



# Demographic Profile of Patients Receiving Dermatological Care Before and During the COVID – 19 Pandemic

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## Abstract

**Background:** Limited studies have analyzed the patient profile receiving specialty care in dermatology and the impact the COVID-19 pandemic had on dermatological care. The objective is to analyze the patient profile receiving dermatological care before and during the COVID-19 pandemic and compare with existing international studies.

**Methods:** A retrospective cohort study using Northwestern's Enterprise Data Warehouse compiled a dataset of 212,189 unique patients across 18 clinic locations, divided into "Pre-Pandemic" (2018-2019) and "Pandemic" (2020-2021) cohorts.

**Results:** 135,699 patients received dermatological care in the Pre-Pandemic period in comparison to 139,881 patients in the Pandemic period, reflecting an incremental 4,182 patients (3.1%). Each cohort shared a similar demographic breakdown (62.0% / 62.1% women, 75.9% / 75.0% white, 5.7% / 6.3% Black, 4.1% / 4.4% Asian, 6.0% / 6.7% Hispanic, Pre-Pandemic / Pandemic respectively). Both cohorts shared the same top 5 primary diagnoses codes (D22 - Melanocytic nevi, D48.5 - Neoplasm of uncertain behavior of skin, L70 - Acne, L82 - Seborrheic keratosis, L30 - Dermatitis / Eczema). April 2020 saw a 70% decrease in patient visits, however patient visit numbers returned to historic averages by July 2020.

**Conclusions:** The patient profile did not vary following the pandemic. Unexpectedly there was a slight increase in patient visits and the COVID-19 related decrease in patient visits returned to pre pandemic normal within three months.

## 1. INTRODUCTION

Limited studies have analyzed the patient profile receiving specialty care, particularly in dermatology. Considering the seismic changes following COVID-19, we sought to investigate the patient population receiving dermatological care prior to the pandemic and how that patient profile may have changed following the outbreak.

International studies reveal mixed results on the impact of the pandemic on patient visits. Studies from Thailand and China found no significant changes in the number of dermatology visits following the initial drop, however found differences in diagnosis trends<sup>[1, 2]</sup>. Other studies based in Italy and Cameroon found the decrease in outpatient visits to persist through the end of the study period<sup>[3, 4]</sup>. A cohort out of India specifically investigated the use of telemedicine

in dermatology during the pandemic, finding it an effective means for promoting social distancing mandates as well as improving access to dermatological care in a country with fewer dermatologists per capita<sup>[5]</sup>.

We hypothesize that outpatient dermatology visits will decline immediately following the COVID-19 pandemic outbreak (March 2020)<sup>[6]</sup>. In comparison to pre-pandemic patient demographics, we expect a change in the average patient make up in the Pandemic cohort, with a relative decrease in older patients, patients of color, men, and a decrease in patients with chronic conditions.

Understanding the impact the COVID-19 pandemic had on access to specialty care may inform hospital or public health policy in managing future crises, especially as the country shifts back to a post pandemic normal.

## 2. MATERIALS AND METHODS

### 2.1. Patient Population

A retrospective cohort study was conducted using Electronic Health Record (EHR) data extracted from Northwestern's Enterprise Data Warehouse. Data was extracted from a total of 641,648 visits from January 1, 2018 through December 31, 2021. A dataset of 212,189 unique patients across 18 clinic locations was compiled and divided into "Pre-Pandemic" (2018-2019) and "Pandemic" (2020-2021) cohorts based on date of their first visit within that time period. Inclusion criteria included adults greater than 18 years old who had received dermatological care at one clinical site between 2018-2021. Patient demographic information such as age, sex (male, female), race (White, Black or African American, Asian, American Indian or Alaskan Native, Native Hawaiian or Other Pacific Islander), ethnicity (Hispanic or Latino, not Hispanic or Latino), zip code, and marital status (Married, Single, Divorced, Separated, Widowed) were collected. Medical information included primary diagnosis, secondary diagnoses, prescribed medications, and the concurrent diagnosis of chronic conditions.

### 2.2. Measurement

All diagnoses were obtained from the patient's first clinic visit between 2018 and 2021. Indicators of primary diagnoses were

**Table 1.** Summary Patient Demographic and Diagnosis Data

Category	Pre-Pandemic		Pandemic		% change	P
	n	%	n	%		
Total Patients	135,621	-	139,863	-	3.1%	-
Average age (SD)	48.23 (17.60)	-	48.72 (17.62)	-	-	<0.0001
Female	84,125	62.0%	86,888	62.1%	3.2%	0.4909
Married	72,493	53.5%	71,972	51.5%	-0.8%	<0.0001
Chronic Conditions	52,565	38.8%	55,844	39.9%	6.2%	0.9892
White	102,941	75.9%	104,958	75.0%	1.9%	<0.0001
Black	7,771	5.7%	8,752	6.3%	12.6%	<0.0001
Asian	5,523	4.1%	6,175	4.4%	11.8%	<0.0001
Hispanic	8,150	6.0%	9,411	6.7%	15.4%	<0.0001

Multivariate analysis showed no statistically significant difference in sex by time period ( $p = 0.49$ ) or number of chronic conditions ( $p = 0.99$ ), however, they did show statistical significance across all races and ethnicities ( $p < 0.0001$  for all; see Table 1). There was a 0.49 year difference in age between the two groups ( $p < 0.0001$ ).

Both cohorts shared the same top 5 primary diagnoses (melanocytic nevi, neoplasm of uncertain behavior of skin, acne, seborrheic

determined using ICD-10 codes, grouping all diagnoses with the same first letter and two digits (Ex. "D22.1" and "D22.2" are both coded as "D22") (Appendix A).

### 2.3. Analysis

Statistical analysis was performed using SAS v9.4. Differences in demographic characteristics by group were assessed using logistic regression models for categorical characteristics and linear regression models for continuous measurements. A random effect for patient was included in all models in order to account for covariance between observations when participants had a visit in both Pre-Pandemic and Pandemic groups. Average number of patient visits by month in 2020 were calculated and compared to average number of patient visits in that month from the two years prior (2018 and 2019). Examination of in person versus virtual patient visits was visualized and patient age was analyzed using t-tests.

## 3. RESULTS

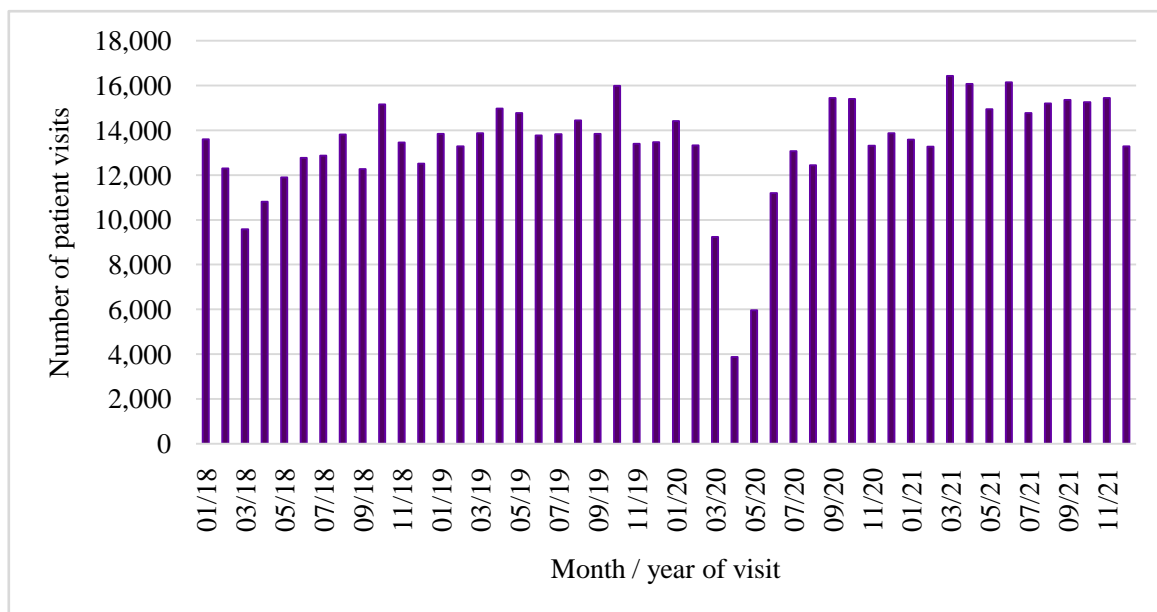
A total of 135,621 (63.9%) patients received dermatological care in the Pre-Pandemic period in comparison to the 139,863 (65.9%) patients in the Pandemic period, reflecting an incremental 4,242 (3.1%) (Table 1). 63,295 (29.8%) patients received care during both time spans.

keratosis, and dermatitis and eczema). However, individual diagnosis rates were different across time periods ( $p < 0.0001$  for all) (Table 2).

In April 2020, a 70% decrease in patient visits occurred in comparison to the same month from the two years prior (2018-2019). By July 2020, overall patient visits surpassed July averages from the past two years, while virtual visits increased beginning in April 2020, and plateaued by September 2020 (Figure 2). Patients who received virtual visits during the

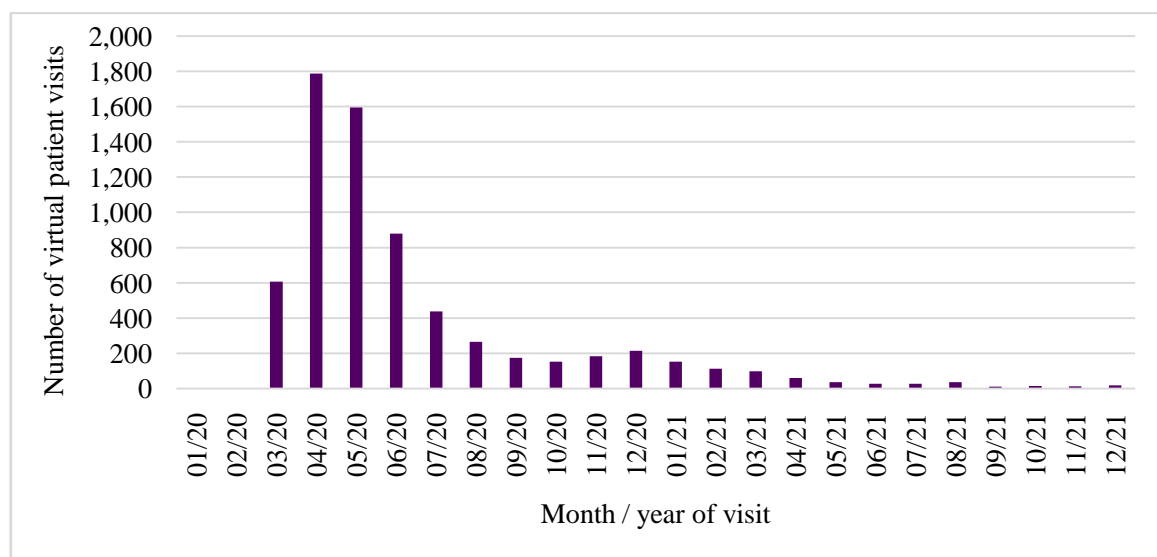
pandemic were on average younger than those receiving in-person visits (42 vs. 49 years  $p <$

0.0001). 68.1% of virtual visits during the Pandemic were with female patients.



Total number of dermatology patient visits from 2018 – 2021.

Figure 1. Patient visits by month 2018-2021



Number of virtual patient visits by month, 2020-2021.

Figure 2. Virtual patient visits 2020-2021

Table 2. Top 10 Diagnoses before and during the COVID-19 pandemic

Diagnosis	Pre - Pandemic		Pandemic		% change	P
	n	%	n	%		
Melanocytic nevi D22	30,400	22.4%	34,248	24.5%	12.7%	<0.0001
Neoplasm of uncertain behavior of skin D48.5	11,834	8.7%	12,296	8.8%	3.9%	<0.0001
Acne L70	10,105	7.5%	10,041	7.2%	-0.6%	<0.0001
Seborrheic keratosis L82	6,866	5.1%	6,390	4.6%	-6.9%	<0.0001
Unspecified dermatitis L30	6,330	4.7%	6,160	4.4%	-2.7%	<0.0001
Skin changes due to radiation L57	5,431	4.0%	5,168	3.7%	-4.8%	<0.0001
Benign neoplasm D23	6,228	4.6%	4,335	3.1%	-30.4%	<0.0001
Psoriasis L40	3,383	2.5%	3,648	2.6%	7.8%	<0.0001
Melanin hyperpigmentation L81.4	2,320	1.7%	3,602	2.6%	55.3%	<0.0001
Rosacea L71	3,150	2.3%	2,890	2.1%	-8.3%	<0.0001

**Table 3.** Summary of corresponding international studies

	US	Thailand	Cameroon	China	Turkey
Pre-Pandemic time frame	January 2018 - December 2019	January 2019 - December 2019	March 1, 2019 - February 29, 2020	January 2019 - December 2019	January 12, 2020 - March 12, 2020
Pandemic time frame	January 2020 - December 2021	January 2020 - June 2021	March 1, 2020 - February 28, 2021	January 2021 - December 2021	March 12, 2020 - May 12, 2020
Pre-Pandemic patients	135,621	8,469	3,618	67,994	133,131
Pandemic patients	139,863	12,446	2,328	67,288	31,747
Average age (pandemic/Pre-Pandemic)	48.23/48.73	55.1/55.7	28 (unavailable by cohort)	31/32	39.9/38.9
Sex (% women) pandemic/Pre-Pandemic	62.0%/61.1%	63.3%/62.7%	63% (unavailable by cohort)	48% (unavailable by cohort)	57%/51%
Single vs. multi-center	Single	Single	Single	Single	Multicenter
Study location	Urban	Urban	Urban /rural	Urban	Multicenter (urban and rural locations)
Top diagnoses	Melanocytic nevi, acne, seborrheic keratosis, dermatitis, eczema	Dermatitis, cutaneous infections, psoriasis, and xerosis cutis	Infectious dermatoses, acne, eczema, dermatitis	Acne, infectious skin diseases, dermatitis, alopecia, and verruca vulgaris	Dermatitis, acne, psoriasis

#### 4. DISCUSSION

The typical dermatology patient within a large metropolitan health care system stayed consistent across 2018-2021, despite the COVID-19 pandemic. The gender breakdown also remained stable, as most dermatology patients were women during both time frames. Most patients identified as White with Black, Asian, and Hispanic patients dividing up the balance relatively evenly (6.3%, 4.4%, and 6.7% respectively). A multivariate regression revealed a statistically significant difference in racial and ethnic groups between the two time periods ( $P < 0.0001$ ), however the difference does not appear to be clinically significant.

Unexpectedly, the percentage of patients who received care during the Pandemic period did not show lower rates of chronic conditions nor a younger age. The increased risk associated with COVID-19 infections in older adults and those with preexisting conditions, led us to anticipate that a younger, more generally healthy population would seek dermatological care during the pandemic. Similarly, due to the higher risk nature of in person visits, we anticipated that patients receiving care during the pandemic would have different diagnoses, shifting towards more emergent conditions. However, the relative consistency in patient diagnoses may reflect that the pandemic had limited impact on common skin conditions and that the patients in this cohort did not find their access to care restricted.

When comparing these findings to the international dermatological community, many trends persist. Studies conducted in Thailand, Cameroon, China, Turkey, and India, used a similar retrospective cohort approach to analyzing the patient profile receiving dermatological care before and during the pandemic<sup>[2, 3, 5, 7, 8]</sup>. These studies ranged in size and area of focus but primarily compared the difference in patient visit trends and diagnoses before and after the COVID-19 pandemic.

##### Turkey

A retrospective cohort study out of Turkey saw a 77% decrease in patient visits immediately after the pandemic, and more specifically found a significant decrease in hospital visits for female patients and patients under 18 years old<sup>[7]</sup>. Additionally, the study noticed that there were larger decreases in patient visits in regions which had lower rates of COVID-19 infections. This study suggested that the findings could be explained by differing assessments of risk. The authors proposed that female patients were less willing to assume the risk of receiving in person care and that the paradoxical correlation between the lower rates of COVID-19 and fewer patient visits revealed that perceived risk had more of an impact on visit rates than actual risk of infection<sup>[7]</sup>.

##### China

A retrospective cohort study out of China did not find a significant decrease in patient visits

across the two time periods nor amongst older patients, however, did observe a significant decrease in pediatric patients<sup>[9]</sup>. This study also found a greater number of male patients closer to the onset of the pandemic but found that the gender ratio evened out by the end of the study period, hypothesizing that female patients viewed an in person visit as higher risk. The authors found a significant increase in urticaria, acne, alopecia, and seborrheic keratosis in the post pandemic period. They hypothesized that the stress associated with the pandemic could partially explain higher rates of stress-based diagnoses such as alopecia and dermatitis<sup>[8]</sup>.

### Thailand

A study out of Thailand found that while patient visits initially dropped significantly, visit rates returned to pre pandemic normal within a couple of months of the initial outbreak<sup>[2]</sup>. Similar to our study, the top five most common diagnoses pre pandemic were the same as during the pandemic (dermatitis, skin infections, xerosis cutis, psoriasis, and cutaneous neoplasms). The study found an increase in dermatitis and hand eczema which they believed correlated with pandemic related hand washing and hand sanitizer use<sup>[2]</sup>. Correspondingly, skin infections and xerosis cutis diagnoses decreased, which was theorized to be due to decreased exposure to sun and crowds of people. Stress related dermatological conditions such as acne, psoriasis, and urticaria were increased and attributed to pandemic related anxiety. Finally, visits for benign skin conditions and pigment-based disorders decreased in the pandemic period, which may have been a result of patients deprioritizing cosmetic procedures due to infection risk and increased cost<sup>[2]</sup>.

### Cameroon

The patient population analyzed by a retrospective study out of Cameroon was primarily younger patients (average age 28 years old) and predominantly female (1:1.7, male to female ratio)<sup>[3]</sup>. Unlike other studies analyzed, this paper found that infectious dermatoses dominated both the pandemic and pre pandemic period due to its location in a more developing country. Acne was the most common diagnosis in both periods, potentially explained by young average patient age<sup>[3]</sup>.

### India

A retrospective cohort study was conducted in Western India analyzing the use of telehealth

services for dermatology following the COVID-19 pandemic<sup>[5]</sup>. Rather than comparing diagnoses before and after the pandemic, this study sought to evaluate the viability of using telehealth services for dermatological care, particularly in the setting of social distancing requirements. This study was predominantly men seeking dermatological care, with the most common diagnoses including dermatophytosis, hair disorders (androgenetic alopecia and telogen effluvium), acne, and dermatitis. The authors concluded that easily accessible web applications like WhatsApp could be used for dermatological concerns beyond the pandemic and improve care access in low resource settings<sup>[5]</sup>.

In our study as well as in several countries worldwide (Cameroon, Thailand, and Turkey) women are the primary consumers of dermatological care<sup>[2, 3, 7]</sup>. Additionally, most studies found relatively consistent top diagnoses, particularly emphasizing the prevalence and burden of acne, psoriasis, and dermatitis. Uniquely, the studies out of China and India showed a male predominance of dermatology, which could reflect a cultural difference particularly surrounding the sharing of images in the form of telehealth<sup>[5, 8]</sup>.

### 5. LIMITATIONS

Limitations of study include patients exclusively from the one large healthcare system based in Chicago and the greater metropolitan area. The retrospective nature of the study also limited the type and amount of data extraction. Additionally, the use of ICD-10 codes inherently limits the degree of nuance in diagnoses and may be susceptible to error. Finally for ease of analysis diagnoses codes were consolidated and therefore a level of granularity was eliminated.

### 6. CONCLUSION

The patient profile at a large metropolitan US healthcare system did not vary following the COVID–19 pandemic. The slight difference in average patient age between the two cohorts is not clinically significant. A decrease in patient visits at the beginning of the pandemic returned to pre-pandemic numbers within three months. Telemedicine visits were employed during the first couple of months of the pandemic but were mostly phased out by the end of 2020. Further studies are needed to analyze specific demographic and diagnosis subgroups to further explore the impact of the pandemic on dermatology patients.

## Appendix

Consolidated Diagnosis ICD 10 Code	Diagnosis
B00	Herpes simplex infections
B07	Viral warts
B35	Dermatophytosis
B36	Mycoses
B37	Candida
C43	Melanoma
C44	Other malignant skin cancer
C84	Mature T cell NK lymphomas (includes mycosis fungoides)
D04	Carcinoma in situ
D17	Benign lipomatous neoplasm
D18	Hemangioma and lymphangioma
D22	Melanocytic nevi
D23	Benign neoplasm
D48.5	Neoplasm of uncertain behavior
L01	Impetigo
L02	Cutaneous abscess (furuncle and carbuncle)
L20	Atopic dermatitis
L21	Seborrheic dermatitis
L23	Allergic contact dermatitis
L24	Irritant contact dermatitis
L25	Unspecified contact dermatitis
L28	Lichen simplex chronicus and prurigo
L29	Pruritus
L30	Unspecified dermatitis
L40	Psoriasis
L50	Urticaria
L57	Skin changes due to radiation
L63	Alopecia areata
L64	Androgenic alopecia
L65	Nonscarring hair loss (unspecified telogen effluvium)
L66	Scarring hair loss
L70	Acne
L71	Rosacea
L72	Follicular cysts of skin and subcutaneous tissue
L73.2	Hidradenitis suppurativa
L74.5	Hyperhidrosis
L81	Disorders of skin pigmentation
L82	Seborrheic keratosis
L90	Atrophic disorders of skin
L91	Hypertrophic disorders of skin
R20	Disturbances of skin sensation
R21	Rash
R22	Localized swelling
Z41.1	Encounter for cosmetic surgery

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**Citation:** *Caroline Gonzalez et al. Demographic Profile of Patients receiving Dermatological Care Before and During the COVID – 19 Pandemic. ARC Journal of Dermatology. 2024; 7(1):1-7. DOI: <http://dx.doi.org/10.20431/2456-0022.0701001>.*

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