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The Satisfaction with Virtual Education and Related Factors from the Perspective of Medical Students during the COVID-19 Pandemic: A Systematic Review

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Abstract

Background: Changes in educational methods and the virtualization of university classes following the COVID-19 pandemic necessitate an evaluation of the opinions of students regarding this method of education. This study was conducted to investigate Iranian medical students' satisfaction with virtual education and its related factors during the COVID-19 pandemic.

Materials and Methods: This study is a systematic review. Two independent researchers selected articles on student satisfaction with virtual education in databases Scopus, EMBASE, Cochrane Library, Web of Science, ERIC, Medline databases, and Google Scholar search engine without time restrictions up to September 2022. The quality of the information was evaluated using the STROBE and COREQ scales.

Results: Fifteen related studies were included. The students' satisfaction with virtual education ranged from 56.3% to 92.15%. The lowest level of satisfaction was related to the items of technical and infrastructural problems, the incompatibility of the volume of course content with the number of courses, and dissatisfaction with the content, assignments/tests, and feedback. There was a significant positive relationship between the students' satisfaction level and their academic performance, gender, semester, education level, and e-learning experience ($p<0.05$).

Conclusion: The level of students' satisfaction with the quality of virtual education was average. Therefore, efforts to improve the facilities and infrastructure of hardware and network, paying attention to the diversity and appeal of training with various solutions, providing appropriate content, and better interactions between educators and students can lead to the development of this type of education and maximize student satisfaction.

Key Words: COVID-19, Iran, Satisfaction, Medical students, Virtual Education.

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1- INTRODUCTION

The COVID-19 pandemic is an ongoing global pandemic of coronavirus disease 2019 caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The novel virus was first identified in an outbreak in the Chinese city of Wuhan in December 2019 (1). The COVID-19 pandemic affected educational systems across the world. Most countries decided to temporarily close educational institutions to reduce the spread of COVID-19 (2, 3). Globally, the education of almost 77 million children and young people was interrupted (4). The pandemic caused by the COVID-19 disease affected educational institutions around the world and led to the closure of almost all schools and universities and the deprivation of more than 1.7 billion students from education (5).

Before the COVID-19 crisis, very few universities, and sometimes only for some subjects, held classes in non-attendance form with teaching via virtual education. With the emergence of COVID-19 and its high spread (6, 7), it was decided to control the disease by preventing the gathering of people in educational spaces. Consequently, virtual education was considered the main solution to continue the education of students and prevent the interruption of curricula in universities and educational centers (8, 9). This issue challenged the regular, face-to-face education system and led to the development and expansion of education based on virtual platforms (10).

Virtual education consists of educational activities that take place using audio, video, computer, and network electronic tools (11). The definition of virtual education is the use of electronic systems for education, which can reduce commute and save time and money, and in some cases, facilitate learning for learners. Virtual education can strengthen the partnership between the teacher and the learner (12). The World Health Organization (WHO) also introduced distance education (such as the use of radio, television, and the internet) as one of the best ways to continue education during the COVID-19 crisis (13). Higher education institutions quickly replaced face-to-face education with online learning, but closures affected learning, exams, and the safety and legal status of international students in the host country (14). Meanwhile, universities of medical sciences are facing more serious challenges as they are responsible for providing the next generation of healthcare workers (15).

There are three important reasons for continuing medical sciences education during the COVID-19 pandemic. First, learning medical sciences is a process, meaning that a student must pass a stage before starting the next, and missing any part of education can be difficult to make up for later. Second, postponing clinical internships for current students' leads to crowded clinical environments and disruption in clinical learning. Third, with the possibility of the continuation of the pandemic, the healthcare system might face a shortage of healthcare workers, and students could help carry out some aspects of patient care (16). As faculties and students of medical sciences face various challenges in education during the corona disease pandemic, it is necessary to examine and monitor the resulting changes and their possible effects on the education of medical sciences, the level of student learning, and the general training process. The rapid transformation from face-to-face to online classes has created debates among scientists (17). Therefore, the changing conditions and the need to use virtual education methods call for a comprehensive evaluation of this new method of education, as it cannot be desirable or improved without a thorough evaluation (18-20).

This study aimed to investigate Iranian medical students' satisfaction with virtual education and the related factors during the COVID-19 pandemic.

2- MATERIALS AND METHODS

2-1. Data sources

The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) checklist was used as a template for this review (21). A systemic search of electronic databases PubMed, Web of Science, SCOPUS, EMBASE, CIVILICA, ERIC, and Google Scholar search engine was conducted using the following terms: "Online education, Virtual education, E-Learning, Remote learning, Web-based learning, Distance learning, Students, Medical students, Iran, COVID-19, and Satisfaction" with no time limit up to September 2022. Keywords were combined using "OR" and "AND" Boolean operators.

2-2. Protocol and registration: Not available.

2-3. Eligibility criteria

The participants, interventions, comparators, and outcomes (PICO) scale was used to formulate the review objective and inclusion criteria.

Participants: Iranian students of medical sciences

Interventions and Comparators: The included studies are non-interventional, so a comparison group did not exist.

Outcomes: Students' satisfaction with virtual education.

2-4. Inclusion criteria

The inclusion criteria were as follows: (1) research studies (qualitative or quantitative) focusing on the students' satisfaction with e-learning/virtual education and related factors; (2) studies addressing virtual education during the COVID-19 crisis; and (3) studies with Iranian students of medical sciences as their statistical populations. Other inclusion criteria were the focus on the satisfaction of medical students towards virtual education, published up to December 2022, written in English or Persian, and published articles with full text available.

2-5. Exclusion criteria

The exclusion criteria were abstracts without the full article, articles not written in English or Persian, books, reviews, meta-analyses, pilot studies, letters, commentaries, editorials, short reports, case reports, and briefs.

2-6. Study selection

The database search was performed for the relevant studies, abstracts of the studies were screened to identify eligible studies, full-text articles were obtained and assessed, and a final list of selected studies was made. This process was performed independently and in duplication by two reviewers, and any disagreement was resolved by a third reviewer. References were organized and managed using EndNote software (version X8).

2-7. Data collection process

Two independent inspectors gathered the information based on the following parameters: 1) author names, study year, and setting; 2) sample size; 3) the field of study of the participants; 4) the rate of satisfaction; and 5) main findings. Two reviewers collected the data independently. The collected data were combined and compared for accuracy, and any discrepancies were solved by a third reviewer.

2-8. Risk of bias

The quality of the included studies was evaluated using the modified STROBE (STrengthening the Reporting of Observational Studies in Epidemiology)

and the COREQ (consolidated criteria for reporting qualitative research) tools (22, 23). The standard tool of modified STROBE is a valuable tool for evaluating the quality of observational studies. This checklist has 11 items, and a maximum of one point is allocated for each methodological element. The final score of the checklist was between 0-11, indicating high quality (8-11), moderate quality (4-7), and low quality (0-3) (22).

The standard COREQ checklist includes 32 items grouped into three domains: (1) research team and reflexivity, which includes eight items on the details of the researcher and relationship with study participants; (2) study design, which includes 15 items identifying the theoretical framework, participant selection process, data collection, and study setting; and (3) data analysis and reporting, which includes nine items. COREQ compliance was coded using established criteria as high (≥ 25 items), moderate (17 to 24), low (9 to 16), and very low (≤ 8) based on the number of items addressed in each study (23). COREQ compliance for each included study was checked against each of the 32 criteria (rated yes/no) by two researchers.

2-9. Synthesis of results

Due to the difference in the included studies, study designs, lack of control groups in some studies, small sample size, students' field, and the type of questionnaires used, a meta-analysis was not conducted.

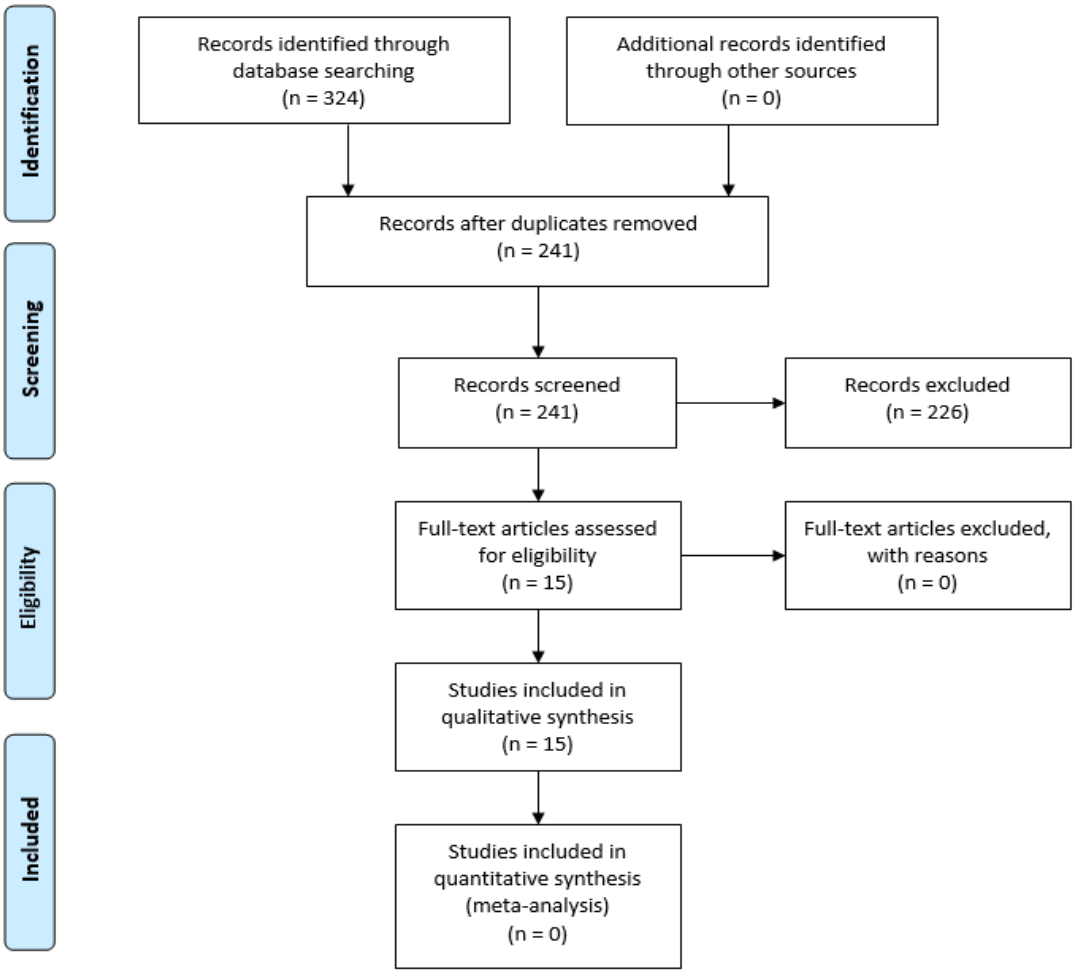

Fig.1: PRISMA flowchart.

3-RESULTS

A total of 15 related studies (n=5322 students) were selected (**Figure 1**). The students' satisfaction with virtual education ranged from 56.3% (Aja University of Medical Sciences) to 92.15% (Arak University of Medical Sciences). The quality of all selected articles was acceptable (**Table 1**). The main characteristics of the selected studies are summarized in **Table 1** and the following:

1. A quasi-experimental study in Ahvaz Jundishapur University of Medical Sciences aimed to investigate the level of satisfaction and learning of students from holding the Grand Round. The results showed that the satisfaction of most students (more than 70%) with the virtual grand round in speech therapy and physiotherapy groups was moderate to high. There was a significant difference between test scores before and after the grand round of the speech therapy group (p=0.002). However, no significant difference was found in the physiotherapy group between the scores before and after the test (p= 0.3) (24).

2. A cross-sectional study at Babol University of Medical Sciences aimed to evaluate the satisfaction of students of the Self-Governing Campus with virtual education. A total of 250 students in four fields of general medicine, general dentistry, bachelor of physiotherapy, and bachelor of nursing participated in the study. The results showed that the general satisfaction of students with virtual education, the possibility of establishing a two-way relationship between professors and students, and providing appropriate feedback was moderate. Regarding the evaluation method at the end of the semester, 84.5% of students had average or low satisfaction. The choice of students in all fields was face-to-face teaching method (25).

3. A cross-sectional descriptive correlational study at Urmia Nursing and Midwifery School aimed to determine the satisfaction rate with virtual education programs during the COVID-19 pandemic and its relationship with academic performance among nursing students. The results showed that the mean scores of students' satisfaction and academic performance were 149.65±16.21 and 74.35±22.94, respectively. It means that the students' satisfaction and academic performance were moderate (73.1%), and good (64.6%), respectively. There was a significant positive relationship between the students' satisfaction level and their academic performance ($p<0.05$) (26).

4. A cross-sectional descriptive study at Alborz University of Medical Sciences aimed to investigate virtual education from the students' point of view. The results showed that virtual education in the areas of lesson introduction, educational content, interaction and feedback, and measurement and evaluation was rated as relatively favorable by students. Comparing the level of satisfaction in different faculties and degrees showed that the faculty of pharmacy and master's students had the highest satisfaction level with the virtual education programs. There was no significant difference in the level of satisfaction between students of different faculties and levels (27).

5. A cross-sectional study at Bushehr University of Medical Sciences aimed to investigate the opinions of medical students about the quality of virtual education courses during the COVID-19 pandemic. The results showed that 84.5% of students agreed with virtual education courses, and 57.7% expressed satisfaction with their quality. Also, 84.5% of students expressed dissatisfaction with technical and infrastructural problems during online education sections, and 70% expressed dissatisfaction with unresponsiveness to their homework activities. There was a

statistically significant relationship between satisfaction with virtual education and the gender of students ($p<0.05$) (28).

6. A cross-sectional study at Tehran Islamic Azad University aimed to evaluate the quality of online teaching courses during the COVID-19 pandemic from the perspective of nursing students. The results showed that students had above-average satisfaction with the quality of online teaching, and the level of satisfaction was higher in women, third-year students, and students who experienced more face-to-face semesters than others ($p<0.05$) (29).

7. A cross-sectional four-stage study (needs assessment and establishment of objectives, content determination, implementation, and evaluation of the program) at Arak University of Medical Sciences aimed to compile, implement, and evaluate an introductory course on virtual learning for medical students (30 students from disciplines medicine, nursing, surgical technology, midwifery, public health, and environmental health). The results showed that the mean scores of students' satisfaction and learning were 18.43±1.5 and 16.8±2.5 out of 20, respectively (30). It means that 92.15% of students were satisfied with virtual education (30).

8. A cross-sectional descriptive-analytical study at Ahvaz Jondishapur University of Medical Sciences aimed to assess the quality and efficacy of virtual education from the perspective of professors and students of the Rehabilitation School. The results showed that simple access to technology and online skills were the strengths and essential factors in increasing the quality of virtual education from the perspective of professors and students (31).

9. A cross-sectional study at Aja University of Medical Sciences aimed to determine the level of satisfaction with the quality of education and virtual education during the COVID-19 pandemic among nursing students. The results showed that more than 66% of students were satisfied with the quality of the training course, and more than half of the students (56.3%) were relatively satisfied with virtual education. Among individual variables, the students' semester was a predictor of satisfaction with the course ($p<0.05$) (32).

10. A cross-sectional, web-based study among medical students of the University of Medical Sciences and the Islamic Azad University of Iran aimed to investigate the level of satisfaction and quality of e-learning in medical universities from the students' point of view during the epidemic of COVID-19. The results showed that the level of satisfaction was low (34.0 ± 10.0, $p< 0.001$), and the intention to reuse was moderate (23.06 ± 6.0, $p= 0.064$). The students' perception of quality in most domains ranged from low to medium. User satisfaction, intention to reuse, the quality of knowledge, and participatory quality for evaluating online courses were significantly higher among the Azad University students than in medical universities. It means that the quality of this type of education and, consequently, the satisfaction of students was low to moderate (33).

11. A cross-sectional study at Larestan University of Medical Sciences aimed to determine the students' level of satisfaction with virtual education. The results showed that the overall mean score of satisfaction with virtual learning was 3.02±0.84. The only correlation was between the students' semesters and the total satisfaction score, where students at higher semesters had lower satisfaction ($p=0.002$) (34).

12. A descriptive cross-sectional study at Zahedan University of Medical Sciences aimed to determine the status of e-learning, student satisfaction, and the relationship between these two variables. The results showed a significant difference

between the mean score of e-learning experience and student satisfaction and a positive correlation between the education level and student satisfaction. Also, there was a positive correlation between all variables of e-learning and student satisfaction. The findings showed that more capable learners were the result of better educational content, stronger e-learning infrastructure, better support, and assessment of e-learning quality, which, in turn, resulted in higher student satisfaction (35).

13. A qualitative-analytical study at Jahrom University of Medical Sciences aimed to investigate the challenges and needs of medical students regarding e-learning during COVID-19. The results showed that students generally cited 11 benefits, including personalization and flexibility of education, revision of more content than face-to-face classes, formative and periodical evaluation of assignments and quizzes in virtual space, and relative satisfaction with education. Also, 19 disadvantages of virtual education were sending large content in an inappropriate time frame, lack of qualitative and interactive content in some courses, non-uniformity of contents, and failure to simulate educational content with face-to-face classes (36).

14. A qualitative study at Sabzevar University of Medical Sciences aimed to investigate the views of faculty members and medical students towards e-learning challenges during COVID-19. The results showed two main themes as virtual educational challenges: confusion in the organization (mainly technical and time concerns and educational alienation), and organizational uncertainty (mainly fundamental inconsistency and managerial inconsistency) (37).

15. A qualitative study at Shiraz University of Medical Sciences aimed to identify the challenges and opportunities of the COVID-19 pandemic for medical education based on the views of students (n=12) and faculty members (n=14). The results classified the main opportunities into five subcategories: attitudes to e-learning and adaptability, preventing students' separation from the educational environment, documentation and monitoring the education, taking control of one's learning, and increasing perceived usefulness. The main challenges were divided into four subcategories: noncompliance with virtual classroom etiquette, inadequate interactions, time limitations, and infrastructure defects and problems (38).

Table-1: General characteristics and quality assessment of included studies (n=15).

Authors, Study year, Reference	Setting	Sample size	Study type	Participants field	Main results	Quality assessment of included studies
Saadat et al., 2019-2020, (24)	Ahvaz Jundishapur University of Medical Sciences	36	quasi - experimental	Undergraduate students in physiotherapy and speech therapy	The more than 70% of students were moderate to highly satisfy with the virtual grand round.	*moderate
Ziaie et al., 2020-2021, (25)	Babol University of Medical Sciences	250	cross - sectional	Undergraduate students in general medicine, general dentistry, physiotherapy, and nursing	84.5% of students had average and lower level of satisfaction.	*moderate
Sadeghzadeh et al., 2020-2021, (26)	Urmia Nursing and Midwifery School	223	cross-sectional	Undergraduate nursing students	The students' satisfaction and academic performance were moderate (73.1%) and good (64.6%), respectively.	* high
Zhalehjoo et al., 2019-2020, (27)	Alborz University of Medical Sciences	364	cross-sectional	Undergraduate medical sciences	The status of virtual education in the areas of lesson introduction, educational content, interaction and feedback, measurement and evaluation was relatively favorable from the students' point of view.	*moderate
Yazdanparast et al., 2020, (28)	Bushehr University of Medical Sciences	90	cross-sectional	Undergraduate medical students	84.5% of students agreed to have virtual education courses and 57.7% of students expressed satisfaction with the quality of virtual education.	*moderate
Abdolreza Gharehbagh et al., 2021, (29)	Islamic Azad University, Tehran, Brach	900	cross-sectional	Undergraduate nursing students	The students had above-average satisfaction with the quality of online teaching and the level of satisfaction was higher in women, third-year students, and students who experienced more face-to face semesters than other students.	*moderate
Shakour et al., 2020-2021, (30)	Arak University of Medical Sciences	30	cross-sectional four stages study	Undergraduate students in medicine, nursing, surgical technology, midwifery, public health, and environmental health	The mean scores of students' satisfaction and learning were 18.43±1.5 and 16.8±2.5 out of 20, respectively. It means 92.15% of students were satisfied with virtual education.	* moderate
Hoseini-Beidokhti et al., 2022, (31)	Ahvaz Jondishapur University of Medical Sciences	210	cross-sectional	Undergraduate and postgraduate (MSc) students in Physiotherapy, Occupational therapy, Speech therapy, and Audiology	The simple access to technology and online skills and relationships were the strengths and essential factors in increasing the quality of virtual education from the perspective of professors and students.	*moderate
Farsi et al., 2019-2020, (32)	Aja University of Medical Sciences	142	cross-sectional	Undergraduate and postgraduate nursing students	More than 66% of students were satisfied with the quality of the training course. More than half of the students (56.3%) were relatively satisfied with virtual education	*moderate

Iravani et al., 2020, (33)	University of Medical Sciences and the Islamic Azad University of Iran	400	cross-sectional web-based	Undergraduate medical students of Iran	The level of satisfaction was low (34.0 ± 10.0); p< 0.001, and intention to reuse was moderate (23.06±6.0); p=0.064. User satisfaction, intention to reuse, the quality of knowledge, and participatory quality for evaluating online courses were significantly higher in the Azad University group than in medical universities.	*moderate
Delam et al., 2021, (34)	Larestan University of Medical Sciences	132	cross-sectional	Undergraduate Medical Sciences students (nursing, public health, nutrition, etc.)	The overall mean score of satisfaction with virtual learning was 3.02±0.84.	*moderate
Erfannia et al., 2021, (35)	Zahedan University of Medical Sciences	300	cross-sectional	Undergraduate Medical Sciences students (nursing, public health, medicine, etc.)	There was a significant difference between the mean score of e-Learning experience and student satisfaction, and a positive correlation between the education level and student satisfaction.	*moderate
Mosalanezhad et al., 2020, (36)	Jahrom University of Medical Sciences	550	qualitative-analytical	Undergraduate Medical Sciences students (nursing, health sciences, medicine, etc.)	students' generally have 11 benefits including personalization and flexibility of education, revision of more content than face-to-face classes, formative and periodical evaluation of assignments and quizzes in virtual space, relative satisfaction with education, etc..	**moderate
Goli et al., 2021, (37)	Sabzevar University of Medical Sciences	16	qualitative study	Undergraduate and postgraduate students of nursing, health and paramedical schools	Two main themes include turmoil in the organization (with the main classes of technical concerns, time concerns, and educational alienation), and organizational uncertainty (with the main classes of fundamental inconsistency and managerial inconsistency) were extracted as virtual educational challenges.	**moderate
Hayat et al., 2020, (38)	Shiraz University of Medical Sciences	students and 14 faculty members	qualitative study	Undergraduate Medical students	The main opportunities from the COVID-19 pandemic for medical education were classified into five subcategories: attitudes to e-learning and adaptability, preventing students' separation from the educational environment, documentation and monitoring education, take control of own learning, and increasing perceived usefulness.	**high

* STROBE tool (22), ** COREQ tool (23).

4- DISCUSSION

This study was conducted to review Iranian medical students' satisfaction with virtual education and related factors during the COVID-19 pandemic. The results showed that the students' satisfaction with virtual education ranged from 56.3% to 92.15%. There was a significant positive relationship between the students' satisfaction level and their academic performance, gender, semester, education level, and e-learning experience ($p<0.05$).

The COVID-19 pandemic affected educational systems across the world (39-43). At the beginning of the pandemic, most countries decided to temporarily close educational institutions to reduce the spread of disease (3-5). In this situation, virtual education was the primary solution to continue the education of students and prevent the interruption of education in universities and educational centers (9, 8). This solution prevented the suspension of education during the outbreak of the disease (44). Online education enables the teacher and learners to access learning and teaching at any place and time (45, 46).

However, like all educational activities, the quality of virtual education programs as an integral part of electronic learning requires evaluation, without which cannot be desirable or improved in quality (18-20). In virtual education, electronic technology is used to provide, support, and strengthen learning and teaching, and communication between students and teachers is achieved through the online content provided (47). Several factors, such as experience, familiarity with computers, the technology used in virtual education courses, suitable teaching methods, the amount of support received, and the flexibility of program acceptance, can affect satisfaction with virtual education (48). Students' satisfaction with the type of education received is also important (49), and should be evaluated to improve learning and promote the goals of educational courses (50). The findings of a study showed that a lack of educational satisfaction reduced the motivation of learners and led to their insufficient effort in educational activities (51).

Based on the current review, the students' satisfaction with virtual education ranged from 56.3% to 92.15%. There were differences in the level of satisfaction of medical students with e-learning during the COVID-19 pandemic in the reviewed studies. These differences may be due to factors such as gender, academic performance, students' semesters, education level, and experience with e-learning before COVID-19.

A systematic review and meta-analysis conducted by Ahmed et al. showed that 57% of medical students were satisfied with e-learning (52). Another systematic review showed that the level of satisfaction with e-learning during the COVID-19 pandemic among medical science students was 51.8%. Factors such as age, gender, clinical year, experience with e-learning before COVID-19, level of study, the time dedicated to e-learning, stress perception, and convenience had significant relationships with the satisfaction of medical students with e-learning (53).

The results of another study in Turkey showed that student satisfaction was at a moderate level (54). A systematic review conducted by Niknaee et al. showed that students' satisfaction with virtual education during the COVID-19 pandemic across worldwide studies ranged from 26.4% to 82%. It was found that the quality of e-learning was primarily affected by service quality with administrative, technical, and learning assistance through tutors and the library, teachers' active role in the process of online education with their responsiveness and timely feedback, and the overall system quality with the mode of delivery mode and IT infrastructure (55).

The coronavirus pandemic has led education to take place online using electronic systems, and the quality of these media is essential to the exchange of information and content (56, 57). The changing conditions and the need to use virtual education methods necessitate the evaluation of this new method of education from all aspects in different universities and solving problems and the dissatisfaction of students and faculty members.

The coronavirus disease has created opportunities for universities and higher education institutions to use electronic education. These opportunities include the development of electronic education infrastructures, updating curriculum headings, production of virtual course content by university professors, expansion of recruitment and registration of international students in specialized or official courses of universities, and the possibility of higher participation in international research (58). Studies show that virtual academic education could be a successful and efficient system if the educational content is formulated and evaluated properly (59, 60).

The advantages of virtual education include access to learning without time and place restrictions and for a larger population, sharing knowledge with other students and professionals, and greater flexibility for students (61-63). E-learning can also contribute to medical education with improvements in attitudes to e-learning and adaptability, preventing students' separation from the educational environment, taking control of learning, and documentation and monitoring of education (38). The general advantages of electronic education and its special capabilities in medical education call for its integration into the current educational programs of universities. This way, conventional education can be presented as a combination of traditional and electronic education and can deal with issues such as the lack of educational spaces, the massive amount of information available, and the time limit of professors and students (64).

In general, virtual training can never substitute for face-to-face training. Studies have suggested that virtual education should always be used as a complementary method alongside face-to-face education (12). A lack of motivation, lack of physical interaction of students with professors, social isolation, and lack of immediate feedback from professors have been mentioned as major disadvantages of virtual education (62). Other obstacles to virtual education include weak technical skills, insufficient infrastructure, and the absence of strategic plans (16). On the other hand, the quality of university education has decreased following the non-attendance of students. University employees faced the challenge of losing their jobs, and university managers and faculty members were forced to reconsider the way of providing university education and management (58).

Also, the implementation of curricula in electronic form faced problems, especially a reduction in educational quality and difficulties in the electronic evaluation of students (65). Remote learning has also inadvertently facilitated cheating for students (66). The lack of interaction between students and the teacher has lowered the enthusiasm of students toward the integrity of their work. Students turned in half-completed assignments, received the answers from classmates, or turned in nothing at all simply because education lost much importance following COVID-19 (67-69). Despite the short life of efforts to improve the facilities and infrastructure of hardware and network, the significant global expansion of virtual education necessitates attention to the diversity and appeal of training using various solutions, providing appropriate content based on the results of needs assessment, and more

interactions between professors and students to develop this method of education and maximize student satisfaction (34, 70).

5- CONCLUSION

The Iranian students' satisfaction with virtual education during COVID-19 ranged from 56.3% to 92.15%. There was a significant positive relationship between the students' satisfaction level and their academic performance, gender, semester, education level, and e-learning experience. E-learning can offer opportunities in medical education, such as improvements in attitudes to e-learning and adaptability, preventing students' separation from the educational environment, taking control of one's learning, and documentation and monitoring of education. Despite the short life of efforts to improve the facilities and infrastructure of hardware and network, the significant expansion of virtual education around the world calls for paying attention to the diversity and appeal of training using various solutions, providing appropriate content based on the results of needs assessment, and more interactions between professors and students to develop this method of education and maximize student satisfaction.

This review found that most studies highlighted the use of virtual education and acknowledged it as an appropriate method of education. A lack of adequate infrastructure and educational equipment created challenges for learners and teachers. Therefore, it is recommended to eliminate these shortcomings to continue using this type of education after the end of the COVID-19 pandemic. Universities should use the experience of the coronavirus crisis and follow the combination of face-to-face and virtual training in their policies, particularly due to the possibility of similar events in the future.

6- AUTHORS' CONTRIBUTIONS

Study conception or design: SB, and ZA; Data analyzing and draft manuscript preparation: SA, RA, SI, and ZR; Critical revision of the paper: SB, and SA; Supervision of the research: SB, and ZA; Final approval of the version to be published: SB, SA, RA, SI, ZR, and ZA.

7- CONFLICT OF INTEREST: None.

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