

DOI: 10.17986/blm.1596

Adli Tıp Bülteni 2022;27(3):225-232

# Impact of the COVID-19 Pandemic on Forensic Medicine Residency Training

## COVID-19 Pandemisinin Adli Tıp Asistanlık Eğitimine Etkisi

✉ Mahmut Şerif Yıldırım<sup>1</sup>, ✉ Halit Canberk Aydoğan<sup>2</sup>, ✉ Hatice Yağmur Zengin<sup>3</sup>, ✉ Ramazan Akçan<sup>4</sup>, ✉ Ali Rıza Tümer<sup>4</sup>

<sup>1</sup>Afyonkarahisar Health Sciences University Faculty of Medicine, Department of Forensic Medicine, Afyonkarahisar, Turkey

<sup>2</sup>University of Health Sciences Turkey, Gülhane Training and Research Hospital, Department of Forensic Medicine, Ankara, Turkey

<sup>3</sup>Hacettepe University Faculty of Medicine, Department of Biostatistics, Ankara, Turkey

<sup>4</sup>Hacettepe University Faculty of Medicine, Department of Forensic Medicine, Ankara, Turkey

### ABSTRACT

**Objective:** This paper aims to assess the impact of severe acute respiratory syndrome coronavirus 2 outbreak on forensic medicine residency training and to reveal implemented methods to keep the standard of residency education to prevent pandemic's catastrophic effects on education of forensic medicine residents in Turkey.

**Methods:** Two online-based surveys were prepared towards "Residents of forensic medicine" and "Head of departments". Survey-1 completed by 125 forensic medicine residents and Survey-2 completed by 18 heads of forensic medicine departments from different regions of Turkey.

**Results:** More than half of the residents who started their clinical training practice before outbreak of pandemic reported that there has been a decrease in numbers of clinical practical activities, and half of the residents stated that lectures/meetings have been suspended due to the pandemic. Distance learning/meeting applications in educational activities were found "partially useful" or "useful" by 83.2% of the residents (n=104). Residents who pointed out a change in practical autopsy training reported that this change has negatively affected their forensic medicine residency training.

**Conclusion:** Sharing our results might force potential implementations to prevent worsening and improve forensic medicine residency training here and worldwide to identify effective responses to such unexpected issues.

**Keywords:** SARS-CoV-2, COVID-19 pandemic, forensic medicine education, autopsy practice



**Address for Correspondence/Yazışma Adresi:** Mahmut Şerif Yıldırım, Afyonkarahisar Health Sciences University Faculty of Medicine, Department of Forensic Medicine, Afyonkarahisar, Turkey  
**E-mail:** dr.msyildirim@gmail.com  
**ORCID ID:** orcid.org/0000-0001-8861-9016

**Received/Geliş tarihi:** 11.11.2021  
**Accepted/Kabul tarihi:** 25.03.2022

## ÖZ

**Amaç:** Bu makale, şiddetli akut solunum yolu sendromu koronavirüsü 2 salgınının adli tıp asistanlık eğitimine etkisini değerlendirmeyi ve pandeminin Türkiye'deki adli tıp asistanlarının eğitimine katastrofik etkilerini önlemek için asistanlık eğitimi standardını korumak amacıyla uygulanan yöntemleri ortaya çıkarmayı amaçlamaktadır.

**Yöntem:** "Adli Tıp Asistanları" ve "Anabilim Dalı Başkanları"na yönelik olarak iki adet online tabanlı anket hazırlanmıştır. Anket-1, 125 adli tıp asistanı tarafından ve Anket-2, Türkiye'nin farklı bölgelerinden 18 adli tıp anabilim dalı başkanı tarafından tamamlanmıştır.

**Bulgular:** Pandemi öncesinde klinik eğitim uygulamasına başlayan asistanların yarısından fazlası klinik uygulamalı faaliyetlerin sayısında azalma olduğunu, asistanların yarısı ise pandemi nedeniyle ders/toplantılara ara verildiğini belirtmiştir. Eğitim etkinliklerinde uzaktan eğitim/toplantı uygulamaları asistanların %83,2'si (n=104) tarafından "kısmen faydalı" veya "faydalı" bulunmuştur. Uygulamalı otopsi eğitiminde bir değişikliğe dikkat çeken asistanlar, bu değişikliğin adli tıp asistanlık eğitimlerini olumsuz etkilediğini bildirmiştir.

**Sonuç:** Bu çalışmanın çıktıkları uygulamalardaki olası kötüleşmeyi önlemeye ve bu tür beklenmedik sorunlara etkili yanıtları belirlemek için ülkemizde ve dünya çapında adli tıp uzmanlık eğitimini iyileştirmeye olan ihtiyacı göstermektedir.

**Anahtar Kelimeler:** SARS-CoV-2, COVID-19 pandemisi, adli tıp eğitimi, otopsi uygulamaları

## Introduction

With the outbreak of the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic at the end of 2019, the whole world has been experiencing an exceptional period. In this period, medical doctors, as other healthcare professionals, play an important role to overcome the effects of the pandemic (1,2). Various measures have been taken to reduce the negative effects of the pandemic on education. Postgraduate medical training also appears to have been affected in various ways by the pandemic (3-5). Besides major structural changes, changes in working hours, shifts among academic staff, cancelling of face-to-face theoretical and practical educational activities, cancelling, or postponing certain projects are among other consequences of pandemic. In our country, undergraduate medical education has become completely distance learning. On the other hand, postgraduate medical education is tried to be improved with the combination of traditional and new methods in most places. Face-to-face seminars, lectures or practices had to be updated into another method to maintain physical distance in order to avoid transmission of coronavirus disease (COVID) (6). Postgraduate residents from all medical specialties, as well as forensic medicine, were also assigned in COVID clinics. In this sense, post-graduate education should be expected to be affected by this situation.

In our country, forensic medicine residency education takes 4 years, and is given by departments of forensic medicine that provide postgraduate education. The forensic medicine residency curriculum (in Turkish: "ÇEP, Çekirdek Eğitim Programı") is organized by Medical Specialization Board. Clinical practices, educational meetings, research studies, and autopsy are the main topics in curriculum that should be implemented during forensic medicine residency training. Pathology, psychiatry, child and adolescent psychiatry rotations are obligatory for two months each in forensic medicine residency program. The

forensic medicine resident also has to conduct and publish a postgraduate thesis to achieve the right for taking the specialty examination at the end of the four years to become a forensic specialist.

We have created two surveys in order to find out the effects of COVID-19 pandemic on forensic medicine residency training, and to reveal methods implemented by various departments to keep the standard of residency education against the catastrophic effects of the pandemic.

## MATERIALS and METHODS

Two online-based surveys were prepared towards "residents of forensic medicine" and "head of departments (HD)". The first one sent to 350 residents via e-mail and the group for forensic medicine residents electronically. The second survey was sent to 35 heads of departments in which at least one resident started training in the last year, based on the date of application to the ethics committee of this study (7,8). Limit of one response per participant was ensured. The anonymity of results was guaranteed to protect participants. No compensation was offered.

Survey-1 is divided into four sections:

Demographics (i): This section includes participants' age, gender, geographical region and duration of the forensic medicine residency training.

Clinical training (ii): In this section, clinical practices before and during the pandemic were assessed.

Educational meetings and research activities (iii): In this section we asked whether and how the pandemic affected the research and educational meetings for residents.

Autopsy training, contamination, precautions (iv): In this section, the effects of pandemic on practical education and autopsy training were investigated. Furthermore, institutional, and individual precautions in order to prevent COVID contamination during pandemic were also questioned.

Survey-2 was applied as a supplement to Survey-1 in order to determine the perspectives of the heads of departments. Survey-1 and Survey-2 questions are presented as "Supplementary material".

### Statistical Analysis

Numerical data were presented with minimum value, maximum value and median where categorical data were presented as frequency and percentage. Independence between categorical variables were analyzed using Pearson chi-square test when the test assumptions were satisfied. Otherwise, Fisher's Exact test for 2x2 contingency tables and Fisher-Freeman-Halton Exact test for other RxC contingency tables were used. Statistical analysis was carried out using IBM SPSS Statistics version 23 for Windows. In addition, ggplot2, tmap, ggpubr libraries in "R" were used for descriptive purposes. Significance level was determined as 0.05 (9-11).

This study was reviewed and approved by the Research Ethics Committee of Hacettepe University and Scientific Research Board of the Ministry of Health of Turkey.

## Results

### Survey-1

Out of 350 residents who included in the study, Survey-1 completed by 125 (35.7%) forensic medicine residents from different regions of Turkey.

**Demographics:** The median age (min-max) of participants was 29 years (25-38 years). About half of the respondents were female (56%; n=70). One hundred and eight (86.4%) participants were attending forensic medicine residency training at a University Hospital, which followed by Training and Research Hospital and Council for Forensic Medicine. Central Anatolia region was the region with the highest number of residents, which followed by Aegean, and Marmara regions. One-third of residents were in their fourth year of the residency training, while remaining almost equally distributed among the first three years. Only 16%

of the participants have started their residency training during the pandemic period.

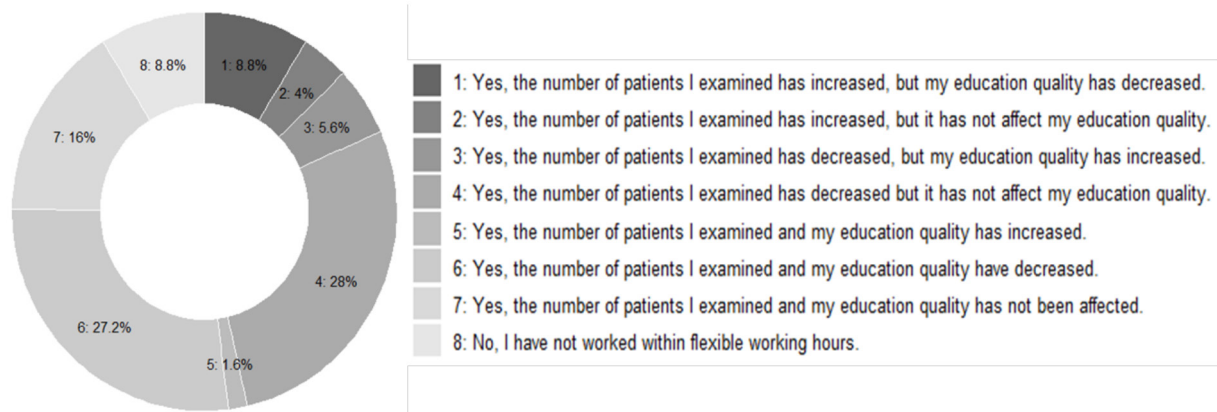
**Clinical Training:** Sixty-two residents (49.6%) stated that there has not been a decrease in the number of clinical forensic cases being evaluated through their medical and/or judicial files (without examining the patient in clinic); 35.2% (n=44) of all residents stated that there has been a decrease in the number of patients (clinical forensic cases) which are examined in the clinic. Forty-four residents (35.2%), out of those who reported decrease in the number of examined patients and/or prepared forensic reports (n=85), stated that the reduction in the number of those cases has no negative impact on their forensic medicine training. One hundred and fourteen participants (91.2%) reported that they have worked within flexible working hours during the pandemic period. Thirty-five (50.7%) residents, out of those reported that there has been a decrease in the number of patients that are examined (n=69), stated that the quality of education has not been affected. Thirty-four participants (27.2%) reported that the quality of education has been decreased (Figure 1).

Moreover, 28 (22.4%) participants stated that working hours in the forensic medicine clinic has decreased, and they have been assigned to COVID clinics. Only three participants (2.4%) stated that they had no change in their working schedule, and their work shifts continued as before the pandemic.

No statistical difference was found between responses of residents who had started forensic medicine residency before and during the pandemic in terms of evaluation regarding clinical training ( $p>0.05$ ) (Table 1).

Similarly, there was no significant difference between responses of residents in terms of the duration of residency ( $p>0.05$ ).

Regarding obligatory rotations, eighteen (58.06%) of the residents out of those who have done rotations during the pandemic stated that their rotations negatively affected. In addition, 21 (16.8%) participants reported that there has been a delay in their rotations during this period.



**Figure 1.** Distribution of responses regarding flexible-working and its effect on number of examined cases and the quality of residency training

**Table 1. The distribution of responses regarding clinical training, theoretical and distance learning applications, research projects in terms of starting residency before or during pandemic**

|   |   | Those started before the pandemic<br>n (%) | Those started during the pandemic<br>n (%) | p                   |
|---|---|--|--|---------------------|
| Do you think distance learning/meeting applications are useful for the case council (case discussion) meetings?                               | Yes   | 7 (38.9%)                                  | 35 (36.1%)                                 | 0.870 <sup>b</sup>  |
|   | No  | 4 (22.2%)                                  | 18 (18.6%)                                 |                     |
|   | Partially useful                            | 7 (38.9%)                                  | 44 (45.4%)                                 |                     |
| How have your face-to-face theoretical educational sessions been affected by the pandemic?  | It has been suspended                       | 7 (41.2%)                                  | 56 (56.6%)                                 | 0.178 <sup>c</sup>  |
|   | It has continued regularly                  | 2 (11.8%)                                  | 19 (19.2%)                                 |                     |
|   | It has decreased                            | 8 (47.1%)                                  | 24 (24.2%)                                 |                     |
| Do you think distance learning/meeting applications (Zoom, Webinar, Microsoft Teams vb.) are useful for forensic medicine residency training? | Yes   | 9 (45.0%)                                  | 57 (54.3%)                                 | 0.280 <sup>c</sup>  |
|   | I have no idea                              | 1 (5.0%)                                   | 16 (15.2%)                                 |                     |
|   | No  | 1 (5.0%)                                   | 3 (2.9%)                                   |                     |
|   | Partially useful                            | 9 (45.0%)                                  | 29 (27.6%)                                 |                     |
| How has your number of research projects been affected by the pandemic?   | It has increased                            | 1 (5.0%)                                   | 13 (12.4%)                                 | 0.006 <sup>c*</sup> |
|   | It has decreased                            | 4 (20.0%)                                  | 16 (15.2%)                                 |                     |
|   | No change                                   | 14 (70.0%)                                 | 38 (36.2%)                                 |                     |
|   | My research projects have been interrupted. | 1 (5.0%)                                   | 38 (36.2%)                                 |                     |

\*: Significant at the 0.05 level, <sup>a</sup>: Fisher's Exact test p-value, <sup>b</sup>: Fisher-Freeman-Halton Exact test p-value, <sup>c</sup>: Pearson chi-square test p-value

Sixty (57.14%) residents, out of those (n=105) who started their clinical training practice before the pandemic reported that there has been a decrease in numbers of clinical practical activities. Moreover, 61 (48.8%) also stated that this decrease has a negative effect on forensic medicine residency training; however, 47.2% (n=59) stated that there is no effect at all, while only 4% (n=5) noted a positive effect.

**Educational Meetings and Research Activities:** Seventy-five (60%) residents stated that they had case council meetings in department before the pandemic, while only 30 (40%) of these residents reported that these meetings have continued with distance learning or e-meeting applications. Out of 116 (92.8%) residents attended face-to-face theoretical educational activities/meetings before the pandemic, 63 (54.31%) declared that these meetings have been suspended during the pandemic. Thirty-four (27.2%) participants have never used these applications in educational meetings. Although 13.6% (n=17) stated that they have no idea regarding mentioned applications, residents who considered the use of these applications in educational meetings "partially useful" and "useful" were quite high (83.2%; n=104). Thirty-nine participants (31.2%) reported that their ongoing research activities have been interrupted due to the pandemic. The duration of forensic medicine residency training has been extended for 25 participants (20%), since they could have not finished their thesis project due to the pandemic (Table 2).

No statistical difference was found between responses of residents who had started forensic medicine residency before

and during the pandemic in terms of evaluation regarding educational meetings and research activities except of number of research projects ( $p>0.05$ ). Similarly, there was no significant difference between responses of residents in terms of the duration of residency ( $p>0.05$ ).

**Autopsy Training, Contamination, and Precautions:** Fifty residents (40%) stated that they have not practiced autopsy, while 65 (52%) stated that they have not participated in any autopsy reports before the pandemic. Forty-six (82.14%) out of those 56 residents who pointed a change in practical autopsy

**Table 2. The effects of the pandemic on the number of research projects and on the thesis**

| Number of Research Projects   | n  | %    |
|---|----|------|
| Increased   | 14 | 11.2 |
| No change   | 52 | 41.6 |
| Decreased   | 20 | 16   |
| Interrupted   | 39 | 31.2 |
| Thesis Research   | n  | %    |
| Thesis research changed to a different topic                        | 6  | 4.8  |
| Thesis research changed to be related to COVID                      | 2  | 1.6  |
| Delay in thesis project, no prolongation of training period         | 20 | 16   |
| Delay in thesis project that caused prolongation of training period | 5  | 4    |
| No delay  | 23 | 18.4 |
| Not in an active period of study related to thesis research         | 69 | 55.2 |

training (dissection practice and report writing) stated that this change has negatively affected their forensic medicine residency training.

Biosafety and related issues have been questioned in detail. Fifty-seven (45.6%) participants reported that they have no information about whether a polymerase chain reaction (PCR) test is performed or not against the risk of COVID transmission in every autopsy case. However, 31 (24.8%) participants reported that PCR tests has been applied only in suspected autopsy cases. It was also found that the residents have no information about the precautions at the autopsy to minimize the risk of COVID transmission during applications including dissection technique and macroscopic examination (45.6%; n=57), histopathological sampling (52.8%; n=66), toxicological sampling (52%; n=65), storage and transfer of the samples gathered from the case (73.6%; n=92) and postmortem tissue fixation procedure (72.8%; n=91). No statistical difference was found between residents who had started forensic medicine residency before and during the pandemic in terms of responses regarding autopsy training ( $p>0.05$ ).

Thirty (24%) participants stated that they take higher protective measures personally, while 29 (23.2%) declared that institutional measures have been applied during autopsies. The majority of the residents stated that they have no information regarding structural protective changes or renovations such as ventilation of the autopsy room (50.4%; n=63), organization of autopsy case entry and exits (46.4%; n=58) or additional disinfection measures (52%; n=65), while remaining pointed implemented protective measures. Residents have also reported lack of information on whether the protective equipment changed or updated to minimize the risk of COVID transmission during the autopsy (33.6%; n=42), and the efficiency of protective equipment utilized to prevent COVID transmission (46.4%; n=58).

Fifty-four participants (43.2%) stated that they had a contact with a patient, autopsy case or colleague who were determined as COVID positive with PCR tests. It was found that this contact has been mostly caused by colleagues (22.4%; n=28), at workplace.

More than half (55.2%) of the residents (n=69) declared that they have not participated in SARS-CoV-2 positive autopsy cases. Moreover, 112 participants (89.6%) stated that they have not received any special training regarding dissection procedure, safety measures or pathological findings of such autopsies.

Lastly, 72 (57.6%) residents stated that warning and direction signs have been arranged by the institutions and (48%; n=60) the management procedure (COVID positive personnel, COVID positive forensic case, contact personnel, etc.) has been determined by the infection protection committee; however, more than half of residents (50.4%, n=63) stated that biosafety training has not been provided by their institutions.

## Survey-2

Out of 35 HDs who included in the study, Survey-2 completed by 18 (51.4%) HDs from different regions of the country. One-third (33.33%; n=6) of HDs stated that there has been decrease in the number of forensic cases which is evaluated through the file, the number of examined clinical forensic cases and number of issued forensic reports. Eight (44.4%) HDs also stated that this situation had a negative effect on training of their residents.

Sixteen (88.9%) HDs stated that they have worked within flexible working hours, and 11 (68.75%) of them also reported flexible working had negative effects on postgraduate education.

Eight (44.4%) HDs declared that these meetings have been suspended due to the pandemic. Eleven (61.1%) HDs stated that they have never used distance learning/meeting applications for educational purpose of residents. One-third of HDs consider these applications as "not useful".

Most of the HDs (72.2%; n=13) declared that the number of research in their departments have been affected by the pandemic, either decreased in number or all activities were suspended.

Seven (38.8%) HDs stated that their residents have not practiced autopsy dissection and not prepared any autopsy reports (38.8%; n=7) before the pandemic. On the other hand, 8 (44.4%) HDs declared that there has not been a change in autopsy training of residents during the pandemic.

## DISCUSSION

The COVID-19 pandemic caused many challenges for academic institutions and education programs all around the world (12-17). Addressing these issues with an adaptable and creative spirit is crucial to ensure the quality of the residents' education. There are still few studies about effects of the pandemic on medical education in the literature, furthermore, to the best of our knowledge, there are no studies dealing with the effects of the pandemic on postgraduate forensic medicine residency programs. With our survey, we found that SARS-CoV-2 outbreak in Turkey had an overall subjective negative impact for forensic medicine residents on clinical practices, educational meetings, autopsy training and research activities. We also determined that there is a great lack of information of both institutions and individuals on biosafety. Our study contains valuable feedback as it includes the evaluation of both forensic medicine residents and the HDs who coordinates related programs. Results of both surveys were generally overlap.

In this study, the most remarkable effect of pandemic was stated to be decrease in the number of forensic cases in the clinic, which was attributed to quarantine measures and self-isolation during the pandemic. As an expected consequence, almost half of the participants reported a decrease in the number of clinical examinations (sexual assault, trauma, disability, criminal-liability, etc.) and reporting as part of

practical training during the pandemic. This situation was stated to have dramatic negative effects and weaken the quality of education. However, surprisingly, a considerable number of residents stated that above mentioned decrease in the number of patients and the evaluations of forensic cases through the file did not affect the quality of residency education. This might be related to excessive workload of departments before the pandemic, and somehow few residents stated that decrease in number of forensic cases has positive impact on the quality of their theoretical and practical education. Majority of the residents stated that there has been a decrease in the number of cases due to flexible working hours, which reported not to be affective on the quality of residency education. Extending the duration of residency training is now discussed as one of the options that should be done to increase the quality of education and complete the need of practical case training as curricular requirements. It is obvious that both the residents and institutions will suffer a financial loss due to this extension in the education period. At this point, it is necessary to carry out studies that require cooperation on a national and global scale in order to minimize the damages caused by such an extension and to determine its duration.

During the pandemic period, medical doctors from all specialties has been taking part in healthcare services related to COVID (18). It is noteworthy that residents included in this study stated that their working-hours in the forensic medicine clinic has been decreased. Rotational educations in other departments, which is one of the most important parts of forensic medicine education, were also likely to be affected by the pandemic. Our findings also revealed that residents who attended their rotations during the pandemic reported a drop in education quality. Therefore, postponing or reorganizing rotational training should be considered as one of the most appropriate options in this exceptional time period.

While fighting against effects of pandemic, implementing a number of system-related novelties and modification of previous application, which potentially defined as the "new normal" is crucial in terms of educational processes. Distance learning/meeting applications take place among valuable changes that current pandemic has brought to our professional lives. The need for reduction of physical contact, social gatherings and isolation have decreased the face-to-face theoretical educational meetings but has increased use of these applications especially for residency training (19-21). Although a study from India (12) showed that medical students think differently, and do not find distance learning applications useful, it was determined that forensic medicine residents in our study found these applications beneficial.

Abati et al. (22) stated that during the pandemic, most of the neurology residents' research activities were decreased

or interrupted. Similarly, our study remarkably showed this reduction and interruption including residents' thesis.

All forensic medicine residents need to learn how to perform each step of dissecting a body and how to complete a perfect autopsy report during their residency. They have to be trained on autopsy practice by their supervisor academicians (23). In our study, 46 residents declared that the pandemic period had a negative effect on the practical autopsy training. Furthermore, approximately half of the participants stated that they participated in "any" dissection practices before or during the pandemic and had not prepared an autopsy report. This statement shows a system-based problem in addition to effects of pandemic. In order to solve this issue, strict rules and measures need to be taken for this unacceptable situation, institutionally and nationally.

During the pandemic, entrances to the autopsy rooms and the number of people present during the autopsy were restricted to reduce the risk of COVID-19 transmission (24,25). In our study, it was prominent that most of the forensic medicine residents have no knowledge about the recommended number of professionals to take part in autopsy. This also might be caused by lack of institutional precautions. Therefore, it is necessary to increase the frequency of "biosafety at autopsy" training courses for residents, and to perform more educational autopsy practices involving more residents.

One of the remarkable points of our study was that majority of contacts with the PCR positive cases were with colleagues from workplace. Failure to take PCR test samples from healthcare professionals regularly was considered as one of the most important reasons for this situation. Another possible reason of workplace related transmission, as stated by the majority of the residents, lack of institutional precautions or an isolation protocol for those who contacted with PCR positive cases.

When the participation in the study was analyzed by regions, it was seen that the participation was highest from the Central Anatolia region, which is the region that provides education to the highest number of medical residents with 11 institutions, and the participation was consistent with the number of education institutions and people who received education in other regions.

### Study Limitations

The bias of the participants can be considered as a possible limitation of this study. Theoretically, it is possible to think that people who have negative thoughts in this process will be more eager to participate in this survey. However, the high number of participants, the overlap between answers to questions about facts, not opinions, given by the HDs and the residents when they institutionally matched, and the regional distribution of the participants indicate that even if such a bias exists, its effect will be extremely limited.

## CONCLUSION

In conclusion, SARS-CoV-2 outbreak came unexpectedly and forced the entire medical community and the world to adapt a rapidly changing lifestyle. The present study highlights some of the problems that arose in forensic medicine residency training in Turkey, which come up with a number of suggestions. First of all, further studies are needed to clarify the extend of the damage to post-graduate education of forensic medicine in terms of requirements of forensic medicine residency curriculum is organized by Medical Specialization Board. Studies investigating the gap between these *de-jura* requirements and *de-facto* situation of the residents could give a better understanding of level of residents' education, and will contribute greatly to the adoption of new and more effective measures.

The effects of measures against pandemic on those who started their training during pandemic may be much more intense, which deserves further attention. The pandemic period will likely have long-term effects on clinical practices, educational meetings, research activities and autopsy training of forensic medicine residents. During the ongoing process of the pandemic, more effective measures should be taken to increase the quality of training of residents, and plans should be made with the cooperation of international associations to make up for the lack of training in this process.

## Ethics

**Ethics Committee Approval:** This study was reviewed and approved by the Research Ethics Committee of Hacettepe University and Scientific Research Board of the Ministry of Health of Turkey (approval number: 2020/19-26, date: 17.11.2020).

**Peer-review:** Internally peer-reviewed.

## Authorship Contributions

Concept: M.Ş.Y., H.C.A., R.A., A.R.T., Design: M.Ş.Y., H.C.A., H.Y.Z., R.A., A.R.T., Data Collection or Processing: M.Ş.Y., H.C.A., Analysis or Interpretation: M.Ş.Y., H.Y.Z., R.A., A.R.T., Literature Search: M.Ş.Y., H.C.A., Writing: M.Ş.Y., H.C.A., H.Y.Z.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study received no financial support.

## REFERENCES

- Bauchner H, Sharfstein J. A Bold Response to the COVID-19 Pandemic: Medical Students, National Service, and Public Health. *JAMA* 2020;323(18):1790-1791.
- Adhikari SP, Meng S, Wu YJ, Mao YP, Ye RX, Wang QZ, et al. Epidemiology, causes, clinical manifestation and diagnosis, prevention and control of coronavirus disease (COVID-19) during the early outbreak period: a scoping review. *Infect Dis Poverty* 2020;9(1):29. <https://doi.org/10.1186/s40249-020-00646-x>
- 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.
- Tolu LB, Feyissa GT, Ezeh A, Gudu W. Managing Resident Workforce and Residency Training During COVID-19 Pandemic: Scoping Review of Adaptive Approaches. *Adv Med Educ Pract*. 2020;11:527-535. <https://doi.org/10.2147/AMEPS262369>
- Schwartz AM, Wilson JM, Boden SD, Moore TJ Jr, Bradbury TL Jr, Fletcher ND. Managing Resident Workforce and Education During the COVID-19 Pandemic: Evolving Strategies and Lessons Learned. *JB JS Open Access*. 2020;5(2):e0045. <https://doi.org/10.2106/JBJS.OA.20.00045>
- Madeshia PK, Verma S. Review on higher education in India. *J Crit Rev*. 2020;7(10):1161-1164.
- ÖSYM. 2019-TUS 1. Dönem Tercih İşlemleri: Tercih Kılavuzu ve Tablolara [Internet]. 2019 [cited 2022 Feb 21]. Available from: <https://www.osym.gov.tr/TR,15695/2019-tus-1-donem-tercih-islemleri-tercih-kilavuzu-ve-tablolara.html>
- ÖSYM. 2019-TUS 2. Dönem: Kılavuz ve Başvuru Bilgileri [Internet]. 2019 [cited 2022 Feb 21]. Available from: <https://www.osym.gov.tr/TR,16851/2019-tus-2-donem-kilavuz-ve-basvuru-bilgileri.html>
- Wickham H. *ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. ISBN 978-3-319-24277-4, <https://ggplot2.tidyverse.org>.
- Tennekes M. Tmap: Thematic maps in R. *J Stat Softw*. 2018;84(6):1-39. <https://doi.org/10.18637/jss.v084.i06>
- Kassambara A. *ggpubr: 'ggplot2' Based Publication Ready Plots*. R package version 0.4.0. <https://CRAN.R-project.org/package=ggpubr>, 2020.
- Singh K, Srivastav S, Bhardwaj A, Dixit A, Misra S. Medical Education During the COVID-19 Pandemic: A Single Institution Experience. *Indian Pediatr*. 2020;57(7):678-679. <https://doi.org/10.1007/s13312-020-1899-2>
- Sahi PK, Mishra D, Singh T. Medical Education Amid the COVID-19 Pandemic. *Indian Pediatr*. 2020;57(7):652-657. <https://link.springer.com/article/10.1007/s13312-020-1894-7>
- Goh PS, Sandars J. A vision of the use of technology in medical education after the COVID-19 pandemic. *MedEdPublish*. 2020. <https://doi.org/10.15694/mep.2020.000049.1>
- Rajab MH, Gazal AM, Alkattan K. Challenges to Online Medical Education During the COVID-19 Pandemic. *Cureus*. 2020;12(7):e8966. [https://pubmed.ncbi.nlm.nih.gov/32766008/#:~:text=The%20reported%20challenges%20to%20online,%2C%20and%20technophobia%20\(17%25\)](https://pubmed.ncbi.nlm.nih.gov/32766008/#:~:text=The%20reported%20challenges%20to%20online,%2C%20and%20technophobia%20(17%25))
- Ferrel MN, Ryan JJ. The Impact of COVID-19 on Medical Education. *Cureus*. 2020;12(3):e7492. <https://pubmed.ncbi.nlm.nih.gov/32368424/>
- Ahmed H, Allaf M, Elghazaly H. COVID-19 and medical education. *Lancet Infect Dis*. 2020;20(7):777-778. [https://doi.org/10.1016/S1473-3099\(20\)30226-7](https://doi.org/10.1016/S1473-3099(20)30226-7)
- Chopra V, Toner E, Waldhorn R, Washer L. How Should U.S. Hospitals Prepare for Coronavirus Disease 2019 (COVID-19)? 2020;172(9):621-622. <https://doi.org/10.7326/M20-0907>
- Chick RC, Clifton GT, Peace KM, Propper BW, Hale DF, Alseidi AA, et al. Using Technology to Maintain the Education of Residents During the COVID-19 Pandemic. *J Surg Educ*. 2020;77(4):729-732. <https://doi.org/10.1016/j.jsurg.2020.03.018>
- Wittich CM, Agrawal A, Cook DA, Halvorsen AJ, Mandrekar JN, Chaudhry S, et al. E-learning in graduate medical education: Survey of residency program directors. *BMC Med Educ*. 2017;17(1):114. <https://doi.org/10.1186/s12909-017-0953-9>
- Rakowsky S, Flashner BM, Doolin J, Reese Z, Shpilsky J, Yang S, et al. Five questions for residency leadership in the time of COVID-19: Reflections of chief medical residents from an internal medicine program. *Acad Med*. 2020;95(8):1152-1154. <https://doi.org/10.1097/ACM.0000000000003419>
- Abati E, Costamagna G. Abati E, Costamagna G. Education Research: Effect of the COVID-19 pandemic on neurology trainees in Italy: A resident-

- driven survey. *Neurology*. 2020;95(23):1061-1066. <https://doi.org/10.1212/WNL.00000000000010878>
23. Spencer A, Ross WK, Domen RE. Forensic Pathology Education in Pathology Residency: A Survey of Current Practices, a Novel Curriculum, and Recommendations for the Future. *Acad Pathol*. 2017;4:2374289517719503. <https://doi.org/10.1177/2374289517719503>
24. Barton LM, Duval EJ, Stroberg E, Ghosh S, Mukhopadhyay S. COVID-19 Autopsies, Oklahoma, USA. *Am J Clin Pathol*. 2020;153(6):725-733. <https://doi.org/10.1093/ajcp/aqaa062>
25. Hanley B, Lucas SB, Youd E, Swift B, Osborn M. Autopsy in suspected COVID-19 cases. *J Clin Pathol*. 2020;73(5):239-242. <https://doi.org/10.1136/jclinpath-2020-206522>