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Initial effects of Covid-19 pandemic on graduate anatomy education in Turkey

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Abstract

Objectives: Meeting the growing need for quality anatomy researcher-educator is a difficult task. Graduate anatomy programs in Turkey that consist of Master of Science, Doctor of Philosophy, and Specialty in Medicine aim to achieve this goal. Unfortunately, the rapid spread of the Covid-19 pandemic either paused or halted higher education worldwide. This sectional study aims to outline the initial effects of the pandemic on graduate anatomy education in Turkey.

Methods: An online survey was distributed among graduate students. The survey evaluated educational and research activities prior and during the pandemic, institutional adaptations, and future projections.

Results: Answers of 51 female and 19 male students (response rate 36.6%) were included in the study. There were 10 MSc (14.3%), 45 PhD (64.3%), and 15 Residency (21.4%) students. Seminars, journal clubs, and case presentations completely ceased in Residency programs. Conversely, online lectures significantly decreased in MSc and PhD programs exclusively. Programs that used blended learning methods were viewed as more effective and better adapted to the pandemic. Students favored transferring lectures (94%), seminars (67%), journal clubs (67%), and case presentations (60%) to online resources. Conversely, they contradicted the online transfer of practice (30%) and dissection (7%) hours.

Conclusion: Despite its low response rate, this sectional study summarizes the initial adaptation of graduate educational programs in Turkey to the Covid-19 pandemic. It also provides insight on future curriculum development. Further studies are needed to outline how much content of graduate programs might be delivered online effectively.

Keywords: anatomy education; Covid-19; graduate education; Turkey

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Introduction

On the 31th of December 2019, the World Health Organization (WHO) officially reported cluster type pneumonia cases of unknown etiology in Wuhan, China.[1] On the 7th of January 2020, the novel coronavirus (SARS-CoV-19) was identified as the infectious agent and its genome was publicly shared on January 12.[1] Within the following two months, confirmed cases in South Korea, Japan, Iran, Italy, Spain, and UK started to increase.[2] In Turkey, the Minister of Health announced the first confirmed case on March 11.[3] The same day, WHO declared the level of the outbreak as pandemic.[4] Within the same week, the Turkish Government enacted extensive social precautions.[5]

The Council of Higher Education (CHE) initially suspended face-to-face education at all higher education institutions between 16th of March and 6th of April[6] and requested the institutions to prepare for online education.[7] Following this pause, the CHE decided to terminate face-to-face education until the fall semester and all institutions resumed education at online platforms as of April 6.[8] While this shift covered all theoretical education, practical aspects were to be covered with online means wherever possible.

Although the CHE decision on education initially covered undergraduate programs exclusively, all MSc and PhD programs, which are also regulated by the CHE, resumed education as of March 2020.[8] Nevertheless, similar regulations were not enacted for anatomy Residency programs, which are regulated by the Ministry of Health. Additionally, residents at these programs supported the increased patient load at pandemic hospitals.[9]

Graduate anatomy education in Turkey can be achieved through Master of Science (MSc), Doctor of Philosophy (PhD), and Specialization in Medicine (Residency) degrees.[10] Additionally, since the formation of the CHE in 1981, graduate anatomy education covers only gross anatomy and neuroanatomy. Histology and embryology has been structured as a separate discipline and department with its own graduate programs.

MSc programs offer higher education at a post-bachelorette stage for a wide range of fields including biology, nursing, physical therapy and rehabilitation, and pharmacy. The programs comprise of two consecutive years. The first two semesters cover lectures and laboratory hours while the remaining two semesters are dedicated to a dissertation thesis.[10]

Candidates with an Anatomy MSc, Doctor of Dental Surgery (DDS), Doctor of Dental Medicine (DDM), or Doctor of Medicine (MD) degree can apply to anatomy PhD programs. The PhD programs dedicate four semesters for lectures and lab hours, and another four semesters for a dissertation thesis.[10] Most programs offer advanced courses on anatomical terminology, neuroanatomy, radiologic anatomy, developmental anatomy, legal aspects, and research methods.

Before the formation of the CHE, medical faculties governed by the CHE and training and research hospitals governed by the Ministry of Health offered residency programs.[10,11] In 1986, the Ministry of Health and the CHE established and determined Specialization in Medicine programs, including basic medical sciences, and centralized the application process with a highly competitive exam.[11] Anatomy residency programs are very similar to "Fachartz für Anatomie" programs in Germany and Austria.[12,13] Current training for anatomy residency programs takes three years, each year coinciding with a level of competency.[14,15] Formal rotations to histology and embryology, forensic medicine, and radiology departments are mandatory.[16] All residency programs have a core curriculum[15,17] based on competency in anatomical knowledge, scientific research, anatomical techniques, educational pedagogies, and assessment and evaluation methods.[18]

There is a global shortage of qualified anatomical sciences educators.[19,20] Similarly, Adanır et al.[21] reported that 82% and 55% of the anatomy departments in Turkey did not have lecturers or research assistants, respectively. Furthermore, how a global event that halted face-to-face education would affect graduate programs over the initial and long-term period is unknown. This descriptive study aims to outline the initial effects of the Covid-19 pandemic on graduate anatomy education in Turkey, detect any existing differences between programs, and provide insight for future curricular development.

Materials and Methods

Despite the presence of a metadata website for higher education programs,[22] number of active anatomy MSc and PhD programs and number of graduate students are unknown. According to the Board for Specialty in Medicine,[23] there are 33 anatomy residency programs in Turkey, located in 21 cities (**Figure 1**). Nevertheless, the number of residents enrolled to these programs is also unavailable. Therefore, the exact number of graduate students in Turkey is unknown as of June 2020. Thus, making it impossible for outlining the sample population and calculating a sample size. Nevertheless, there is an unofficial anatomy graduate student WhatsApp (WhatsApp Inc., Mountain View, CA, USA) group that consists of 194 members as of April 2020. Although whether this communication group represents the exact population of graduate students in Turkey is unclear.

The Clinical Research Ethics Committee of Istanbul Faculty of Medicine considered the study as exempt of ethical approval. Therefore, approval was obtained from the Scientific Research Evaluation Commission of the Ministry of Health (protocol no: 2020-05-03T18_56_56) and from the Office of Chief of Staff of Istanbul Faculty of Medicine (protocol no: 85114). The unofficial anatomy graduate student WhatsApp group was used for recruiting participants. An initial (April 30) and two reminder notifications (May 3 and 6) were sent, and the online survey was available until May 10.

Both authors designed the initial survey items. For face validation of the questionnaire, an anatomist blinded to the study evaluated the items and provided feedback. This version, consisting of 4 sections and 25 open-ended and multiple-choice items, was accepted as final. Due to the descriptive nature of the study, reliability of survey items was not calculated.

First section evaluated the educational activities including current status of education, which educational activities were done prior and during the pandemic, format of online education, software used for online education, effectiveness of current online educational activities, reasons for educational impediments, and whether any administrational or health care tasks were assigned during this period. Second section evaluated the current status of scientific research and dissertations, including reasons for difficulties and opportunities provided to overcome them. Third section evaluated how well the program adapted to

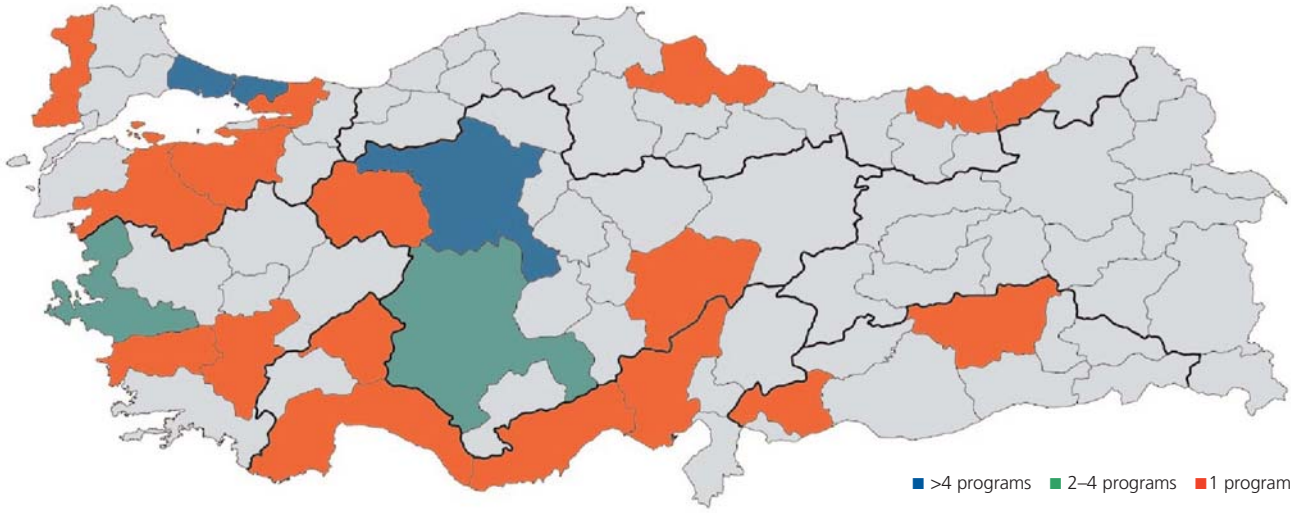

Figure 1. Map illustration shows the distribution of active Residency programs in Turkish cities. Cities with more than 4 active programs are depicted as blue, cities with 2–4 programs are depicted as green, and cities with a single program are depicted as orange. Figure was created with mapchart.net©.

the pandemic, which educational activities could be moved to online platforms permanently, and suggestions for a possible future curricular remodeling regarding global events like a pandemic. The final section collected demographic data of the respondents including age, sex, and type of graduate program.

Descriptive statistics were used to outline frequencies and means. McNemar's test was used to evaluate the proportion change of dichotomous data on educational methods used before and during the pandemic among programs. One way ANOVA and independent samples t-tests were used to compare ordinal data, and Chi-square test was used to compare categorical variables. The statistical analyses were performed using the SPSS statistical package, version 21 (IBM Corp., Armonk, NY, USA).

Results

Seventy-five respondents completed the survey. Cases with no structured graduate programs (n=2) and without regular teaching prior to the pandemic (n=3) were excluded from the analysis. Remaining 70 cases were included in the study with a response rate of 36.6%.

There were 51 females (73%) and 19 males (27%) among the respondents. Average age of the respondents was 30±4.4 and the average ages for females and males were not significantly different (29.3±3.3 vs 31.7±6.3; p=0.12).

There were 10 MSc (14.3%), 45 PhD (64.3%), and 15 Residency (21.4%) students. The female to male ratio in different graduate programs was not significant (p=0.13) (**Table 1**).

As of May 10, fourteen (20%) respondents stated that their institution did not convert to online education. While 53 (77%) students reported that they have, and two (3%) stated that online education was in preparation.

All educational activities significantly receded following the pandemic (**Supplementary Table 1**). Exact McNemar's test determined that there were statistically significant differences in the proportion of lectures (p=0.002), practice hours (p<0.001), dissections (p<0.001), seminars (p<0.001), journal clubs (p<0.001), and case presentations (p=0.039). Comparison of CHE regulated (MSC and PhD) and Ministry of Health regulated (Residency) programs revealed that seminars, journal clubs, and case presentations completely ceased in residency programs (**Supplementary Table 1**). Conversely, online lectures significantly decreased in MSc and PhD programs exclusively (**Supplementary Table 1**).

Synchronous (n=29, 55%), asynchronous (n=11, 21%), and both (n=12, 22%) online education methods were implemented. One respondent (2%) reported lecture notes as the only mode of online education. Graduate programs used a wide variety of software for online lectures,

Table 1

Sex distribution within different anatomy graduate programs.

	Female	Male	p-value
Master of Science	7 (70%)	3 (30%)	0.13
Doctor of Philosophy	36 (80%)	9 (20%)	
Residency	8 (53.3%)	7 (46.7%)	

seminars, and journal clubs. These included Zoom (n=15, 38%), Skype (n=11, 28%), Microsoft Teams (n=9, 23%), Adobe Connect (n=8, 20%), institution's own software (n=4, 10%), Moodle (n=3, 8%), Free Cam (n=1, 3%), and Perculus (n=1, 3%).

Overall mean effectiveness for online lectures and seminars/journal clubs were 4±1 and 2.9±1.5, respectively. Online lectures and seminars/journal clubs were more effective for students who received both synchronous and asynchronous online education (4.5±0.7; 3.8±1.1) compared to the students who received only synchronous (4.2±0.9; 2.7±1.6) and only asynchronous (3.8±0.7; 2.5±0.7) methods. Nevertheless, the differences did not reach significance levels (p=0.22; p=0.34). Similarly, mean effectiveness of online lectures (4.1±0.9 vs 3.6±1.2; p=0.35) and seminars/journal clubs (3.1±1.5 vs 2.2±1.6; p=0.48) were not significantly different between MSc/PhD and Residency programs.

During the Covid-19 pandemic, no tasks were assigned to 47 students (71%) while two (3%) students were only assigned to administrative tasks. Since all medical faculties became pandemic hospitals, 14 (21%) students were assigned to outpatient or emergency departments while three (5%) students were assigned to both administrative and health care tasks. All MSc students (n=10, 100%) and 31 PhD students (75.6%) were not assigned to tasks while 9 (60%) Residency students had received at least one assignment during the pandemic (p=0.017).

Mandatory rotations of 5 residents (50%) were halted and 2 residents (20%) did not have any information regarding their rotations. Conversely, rotations of 2 (20%) and 1 (10%) residents continued traditionally or via Zoom meetings, respectively.

For research activities, 47% (n=32) of the students reported that all activities were terminated following the pandemic. Research activities were limited to dissertation projects for 11 (16%) or prior ongoing research projects for 7 (10%) students. For 18 (27%) students, both dissertation and research projects continued after the pandemic. Mean effective institutional adaptation regarding research activities increased for institutions that continued only dissertations (3.2±1.0), only previous research projects (3.3±1.3), and both (3.9±1.0). Nevertheless, the differences did not reach statistical significance (p=0.09).

According to students, the programs that used asynchronous modes exclusively (3.0±1.3) adapted less effectively than programs that used both synchronous and asynchronous methods (4.25±0.9) (p=0.013). Graduate students agreed that development of a more adaptable curriculum is needed (mean: 4.5±0.8). The need for a curricular remodeling did not change for sex, graduate program, online education method, and research activities following the pandemic (**Table 2**).

Students stated that lectures (n=66, 94%), seminars (n=47, 67%), journal clubs (n=47, 67%), and case presentations (n=42, 60%) could be designed as online courses. Conversely, they disagreed with the idea of transferring practice (n=21, 30%) and dissection (n=5, 7%) hours to online platforms.

Open-ended questions provided limited data that was inadequate for a thematic analysis. Therefore, these items were categorized on the consensus of both authors. While the Covid-19 pandemic was the main reason for the impediment on educational and research activities, it was followed by insufficient institutional infrastructure for online courses and lockdowns for accessing facilities (**Figure 2**). The institutions that managed to continue research activities during the pandemic used online platforms for research education and online mentoring. Four students (6%) stated that the institution managed to keep the laboratories open for research (**Figure 3**). Students suggested using online means to cover theoretical and practical aspects should be kept in mind for future curricular development (**Figure 4**). Similarly, they suggested online or technology-led research education with increased course hours should be kept in mind for future curricular development (**Figure 5**).

Table 2
Mean values for students' need for designing a more adaptable curriculum.

	Mean±SD	p-value
Sex		
Females	4.5±0.9	0.77
Males	4.5 0.8	
Graduate anatomy program		
Master of Science	4.6±0.7	
Doctor of Philosophy	4.6±0.9	0.32
Residency	4.2±0.9	
Online educational format		
Only synchronous	4.6±0.9	
Only asynchronous	4.5±0.7	0.81
Both methods	4.7±0.7	
Research activities continued during the pandemic		
No activities	4.5±0.9	
Only dissertation theses	4.1±1	0.31
Only ongoing research projects	4.6±0.8	
Both dissertations and research projects	4.7±0.6	

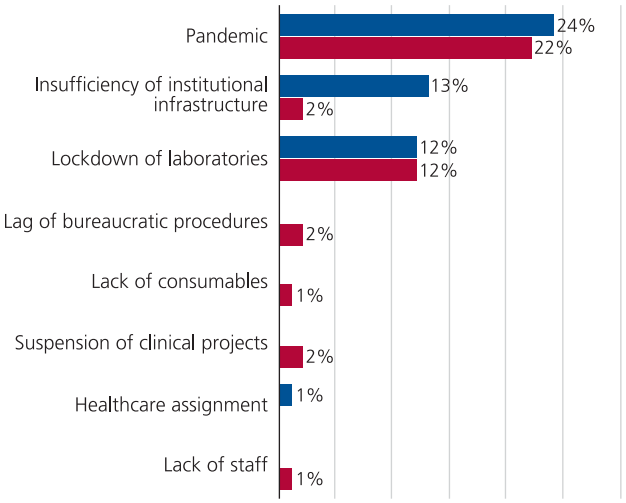

Figure 2. Graduate students' opinions on the reasons for the impediment of educational (blue) and research (red) activities. The values are presented as frequencies of given reason among participants.

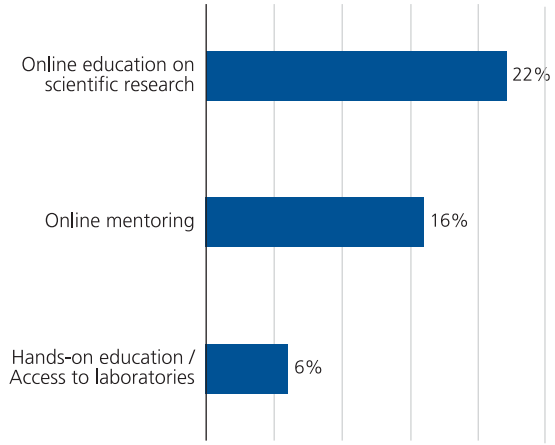

Figure 3. Methods used by institutions that managed to continue research activities during the covid-19 pandemic. The values are presented as frequencies of given reason among participants.

Discussion

The initial stage of the global outbreak had a negative effect on graduate anatomy education in Turkey just as it did to medical education worldwide.[24] Despite this drawback many medical schools around the world had managed a successful change to online platforms for content delivery for undergraduate medical or postgraduate trainee programs.[25] Although many institutions managed to switch their programs to online courses in Turkey, all graduate anatomy programs were affected differently with regard to their features. For example, seminars and journal clubs ceased completely in Residency programs exclusively, while less MSc and PhD programs managed to continue their courses with online lectures. Similarly, due to their medical background, Residency students are assigned to healthcare or administrative tasks more frequently.

Although the majority of graduate anatomy programs in Turkey have switched to online courses initially, the effectiveness of these courses varied among institutions. Institutions that used single mode of delivery seem to be less effective for graduate students. Implementing blend-

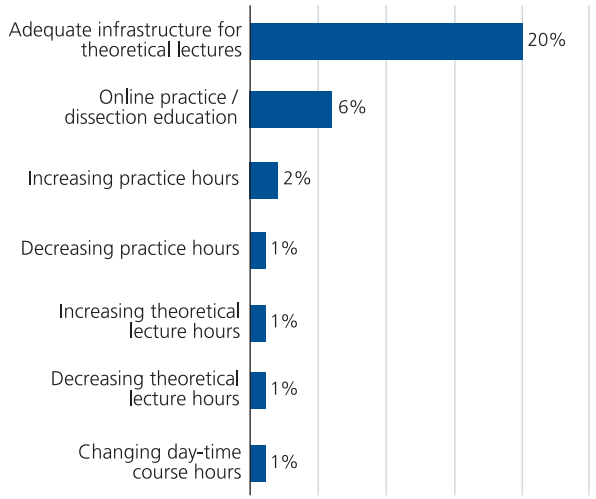

Figure 4. Students' suggestions for future curriculum development on the educational aspects of graduate anatomy education. The values are presented as frequencies of given reason among participants.

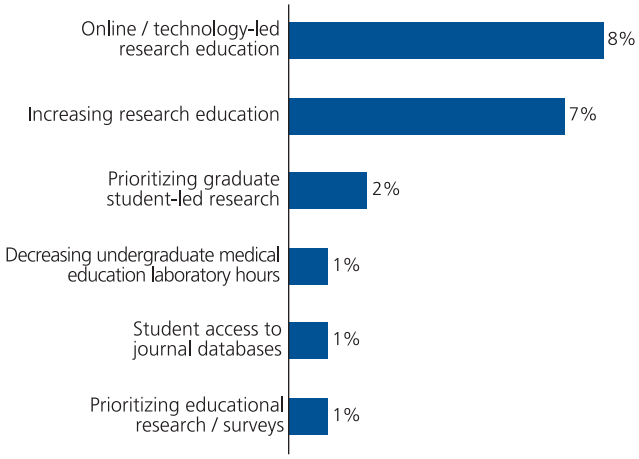

Figure 5. Students' suggestions for future curriculum development on the scientific research aspects of graduate anatomy education. The values are presented as frequencies of given reason among participants.

ed learning into current graduate anatomy education may provide some solutions. Especially using both synchronous and asynchronous modes of education seems preferred by students. Synchronous education facilitates a limited interaction between academics and students by using polls, Q&A sessions, or active discussions.[25–27] While asynchronous education provides an opportunity of using and editing previously created content and effective time management.[27,28] On the other hand, synchronous education needs detailed scheduling. Thus, hindering students with parental or caregiving responsibilities from attending these sessions. Similarly, both synchronous and asynchronous methods are time consuming, require upskilling in new technologies, and increase the workload of the teacher.[2,26,28] Therefore, instead of transitioning existing resources to online environment, re-designing existing courses into blended learning environments with increased interaction might be planned.[26] Online teaching has additional technical difficulties including internet quality, hardware or software problems, and online security risks such as Zoombombing.[25,27,29] Additionally, anatomy teachers had expressed that they had difficulty in grasping the student progress and learning with online education.[27] Furthermore, loss of face to face aspects of education including dissection sessions had caused a decrease in student wellbeing.[25,29,30]

Another important aspect of adapting to the current situation is evaluating the weaknesses of each program.[28] For example, anatomy residents were deprived of seminars and journal clubs, which are vital for their academic development.[31] These activities have already been done at many institutions. Therefore, future inclusion of residents would be relatively easy despite their increased workload as healthcare providers during the pandemic. Similarly, despite the CHE mandate, online lectures were significantly reduced for MSc and PhD programs. Since all universities are expected to accommodate online courses for undergraduate education,[32] integrating MSc and PhD programs to the same infrastructure might provide a swift solution. Although, graduate students also reported inadequate institutional infrastructure as a common reason for educational pause. Anatomists in New Zealand and Australia considered the curricular changes within the short timeframe as an additional motivation for resource development as well.[28]

All practical aspects of anatomy education, especially access to cadavers, were nearly stopped due to lockdowns and institutional restrictions.[2,26,27,33,34] Although many institutions around the world decided to create new cadaveric educational material to meet this challenge,[2,28,35] there are also high quality products to avoid increased workload.[2] Therefore, weighing the costs, such as time and budget, and benefits, such as educational outcomes, of different approaches may come in handy for future planning of online practical anatomy education. Using living individuals for anatomy teaching is a standard method for some institutions around the world.[36] This approach is considered as less favorable because it delivers anatomy knowledge without cadavers. Similarly, current digital media for anatomy education is found to be as effective as cadaveric methods for short-term knowledge gain[37] and might replace cadavers in undergraduate medical education.[35,38] These approaches might be preferred for MSc programs where anatomical knowledge gain is the main outcome. Especially online theoretical lectures are favored as norm for anatomical content delivery among medical students in Malta due to their high effectiveness.[25,30] Similarly, 36% of Chinese anatomy teachers were willing to continue teaching theoretical sessions online.[27]

On the other hand, human cadavers remain invaluable for PhD and Residency programs because their curriculum relies on competencies. These competencies include the handling and management of human cadavers, preparation of anatomical specimens, basic and advanced dissection techniques, and research methods.[17,18] The absence of these aspects of both programs, which could not be replaced with online media, should be analyzed in detail. Additionally, procurement of adequate numbers of bodies to support these activities are also affected. Some of the body donation programs in UK, Ireland, and New Zealand have been halted for the time being.[2,28,35,39,40] Although manipulation of dead bodies might pose a risk of contamination,[41,42] the International Federation of Associations of Anatomists and some countries recommended that embalming could be performed with proper personal protective equipment and workplace decontamination.[25,42–44] Recent reports indicate that body donation programs have been started to accept bodies, though, with a relatively decreased number of bodies compared to previous years.[27,39] The reopening of donation programs had resulted in limited face to face dissection sessions at some medical schools in the UK.[39] Similarly, our institution did not cease its donation program, received three bodies within the last six months, and resumed rotational face-to-face dissections for graduate students in July 2020.

There is a growing need for academics who can both provide healthcare and perform research (the physician-researcher)[45] or provide healthcare and deliver teaching (clinician-educator)[46] at the same time. This need resulted in various tracks for engaging residents into scientific

research.[31] Graduates of these programs were more likely to perform scientific research in the future, author at least one article, achieve first authorship, and follow an academic career.[47] Therefore, continuing research activities becomes essential for graduate programs in Turkey. Nearly half of the graduate programs halted any ongoing research so far due to lockdowns, institutional restrictions, or bureaucratic obstacles. The programs that managed to continue research had done this by transitioning existing activities that did not require laboratory attendance to online platforms. These included literature review, statistical analysis, manuscript writing, and mentoring. Therefore, carrying on all non-lab activities at online platforms could be planned during the initial period of the pandemic. Conversely, rotational use of labs, keeping adequate social distancing, and following strict decontamination rules might be advised for maintaining an ongoing research activity to promote academic competencies of graduate students.[48]

Initial reports on anatomy education during the pandemic predicted returning to face-to-face education as impossible for the near future,[49] resulting in a prolonged, and possibly unknown, mandatory period for graduate anatomy education. Similarly, almost all academics who participated in a survey study believed that anatomy education is likely to change permanently given the scale of the outbreak and this change will probably call into question our traditional approach to anatomy education.[28] Although the impact of the coronavirus outbreak is undeniable, predictions for post-pandemic anatomy or medical education would be something between going back to pre-pandemic normal to a major transformative change.[50] It was proposed that the increased use of technology to enhance teaching and learning with accelerated application of novel emergent technologies such as extended reality and artificial intelligence would result in an educational approach that combines traditional face to face and online education.[50] Therefore, switching to technology supported online education for content delivery in MSc programs may be favorable since the programs' main outcome is the students' gain of basic anatomical knowledge. Nevertheless, the PhD and Residency programs require additional competencies for anatomical techniques and research, which could not be achieved by digital means. Coherent with the literature, Turkish graduate students opined transferring some aspects of the curriculum online, while keeping traditional face-to-face laboratory practice and dissections. Thus, recommending a hybrid curriculum that might have the ability to adapt more efficiently against global events like the pandemic.

The lack of knowledge regarding the exact number of students in MSC, PhD, and Residency programs is a drawback for the findings of this study. It was impossible to perform a power analysis and determine a reliable sample size. Therefore, it is uncertain whether the respondents represent all graduate students in Turkey. Therefore, the unofficial graduate student group was used as a population. Unfortunately this Whatsapp group might not include all graduate students and not represent the exact graduate student population in Turkey. Similarly, the validity and internal reliability of the survey items could not be done. Therefore, the results of this study should be considered as descriptive rather than definitive. Finally, city information was excluded for keeping the respondents and programs anonymous.

Conclusion

This sectional study showed the initial adaptation of graduate anatomy education in Turkey to the Covid-19 pandemic. The students favored a hybrid approach to graduate anatomy education where theoretical aspects might be covered online. Similarly, they expect scientific research education and mentoring could be done via online methods for the time being. Conversely, competency based training such as anatomical techniques, dissection, and scientific research were favored to resume traditionally. Nevertheless, anatomists who are the primary providers for graduate programs may start to consider testing how much content of their programs might be transferred to online platforms. In order to achieve this, a Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis[2] among Turkish anatomists might be useful.

Conflict of Interest

The authors declare no conflicts of interest.

Author Contributions

All authors equally contributed.

Ethics Approval

Approval for the study was obtained from the Scientific Research Evaluation Commission of the Ministry of Health (protocol no: 2020-05-03T18_56_56) and from the Office of Chief of Staff of Istanbul Faculty of Medicine (protocol no: 85114).

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Supplementary Table 1

Contingency tables for the results of the McNemar's exact test.
Results are presented as number of cases.

Comparison of educational activities before and after the pandemic					
		Lecture after			p-value
		-	+	Total	
Lecture before	-	3	2	5	0.002
	+	15	50	65	
	Total	18	52	70	
		Practice after			p-value
		-	+	Total	
Practice before	-	10	0	10	<0.001
	+	58	2	60	
	Total	68	2	70	
		Dissection after			p-value
		-	+	Total	
Dissection before	-	21	0	21	<0.001
	+	48	1	49	
	Total	69	1	70	
		Seminar after			p-value
		-	+	Total	
Seminar before	-	12	1	13	<0.001
	+	52	5	57	
	Total	64	6	70	
		Journal club after			p-value
		-	+	Total	
Journal club before	-	42	3	45	<0.001
	+	21	4	25	
	Total	63	7	70	
		Case presentations after			p-value
		-	+	Total	
Case presentations	-	57	2	59	0.039
	+	10	1	11	
	Total	67	3	70	

Comparison of educational activities before and after the pandemic among Council of Higher Education regulated (MSC and PhD programs) and Ministry of Health regulated (Residency) programs						
			Lecture after			p-value
			-	+	Total	
Lecture before	MSc/PhD programs	-	1	2	3	0.007
		+	13	39	52	
		Total	14	41	55	
	Residency programs	-	2	0	2	
		+	2	11	13	
		Total	4	11	15	

Supplementary Table 1 ***[Continued]***

Contingency tables for the results of the McNemar's exact test.
Results are presented as number of cases.

			Practice after			p-value
			-	+	Total	
Practice before	MSc/PhD programs	-	7	0	7	<0.001*
		+	47	1	48	
		Total	54	1	55	
	Residency programs	-	3	0	3	
		+	12	0	12	
		Total	15	0	15	
			Dissection after			**p-value**
			-	+	Total	
Dissection before	MSc/PhD programs	-	16	0	16	†
		+	39	0	39	
		Total	55	0	55	
	Residency programs	-	5	0	5	
		+	10	0	10	
		Total	15	0	15	
			Seminar after			**p-value**
			-	+	Total	
Seminar before	MSc/PhD programs	-	8	1	9	<0.001*
		+	42	4	46	
		Total	50	5	55	
	Residency programs	-	4	0	4	
		+	11	0	11	
		Total	15	0	15	
			Journal club after			**p-value**
			-	+	Total	
Journal club before	MSc/PhD programs	-	32	3	35	0.003*
		+	17	3	20	
		Total	49	6	55	
	Residency programs	-	10	0	10	
		+	5	0	5	
		Total	15	0	15	
			Case presentations after			**p-value**
			-	+	Total	
Case presentations	MSc/PhD programs	-	45	1	46	0.39*
		+	8	1	9	
		Total	**53**	**2**	**55**	
	Residency programs	-	13	0	13	
		+	2	0	2	
		Total	15	0	15	

*Binominal distribution was used because there were no cases in the Residency program after the pandemic. †No comparison was unavailable because there were no cases in all programs after the pandemic.