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ORIGINAL RESEARCH

Consequences of COVID-19 Pandemic on Orthopedic Residents' Clinical and Academic Performance, and the Subsequent Impact on Their Mental Status in Saudi Arabia

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Introduction: Impact of COVID-19 pandemic on the orthopedic residency programs was substantial worldwide. Orthopedic residency programs eventually survived such a hardship with implementation of certain measures. The impact of COVID-19 pandemic on the orthopedic trainees was variable relative to the country in which orthopedic residency program is based. This study aimed to assess the experience of the orthopedic residents during COVID-19 pandemic in Saudi Arabia and consequences on mental health, academic performance, and clinical training.

Methods: A cross-sectional study was conducted from June 2021 to August 2021. An online survey was sent to the orthopedic residents in Saudi Arabia. The questionnaire was arranged into four sections pertaining to demographic data, academic activity, mental health, and clinical activity.

Results: One-hundred forty-four orthopedic residents participated with mean age of 28.7 ± 5.67 years. Males were 108 (75%) and females were 36 (25%). Fifty-four (37.5%) residents worked in COVID-19 isolation unit. One-hundred twenty residents (83.3%) treated COVID-19 patients. Thirty residents (20.8%) had positive COVID-19 tests. Eighty-four (58.3%) residents were quarantined. Overall online education was difficult (41%). Half of the participants faced online difficulties in technicality, maintaining attention, and interaction with audience and examiners. Prospective research conduction was difficult (71.4%). More than 50% of residents experienced difficulties with isolation, quarantine, socialization, and anxiety of disease transmission. Physical examination was difficult for 50% of trainees. No shortage of PPE supply was reported. Getting hands-on surgical training was very difficult (47.8%).

Conclusion: COVID-19 pandemic had an adverse impact on Saudi orthopedic residents in terms of academic performance, mental wellbeing, and clinical training. After all, adequate level of orthopedic training quality was maintained. In crises, collaborative efforts are needed to minimize undesirable consequences on the trainees' competency level. Residency program decision makers should utilize all available strategies to optimize the training environment to achieve the required competency level.

Keywords: COVID-19, education, orthopedic, orthopedic resident, quarantine

Introduction

In December 2019, the coronavirus disease 2019 (COVID-19) broke out in China.[1] It was declared a global pandemic by the World Health Organization (WHO) in March 2020.[2] The high infectivity rate forced the governments to take strict actions in socioeconomic measures such as confinement, suspension of business operations, and reallocation of resources. Virtual ways of communication appeared reasonable alternative channels offering contactless media and meeting social distancing requirements. Online solutions were heavily present in education and health care.

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Surgical specialties, including orthopedics, had to decrease their surgical practice and work outside their surgical specialties to help control overwhelming situation.[3] Elective orthopedic surgery was suspended. The workload was decreased to minimize the virus spread and reallocate resources in healthcare personal, medical equipment, and beds.[4] In Europe, there was a significant drop in arthroplasty and arthroscopy procedures.[5,6] As a result of "stay at home" policy, a relative decline was noticed in trauma-related orthopedic surgeries during the pandemic.[7] The impact of COVID-19 went beyond surgeons and patients and reached orthopedic trainees who suffered from limited clinical and surgical exposure and cancellation of most of the scientific meetings.[8] There was a huge shift in the educational process of residents from problem-based learning into web-based learning methods.[9] Some authors highlighted a similar issue in other surgical specialties.[10,11]

Major interruption in orthopedic residency training program has occurred during the COVID-19 pandemic. The authors hypothesized possible negative impact on the overall trainees' level and intended to test that issue and provide useful insight. There is a relative lack of information in our region about the impact of COVID-19 pandemic on the orthopedic residents and the changes in clinical rotations and academic activities. Our study aimed to focus on the experience of the orthopedic residents in Saudi Arabia during COVID-19 and the changes happened since pandemic beginning until this survey conduction in July 2021 in terms of mental health, academic performance, and clinical practice training.

Methods

The study proposal was approved by the institutional board review at King Saud University (reference number 21/0489/IRB). A country-wide cross-sectional study was conducted using an online anonymous survey emailed to the orthopedic in-training residents enrolled in the Saudi Commission for Health Specialties at the time of the study.

The inclusion criteria included having current valid registration in the Saudi orthopedic in-training residency program during the COVID-19 pandemic period. All orthopedic residents who completed training before the pandemic were excluded as well as those whose training was on-hold for any reason. The study period was from July 2021 to August 2021. All respondents agreed to participate in the informed consent section preceding the survey. No participant identifiers were collected, and the identity of participants remained anonymous throughout the study. The survey was sent by email to 386 orthopedic in-training residents. The questionnaire used in the present study was originally developed and validated by Barik and coworkers.[12] The original authors permitted re-use of the questionnaire in our study. The questionnaire is comprised of 3 main sections concerning academic activity, mental health, and clinical activity. The academic activity questions were categorized into 3 subsections about online, research, and examination activities. The mental health questions were directed to assess the cognitive, affective, and psychomotor aspects. Its focus was to explore the personal time experience in isolation or quarantine, coping with non-orthopedic duties, managing individual's time and socializing with others. The section of clinical activities was designed to cover the ordinary work tasks in the settings of operating theater, inpatient, outpatient, and emergency. The given answers were based on Likert scale consisting of 5 levels of difficulty (1 very difficult, 2 difficult, 3 same, 4 easy, 5 very easy). The participants were instructed to select a single appropriate response relative to the ordinary situation prior to the pandemic. Also, the survey contained relevant questions related to age, workplace, experience of treating COVID-19 patients, knowledge about precautions, history of quarantine, getting tested for COVID-19, and being COVID-19 positive. Descriptive statistics were presented in the form of mean with standard deviation for normally distributed numerical variables and median with interquartile range for non-normally distributed variables, while numbers and percentages are used for the categorical variables. The statistical analysis was performed using Microsoft Excel software.

Results

Total of 144 responses were collected with response rate of 37%. The responders were 108 (75%) male subjects while 36 (25%) were females. The participating residents were distributed over the residency levels; 30 level 1 (20.8%), 48 level 2 (33.3%), 30 level 3 (20.8%), 18 level 4 (12.5%), and 18 level 5 (12.5%). Mean age of the study sample was 28.7 ± 5.67. Fifty-four (37.5%) residents had work assignments in COVID-19 isolated areas during the pandemic. One-hundred twenty orthopedic residents (83.3%) have treated patients with COVID-19. Thirty residents (20.8%) had positive COVID-19 tests. Eighty-four (58.3%) residents were quarantined due to exposure to COVID-19 patients.

Academic Activity Section

Overall online learning was difficult for 41.7% of the residents (Table 1). About half of the participants described dealing with technical issues, interacting with audience, and maintaining audience attention as difficult tasks. Half of the residents noticed no change with study time management. More than 50% of the residents experienced no change in preparing educational slides and gaining more knowledge as a presenter. Interaction with examiners was difficult according to 44.4% of the residents. Most of the residents experienced no change in the exam environment, digital examinations, dummy-based stations, multiple-choice questions (MCQs), objective structured clinical examination (OSCE), and objective structured practical examination (OSPE). Recruitment of new patients for prospective research was difficult as judged by most of the residents. Conducting a prospective study and moving forward with publication were the same for about half of the participants. Assigning time for research was difficult for more than half of the residents (52.2%).

Mental Activity Section

Greater than 50% of the residents had difficulties with time in isolation/quarantine or managing time for themselves. It was difficult for 57.1% of the residents to run non-orthopedic hospital duties. Socialization with others was considered difficult by 54.2% of the participants.

Table 1 Proportions of the Questionnaire Responses Among Orthopedic Residents in Saudi Arabia

Item	Very Difficult	Difficult	Same	Easy	Very Easy
Academic Activity Section					
1. Examination					
Interaction with examiners	5.6	44.4	33.3	11.1	5.6
Interaction with standardized patients (dummy)	0	27.8	55.6	11.1	5.6
Online interface-based viva voce	0	31.6	52.6	10.5	5.3
Environment of exam	0	33.3	46.7	13.3	6.7
"MCQ" pattern of the theory exam	0	12.5	62.5	18.8	6.3
Complete OSCE/OSPE pattern	0	22.2	61.1	11.1	5.6
2. Research					
Recruiting new patients for research	4.5	54.5	22.7	13.6	4.5
Conducting prospective research	4.8	71.4	9.5	9.5	4.8
Conducting retrospective research with available data	0	13.6	50.0	27.3	9.1
Getting time for research	0	52.2	17.4	13.0	17.4
Getting research published	0	26.1	60.9	8.7	4.3
3. Online academic activities					
Managing time to study	4.2	29.2	50.0	8.3	8.3
Preparing for an academic activity (slides)	4.2	16.7	58.3	12.5	8.3
Interaction with audience	8.3	45.8	16.7	16.7	12.5
Maintain the attention span of the audience	10.7	51.0	19	9.3	10
Any gain in knowledge for a presenter	0	25.0	54.2	16.7	4.2
Technicality of an online conference	0	50.0	33.3	8.3	8.3
Participating in a case scenario/case presentation	0	50.0	25.0	16.7	8.3
Overall learning through web platforms	0	41.7	25.0	20.8	12.5
Mental health section					
Spending time during isolation/quarantine	18.2	50.0	13.6	4.5	13.6
Pursuing non-orthopedic hospital duties	14.3	57.1	14.3	4.8	9.5
Managing time for yourself	12.5	66.7	4.2	4.2	12.5
Socializing with others	29.2	54.2	8.3	0	8.3
Clinical activity section					
1. Working in operating room					
Pre-operative preparation of a patient posted for surgery	21.7	56.5	13.0	4.3	4.3
Arrangement of necessary implant	21.7	21.7	47.8	4.3	4.3
Scheduling a slot for surgery	26.1	52.2	13.0	4.3	4.3
Learning options in operating room	30.4	17.4	43.5	4.3	4.3
Getting hands-on surgical experience	47.8	21.7	21.7	4.3	4.3
Availability of PPE	16.7	33.3	37.5	8.3	4.2

(*Continued*)

Table 1 (Continued).

Item	Very Difficult	Difficult	Same	Easy	Very Easy
Working with anxiety about COVID-19 infection	29.2	58.3	4.2	4.2	4.2
2. Emergency room/outpatient department					
Managing patient volume	17.4	47.8	13.0	17.4	4.3
Clinical examination of patients	12.5	50.0	25.0	8.3	4.2
Dressing and plaster room services	4.3	21.7	60.9	8.7	4.3
Sending laboratory and radiological investigations	0	26.1	60.9	8.7	4.3
Obtaining expert opinion (from a consultant)	0	16.7	66.7	12.5	4.2
Availability of PPE	8.3	29.2	45.8	12.5	4.2
Working with anxiety about COVID-19 infection	12.5	70.8	0	12.5	4.2
3. Inpatient ward					
Follow up of patient admitted	8.3	16.7	62.5	8.3	4.2
Sending laboratory and radiological investigations	8.7	17.4	60.9	8.7	4.3
Availability of adequate medicine/equipment	8.3	16.7	66.7	4.2	4.2
Obtaining references from other departments	8.3	20.8	62.5	4.2	4.2
Availability of PPE	16.7	25.0	50.0	4.2	4.2
Co-operation from co-residents and staff	12.5	8.3	70.8	4.2	4.2
Working with anxiety about COVID-19 infection	25.0	50.0	16.7	4.2	4.2

Notes: Adapted from Barik S, Paul S, Kandwal P. Insight into the changing patterns in clinical and academic activities of the orthopedic residents during COVID-19 pandemic: a cross-sectional survey. Knee Surg Sports Traumatol Arthrosc. 2020 Oct;28(10):3087–3093. doi: 10.1007/s00167-020-06274-0. Epub 2020 Sep 14. PMID: 32926255; PMCID: PMC7487263.[12]

Abbreviations: COVID-19, novel coronavirus 2019; MCQ, multiple-choice questions; OSCE, objective structured clinical examination; OSPE, objective structured practical examination; PPE, personal protective equipment.

Clinical Activity Section

It was difficult for many residents to work with anxiety of acquiring COVID-19 infection with variable proportions based on the workplace settings: 70.8% in the emergency or outpatient departments, 58.3% in the operating theater, and 50% in the inpatient floor. Most of the responses indicated that availability of personal protective equipment (PPE) during the pandemic was the same as prior to the pandemic. In the emergency and outpatient setting, managing high volume of patients and performing physical examination were difficult based on about 50% of the responses. Other aspects of emergency and outpatient work like seeking senior opinion and provision of dressing, plaster room, radiography, laboratory services were unaffected according to two-thirds of the participants. In the operating room, pre-operative preparation and scheduling patients for surgery were difficult. Moreover, getting hands-on surgical training was very difficult based on 47.8% of the responses. Apart from anxiety of having COVID-19 disease, inpatient-related work showed no difference compared to before the pandemic.

Discussion

All countries around the world were affected by the COVID-19 pandemic. Worldwide restrictions were enforced, affecting the daily life of everyone. Political and economical challenges were faced by many countries. The healthcare system was mostly affected by the pandemic. Healthcare workers worldwide had to overcome such an obstacle. Orthopedic service was reduced to a minimum the capacity in outpatient clinics, inpatient wards, and elective surgeries.[9,13,14] Orthopedic surgery residents had to abandon a major part of their orthopedic practice and help caring for COVID-19 patients. On the other hand, directors of orthopedic training programs were put in a situation with which core orthopedic training falls incredibly under par.

Academic online learning was a necessity during the pandemic due to implementation of social distancing. According to 41.7% of the residents, overall online learning experience was difficult. Perhaps due to the rapid switch from physical mode to online mode of teaching which happened in an unexpected manner leaving no time to adapt. Sometimes, it was hard to initiate and maintain an efficient trainer-trainee connection throughout educational activities, without a solid accessible technical support reliably available. Technicality issues were difficult to overcome by 50% of the residents. Difficulties to interact with audience and maintain attention span were reported by 45.8% and 51% of the responders, respectively. In contrast, Barik et al reported an easy

overall online learning experience among Indian orthopedic residents.[12] Geographical variation and using different online platforms may be behind that. However, our findings were comparable to Barik et al study regarding difficulty to maintain audience attention span during online educational activities.[12] Unlike Barik et al findings, our residents felt no change dealing with dummy standardized patients and completing online MCQs and OSCE/OSPE.[12] The orthopedic-on-training residents in Saudi Arabia are familiar with different forms of electronic examinations. Electronic exams were introduced earlier in most of the Saudi colleges before the pandemic. Besides, applicants for colleges are required to pass certain electronic national exams prior to joining. However, interaction with examiners online was difficult for most of our residents as well as their peers in India.[12]

Multiple factors could have been affected the research activity during COVID-19 pandemic. Time restrictions, physical and mental health integrity of researchers, availability of patients and other research tools could be considered examples of these factors. Most of our study respondents had difficulty to have time for research in contrast to the Indian group that had easier time for research.[12] It was harder for the participants to conduct prospective research projects compared to retrospective studies. Recruitment of new subjects for prospective studies could be problematic during crises whereas conducting a retrospective study using pre-existing data seems to be much easier task. However, the publication rate was neither increased nor decreased in both Indian and Saudi groups.[12] Mavrogenis et al indicated that journal editors were faced with huge number of manuscript submissions during the pandemic and there was a relative scarcity of peer reviewers.[4]

Literature showed negative impact of COVID-19 pandemic on overall mental health of trainees.[15–18] Our findings indicated a decline in mental health of orthopedic residents. Many orthopedic trainees spent difficult times isolated, quarantined, or pulled out of orthopedic field as frontliners managing non-orthopedic medical conditions. Human socialization needs were hard to be met with strict social distancing obligations. Mental wellbeing of healthcare providers including orthopedic residents was endangered during the pandemic. As a result, establishment of dedicated mental health support has been advocated to ensure mental health welfare of healthcare providers.[8,19,20]

In the clinical field, fear of COVID-19 transmission was a common prominent feeling among residents working in various hospital areas such as emergency departments, outpatient clinics, surgery theaters, or hospital wards.[21] The residents who worked in emergency settings experienced higher level of anxiety about getting COVID-19 infection than other workplaces. The reason could be that many patients with undetermined COVID-19 status used to seek medical care in emergency units. Clinical examination in the outpatient setting was unpleasant for the Saudi orthopedic trainees. Social distancing is almost impossible whilst performing optimal physical examination which exposes the clinicians to higher risk of COVID-19 infection. Unlike many parts of the world, orthopedic residents in Saudi Arabia did not feel shortage of PPE supply. The Saudi Ministry of Health anticipated a forthcoming deficiency in the PPE supply at early stage and made prompt actions to secure the country needs of PPE. Performing surgeries was difficult along the way. Orthopedic residents in Saudi programs faced difficulties in fulfilling pre-operative preparatory steps, securing surgical time for patients in the operating room, and getting adequate hands-on intra-operative practice. Globally, orthopedic trainees suffered from limited surgical exposure during COVID-19 pandemic.[12,13] Certain measures were taken by the program directors to address such an issue and ensure adequate practice. Telemedicine can offer an effective way to provide non-urgent orthopedic care.[22] Virtual surgical simulation could be helpful for surgical skills learning and retaining.[23–25]

The present study is limited by its geographical locality. Orthopedic trainees in other countries could have dissimilar experiences. However, multiple studies from different parts of the world can collectively help identify, understand, and overcome the obstacles facing orthopedic residents during crisis like COVID-19 pandemic.

Conclusion

In conclusion, COVID-19 pandemic has left an unfavorable impact on the orthopedic residents in Saudi Arabia. The consequences extended to a variable degree in multiple dimensions of orthopedic residency training including academic, mental and clinical domains. Collaboration between healthcare sectors is mandatory during crises. However, orthopedic residency training quality should be maintained. Extra efforts are needed to minimize any negative impact on the trainees' competency level. Orthopedic residency program decision makers should utilize all available strategies to optimize the training environment for residents to achieve the required orthopedic core competencies.

Disclosure

The authors report no conflicts of interest in this work.

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