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RESEARCH ARTICLE

PERCEPTION OF COVID-19: KNOWLEDGE, PREPAREDNESS AND IMPACT ON FAMILY MEDICINE RESIDENTS IN MAKKAH, KINGDOM OF SAUDI ARABIA

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ABSTRACT

Background: As a result of Covid-19 pandemic, doctors across the kingdom of Saudi Arabia were recruited to provide their services to cover hospitals and quarantine facilities. This recruitment included residents from local training programs. **Objectives:** To assess the knowledge, preparedness and impact of COVID-19 pandemic among family medicine residents in Makkah 2020. **Subjects and methods:** A cross-sectional study was conducted in Makkah city, Saudi Arabia among all joint program of family medicine resident physicians, levels two, three and four on September 2020 (n=120). A self-administered electronic questionnaire was used in this study. It includes sociodemographic data, COVID-19 knowledge related questions, questions regarding basic Infection control skills and the overall impact of this pandemic on resident well-being. **Results:** A total of 104 family Medicine residents participated in the study out of targeted 120 with a response rate of 86.7%. Most of them (75%) aged below 30 years. The total Covid-19 knowledge score ranged between 0 and 7. It was abnormally distributed (p-value of Shapiro-Wilk test was <0.001). The median and interquartile range (IQR) were 5 (4-5). Females were more knowledgeable about Covid-19 pandemic than males, p=0.047. Majority of the family medicine residents reported receiving of COVID-19 vaccine (98.1%), formal training for hand hygiene in the last two years and on wearing and removing personal protective equipments (94.2%), and participated in COVID-19 duty (92.3%). 14.4% of the residents tested positive for Covid-19 whereas 12.5% did not perform the test. Majority of them (85.6%) thought the lockdown has negatively affected their family medicine training and theoretical learning/classroom training (78.8%). Almost half (51.9) of physicians mentioned that their exam result was negatively affected by the pandemic. Most of them (72.1%) thought that the COVID-19 lockdown has increased their stress levels. **Conclusion:** Overall, knowledge of family medicine residents in Makkah, Saudi Arabia about Covid-19 pandemic was satisfactory; they were adequately prepared for the Covid-19 pandemic. However, majority of them thought the Covid-19 lockdown has negatively affected their family medicine training and theoretical learning/classroom training.

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INTRODUCTION

The novel Coronavirus (2019-nCoV, COVID-19) is one of the most severe acute respiratory syndromes and pandemics to affect the globe in the twenty-first century (Asokan, 2020). As it has shed its impact on health system, medical education and training (Odedra, 2020). The spectrum of corona virus illness ranges from mild disease to more severe form such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV) (Bhagavathula et al., 2020). The virus first reported cases originated from Wuhan, china in late 2019, with its rapid spread through its high virulence as it has till now affected more than 7 million people

worldwide in more than 216 countries (Coronavirus disease, 2020). Locally, Saudi Arabia reported by 13th of October 2021, the registration of 57 confirmed COVID-19 cases and 44 recoveries. The ministry added that the number of critical cases reached 111. And the total number of infections in the country reached 547,761 while the recovery reached 536,768 (<https://covid19.cdc.gov.sa/daily-updates/>). The Saudi Food and Drug Authority (SFDA) announced on Thursday December 10, 2020, that it has approved the registration of Pfizer-BioNTech COVID-19 Vaccine in the Kingdom of Saudi Arabia (Saudi Food and Drug Authority), vaccines will help ends this pandemic. The number of doses administered till now 44,048,681 (<https://covid19.cdc.gov.sa/daily-updates/>). As a result of this pandemic, doctors across the kingdom were

recruited to provide their services to cover hospitals and quarantine facilities. This recruitment included residents from local training programs. The quality of training due to this pandemic has been highly influenced (Odedra, 2020; Alhaj, 2020) as many hospitals with high infection burden postponed their academic activities and training services. In addition, the preventative regulations established by Saudi government which included physical distancing rules and safety precautions led to restriction of workflow to minimize physical presence, preventing in-person case reviews and teaching sessions (Yezli, 2020). Family medicine residents in Makkah city, which is one of the top cities in the kingdom with reported cases, were no exception as they were covering in quarantine hotels and online medical consultation through authorized platform. This has raised a concern regarding the psychological wellbeing of doctors in residency training programs. As this pandemic placed an additional pressure that brings a greater risk of psychological distress (Odedra, 2020). To our best knowledge, this is the first study regarding the preparedness of family medicine residents for the COVID-19 pandemic, their role and impact it has on their training.

SUBJECTS AND METHODS

A cross-sectional study was conducted in Makkah, which is the holy city for all Muslims and located in the western region of Saudi Arabia in an area called Makkah region. Joint program of family medicine (JPFM) one of specialty training program provided by the Ministry of Health, under the supervision of Saudi Commission for Health Specialties, the residents spend four years to graduate a well-trained family medicine physician. All candidates of levels R2, R3 and R4 enrolled in the joint program of family medicine, Makkah (2020-2021) were included in the study. A self-administered electronic questionnaire was reviewed by two consultants for validation, then, distributed to all candidates involved in the study. The investigator designed the questionnaire based on researches conducted to evaluate the knowledge, preparedness, and impact of COVID-19 pandemic among family medicine residents. The questionnaire consists of four main sections: The first section was about sociodemographic data, age, gender, level of training, and COVID-19 test result. The second section includes knowledge related questions; this part consists of five statements based on clinical guideline of COVID-19 clinical symptoms, transmission, and infection control in health care setting published by CDC. The third section consists of six questions regarding basic Infection Control Skills and the fourth section will assess the overall impact of this pandemic on resident well-being. The electronic questionnaires form were distributed to candidates of the JPFM.

Approval from the joint program of family medicine in Makkah was obtained. In addition, permission from the directorate of Health Affairs of the Holy Capital Primary Health Care was obtained (IRB Committee). Consent from the participants was taken through the sentence (Do you agree to participate in this study). The Statistical Package for Social Sciences (SPSS) software version 26.0 was used for data entry and analysis. Statistical analysis were carried out using the frequency and percentage for categorical variables while median and interquartile range (IQR) were used for continuous variable such as knowledge score as it was abnormally distributed as shown by significant Shapiro-Wilk test.

Chi-square and Fischer Exact tests were applied to test for the association between two categorical variables. P values were considered significant if less than 0.05.

RESULTS

A total of 104 family Medicine residents participated in the study out of targeted 120 with a response rate of 86.7%. Most of the participants (75%) aged below 30 years and more than half of them (54.8%) were females and 41.4% were recruited from R3.

Knowledge about Covid-19 pandemic: From Table 1, it is shown that majority of the family medicine residents could recognize that the main mode of transmission of Covid-19 is droplet transmission (86.5%), the preferred hand hygiene method in health care setting is alcohol-based hand rub (79.8%), and the most common symptoms of Covid-19 are fever and cough (70.2). Also, majority of them are familiar with the Saudi CDC guide to COVID-19 surveillance cases definitions (73.1%) and have used the respiratory triage checklist during your practice (80.8%).

The total Covid-19 knowledge score ranged between 0 and 7. It was abnormally distributed (p -value of Shapiro-Wilk test was <0.001). The median and interquartile range (IQR) were 5 (4-5). Figure 1. Females were more knowledgeable about Covid-19 pandemic than males (mean ranks were 57.66 and 46.24, respectively ($p=0.047$)). Residents of R4 level had the highest knowledge score (mean rank=62.35). However, the difference from other residency levels did not reach a critical value for statistical significance, $p=0.061$. Table 2

Preparedness regarding COVID-19 pandemic: From Table 3, it is obvious that majority of the family medicine residents reported receiving of COVID-19 vaccine (98.1%), formal training for hand hygiene in the last two years and on wearing and removing personal protective equipments (94.2%), and participated in COVID-19 duty (92.3%). Most of them (76.9%) reported direct dealing with COVID-19 patients. Male physicians were more likely than females to receive training for hand hygiene in the last two years and training on wearing and removing of PPEs (100% vs. 89.5%), $p=0.024$. Most of R2 physicians (75%) compared to 45.5% of R4 physicians knew the correct size of N-95 mask that fit them, $p=0.018$. On the other hand, all R4 physicians compared to 82.1% of R2 physicians have participated in COVID-19 duty, $p=0.032$.

Impact of COVID-19 pandemic: 14.4% of the residents tested positive for Covid-19 whereas 12.5% did not perform the test. Home isolation during Covid-19 pandemic was reported by more than half of residents (57.7%). More than one third of physicians (38.8%) believed that working duties during COVID-19 improved their clinical practice. Majority of them (85.6%) thought the lockdown has negatively affected their family medicine training and theoretical learning / classroom training (78.8%). Almost half (51.9%) of physicians mentioned that their exam result was negatively affected by the pandemic. Most of them (72.1%) thought that the COVID-19 lockdown has increased their stress levels. Majority of them (94.2%) mentioned that their families expressed concern for their safety during COVID-19 lockdown and 72.1% were unhappy during the lockdown Table 4. Male physicians were more likely than females to be tested positive for Covid-19

Table 1. Response of family medicine residents, Makkah to knowledge questions about Covid-19 pandemic

Knowledge questions	Right answers	
	No.	%
What is the type of novel coronavirus-19 (MERS-CoV)	43	41.3
What is the main mode of transmission (Droplet transmission)	90	86.5
What are the most common symptoms (Fever and cough)	73	70.2
What is the estimated incubation period (2-14 days)	28	26.9
What is the preferred hand hygiene method in health care setting (Alcohol-based hand rub)	83	79.8
Are you familiar with the Saudi CDC guide to COVID-19 surveillance cases definitions (Yes)	76	73.1
Have you used the respiratory triage checklist during your practice (Yes)	84	80.8

Table 2. Factors associated with knowledge about Covid-19 among family medicine residents, Makkah

	Total Covid-19 knowledge score			p-value
	Median	IQR	Mean rank	
Age (years)				
<30	5	4-5.25	52.22	
≥30	5	4-5	53.35	0.864*
Gender				
Male	5	4-5	46.24	
Female	5	4-6	57.66	0.047*
Year of residency training				
R2	435	3.25-5	46.59	
R3	5	4-5	48.79	
R4	5	4-6	62.35	0.061**

IQR: Interquartile range; *Mann-Whitney test **Kruskal-Wallis test

Table 3. Preparedness of the family medicine residents in Makkah regarding COVID-19 pandemic

Questions	N (%)
Did you receive any formal training for hand hygiene in the last 2 years?	98 (94.2)
Did you receive any formal training on wearing and removing personal protective equipment?	98 (94.2)
Do you know the correct size of N-95 mask that fit you?	63 (60.6)
Have you participated in COVID-19 duty?	96 (92.3)
How did you participate on COVID-19 duty?	
-Emergency room	54 (51.9)
-MOH online consultation	48 (46.2)
-Quarantine facilities	40 (38.5)
-12 hours on call duty	30 (28.8)
-None	4 (3.8)
Have you dealt directly with COVID-19 patients?	80 (76.9)
Have you received COVID-19 vaccine?	102 (98.1)

Table 4. Impact of COVID-19 pandemic on family medicine residents, Makkah

	Frequency	Percentage
Results of Covid-19 testing among family medicine residents, Makkah		
Negative	76	73.1
Positive	15	14.4
Not tested	13	12.5
History of home isolation During the COVID-19 crisis	44	42.3
No	60	57.7
Yes		
Did working duties during COVID-19 improved your clinical practice		
No	64	61.5
Yes	40	38.5
Do you think this lockdown has negatively affected your family medicine training		
No	15	14.4
Yes	89	85.6
Do you think this lockdown has negatively affected your theoretical learning / classroom training		
No	22	21.2
Yes	82	78.8
Has your exam (Promotion, part, OSCE) result were negatively affected by the pandemic		
No	50	48.1
Yes	54	51.9
How do you think the COVID-19 lockdown has affected your stress levels		
Decreased	7	6.7
Increased	75	72.1
No effect	22	21.1
Did your family express concern for your safety during COVID-19 lockdown		
No	6	5.8
Yes	98	94.2
As a training doctor, what is your general state-of-mind during the lockdown?		
Unhappy	75	72.1
Happy	29	27.9

Table 5. Impact of Covid-19 pandemic on family medicine residents, according to their gender

	Males N=47 N (%)	Females N=57 N (%)	p-value
Results of Covid-19 testing among family medicine residents, Makkah			
Negative (n=76)	36 (76.6)	40 (70.2)	
Positive (n=15)	9 (19.1)	6 (10.5)	
Not tested (n=13)	2 (4.3)	11 (19.3)	0.047*
History of home isolation during the COVID-19 crisis			
No (n=44)	17 (36.2)	27 (47.4)	
Yes (n=60)	30 (63.8)	30 (52.6)	0.250*
Did working duties during COVID-19 improved your clinical practice			
No (n=64)	30 (63.8)	34 (59.6)	
Yes (n=40)	17 (36.2)	23 (40.4)	0.663*
Do you think this lockdown has negatively affected your family medicine training			
No (n=15)	8 (17.0)	7 (12.3)	
Yes (n=89)	39 (83.0)	50 (87.7)	0.493*
Do you think this lockdown has negatively affected your theoretical learning / classroom training			
No (n=22)	14 (29.8)	8 (14.0)	
Yes (n=82)	33 (70.2)	49 (86.0)	0.050*
Has your exam (Promotion, part, OSCE) result ware negatively affected by the pandemic			
No (n=50)	29 (61.7)	21 (36.8)	
Yes (n=54)	18 (38.3)	36 (63.2)	0.012*
How do you think the COVID-19 lockdown has affected your stress levels			
Decreased (n=7)	6 (12.8)	1 (1.8)	
Increased (n=75)	30 (63.8)	45 (78.9)	0.059*
No effect (n=22)	11 (23.4)	11 (19.3)	
Did your family express concern for your safety during COVID-19 lockdown			
No (n=6)	4 (8.5)	2 (3.5)	
Yes (n=98)	43 (91.6)	55 (96.5)	0.252**
As a training doctor, what is your general state-of-mind during the lockdown?			
Unhappy (n=75)	31 (66.0)	44 (77.2)	
Happy (n=29)	16 (34.0)	13 (22.8)	0.203*

*Chi-square test**Fischer Exact test

Table 6. Impact of Covid-19 pandemic on family medicine residents , according to their residency level

	R2 N=28 N (%)	R3 N=43 N (%)	R4 N=33 N (%)	p-value*
Results of Covid-19 testing among family medicine residents, Makkah				
Negative (n=76)	21 (75.0)	31 (72.1)	24 (72.7)	
Positive (n=15)	5 (17.9)	6 (14.0)	4 (12.1)	
Not tested (n=13)	2 (7.1)	6 (14.0)	5 (15.2)	0.865
History of home isolation During the COVID-19 crisis				
No (n=44)	10 (35.7)	15 (34.9)	19 (57.6)	
Yes (n=60)	18 (64.3)	28 (65.1)	14 (42.4)	0.099
Did working duties during COVID-19 improved your clinical practice				
No (n=64)	13 (46.4)	28 (65.1)	23 (69.7)	
Yes (n=40)	15 (53.6)	15 (34.9)	10 (30.3)	0.145
Do you think this lockdown has negatively affected your family medicine training				
No (n=15)	7 (25.0)	5 (11.6)	3 (9.1)	
Yes (n=89)	21 (75.0)	38 (88.4)	30 (90.9)	0.168
Do you think this lockdown has negatively affected your theoretical learning / classroom training				
No (n=22)	8 (28.6)	10 (23.3)	4 (12.1)	
Yes (n=82)	20 (71.4)	33 (76.7)	29 (87.9)	0.266
Has your exam (Promotion, part, OSCE) result ware negatively affected by the pandemic				
No (n=50)	20 (71.4)	18 (41.9)	12 (36.4)	
Yes (n=54)	8 (28.6)	25 (58.1)	21 (63.6)	0.014
How do you think the COVID-19 lockdown has affected your stress levels				
Decreased (n=7)	2 (7.1)	3 (7.0)	2 (6.1)	
Increased (n=75)	16 (57.2)	33 (76.7)	26 (78.8)	
No effect (n=22)	10 (35.7)	7 (16.3)	5 (15.2)	0.279
Did your family express concern for your safety during COVID-19 lockdown				
No (n=6)	2 (7.1)	3 (7.0)	1 (3.0)	
Yes (n=98)	26 (92.9)	40 (93.0)	32 (97.0)	0.716
As a training doctor, what is your general state-of-mind during the lockdown?				
Unhappy (n=75)	19 (67.9)	29 (67.4)	27 (81.8)	
Happy (n=29)	9 (32.1)	14 (32.6)	6 (18.2)	0.322

*Chi-square test

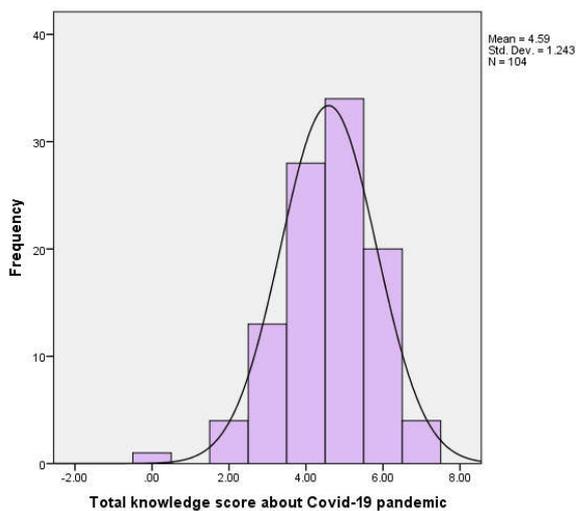


Figure 1. Distribution of the total knowledge score about Covid-19 pandemic among family medicine residents, Makkah

(19.1% vs. 10.5), $p=0.047$. Majority of female physicians (86%) compared to 70.2% of males thought the covid-19 lockdown has negatively affected their theoretical learning/classroom training. However this was borderline insignificant, $p=0.050$. Also, 63.2% of female physicians compared to only 38.3% of males mentioned that their exam (Promotion, part, OSCE) result was negatively affected by the pandemic, $p=0.012$ Table 5. There were no significant differences between younger (<30 years) and older (≥ 30 years) regarding impact of covid-19 on their academic issues. Most of R4 physicians (63.6%) compared to 28.6% of R2 physicians mentioned that their exam (Promotion, part, OSCE) result was negatively affected by the pandemic, $p=0.014$. Residency level was not significantly related to other issues related to impact of COVID-19 Table 6.

DISCUSSION

During period of Covid-19 pandemic, knowledge of physicians in frontline and in direct contact with patients, such as the family medicine residents about the pandemic can affect their handling of patients.⁹⁻¹¹ However; the level of knowledge regarding COVID-19 among this group of physicians is still unclear. This study explored, among its aims, the level of knowledge of family medicine residents about some aspects of Covid-19 pandemic as well as assess their preparedness as regards Covid-19 pandemic and finally explore the impact of Covid-19 pandemic on their training program and trying to find solutions for obstacles.

Knowledge about Covid-19 pandemic: In the current study, overall level of knowledge of family medicine residents about Covid-19 pandemic was satisfactory as majority of them could recognize the main mode of transmission of Covid-19, the preferred hand hygiene method in health care setting, and the most common symptoms of Covid-19. Additionally, they were familiar with the Saudi CDC guide to COVID-19 surveillance cases definitions and have used the respiratory triage checklist during your practice. This means that the Saudi CDC guide to COVID-19 surveillance cases definitions had effective influence in improving physicians' knowledge. Furthermore, being familiar with information from these unbiased and reliable sites is important for family medicine physicians' preparedness and response to the pandemic.

The same high level of knowledge about covid-19 pandemic has been reported from other studies carried out among physicians in Lebanon (Abou-Abbas, 2020), China (Zhang, 2020), Uganda, (Olum, 2020) Pakistan (Saqlain, 2020) and Vietnam (Huynh, 2020). However, another study showed insufficient knowledge among healthcare workers in United Arab of Emirates, especially regarding the mode of transmission and the Covid-19 incubation period (Bhagavathula, 2020). This could be due to the fact that we included only family medicine resident physicians while the other study included all healthcare workers; however, they found that physicians were more knowledgeable than other healthcare workers' categories. In the present study, female physicians were more knowledgeable about Covid-19 pandemic than males. Other studies carried out in Lebanon,¹² and United Arab of Emirates³ did not find a gender difference in knowledge

Preparedness regarding Covid-19: The present study showed that, overall, family medicine residents were adequately prepared for the Covid-19 pandemic as majority of them received COVID-19 vaccine, formal training for hand hygiene in the last two years and on wearing and removing personal protective equipments, as well as they participated in COVID-19 duty. Moreover, most of them (76.9%) reported direct dealing with COVID-19 patients. In another study carried out in the United Arab of Emirates, the average score of preparedness was 68.7% and 30.9% of studied healthcare workers had good preparedness scores.¹⁷ Male physicians were more likely than females to receive training for hand hygiene in the last two years and training on wearing and removing of PPEs than females. This is quite expected, as males usually involved in difficult critical situations than females. Also, physicians of lower residency training level were more knowledgeable than older residents regarding the correct size of N-95 mask that fit them; mostly because they were more concerned about the pandemic due to their relatively lower experience with emergencies. However, older physicians were more likely to participate in COVID-19 duty; again because they have a little bit more experience.

Impact of Covid-19 pandemic on the training: This study revealed that 14.4% of the resident physicians tested positive for Covid-19 whereas 12.5% did not perform the test. Lower rate has been reported earlier in Washington, USA (5.3%)¹⁸ and also in another USA study (7.99%).¹⁹ The difference could be attributed to the fact that the two American studies were carried out earlier with less spread of the infection compared to our study. In the present study, home isolation during Covid-19 pandemic was reported by 57.7% of resident physicians. Family medicine specialty as a non-surgical one is subjected to reconstruction to protect trainees from contracting COVID-19 while maintaining their educational preparedness; through usage of telehealth visits, this is not applicable for surgical specialties (Enujoike, 2020). More than one third of physicians (38.8%) in this study believed that working duties during COVID-19 improved their clinical practice. Similarly, Enujoike et al. (2021) has mentioned that this pandemic provided very special learning opportunities for healthcare workers as a result of better social connection and educational autonomy. Contrary to that, in Canada, radiology residents reported an overall more disruption in their daytime schedules and number of cases (2). Difference between the nature of various specialties could explained this. Majority of family medicine residents in the present study (85.6%) thought the

lockdown has negatively affected their training and theoretical learning/classroom training (78.8%) and also 51.9% of them mentioned that their exam result was negatively affected by it. Other residency programs of various specialties conducted elsewhere reported negative impact of Covid-19 lockdown on their residency training programs.^{2, 7, 21-23} However, up to our knowledge, no study has been carried till the time of writing this reported among family residents; at least in the Kingdom of Saudi Arabia. Most of resident physicians in the current study (72.1%) thought that the COVID-19 lockdown has increased their stress levels. Other studies reported that preserving resident physicians' safety through access to personal protective equipment and protection against contracting the virus as well as preserving high quality education can reduce their stress (Brar, 2021; Rana *et al.*, 2020; Lou, 2021; Aziz, 2021). Furthermore, it has been indicated that mental health support from the department significantly improved with educational preparedness during the pandemic (Enujioké, 2020). Majority of the participants in the present study (94.2%) mentioned that their families expressed concern for their safety during COVID-19 lockdown and 72.1% were unhappy during the lockdown. The same has been reported by others (Enujioké, 2021; Khusid, 2020; Collins, 2021). In this context, Kannampallil TG, et al observed that the higher level of burnout and stress reported by Healthcare workers exposed to COVID-19 positive patients often included worries about their work-family balance (Kannampallil, 2020). The present study is the first, at least in the Kingdom of Saudi Arabia, up to our knowledge to investigate the preparedness of family medicine residents during covid-19 pandemic as well as to explore its impact on training program and the results could be of importance to educators to help them to focus on what is important for the residency programs during disasters. However, some limitations exist. Conduction of the study in only one residency program could impact the ability to generalize results over other programs. The self-reported nature of the study tool in another limitation, subjected to bias. In conclusion, knowledge of family medicine residents in Makkah, Saudi Arabia about Covid-19 pandemic was overall satisfactory; with defective knowledge particularly regarding type of novel coronavirus-19 and its incubation period. They were adequately prepared for the Covid-19 pandemic as majority of them received COVID-19 vaccine, formal training for hand hygiene in the last two years and on wearing and removing personal protective equipments, as well as they participated in COVID-19 duty. A considerable proportion of them tested positive for Covid-19. Majority of them thought the lockdown has negatively affected their family medicine training and theoretical learning/classroom training. Furthermore, almost half of them mentioned that their exam result was negatively affected by the pandemic and most of them that the COVID-19 lockdown has increased their stress levels.

Based on the current study's findings, we recommended the following:

- Providing online courses on stress management for family medicine residents
- Activate tele-mentoring as a suitable mean of education in these circumstances
- Ensure safety and encourage residents' wellbeing through provision of adequate personal protective equipments, adequate training and supervision.

- Care should be paid for mental health of those on the frontline.
- Social support through engagement in social activities, with keeping social distancing such as outdoor meet ups

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