation requests from the adult and paediatric emergency departments (EDs) of a university hospital during 8 months of the COVID-19 pandemic in 2020 and to compare them with the same 8 months of 2019.

Materials and Methods: Electronic medical records of dermatology consultation requests from adult and paediatric EDs between 15 March 2019 and 15 November 2019, and between 15 March 2020 and 15 November 2020 were retrospectively reviewed.

Results: The study included 495 consecutive dermatology consultation requests. In total, 283 (57%) consultation requests occurred in 2019, vs 212 (43%) between in 2020 during the COVID-19 pandemic. The number of consultation requests per day was significantly lower in 2020 (0.9 ± 0.1 per day) than in 2019 (1.15 ± 0.1 per day; $P = .002$), and was significantly lower in March, April and May 2020, as compared with March, April, and May 2019 ($P = .004$, $P = .001$, and $P = .001$, respectively). The median time from onset of dermatological symptoms to ED presentation was significantly longer in 2020 than in 2019 (4 days in 2019 vs 7 days in 2020; $P < .001$). Dermatological emergencies in 2019 and 2020 constituted 6.7% of all emergency presentations, with no significant difference between the 2 years (7.1% of all ED presentations in 2019, vs 6.1% in 2020; $P = .795$).

Conclusion: COVID-19 restrictions and fear of COVID-19 infection might have discouraged patients from presenting to EDs because of skin problems; however, the easing of COVID-19 restrictions might lead to an increase in ED presentations, including non-urgent dermatological disorders. In order to reduce unnecessary use of EDs and prevent ED overcrowding, the general public should be educated about what constitutes a dermatological emergency.

1 | INTRODUCTION

The World Health Organization (WHO) recognised the COVID-19 outbreak as a pandemic on 11 March 2020.¹ The first COVID-19 case in Turkey was reported on 15 March 2020 and by 15 November 2020 there were 415 000 cases and 11 500 deaths.² Turkey took some measures to prevent and control the COVID-19 pandemic, such as a limited lockdown for those aged >65 years and <20 years that began on 19 March 2020. Moreover, a weekend lockdown for everyone in Turkey has been imposed intermittently since 11 April 2020.³ In June 2020, Turkey began easing these COVID-19 restrictions as the spread of the virus slowed, and by the end of November 2020 control measures consisted almost exclusively of mandatory social distancing and mask wearing, and personal hygiene.⁴

Patient presentations to emergency departments (EDs) because of dermatological disorders constituted approximately 10% of ED presentations worldwide before the COVID-19 pandemic.⁵ COVID-19 lockdown measures and fear of infection have led to a decrease in the number of patients presenting to EDs.⁶ Although dermatology outpatient clinics continued to work during the COVID-19 pandemic, the number of patients has decreased because of COVID-19 lockdown measures and fear of infection.⁷⁻⁹ As such, the present study aimed to determine the number and characteristics of dermatology consultation requests from the adult and paediatric EDs of a university hospital during 8 months of the COVID-19 pandemic in 2020 and to compare them with the same 8 months of 2019.

2 | MATERIAL AND METHODS

Electronic medical records of dermatology consultation requests from the paediatric ED (PED) and adult ED (AED), and the medical records of patients that presented to the PED and AED with dermatological complaints were retrospectively analysed. The study was conducted at Hacettepe University Hospital, Ankara, Turkey, which is a tertiary care training hospital. Consecutive dermatology consultation requests from the PED and AED during the 8-month period of 15 March to 15 November of 2019 and 2020 were reviewed.

The hospital's dermatology department operated adult and paediatric outpatient dermatology clinics between 0830 and 1700 before the COVID-19 pandemic, but after the first COVID-19 case was reported in Ankara on 15 March 2020 the dermatology outpatient clinic only saw patients with urgent conditions; however, dermatology consultation for the PED and AED remained available 24/7.

The study included dermatology consultation requests from the PED and AED with data sufficient for analysing clinical variables. Patient demographic data, date and hour of presentation, extent of lesions (localised or generalised), type of skin lesions (macule, patch, papule, plaque, vesicle, bulla, nodule, pustule, ulcer, erosion, petechia/purpura, excoriation, erythroderma, angioedema), symptoms (pruritus, burning, pain, asymptomatic), time from onset of symptoms to ED presentation, time from ED presentation and

What's known

- Patient presentations to emergency departments (EDs) because of dermatological disorders constitute a significant part of ED presentations worldwide.
- The COVID-19 pandemic has led to changes in patients' use of healthcare system and EDs.

What's new

- Restrictions and fear of COVID-19 infection might have discouraged patients from presenting to EDs because of skin problems as the COVID-19 pandemic began; however, the ease in restrictions has led to an increase in patient presentations to EDs with even non-urgent dermatological disorders.
- In order to reduce inappropriate use of emergency departments and prevent overcrowding in EDs, public should be educated about dermatological emergencies.

dermatology consultation, final diagnosis by a dermatologist and the need for hospitalisation were recorded. Acute and life-threatening dermatological disorders, such as angioedema, severe drug reactions, extensive bullous disorders, erythroderma and pustular psoriasis with metabolic complications, were accepted as true dermatological emergencies.¹⁰ The Hacettepe University Institutional Review Board approved the study protocol [05.01.2021, GO 21/49].

Data were analysed using IBM SPSS Statistics for Windows v.23.0 (IBM Corp., Armonk, NY). Categorical data are presented as frequency and percentage, and continuous data are presented as mean \pm SD or median. The Shapiro-Wilk test was used to determine the normality of the distribution of continuous data. Student's *t* test was used to analyse normally distributed data, and the Mann-Whitney U-test was used to analyse data not normally distributed. The chi-squared test or Fisher's exact test was used to compare differences in categorical variables between consultations requests in 2019 and 2020. The level of statistical significance was set at $P < .05$.

3 | RESULTS

In total, 495 dermatology consultation requests from the PED and AED were reviewed, of which 283 (57%) were received between 15 March and 15 November 2019, and 212 (43%) were received between 15 March and 15 November 2020. In all, 94.7% (268 of 283) of the ED presentations in 2019 and 95.3% (202 of 212) of those in 2020 were primarily because of dermatological complaints.

Mean age of the patients in 2019 was 29.8 ± 26.5 years, vs 23.0 ± 23.6 years in 2020 ($P = .003$). The number of patients aged <17 years and >65 years was significantly lower in 2020 than in 2019 ($P = .013$ and $P = .029$, respectively). Patient demographical

data, symptoms and skin lesions (primary and secondary lesions, extension of lesions, mucosa involvement) are shown in Table 1.

The mean number of dermatology consultations per day in 2019 (1.15 ± 0.1) was higher than in 2020 (0.9 ± 0.1 ; $P = .002$). The distribution of dermatology consultations according to month is shown in Figure 1. The mean number of consultations per day was significantly lower in March, April and May 2020 than in March, April and May 2019 ($P = .004$, $P = .001$, and $P = .001$, respectively); however, there were not any significant differences between June, July, August, September, October and November of 2019 and 2020. The percentage of dermatology consultation requests received between 0800 and 1600 in 2020 was significantly higher than in 2019 (52.8% in 2020, vs 39.6% in 2019; $P = .003$), whereas the percentage of consultation requests received between 1600 and 2400 was

significantly lower in 2020 than in 2019 (49.5% in 2019, vs 38.7% in 2020; $P = .017$; Figure 2)

The median time from onset of symptoms and ED presentation was significantly higher in 2020 (7 days) than in 2019 (4 days) ($P < .001$). The time from onset of symptoms to ED presentation was >5 days in 38.1% of presentations in 2019, vs 53.0% of presentations in 2020 ($P = .001$). In total, 41.7% (118 of 283) of the patients in 2019 and 22.3% (47 of 212) of the patients in 2020 first presented to a non-ED physician for their current complaints ($P < .001$). The median time from ED presentation to dermatology consultation request was 13 minutes in 2019, vs 11 minutes in 2020 ($P = .734$).

The final diagnoses in all cases of dermatology consultation requests from the PED and AED are shown in Table 2. Dermatological emergencies constituted 7.1% of all the consulted cases in 2019, vs

TABLE 1 Patient clinical characteristics

	Total (n = 495) n (%)	2019 (n = 283) n (%)	2020 (n = 212) n (%)	χ^2	P*
Gender					
Male	240 (48.5)	130 (45.9)	110 (51.9)	1.718	.190
Age					
Younger than 17 y	246 (49.7)	156 (55.1)	127 (44.9)	6.142	.013
17-65 y of age	194 (39.2)	117 (41.3)	77 (36.3)	1.283	.257
Older than 65 y	55 (11.1)	39 (13.8)	16 (7.5)	4.769	.029
Extension of symptoms					
Localised	298 (60.7)	181 (64.4)	117 (55.7)	3.812	.051
Generalised	193 (39.3)	100 (35.6)	93 (44.3)	3.812	.051
Mucosa involvement	20 (4.1)	19 (6.8)	1 (0.5)	12.151	.000
Skin lesions					
Macule	29 (5.9)	12 (4.3)	17 (8.1)	3.164	.075
Patch	37 (7.5)	16 (5.7)	21 (10)	3.198	.074
Papule	145 (29.5)	58 (20.6)	87 (41.4)	24.957	.000
Plaque	200 (40.7)	108 (38.4)	92 (43.8)	1.438	.230
Nodule	5 (1)	3 (1.1)	2 (1)	0.016	1
Vesicle	104 (21.2)	61 (21.7)	43 (20.5)	0.109	.741
Bulla	37 (7.5)	29 (10.3)	8 (3.8)	7.312	.007
Pustule	31 (6.3)	12 (4.3)	19 (9)	4.637	.031
Petechia/purpura	21 (4.3)	15 (5.3)	6 (2.9)	1.807	.179
Ulcer	14 (2.9)	10 (3.6)	4 (1.9)	1.187	.276
Erosion	8 (1.6)	7 (2.5)	1 (0.5)	3.044	.146
Excoriation	18 (3.7)	9 (3.2)	9 (4.3)	0.399	.528
Erythroderma	1 (0.2)	1 (0.4)	0 (0)	0.749	1
Angioedema	17 (3.4)	9 (3.2)	8 (3.8)	0.129	.720
Symptoms					
Itching	316 (63.8)	169 (59.7)	147 (69.3)	4.861	.027
Burning	49 (9.9)	38 (13.4)	11 (5.2)	9.224	.002
Pain	106 (21.4)	78 (27.6)	28 (13.2)	14.840	.000
Asymptomatic	86 (17.4)	47 (16.6)	39 (18.4)	0.270	.603

Note: Significant P values are shown in bold typeface.

*Chi-square test for comparison between 2019 and 2020.

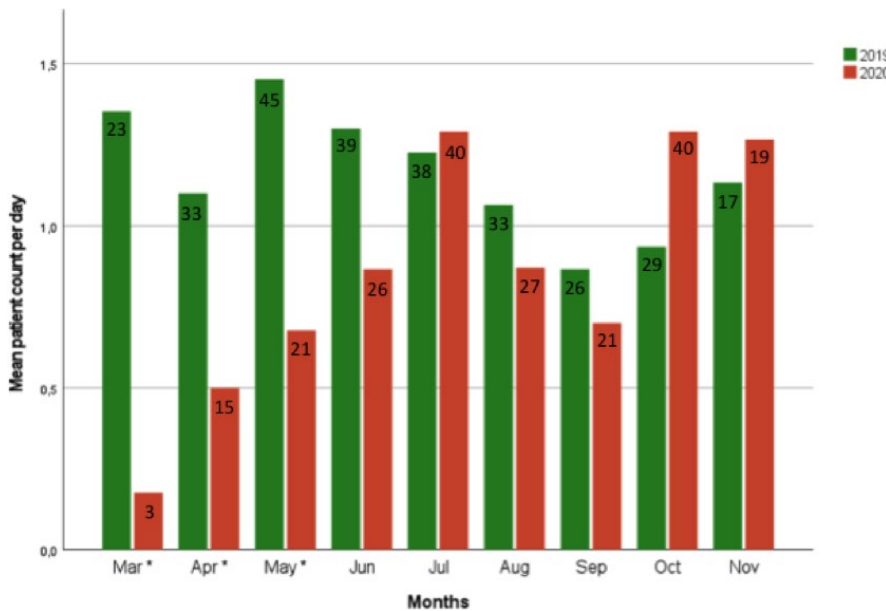


FIGURE 1 Distribution of dermatology consultation requests in 2019 and 2020, according to month. The mean number of ED presentations per day was significantly lower in March, April and May 2019. * $P = .004$, $P = .001$ and $P = .001$, respectively

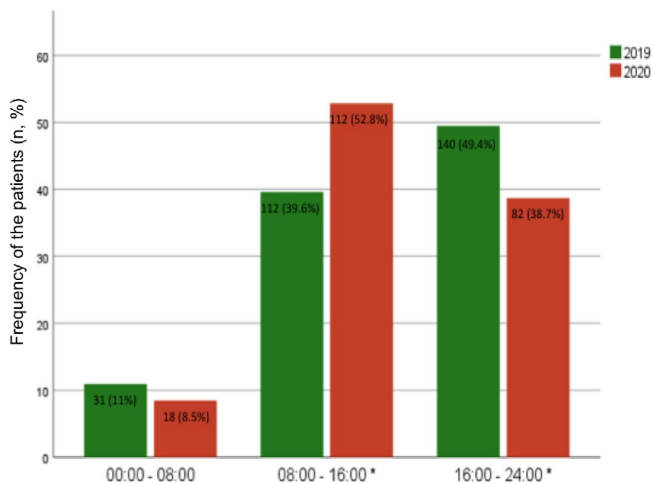


FIGURE 2 The distribution of dermatology consultation requests by the EDs in 2019 and 2020, according to time day. The percentage of dermatology consultation requests received between 0800 and 1600 in 2020 was significantly higher than in 2019, whereas the percentage of consultation requests received between 1600 and 2400 was significantly lower in 2020. * $P = .003$, $P = .017$, respectively

6.1% of all consulted cases in 2020; the difference was not significant ($P = .680$; Table 3). Among the patients, 11.3% (32 of 283) of those in 2019 and 6.6% (14 of 212) of those in 2020 required hospitalisation because of a dermatological disorder ($P = .074$). The final diagnoses in all consulted cases that were hospitalised are shown in Table 4. The three most common dermatological findings that required hospitalisation were vesicles (39.1%), plaques (28.3%) and bullae (15.2%). The frequencies of vesicles and erosions were significantly higher in patients requiring hospitalisation, as compared with those that did not ($P = .002$ and $P = .03$, respectively). In total, four patients (1.9%) with a confirmed diagnosis of COVID-19 were consulted to the dermatology department because of cutaneous

manifestations of COVID-19 during the pandemic. The cutaneous manifestations included maculopapular rash ($n = 2$), urticarial rash ($n = 1$) and varicelliform rash ($n = 1$).

4 | DISCUSSION

The COVID-19 pandemic has had a negative effect on patient access to the healthcare system. The number of ED presentations during the COVID-19 pandemic has decreased significantly in Turkey,¹¹ as it has worldwide.^{12,13} A significant drop in ED presentations because of non-urgent complaints as well as those related to trauma, and cardiovascular and cerebrovascular events have been observed.⁴ The present findings show that the number of presentations to the PED and AED because of dermatological complaints decreased significantly during the COVID-19 pandemic, especially between March and May 2020, as reported elsewhere.^{14,15} The decrease in ED presentations observed in the present study was most pronounced among elderly and paediatric patients, which is thought to be related to the fear of COVID-19 infection and the severity of the disease. Nonetheless, as COVID-19 restrictions in Turkey were relaxed after June 2020, the number of ED presentations increased; therefore, it might be concluded that government-imposed COVID-19 restrictions also had a significant effect on decreasing the number of ED presentations because of dermatological disorders.

In the present study, ED presentations because of dermatological complaints most commonly occurred between 1600 and 2400 before the pandemic, whereas during the pandemic such presentations were more common between 0800 and 1600, which might have been related to the fact that during the pandemic scheduling of appointments for the dermatology outpatient clinic was limited. In addition, the significant decrease in the number of ED patients that had first visited a non-ED physician because of the current dermatological complaint in 2020 was thought to be related to the limited

TABLE 2 Diagnoses of the patients that presented to the EDs with dermatological complaints

	Total (n = 495) n (%)	2019 (n = 283) n (%)	2020 (n = 212) n (%)	χ^2	P*
Herpes zoster infections	51 (10.3)	37 (13.1)	14 (6.6)	5.491	.019
Urticaria with and w/o angioedema	52 (10.1)	36 (12.7)	16 (7.5)	3.451	.063
Contact dermatitis	58 (11.7)	36 (12.7)	22 (10.4)	0.643	.422
Adverse cutaneous drug reactions	35 (7.1)	25 (8.8)	10 (4.7)	3.126	.077
Insect bite	38 (7.7)	22 (7.8)	16 (7.5)	0.009	.925
Scabies	25 (5)	4 (1.4)	21 (9.9)	18.228	.000
Atopic dermatitis	20 (4)	9 (3.2)	11 (5.2)	1.261	.261
Cutaneous vasculitis	18 (3.6)	12 (4.2)	6 (2.8)	0.688	.407
Erizipelas /Cellulitis	10 (2)	7 (2.5)	3 (1.4)	0.686	.527
Superficial fungal infections	17 (3.4)	6 (2.1)	11 (5.2)	3.441	.064
Varicella	7 (1.4)	6 (2.1)	1 (0.5)	2.362	.247
Pityriasis rosea	6 (1.2)	0 (0)	6 (2.8)	8.108	.006
Non-specific viral eruptions	10 (2)	5 (1.8)	5 (2.4)	0.214	.751
Genital ulcer	6 (1.2)	5 (1.8)	1 (0.5)	1.698	.245
Psoriasis	8 (1.6)	5 (1.8)	3 (1.4)	0.094	1
Erythema nodosum	4 (0.8)	3 (1.1)	1 (0.5)	0.523	.639
Miliaria	5 (1)	3 (1.1)	2 (0.9)	0.017	1
Folliculitis	7 (1.4)	3 (1.1)	4 (1.9)	0.594	.468
Herpes simplex infections	6 (1.2)	4 (1.4)	2 (0.9)	0.224	1
Impetigo	9 (1.8)	7 (2.5)	2 (0.9)	1.590	.312
Gianotti-Crosti syndrome	3 (0.6)	3 (1.1)	0 (0)	2.261	.264
Acne vulgaris	3 (0.6)	0 (0)	3 (1.4)	4.029	.078
Pyogenic granuloma	3 (0.6)	0 (0)	3 (1.4)	4.029	.078
Stasis dermatitis	4 (0.8)	1 (0.4)	3 (1.4)	1.705	.318

Note: Significant P values are shown in bold typeface.

*Chi-square test for comparison between 2019 and 2020.

access to dermatology outpatient clinics because of COVID-19 restrictions. Moreover, the government-imposed 2100-0500 lockdown during the pandemic may have played a role in the decrease in the number of ED presentations between 1600 and 2400, as compared with ED presentations between 0800 and 1600.

The incidence of skin lesions in COVID-19 patients was reported to be 1.7%. Skin lesions most commonly present as late manifestations of COVID-19, with a mean delay around 6.8 days.¹⁶ In the present study, four patients (1.9%) with a confirmed diagnosis of COVID-19 were consulted to the dermatology department because of maculopapular, urticarial and varicelliform rash during the pandemic. Furthermore, there were not any significant differences in the percentage of patients that presented to the EDs with urticarial or petechial/purpuric lesions between 2019 and 2020, in contrast with an earlier report¹⁴; however, the present findings show that during the pandemic there was a significant increase in ED presentations

because of pityriasis rosea, which is thought to be a cutaneous manifestation of COVID-19.¹⁷⁻¹⁹ Thus, pityriasis rosea might be associated with COVID-19 because of its increased frequency during 2020 and, therefore, ED physicians and dermatologists should be aware of this potential cutaneous manifestation of COVID-19. Additionally, in the present study the frequency of ED presentations because of scabies infestation was significantly higher during the pandemic, as previously reported from Turkey and other European countries.^{14,20,21}

The desire for rapid evaluation and relief of symptoms that significantly reduce quality of life, such as itching, pain and burning, could be among the reasons for ED presentations because of dermatological complaints.²² Murr et al²³ described "dermatological emergency" as any acute dermatological disorder that develops, and then exacerbates within 5 days. Gupta et al⁸ classified such dermatological disorders as generalised bullous disorders, leprosy reactions, angioedema, erythroderma, severe drug reactions and

	Total (n = 495) n (%)	2019 (n = 283) n (%)	2020 (n = 212) n (%)	χ^2	P*
Urticaria with angioedema	13 (2.6)	6 (2.1)	7 (3.3)	0.662	.416
Angioedema	4 (0.8)	3 (1.1)	1 (0.5)	0.523	.639
Extensive bullous pemphigoid	3 (0.6)	3 (1.1)	0 (0)	2.261	.264
Extensive bullous impetigo	2 (0.4)	1 (0.4)	1 (0.5)	0.042	1
Epidermolysis bullosa	1 (0.2)	0 (0)	1 (0.5)	1.338	.428
DRESS	3 (0.6)	2 (0.7)	1 (0.5)	0.111	1
SJS/TEN	2 (0.4)	2 (0.7)	0 (0)	1.504	.509
Erythema multiforme major	1 (0.2)	0 (0)	1 (0.5)	1.338	.428
Erythrodermic psoriasis	1 (0.2)	1 (0.4)	0 (0)	0.751	1
Generalised pustular psoriasis	1 (0.2)	1 (0.4)	0 (0)	0.751	1
LABD	1 (0.2)	0 (0)	1 (0.5)	1.338	.428
Extensive pemphigus vulgaris	1 (0.2)	1 (0.4)	0 (0)	0.751	1
Total	33 (6.7)	20 (7.1)	13 (6.1)	0.170	0.680

TABLE 3 True dermatological emergencies that presented to the EDs

Note: DRESS, drug rash with eosinophilia and systemic symptoms; SJS, Stevens-Johnson syndrome; TEN, toxic epidermal necrolysis; LABD, linear IgA bullous dermatitis.

*Chi-square test for comparison between 2019 and 2020.

pustular psoriasis with metabolic complications as “true dermatological emergencies”. In the present study, ED presentations within 5 days of the onset of symptoms constituted 61.9% of all presentation in 2019, vs 47% in 2020. In the present study, a delay of >5 days between the onset of dermatological symptoms and ED presentation was significantly more common during 2020. The present findings indicate that patient evaluation-seeking behaviour might have been delayed in 2020 because of fear of COVID-19 infection. In the present study, only 6.7% of the ED patients with dermatological disorders consulted to the dermatology department met the definition of true dermatological emergency; all other consulted cases were non-urgent. Furthermore, the hospitalisation rate among ED patients in the present study that were consulted to the dermatology department was 11.3% in 2019 and 6.6% in 2020. There were not any significant differences between the pre-pandemic period and pandemic period regarding the frequency of non-urgent and emergent ED presentations requiring hospitalisation, which is consistent with earlier pre-pandemic research.^{5,24,25} ED presentations because of non-urgent dermatological complaints still constituted the majority of ED presentations in the present study, even during the pandemic period.

Worldwide, EDs are among the busiest and most overcrowded of hospital departments. In addition to the fact that those that present to EDs with non-urgent complaints play a role in such overcrowding, consultation requests from the ED to other departments prolong patient length of stay in the ED, adding to the workload.²⁶ It was reported that even though ED presentation

of patients because of non-COVID-19 dermatological diseases decreased within a few months of the start of the COVID-19 pandemic, the number of patients can increase over time with relaxation of COVID-19 restrictions,⁴ as occurred in the present study. As such, ED physicians should carefully assess the need for dermatology consultation via proper anamnesis and dermatological examination. In the present study patients that presented to the PED and AED with vesicles and erosions were more likely to have an emergent dermatological disorder and require hospitalisation. In addition, angioedema, erythroderma, generalised bullous and erosive cutaneous manifestations should alert ED physicians to the possibility of an urgent dermatological condition. As dermatological emergencies can lead to systemic complications, and morbidity and mortality, ED physicians should rapidly request consultation from the dermatology and other related departments (ophthalmology, internal medicine, ICU). ED presentations because of non-urgent dermatological disorders, such as localised contact dermatitis, insect bites and superficial fungal infections, should be given symptomatic treatment and directed to a primary care physician or dermatology outpatient clinic in order to shorten the length of stay in the ED and prevent overcrowding.

The present study has a few limitations, including a retrospective design and the exclusion of ED presentations that were not consulted to the dermatology department. Nonetheless, the present study clearly highlights the characteristics of ED presentations because of dermatological complaints before and during the COVID-19 pandemic that resulted in dermatology consultation requests.

TABLE 4 Diagnoses of the ED patients that were consulted to the dermatology department and required hospitalisation

	Total (n = 495) n (%)	2019 (n = 283) n (%)	2020 (n = 212) n (%)	χ^2	P*
Herpes zoster infections	16 (3.2)	11 (3.9)	5 (2.4)	0.905	.341
Erysipelas/Cellulitis	6 (1.2)	4 (1.4)	2 (0.9)	0.224	1
Urticaria with angioedema	5 (1)	2 (0.7)	3 (1.4)	0.608	.656
Maculopapular drug reactions	3 (0.6)	3 (1.1)	0 (0)	2.261	.264
DRESS	3 (0.6)	2 (0.7)	1 (0.5)	0.111	1
SJS/TEN	2 (0.4)	2 (0.7)	0 (0)	1.504	.509
AGEP	1(0.2)	1 (0.4)	0 (0)	0.751	1
Extensive bullous pemphigoid	2 (0.4)	2 (0.7)	0 (0)	1.504	.509
Extensive pemphigus vulgaris	1 (0.2)	1 (0.4)	0 (0)	0.751	1
Epidermolysis bullosa	1 (0.2)	0 (0)	1 (0.5)	1.338	.428
Erythema multiforme major	1 (0.2)	0 (0)	1 (0.5)	1.338	.428
Angioedema	1 (0.2)	0 (0)	1 (0.5)	1.338	.428
Erythrodermic psoriasis	1 (0.2)	1 (0.4)	0 (0)	0.751	1
Generalised pustular psoriasis	1 (0.2)	1 (0.4)	0 (0)	0.751	1
Cutaneous vasculitis	2 (0.4)	2 (0.7)	0 (0)	1.504	.509
Total	46 (9.2)	32 (11.3)	14 (6.6)	3.181	.074

Note: AGEP, acute generalised exanthematous pustulosis; DRESS, drug rash with eosinophilia and systemic symptoms; SJS, Stevens-Johnson syndrome; TEN, toxic epidermal necrolysis; LABD, linear IgA bullous dermatitis.

*Chi-square test for comparison between 2019 and 2020.

5 | CONCLUSION

In conclusion, lockdown measures and fear of COVID-19 infection most likely prevented patients with dermatological complaints from presenting to the PED and AED as the COVID-19 pandemic began; however, presentations to both EDs, even among those with non-urgent dermatological disorders, increased over time during the pandemic when COVID-19 restrictions were relaxed. As such, the general public should be educated about which severe and life-threatening dermatological conditions require prompt presentation to the ED in order to prevent unnecessary ED presentation and overcrowding during the COVID-19 pandemic period. It is essential that ED physicians and dermatologists have the skills and knowledge to diagnose and appropriately manage dermatological disorders commonly encountered in EDs.

ACKNOWLEDGEMENTS

The authors did not receive any funding sources and declare no conflict of interest in relation with this work.

DISCLOSURES

The authors declared no conflict of interest in relation with this work.

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How to cite this article: Demirel Öğüt N, Tabak GH, Gülseren D, et al. The effect of the COVID-19 pandemic on dermatology consultation requests from adult and paediatric emergency departments. *Int J Clin Pract.* 2021;75:e14906. doi:[10.1111/ijcp.14906](https://doi.org/10.1111/ijcp.14906)