Knowledge of Dermatology Residents on the COVID-19 Pandemic: A Cross-Sectional Study

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Abstract

Background: A novel coronavirus disease (COVID-19) has spread throughout the world leading to a global pandemic. As a result, all healthcare workers have been profoundly affected.

Objectives: The goal of our study is to identify the level of knowledge and the effect of COVID-19 on dermatology residents.

Methods: A cross-sectional analysis in which 77 dermatology residents from three Gulf Cooperation Council (GCC) countries and Canada completed an online questionnaire-based survey. The questionnaire consisted of four sections: one general information about the resident and three on knowledge, safety measures and impact of COVID-19, with a total of 26 questions. The questionnaire was scored out of 10 with those above the mean considered as having satisfactory knowledge.

Results: The mean (SD) knowledge score was 6.25 (1.6). There was a statistically significant difference noted between the GCC countries and Canada in terms of the knowledge score (p-value=0.035). Only 14% of dermatology residents felt competent in managing COVID-19 patients. Seventy percent felt that the pandemic has negatively affected their dermatology training.

Conclusion: Dermatology residents demonstrated a difference in knowledge score in relation to the geographic location of the program. Almost 46% of residents illustrated a satisfactory knowledge score about COVID-19. Only a small percentage of residents are confident in treating COVID-19 patients. Subsequently, the need for improved education of residents regarding COVID-19 before redeployment is warranted.

Keywords: Coronavirus (COVID-19); Knowledge; Dermatology Residents; Impact

Abbreviations

COVID-19: Coronavirus disease 2019

GCC: Gulf Cooperation Council

ICU: Intensive care unit

PPE: Personal protective equipment

WHO: World Health Organization

- Basic courses on managing COVID-19 patients before allocating dermatology residents to situations where they are required to deal with such cases. Yearly session on the preferred hand hygiene method is encouraged.

Capsule Summary

- Dermatology Residents are being reassigned to different specialties to care for COVID-19 patients due to the rapid spread of the disease.

Introduction

In 2019, a novel coronavirus disease (COVID-19) was identified as a cause of upper and lower respiratory tract infections among patients in Wuhan, a city in the Hubei Province of China. The virus has spread swiftly throughout the globe so fast and has resulted in a state of chaos and a pandemic. Although roughly 80% of cases have mild manifestations, up to 20% have a severe infection [1].

The COVID-19 pandemic has affected almost everyone around the world, but especially healthcare workers. Although dermatologists are not frontline physicians, many have been redeployed to COVID-19 wards/ICU or emergency department, necessitating a rapid revision course regarding the management of critical patients [2]. Concerning medical education, the current state poses a challenge to medical residents in all specialties. The replacement of in-person classes, seminars, and bedside teaching with online lectures is undoubtedly essential and has been implemented by many centers. However, it also has the potential to create a loss of hands-on in-hospital training and could impact training. This change can be particularly accurate for residents in surgical specialties [3]. Non-urgent outpatient appointments have shut down due to the need for social distancing, and thus, residents were unable to complete their scheduled clinical rotations. Telemedicine has been applied by several institutes [4]. Moreover, multiple programs have rescheduled certain examinations, and thus programs are unable to assess the level of knowledge and skills that residents have acquired [5]. Multiple programs have reduced the number of residents by 50%, reducing hospital training, and inadvertently increasing studying hours [6].

This study's objective is to assess the knowledge and impact of COVID-19 on dermatology residents in different countries.

Methods

This is a cross-sectional study where dermatology residents from different centers were invited via phone messages or e-mail and asked to complete a questionnaire-based survey. Responses were collected from June 4, 2020, until June 16, 2020. We aimed to reach out to as many residents as possible among three GCC countries (Saudi Arabia, Oman, and Kuwait) and Canada. Our sample size (n) included 77 residents, 33 were enrolled in a Canadian program, and 44 were in three GCC countries. We attempted to balance the number of participants between the two regions in order to adequately compare the two groups in terms of knowledge and impact. Approximately half of our participants are from Canadian programs, with the rest being from GCC countries. Our inclusion criteria involved dermatology residents. All other medical doctors and residents of other specialties were excluded. All dermatologists who completed their residency training were also excluded.

Informed consent was obtained from all those who participated in the study. The responses were anonymous. The survey (Appendix A) was used to assess the knowledge and impact of COVID-19. It consisted of four sections that contained

26 questions. Section one consisted of baseline information, section two was utilized to assess the knowledge regarding COVID-19, section three examined safety measures undertaken by the residents, and section four inquired about the impact of the pandemic on their training and education. Our questionnaire was predominantly adapted from a recently published study regarding the knowledge and impact of COVID-19 on neurosurgery residents [6]. The questionnaire was then modified to address dermatology residents more specifically using US Centers for Disease Control and Prevention (CDC) and several other newly published studies. Additionally, more questions were added to the knowledge section to more accurately evaluate the residents' awareness of the COVID-19 [7-11].

The knowledge section consisted of ten questions. The quantitative variable (total knowledge score) was calculated by adding the points of the ten knowledge items (each item equaled one point). The total knowledge score was then divided into satisfactory and non-satisfactory based on the number of correct answers each participant acquired from the ten questions. Those who accumulated a score above the mean were assigned into the satisfactory component, while those who scored at the mean or below were deemed to have a non-satisfactory knowledge score.

We used The Statistical Package for Social Sciences (IBM SPSS Statistics) for data entry and analysis. Qualitative variables were described by frequencies as well as percentages. This was done via the usage of univariate analysis. Next, parametric tests were utilized to determine the presence or absence of a significant correlation (p -value ≤ 0.05) between variables. These included Pearson's Chi-square, Two-sample-t-test, and Analysis of variance (ANOVA).

Results

A total of 77 dermatology residents from Canada, Saudi Arabia, Oman, and Kuwait responded. The descriptive characteristics of the participants are presented in (Table 1). The percentage of residents from each country is as follows: Canada (42%), Kuwait (23%), Saudi Arabia (18%), Oman (15%). Thus, around 43% of our results were obtained from Canada and 57% from GCC countries. The majority (64%) were females, and 36% were males. The number of residents from first year (R1) to year five (R5) of training were proportionate. R1 residents comprised 17%, year two 23%, year three 22%, year four 23%, and year five 14%. Among these, 32% had contact with COVID-19 patients, and 20% were under quarantine. Only one resident in our sample has tested positive for COVID-19.

The correct answers to the knowledge questions were as follows: 78% were aware of the RNA-single stranded nature of the virus, 86% understood the primary mode of transmission was via respiratory droplets, 71% answered fever and cough as being the two most common symptoms, and only 39% stated that the incubation period was approximately five days [11]. Furthermore, only 27% of residents in the GCC region, and 62% in Canada are familiar with the preferred hand hygiene technique [13]. Fifty-seven percent wore the PPE in the correct order of gown, mask, face shield, and gloves [14]. The majority (83%) knew that polymerase

Table 1: Descriptive characteristics of the Dermatology Residents in our study (n = 77). %

Characteristic	n	%
Gender		
Male	28	36.4
Female	49	63.6
Location of the residency program		
Canada	33	42.9
Kuwait	18	23.4
Saudi Arabia	14	18.2
Oman	12	15.6
Year of the residency (R) training		
R1	13	16.9
R2	18	23.4
R3	17	22.1
R4	18	23.4
R5	11	14.3
Dermatology residents under quarantine		
Yes	15	19.5
No	62	80.5
Test for Coronavirus		
Positive	1	1.3
Negative	37	48.1
Not Tested	39	50.6
Contact with COVID-19 patients		
Yes	25	32.5
No	52	67.5

= column %

chain reaction is the most sensitive test to diagnose COVID-19 [10]. Surprisingly, 53% of residents knew that morbilliform rash was the most common cutaneous manifestation of the virus [8]. Because participants were enrolled in a dermatology residency program, we expected a higher number. Elevated liver enzymes were associated with a worse outcome in those who tested positive for the virus, and only 27% knew this information [9]. The final question in the knowledge section was about the most common CT finding in COVID-19 patients. Eighty-seven percent answered ground-glass opacity [15].

(Table 2) compares the correct response of the knowledge questions between the GCC countries and Canada. A significant difference was revealed among the two regions in five out of the ten questions. These items were as follows: the most common two symptoms, most accurate incubation period, preferred hand hygiene method, most common cutaneous manifestation, and most common Computed Tomography (CT) finding in COVID-19 patients. Also, residents in Canadian programs appear to have a higher percentage of correct answers than the GCC programs.

A knowledge score was generated in order to divide participants into two groups: satisfactory and non-satisfactory knowledge level. The mean knowledge score was 6.25, with a standard deviation (SD) of 1.6 (Figure 1). Table 3 depicts the relation of the knowledge score with multiple characteristics. A significant difference can be appreciated when comparing the

score of Canadian residents and GCC residents. Moreover, with regards to different Canadian provinces, it is reasonable to say that Nova Scotia and British Columbia had a lower score as opposed to Quebec and Alberta. When assessing the difference among GCC countries, Saudi Arabia had a higher Knowledge score mean (6.5) in contrast with Oman (5.5) and Kuwait (5.44).

Table 4 represents the impact of the pandemic on the residents. Seventy percent of the participants believed that their hospital training was negatively affected during the current time, while 30% experienced no change. Additionally, 43% acknowledged that their studying hours increased during this time, while 34% admitted a decrease. It should be further emphasized that the results were gathered three months after the WHO declared a COVID-19 pandemic, from June 4, 2020, until June 16, 2020.

Figure 2 highlights the location of the program and the satisfactory level of knowledge among the different regions. Out of the results, Canada contributed to around 26% of the participants with a satisfactory level of knowledge. However, among the GCC countries, this number was lower and as follows: Saudi Arabia 7.8%, Oman 6.5%, and Kuwait 5.2%, respectively. The percentage of participants with a non-satisfactory knowledge was highest in Kuwait (18%). Figure 3 displays the percentage of residents who believe that dermatology outpatient clinics should be closed during this time (63%).

Table 2: Knowledge items vs location (n = 77).

Item	All (n=77)	Location of the program		p-value
		Canada (n=33)	GCC countries (n=44)	
	n (%)	n (%)	n (%)	
Correct response to the knowledge items:				
The type of the virus	60 (78)	28 (85)	32 (73)	0.084
The main mode of transmission	66 (86)	30 (91)	36 (82)	0.514
The most common two symptoms	55 (71)	26 (79)	29 (66)	0.023
The most accurate estimated incubation period	30 (39)	15 (45)	15 (34)	0.004
The preferred hand hygiene method in the healthcare settings	32 (42)	20 (61)	12 (27)	0.018
The correct order of wearing PPE	44 (57)	21 (64)	23 (52)	0.073
The most sensitive Diagnostic test	64 (83)	28 (85)	36 (82)	0.085
The most common cutaneous manifestation	41 (53)	19 (58)	22 (50)	0.036
Lab finding associated with worse outcome	21 (27)	8 (24)	13 (30)	0.912
The most common Computed tomography finding of COVID-19	67 (87)	31 (94)	36 (82)	0.006

- % = column %
- GCC: Gulf Cooperation Council (Kuwait, Oman, Saudi Arabia)
- PPE: Personal Protective Equipment
- P-values were generated using Pearson's chi-square test (≤ 0.05 is statistical significant)

Figure 1: Knowledge on COVID-19 bell curve among dermatology.

Table 3: Association of total knowledge score concerning COVID-19 pandemic with baseline information and characteristics of the participants.

	Mean (SD)	
Gender		0.390
Male	6.04 (1.7)	
Female	6.37 (1.5)	
Year of residency training*		0.771
Residency years 1	6.00 (0.87)	
Residency years 2	6.44 (1.95)	
Residency years 3	5.94 (1.89)	
Residency years 4	6.56 (1.9)	
Residency years 5	6.18 (1.7)	
Location of the dermatology program		0.035
Canada	6.85 (1.34)	
GCC countries	5.80 (1.77)	
Canadian provinces*		0.017
Nova Scotia	6.33 (2.4)	
Quebec	7.00 (1.76)	
British Columbia	6.50 (1.41)	
Alberta	7.83 (0.75)	
GCC countries		0.006
Saudi Arabia	6.50 (1.02)	
Oman	5.50 (1.51)	
Kuwait	5.44 (1.29)	
Feeling competent in dealing with COVID-19 patients		0.027
Yes	6.27 (3)	
No	6.24 (4)	
<ul style="list-style-type: none"> SD = Standard deviation GCC: Gulf Cooperation Council (Kuwait, Oman, Saudi Arabia). P-values were generated using the two-sample t-test test for comparing two groups and *Analysis of variance (ANOVA) test for comparing more than two groups (≤ 0.05 is statistical significant) Mean score = 6 		

Table 4: The impact of COVID- 19 pandemic among the dermatology residents (n = 77).

	n	%
COVID-19 Pandemic has negatively affected my hospital training		
Yes	54	70
No	23	30
COVID-19 Pandemic has affected my studying hours		
Increase studying hours	33	43
Decrease studying hours	26	34
Not affected	18	23
<ul style="list-style-type: none"> % = column %

Figure 2: Satisfaction level of knowledge based on the dermatology program location.

Figure 3: Pie chart showing most residents favours the closure of dermatology clinics during the COVID-19 pandemic.

Discussion

The COVID-19 pandemic has adversely influenced all healthcare workers. Dermatology residency programs are required to adapt and modify teaching methods to provide a safe teaching environment. Also, some dermatology residents will ultimately be called upon by other departments to help treat COVID-19 patients. As a result, residents need to be familiar with fundamental

medical knowledge and skills. "It is unethical ... for a dermatologist to refuse the management of a patient because of medical risk, real or imagined" [16]. It is the responsibility of dermatology residents to treat COVID-19 positive or suspected cases. However, many dermatologists have not managed patients in the internal medicine or intensive care unit ward in an extended period [9]. Our results demonstrate that almost 50% of the residents have

a knowledge score of less than or equal to six (non-satisfactory). Subsequently, before deployment of dermatology residents to internal medicine or ICU units, it is essential to provide them with a "refresher" course in the management of critical patients and those who are COVID-19 positive. Although they should not be expected to make critical decisions, the basic principles of management should be familiar. Furthermore, only 15% of participants feel competent in managing patients with COVID-19, thus underlining the importance of preparing dermatology residents and making them feel more confident in managing such cases. Compared to the residents in our study, 46% of neurosurgery residents felt comfortable in treating COVID-19 patients [6].

The knowledge level among the GCC and Canada has demonstrated to be statistically significantly different. The results display a higher level of knowledge among residents in Canadian programs, accentuating the need to educate dermatology residents in the GCC region. Among different Canadian provinces, British Columbia and Nova Scotia had a lower mean level of knowledge (6.5 & 6.3, respectively). Although this difference might only be statistically, and not clinically significant, the possibility for the need of further educating residents among these two provinces, regarding COVID-19, must be considered. The variance between the provinces can also be attributed to COVID-19 patients in Quebec and Alberta compared to the other provinces [17].

Many universities have shut down during this period, and hence classical lectures, seminars, bedside teaching have been ceased [18]. Consequently, residency programs have resorted to online platforms and webinars. Although these alternatives can never replace the need for face to face education, they are fundamental to minimizing disruption of education and providing necessary courses, especially to regions with a lower level of knowledge regarding COVID-19, proper PPE usage, and hand hygiene. Two papers reported that 52% of healthcare students and professionals, and 52% of neurosurgery residents were familiar with the preferred hand hygiene [6,19]. A recent study on COVID-19 and final year medical students' awareness reported that 38% of the respondents were aware of the preferred method of hand hygiene in health care settings [20]. However, our results showed that only 27% of residents in GCC countries and 62% of Canada's residents knew the ideal hand hygiene method. Correct hand hygiene practices play a crucial role in preventing the spread of infection.

Multiple dermatology practices are now using telemedicine to limit infection rates. While this is advantageous, it can alter the clinic workflow and compromise dermatology resident hospital education. Roughly 70% of residents in our study have stated that the pandemic had negatively affected their hospital training. A study examining the impact of COVID-19 on radiology residents revealed that the hospital training of 87.4% of responders was affected [21]. Regardless of this adverse effect, almost 63% of participants believe that outpatient clinics should be closed during this time. Even though the COVID-19 pandemic is seen as unfavorable for residents, it has a positive effect. Almost 43% of

residents have experienced an increase in studying hours.

This study has several limitations. Due to the nature of cross-sectional studies, a temporal relationship between the knowledge score and various characteristics among the residents would be impossible to establish. Residency programs in other nations were not included, and therefore it would be irrational to generalize the results on dermatology residents world-wide.

Conclusion

This study revealed a statistically significant difference among knowledge, regarding COVID-19, between 3 GCC countries (Oman, Saudi Arabia, and Kuwait) and Canadian dermatology residents. Furthermore, a difference was also noted among the different provinces of Canada. Although this pandemic has multiple negative consequences, such as reduced hands-on experience, it also has positive effects, namely, an increase in studying hours with the ability to attend online webinars by multiple dermatology experts worldwide and an opportunity for dermatology residents to involve in the rewarding experience of helping in the management of critically ill patients. We recommend providing dermatology residents with basic courses on managing COVID-19 patients before redeployment. Yearly session on the preferred hand hygiene method and how to wear PPE in the correct order will be helpful. Additionally, education about COVID-19 needs to be encouraged among GCC countries and certain Canadian provinces compared to others, given the possibility of future surges. The need to familiarize dermatology residents with proper PPE handling and hand hygiene is not unfounded.

Recommendations

We recommend providing dermatology residents with basic courses on managing COVID-19 patients before allocating them in situations where they are required to deal with such cases. Yearly session on the preferred hand hygiene method will help limit infection rates. Additionally, education about COVID-19 needs to be encouraged among GCC countries and certain Canadian provinces compared to others. The need to familiarize residents with proper PPE handling and hand hygiene is not unfounded.

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References

1. Wu Z, McGoogan JM. Characteristics of and Important Lessons from the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases from the Chinese Center for Disease Control and Prevention. *JAMA*. 2020;10:2648. doi:10.1001/jama.2020.2648
2. Bhargava S, Rokde R, Rathod D, Kroumpouzou G. Employing dermatologists on the frontline against COVID-19: All hands on deck. *Dermatol Ther*. 2020;e13420.
3. Ferrel MN, Ryan JJ. The Impact of COVID-19 on Medical Education. *Cureus*. 2020;12(3):e7492.

4. Oldenburg R, Marsch A. Optimizing teledermatology visits for dermatology resident education during the COVID-19 pandemic. *J Am Acad Dermatol*. 2020;82(6):e229. doi:10.1016/j.jaad.2020.03.097
5. Potts JR 3rd. Residency and Fellowship Program Accreditation: Effects of the Novel Coronavirus (COVID-19) Pandemic. *J Am Coll Surg*. 2020;230(6):1094-1097. doi:10.1016/j.jamcollsurg.2020.03.026
6. Alhaj AK, Al-Saadi T, Mohammad F, Alabri S. Neurosurgery Residents' Perspective on COVID-19: Knowledge, Readiness, and Impact of this Pandemic World. *Neurosurg*. 2020.
7. Wang D, Hu B, Hu C. Clinical Characteristics of 138 Hospitalized Patients with 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA*. 2020;323(11):1061-1069.
8. Ghazal S, Litvinov IV, Aljahani N, Jfri A, Netchiporouk E. Cutaneous Manifestations of Coronavirus Disease 2019 (COVID-19) Infection-What Do We Know So Far? *J Cutan Med Surg*. 2020;1203475420928375.
9. Wu C, Chen X, Cai Y. Risk Factors Associated With Acute Respiratory Distress Syndrome and Death in Patients With Coronavirus Disease 2019 Pneumonia in Wuhan, China. *JAMA Intern Med*. 2020;e200994.
10. Chan JF, Choi GK, Tsang AK, Tee KM, Lam HY, et al. Development and evaluation of novel real-time reverse transcription-PCR Assays with locked nucleic acid probes targeting leader sequences of human-pathogenic Coronaviruses. *J Clin Microbiol*. 2015;53(8):2722-2726.
11. Information for healthcare professionals. Centers for Disease Control and Prevention. 2020.
12. Nassim, David, Abdulhadi, Litvinov, Netchiporouk. Preliminary Data Suggests That Biologics in Dermatology Are Not Associated With Adverse COVID-19 Outcomes. *Journal of Cutaneous Medicine and Surgery*. 2020.
13. Frequently asked questions about hand hygiene for healthcare personnel responding to COVID-2019. 2020.
14. Sequence for putting on personal protective equipment (PPE). 2020.
15. Bao C, Liu X, Zhang H, Li Y, Liu J. Coronavirus Disease 2019 (COVID-19) CT Findings: A Systematic Review and Meta-analysis. *J Am Coll Radiol*. 2020;17(6):701-709.
16. Stoj VJ, Grant-Kels JM. Dermatology residents and the care of patients with coronavirus disease 2019 (COVID-19). *J Am Acad Dermatol*. 2020;82(6):1572-1573.
17. Public Canada. Coronavirus disease (COVID-19): Outbreak update-Canada. 2020.
18. Wollina U. Challenges of COVID-19 pandemic for dermatology. *Dermatol Ther*. 2020;e13430.
19. Modi P D, Nair G, Uppe A. COVID-19 awareness among healthcare students and professionals in Mumbai Metropolitan region: A questionnaire-based survey. *Cureus*. 2020;12(4):e7514.
20. Al-Saadi H, Al-Busaidi F, Al-Kalbani M, Al-Abri S, Malallah H, et al. COVID-19 And Final Year Medical Students' Learning Process In Oman: Exploring Knowledge, Consequences And Preparedness For Internship. *European Journal of Medical and Health Sciences*. 2020;2(3).
21. Matthew D, Elizabeth G, Francis D. The Impact of COVID-19 on Radiology Trainees. *Radiology*. 2020;27:201222