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# The effect of coronavirus (COVID-19) pandemic on medical sciences education in Iran

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## Abstract:

**BACKGROUND:** COVID-19 has a great impact on medical sciences education. Some researches have been conducted on the effects of the COVID-19 pandemic on medical sciences education in the world. The aim of this study was to identify the effects of this disease on medical sciences education in Iran.

**MATERIALS AND METHODS:** This futures study research was carried out using the future wheel method in Iran's University of Medical Sciences in the spring of 2020. A semi-structured interview was also conducted on the vice chancellors of medical sciences universities, faculty presidents, faculty vice chancellors, faculty members, medical education specialists, and university students, who were purposefully identified. The interview continued until achieving data saturation. Analysis of the interviews was performed by MAXQDA version 10 software.

**RESULTS:** The effects were presented at three levels including primary effects, secondary effects, and third effects. In addition, 16 primary effects, 51 secondary effects, and 24 tertiary effects were recognized. One primary effect of the coronavirus (COVID-19) pandemic on medical sciences education in Iran was fear, stress, and anxiety among students and faculty members as well as staffs to get the disease. In addition, rumor was circulated concerning the infection of some people, thus, there was a need for holding courses regarding stress management and rumor management. One secondary effect of the coronavirus (COVID-19) pandemic on medical sciences education in Iran was allocation of a number of educational hospitals to the referral hospitals of COVID-19. One tertiary effect of the coronavirus (COVID-19) pandemic on medical sciences education in Iran was increasing the number of virtual courses.

**CONCLUSIONS:** The most important effect of this disease on medical sciences education is the postponement of practical and apprenticeship classes, and consequently the increased length of the academic term that leads to delay in the students' graduation, which can reduce the workforce. On the one hand, this disease causes death of a number of students, educational and medical staffs, and faculty members, as well as reduces the workforce. Also, lengthening the recruitment of faculty members will add to this challenge. In this regard, there is a need to plan to compensate for the shortage of required human resources.

## Keywords:

Coronavirus, COVID-19, futures study, Iran, medical education

## Introduction

COVID-19 started in 2019 in China and is now recognized as a pandemic disease that has affected all countries in the world. Until August 15, 2020, the total number of

patients with this disease in the world was 21,026,758 and the total number of deaths was 755,786. The disease is also prevalent in Iran and until August 15, 2020, the number of patients with this disease in Iran was 338,825 and the number of deaths due to

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this disease was 19,331.<sup>[1-3]</sup> This disease has had a great impact on different parts of the countries.<sup>[4,5]</sup> One of these parts that has been affected by COVID-19 was medical sciences education. Some researches have been conducted on the effects of the COVID-19 pandemic on medical sciences education in the world.<sup>[6-14]</sup> In one correspondence to the *Lancet*, Ahmed *et al.* noted that the prevalence of COVID-19 has posed some challenges for medical education, and students are likely to become infected by rotating between wards and hospitals. They stated that the main concern of students was the effects of COVID-19 on medical education.<sup>[7]</sup> Daroedono *et al.* in Yours research investigated perception of students of Kristen University of Indonesia on the practice of long-distance learning in the COVID-19 period with a questionnaire on Google Forms. The study revealed some supportive, but also, inhibitory factors. The supportive factors were time flexibility, location flexibility, no specific preparation is needed, and low cost (except for cellular data) and the inhibitory factors were cost for additional cellular data, signal dependent, time flexibility is too loose, lack of concentration, lack of understanding, and lack of interaction.<sup>[8]</sup> Wong in one special feature illustrated the key lessons learned during COVID-19 at the UBC Faculty of Medicine. She spoke about student's feelings of uncertainty and anxiety about personal safety and continuity of learning experience, their graduation timeline, financial liability, and housing insecurity. And finally, she illustrated the process of implementing educational adaptations.<sup>[14]</sup> Choi *et al.* investigated the impact of COVID-19 on final-year medical students across 33 UK medical schools using an online survey. The impact on final-year medical students' examinations, electives, and assistantship placements and the subsequent effect on preparedness and confidence of students going into Foundation Year 1 were investigated. The results showed that 77.3% of the respondents had electives cancelled; although disappointing to many, the students recognized that worldwide travel restrictions were necessary. Statistical analysis highlighted the key issues related to training that should be addressed in the immediate term. Furthermore, better ways to support students to transition into the workforce in the long term is an essential element that needs consideration.<sup>[15]</sup>

There were two articles on the effects of SARS disease belonging to the coronavirus family, on medical education in 2003.<sup>[16,17]</sup> In 2003, Patil *et al.*, discussed the impact of SARS on medical education in Hong Kong. In this article, the anxiety of a number of medical students infected by SARS, the suspension of clinical education and the closure of universities by the authorities, and the uncertainty of the exam date have been considered as the effects of this disease.<sup>[16]</sup> In another article, Clark discussed the effects of SARS on medical education

in Toronto. The restrictions on attending educational hospitals for medical, nursing, dentistry, pharmacy, and occupational therapy students, as well as the restrictions of inter-organizational meetings and not attending educational hospitals, were discussed to prevent being infected.<sup>[17]</sup>

In Iran, Tabatabai and Ebrahimi *et al.*, in a commentary and a letter to editor, discussed the impact of COVID-19 in medical education and virtual medical education and promotion of remote medical education.<sup>[18,19]</sup>

None of these studies were futures studies on the effects of this disease on medical education. Conversely, the short time effects of this disease were investigated in a letter to editor and so on.

The long-term effects of this disease have not been studied. In order to be aware of the short-term, middle-term, and long-term effects of the COVID-19 pandemic on the medical sciences education in Iran, the science of futures study is needed. Futures study in this disease will help in being aware of the primary effects, the secondary effects (the effects of primary effects), as well as the tertiary effects (the effects of secondary effects) of this disease on the medical sciences education of Iran and will also help policymakers in making appropriate decisions to reduce the harmful effects of this disease.<sup>[20]</sup> No futures study research has been found on the effects of this disease in medical education in Iran and worldwide, but there are many articles on the subject of futures study on medical education in Iran.<sup>[21-23]</sup> Due to the fact that the effect of this disease on medical sciences education has been determined in no research so far, the aim of this study was to identify the effects of this disease on medical sciences education in Iran with futures studies method.

## Materials and Methods

This futures study research was carried out using the future wheel method. The futures wheel is a method for gathering qualitative expert knowledge. This method applies for identifying the present, secondary, and tertiary consequences of trends and events. It is a structured brainstorming method for organizing opinions about the future. The steps of this method are identifying trends or possible future events, and then a researcher has to ask questions and ask about these trends and events to a respondent or a group of individuals. The questions are: "If this event occurs, then what happens next?" or "What are the impacts or consequences?" The responses are recorded, and the future wheel is formed as a series of consecutive chains of effects that are radiated from the initial trends and events.<sup>[24-26]</sup>

This study was carried out in Iran's University of Medical Sciences in the spring of 2020. The ethics code number of this research was "IR.YUMS.REC.1399.013.". Participants were vice chancellors of medical sciences universities, faculty presidents, faculty vice chancellors, faculty members, medical education specialists, and university students, who have the most information. A semi-structured interview was carried out that was purposefully identified. Sampling was carried out until achieving data saturation, which consists of thirty samples. Data saturation achieved when new interviews did not have new information or themes.

Mindjet MindManager software (Corel Corporation, Dublin, Republic of Ireland) was used to design the future wheel, and the analysis of the interviews was done using MAXQDA version 10 (VERBI GmbH, Berlin, Germany) software that is developed and distributed by VERBI Software based in Berlin, Germany. The phrase of the corona pandemic prevalence (COVID-19) was written in the middle of a page. Then, small blades like wheel blades were drawn from the center to the outside. The main effects or consequences (first degree) of the corona pandemic (COVID-19) on medical education were written at the end of each blade. Then, the secondary effects or all the effects of the primary effects were drawn, to form the second ring. This will be continued until a significant picture of the consequences of Corona's pandemic (COVID-19) on medical sciences education become apparent. In order to form the future wheel, one person was assigned as a person in charge of working with the Mindjet MindManager software, another one was assigned as a person in charge of the interview with the participants, and two people were assigned as individuals in charge of analyzing the data from the interviews. The first question that the interviewer asked was, what changes have taken place in medical science education since the corona pandemic (COVID-19)?

Then, the interviewees were on what would be the consequences of this change? Similarly, questions were asked from the interviewees. The interviews were recorded and carried out with the permission of the participants. Due to the prevalence of COVID-19, the interviews were conducted by mobile phone. The results of the interviews were provided to the person in charge of working with Mindjet's mind management software to form the levels of the future wheel. After the formation of the future wheel, to bring this future wheel closer to reality and eliminate insignificant cases, several participants were contacted and asked to participate in several virtual focus groups. Ten of them participated in four virtual focus groups that were held in NAVID LMS (A software suitable for academic learning, in which virtual interaction among users is one of its features, is used in Iranian universities of medical sciences) and

finalized the future wheel. In these virtual focus groups, at first, the primary effects were presented and each person expressed his/her opinions about them. Each person expressed his/her opinion about that item and indicated whether it belongs to the primary or secondary or tertiary effects. More than half of the people in the group had to confirm the belonging of the item to the primary or secondary or tertiary effects. Then, the secondary effects related to each of the primary effects were presented and the members' opinions about it were achieved. Finally, the tertiary effects related to each of the secondary effects were presented and the members' opinions about them were achieved and the duplicate effects were removed.

Research process is shown in Flowchart 1.

Due to the large size of the future wheel, this article does not show the future wheel and communication of each of the effects, and only the final results are presented.

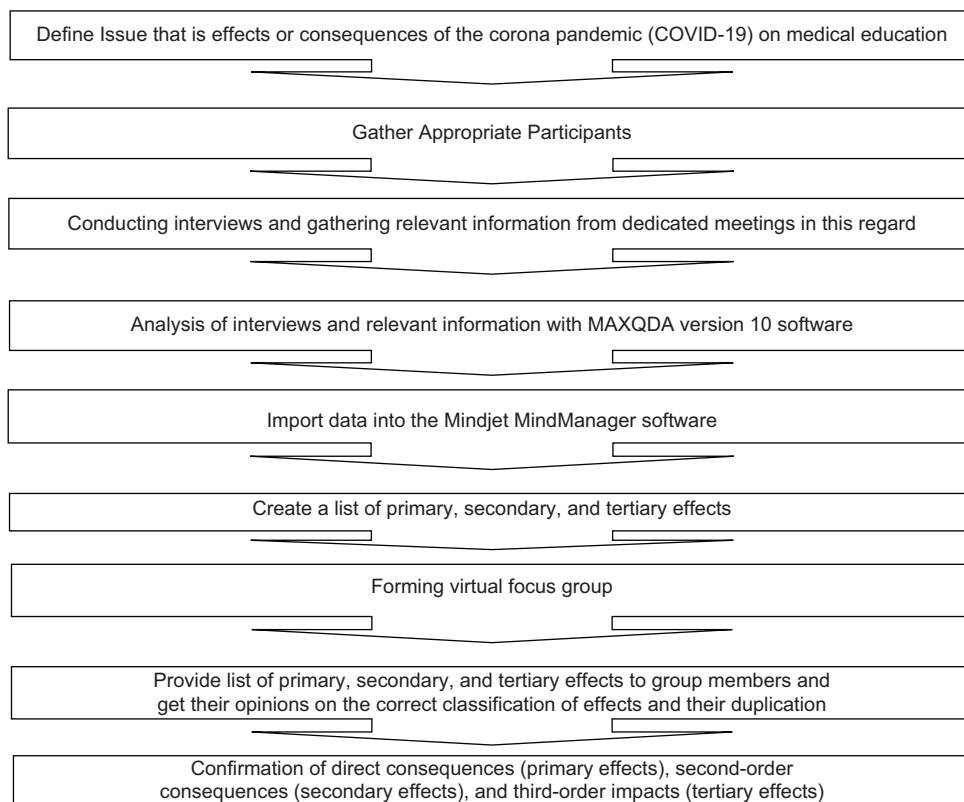
## Results

The effects were presented at three levels including primary effects, secondary effects, and tertiary effects. Accordingly, 16 primary effects were recognized, which are shown in Table 1.

As shown in Table 1, fear, stress, and anxiety of students, faculty members, and staffs on having corona and creation of lots of rumors about people getting infected and need for courses on stress management and rumor management; holding meetings by university, provincial, and ministry officials regarding closure of the classes and closure of face-to-face theoretical, practical, and apprenticeship classes for students of all disciplines temporally and nonclosing of internship students, specialized assistants, subspecialists and medical fellowships, and final-year nursing, laboratory science, and radiology students; necessity to provide masks, gloves, gans, protective shields, and other protective equipment for internship students, specialized assistants, subspecialists, and fellowships, professors, and other specialists; and the increased educational costs are examples of primary effects of coronavirus (COVID-19) pandemic on medical sciences education in Iran.

Fifty-one secondary effects were recognized, as shown in Table 2.

As shown in Table 2, allocation of a number of educational hospitals to the referral hospitals of COVID-19; direct involvement of some faculty members in the management of COVID-19 and disruption of student education in the referral hospitals of COVID-19; the need for staff in hospitals involved in COVID-19 and



Flowchart 1: Research process

recruiting staffs for 89 days from the retired, unemployed nurses, and those who have completed their commitment of workforce; holding a virtual educational course on rumor management, COVID-19, stress management, and psychiatry for subjects covered by continuing medical education, faculty members, and students; and providing virtual content such as videos for the general public are examples of secondary effects of coronavirus (COVID-19) pandemic on medical sciences education in Iran.

Twenty-four tertiary effects were recognized, which are shown in Table 3.

As shown in Table 3, increasing the number of virtual courses, increasing virtual tests, creating virtual tours, providing a course about COVID-19 in the curriculum of all disciplines, increasing the length of the course, and postponing graduation are examples of tertiary effects of coronavirus (COVID-19) pandemic on medical sciences education in Iran.

## Discussion

The aim of this study was to investigate the effects of COVID-19 on medical sciences education in Iran. These effects were presented at three levels. One of the most important effects of this disease on medical sciences education is the postponement of practical and apprenticeship classes and, consequently, the

increased length of the academic term. Extending the semester delays the graduation of students, and this delay in graduation reduces the number of applicants for service commitment, and temporarily reduces the workforce. On the one hand, this disease leads to the death of a number of students, educational and medical staffs, and faculty members, which also reduces the workforce; on the other hand, extending the recruitment of faculty members will add to this challenge and cause the need for planning to compensate for this reduction. Of course, due to the existence of unemployed graduates in the fields of health sciences, there is no problem in terms of workforce in these fields, but in terms of educational and medical forces, there is a need for workforce at the moment, and this shortage is also creating its effects. Ferrel in her editorial also said that cancelling of in-person medical classes was an important immediate effect of COVID-19.<sup>[27]</sup> For a variety of reasons clinical clerkships were canceled. These included: 1) to reduce personal interactions to restrain the spread of COVID-19, 2) to decrease the risk of exposure for medical students and 3) due to lack of personal protective equipment.<sup>[27]</sup>

Wong in her special features said that institutions should apply the foundational consideration to embrace the safety and well-being of students in the context of providing patient-centered care. She said that medical

**Table 1: The primary effects of coronavirus pandemic on medical sciences education in Iran**

**Primary effects**

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Fear, stress, and anxious of students, and faculty members and staffs on having corona and creation of lots of rumors about people getting infection and need for courses conducted on stress management and rumor management
Students did not attend classes and the classes were temporarily
Holding meetings by university, provincial, and ministry officials regarding closing the classes and closing face-to-face theoretical, practical, and apprenticeship classes for students of all disciplines temporarily and nonclosing of internship students, specialized assistants, subspecialists and medical fellowships, and final-year nursing, laboratory science, and radiology students
Necessity to provide masks, gloves, gans, protective shields, and other protective equipment for internship students, specialized assistants, subspecialists and fellowships, professors, and other specialists and the increased educational costs
Closing the basic science's faculty members and staffs
Postponement of face-to-face educational workshops for empowering students, faculty members, and staffs
Postponement of educational missions of faculty members and staffs
Postponement of defending the title, proposal, dissertation, and thesis of students
Increasing workload, reducing rest time, and increasing stress for university officials
Fear of students and graduates to go to other countries to continue their education
Return of foreign and domestic students to their countries and cities
Leaving the dissertation works to the students and destroying the opened kits, stored cells, laboratory mice, and expired chemicals materials that impose costs on faculty members and students
Patients' confusion about when to continue treatment due to the closure of the practical parts of preclinic and clinic of general dentistry students
Cancellation of some face-to-face educational sessions and holding some limited ones in accordance with the principles of health
Postponement of congresses, conferences, and seminars and canceling some of them in 2020 and 2021
Postponement of exams including recruitment exams, student admissions, centralized and decentralized academic achievement exams, scientific Olympiad of medical science students, and Ministry of Health Language exam

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students report feelings of uncertainty and anxiety about personal safety and continuity of learning experience. COVID-19 impacts on graduation timeline, financial liability, and housing insecurity of student were the key questions.<sup>[14]</sup> Accordingly, the Deputy of Ministry of Health and Medical Education must establish a long-term plan to address it.

One of the effects was starting virtually holding some classes. Tabatabai in her commentary said that most medical schools are shifting to live online or video-based learning.<sup>[18]</sup> Maintaining standard and minimizing the assessment disruption are unprecedented challenges.<sup>[18]</sup> Holding virtual exams in the systems will have challenges, considering that students take the exam at home, and hence the possibility of cheating in the exam will increase. Students may answer questions in groups or share content for study, so the strategy for grading and preparing test questions will need to be changed. Designing questions at high cognitive levels, changing the order of questions and options for any student, asking each student to send a summary of the course as an audio or multimedia file to the instructors, and requesting homework are some of the solutions. Another challenge is that not all students have access to electronic devices to use the content and take the test virtually. Cost for additional cellular data is a factor considered to be inhibitory for long-distance learning in Daroedono's research.<sup>[8]</sup> In this regard, it can be announced that students who do not have access to electronic devices to participate in the exam should refer to the university

exam center to participate in the exam or pay for their Internet to go to private centers.

On the other hand, one of the most important effects that will temporarily happen, but will affect many students even in the coming years, can be the issue of temporary changes in educational regulations. For example, changes in the authorized years of study or changes in maximum age allowed taking the test in the fields of specialized and sub-specialized assistant and even employment, it seems that the best strategy is to prolong the duration of the course for at least 6 months under the bylaw or increase at least six months to the maximum age allowed. For example, suppose a medical student who is currently studying in apprenticeship: she is an employee, and by calculating that, after graduation she will be 39 years and 9 months old and can take the specialized assistant exam but due to COVID-19, which delays her graduation, she cannot take exam after graduation, and all her life plans will be destroyed. In this regard, Wong has stressed that medical curricular adaptations should be flexible in terms of delivery and administration.<sup>[14]</sup>

The effects of COVID-19 on medical sciences education will be short term and, with proper planning, these challenges can be addressed. However, in early days and months after the disease, many efforts are needed on the part of medical science universities, the Ministry of Health and Medical Education, and other organizations.

These effects will be different in universities due to their categories of learners and the existence of educational

**Table 2: The secondary effects of coronavirus pandemic on medical sciences education in Iran**

**Secondary effects**

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Allocation of a number of educational hospitals to the referral hospitals of COVID-19

Direct involvement of some faculty members in the management of COVID-19 and disruption of student education in the referral hospitals of COVID-19

The need for staff in hospitals involved in COVID-19 and recruiting staffs for 89 days from the retired, unemployed nurses, and those who have completed their commitment of workforce

Holding a virtual educational course on rumor management, COVID-19, stress management, and psychiatry for subjects covered by continuing medical education, faculty members, and students, and providing virtual content like videos for the general public

Elimination of travel and sightseeing during Nowruz and summer holidays for faculty members, students, and staffs and the need for travel and sightseeing

Reducing the fear and anxiety of students and staff over time and recognizing the disease and voluntary participation in offering services to patients with COVID-19

Starting virtual holding some classes

Imposing the cost of attending virtual classes and downloading materials to students and faculty members

Improving the infrastructure of virtual education

Performing evaluation of virtual teacher by providing virtual teacher evaluation forms and virtual content evaluation forms

Creating a checklist for grading students' virtual activities

Monitoring the virtual presentation of theoretical courses

The increased students' demand for apprenticeship in their hometown and the increased demand for being guest in their hometown

Use virtual reality to present practical lessons

Confusion of students, faculty members, staffs, and applicants for admission to the institute regarding the starting time of face-to-face classes and meetings and getting too much contact with college officials

Creating an IVR system using the capacity of social networks and the faculty website and sending text messages to answer questions from students, faculty members, staffs, and applicants for admission to the institute

The increased free time of students, faculty members, and staffs for staying with the family, complete research projects and unfinished articles, produce virtual content, collaborate on other family members' course topics, watch TV, sleep, and study books

Increasing the waste of time for students, faculty members, and staffs

Reducing the social activities of students, faculty members, and staffs and increasing their immobility

Increase the time spent in cyberspace by students, faculty members, and staffs and make more use of mobile phones

Using cyberspace to respond to faculty members, and study curricula and participate in virtual educational courses by students and using cyberspace to respond to students by professors

Elimination of units added to the approved curriculums by some departments

Being infected and death from COVID-19 in some internship students, specialized and subspecialty assistants and fellowships, faculty members, staff, and families and their relatives

The increased use of sick leave for internship students, specialized and sub-specialized assistants, fellowship, and clinical teachers

Increasing work, mental and psychological pressure on internship students, specialized and sub-specialized assistants, fellowship, and clinical teachers

Reducing the educational performance and providing services of internship students, specialized and sub-specialized assistants, fellowship, and clinical teachers, and consequently reducing the performance of the departments

Strictness in giving transfers or a guest to specialized and sub-specialized assistants and not sending them to other universities to receive other training

Increasing the need for staff services and performing telework by employees

Virtually holding defense meeting of title, proposal, and dissertation or thesis or in person with a very small number of people

Virtually holding empowerment courses for students, faculty members, and staffs or holding them in person by observing issues related to disease prevention

Delay in announcing the results of the call for faculty and staff recruitment

The negative effects of recruitment delay on the personal lives of applicants

Delayed promotion of faculty members and further loss of income

Use of the results of 2 years ago employment tests to recruit staffs in case of necessity

Elimination of a number of academic achievement tests and replacing intra-sectoral, logbook, and professional ethics criteria for them or acceptance of students in academic achievement tests (promotion exams, basic sciences, preinternships, and comprehensive dental exams) conditionally until the next round of exams or holding academic achievement tests using home-based tests and 1-min question method and electronic monitoring of exams or holding academic achievement tests with restrictions including reducing the number of people in each hall, using protective equipment, creating high distance among applicants, and the need to use more test halls

Holding competitive exams (such as bachelors test, masters test, doctoral test, specialized and sub-specialized assistant test) in person after passing the crisis conditions or with restrictions including reducing the number of people in each hall, using protective equipment, creating high distance among applicants, and the need to use more test halls

Virtually holding some tests such as the Olympiad test and the language test using home-based tests and 1-min question method and electronic monitoring of exams

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*Contd...*

**Table 2: Contd...**

**Secondary effects**

Increase in receiving online questions from question designers for centralized tests and reinforce question bank  
The increased use of webcams by students at home  
The increased pressure on the medical education assessment center to announce the results of the exams after passing the crisis and the need to prevent of aggregation in holding of exams  
Informing about the cancellation of exams in website of on the medical education assessment center, and other related website or through office automation to universities  
Postponement of the start of the new semester up to end of the crisis  
The increased length of the second semester until the summer and provide practical and internship courses after the crisis  
Increasing the age of general medicine students and specialized assistants by increasing the length of courses and the need to change the maximum age law for test applicants  
Deletion of the summer semester  
Holding some congresses, conferences, and seminars after overcoming the crisis and the increased possibility of reducing foreign participants  
Lasting faculty members and staff educational missions  
Reducing the recruitment of foreign students  
Reducing the recruitment of Iranian students who study abroad to Iranian university  
Increasing virtual contents  
Temporary revision educational regulations

COVID-19=Coronavirus disease 2019, IVR=Immersive Virtual Reality

**Table 3: The tertiary effects of the coronavirus pandemic on medical sciences education in Iran**

**Tertiary effect**

Increasing the number of virtual courses  
Increasing virtual tests  
Creating virtual tours  
Providing a course about COVID-19 in the curriculum of all disciplines  
Increasing the length of the course and postponing graduation  
Reducing the number of applicants of committed to service in a limited time period  
Decreased specialist staff in the hospital and health centers in a limited time period  
Increasing the commitment of students due to increasing the length of the course, and reducing the amount of commitment due to the duration of the outbreak in the country  
Increasing the work pressure in 1400 to the scientific and executive committee of the conferences, congresses, and seminars that were held with the postponement in 1399 and to be held in 1400  
Delay in launching and creating new and existing disciplines, developing new curricula, and reviewing existing curricula  
Lack of faculty members to teach some courses and lessons with lasting educational missions and delays in announcing the recruitment test results and death in some of faculty member due to COVID-19 and the need to attract faculty members  
Reducing index of the teacher to the student  
Decrease in income from the source of foreign students and Iranian students abroad in a limited time period  
Increasing cyberspace addiction among students, faculty members, and staffs  
Increasing depression among students, faculty members, and staffs  
Providing free internet for students and professors by the Ministry of Health and Medical Education  
Increasing the number of students applying for practical units, internships, and practical departments and using other educational fields, increasing working hours, and reducing internship hours to compensate  
Reduction of recruitment of new students in October according to the request of universities or postponement of recruitment of new students to February  
Lack of internship in a period of time due to interruption of apprenticeship for general medical students in a period of time and severe need for internship students in hospitals  
The need to recruitment interns, specialist and subspecialists assistants, and fellowship students in a period of time due to the death a number of them due to COVID-19  
Severe reduction of the patient to train students in the prosthesis department  
Increasing overweight and related problems among faculty members, staffs, and students  
Increasing number of research projects and article of universities  
Accepting more employees in higher education and weakening the expert body of universities

COVID-19=Coronavirus disease 2019

facilities. For example, in cities where there are only two educational hospitals and in the case these two hospitals have become referral hospitals for COVID-19, the effects

of this disease on education will certainly be greater. However, in cities where there are many educational hospitals, this challenge is less.

In future research, it is suggested to compare the ability of students who have been trained virtually during COVID-19 with students who have been trained in person before COVID-19. It is suggested that the lived experiences of students and faculty members about medical education during the COVID-19 be explained.

## Conclusions

The most important effect of this disease on medical sciences education is the postponement of practical and apprenticeship classes, and consequently the increased length of the academic term that leads to delay in the students' graduation, which can reduce the workforce. On the one hand, this disease causes the death of a number of students, educational and medical staffs, and faculty members, as well as reduces the workforce. In addition, extending the recruitment of faculty members will add to this challenge and lead to the need for planning to compensate for this reduction.

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## Conflicts of interest

There are no conflicts of interest.

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