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Review Article

COVID-19 Pandemic and E-Learning Satisfaction in Medical and Non-Medical Student: A Systematic Review and Meta-Analysis

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Abstract

Background: The COVID-19 pandemic has led to a rapid shift in student education style from face-to-face to electronic learning. Since the education satisfaction index is considered as a measure of the quality of educational services, therefore, this study aimed to assess E-Learning Satisfaction (ELS) in medical and non-medical students during COVID-19 pandemic.

Methods: Articles that had been published from 22 Dec 2019 to 4 Jan 2021 were identified through searching databases including PubMed, Scopus, Elsevier, Google Scholar, Web of Science and Iranian Scientific Information Database (SID), Health.barakatkns, IranDoc, Civilica and MagIran using the following keywords: "Distance learning", "Virtual learning", "E-Learning", "Satisfaction", "COVID 19". We systematically reviewed all studies that reported ELS. In this study, meta-analysis was used to estimate the pooled ELS.

Results: Overall, 184 records were identified by the electronic search, of which 24 relevant studies were included in meta-analysis. The pooled ELS in medical, non-medical and overall were 58.1% (50.5%-65.7%), 70.1% (66.8%-73.5%) and 63.8% (58.9%-68.8%) respectively.

Conclusion: According to our results and lower ELS in medical students in comparison with non-medical students, designing new E-Learning methods for medical students has been suggested.

Keywords: Learning; Satisfaction; COVID-19; Medical student

Introduction

In late 2019, a wave of respiratory diseases began in Wuhan (China). On March 11, 2020, the COVID-19 pandemic was announced by WHO (1). This respiratory disease which is referred to as coronavirus or COVID-19, has spread to more than 125 countries in the world and until now

(October 19, 2021) more than 241 million infections and 5 million deaths have been reported from around the world (2, 3).

This pandemic has had a major impact on various economic (4, 5), social (6, 7), cultural (8) and educational fields (9). The COVID-19 pandemic has had a catalytic effect on improvements in worldwide education systems (10, 11). Rapid shift from face-to-face to E-Learning without enough time to plan and prepare students and teachers as well as hardware and software facilities caused a lot of problems in learning process (12). These problems are more common among medical students in comparison with other students due to the presence of practical courses. Evaluating the number of E-learning problems during the COVID-19 pandemic cannot be directly estimated, but it is possible to indirectly estimate it using satisfaction (13).

Student's satisfaction is considered as an important factor in the continuity and maintenance of universities as well as the ability of institutions to attract students (14). Student's satisfaction depends on special conditions and factors that exist in university. Since student's satisfaction is a complex structure and there is no single global definition, researchers generally consider it to be the result of students' mental evaluation of different results and experiences related to services. The educational environment is very important in their academic success (15-17). The education satisfaction index is considered as a measure of the quality of educational services.

Therefore, this systematic review and meta-analysis aimed to assess E-Learning Satisfaction (ELS) in medical and non-medical students during COVID-19 pandemic.

Methods

Search Strategy

In this study, all cross sectional studies that reported E-Learning Satisfaction (ELS) in medical and non medical students during COVID-19 pandemic has been used. The systematic literature review was conducted through searching databases including, PubMed, Scopus, Elsevier, Web of Science and Iranian Sientific Information Database (SID), Iranian Research Institute for Information Science and Technology (IranDoc), Health.barakatkns, MagIran and Civilica in addition one search engine (Google Scholar). Our last search took place from 22 December 2019 to 4 January 2021. To search and include related studies as many as possible, we used the following terms: "Distance learning", "Virtual learning", "E-Learning", "Satisfaction", "COVID 19" as keywords for titles and/or abstracts in MeSH word search database with such combination. ("Distance Learning"[Title/Abstract]) OR "Virtual Learning"[Title/Abstract] OR "E-Learning"[Title/Abstract]) AND ("Satisfaction"[Title/Abstract]) AND ("COVID 19"[Title/Abstract]).

Selection of Studies and Data Extraction

Published studies were regarded as eligible for the analysis if they met the following criteria: 1) cross-sectional studies with the full text of the paper available in Persian or English, 2) sampling done in COVID-19 pandemic, and 3) studies reporting the prevalence of E-Learning satisfaction. Conversely, the following studies were excluded: 1) non-English or non-Persian full-text reports, 2) studies not providing enough data to estimate the prevalence rate, 3) studies designed as letters to the editor, expert opinions, editorials, commentaries, case-reports, case-series, and reviews, and 4) Studies reporting overlapping data.

Data Extraction

All articles categorized as potentially relevant were separately reviewed by two authors (Author 1, 2 and 4). They evaluated the relevance of each article and summarized the following data in Excel datasheets: First author's name, references, number of participants, overall satisfaction, subject, category, mean age and male percent of participants.

The analysis was conducted according to the preferred reporting items for systematic reviews and meta-analysis (PRISMA)(18). Publication bias was assessed by Egger and Begg's Tests. In this

study, "The Newcastle Ottawa Scale (NOS)" was used to assess the quality of the articles.

Statistical Analysis

The overall E-Learning satisfaction among medical and non-medical students was computed by "metan" command in STATA software. The inverse-variance random effects model was used to calculate pooled overall E-Learning satisfaction. The between-study heterogeneity was assessed using the Q test (P<0.10) and I-squared statistics (I2>40%). To investigate publication bias, Egger and Begg's tests were used in this study.

Results

Search Results and Study Selection

The study selection process has been illustrated in Fig. 1. A total of 184 studies were potentially associated with E-Learning satisfaction among medical and non-medical students. After being reviewed on the basis of titles and abstracts, 83 studies were excluded according to the mentioned inclusion and exclusion criteria. After full-text screening and quality assessment, 24 records were considered as eligible studies.

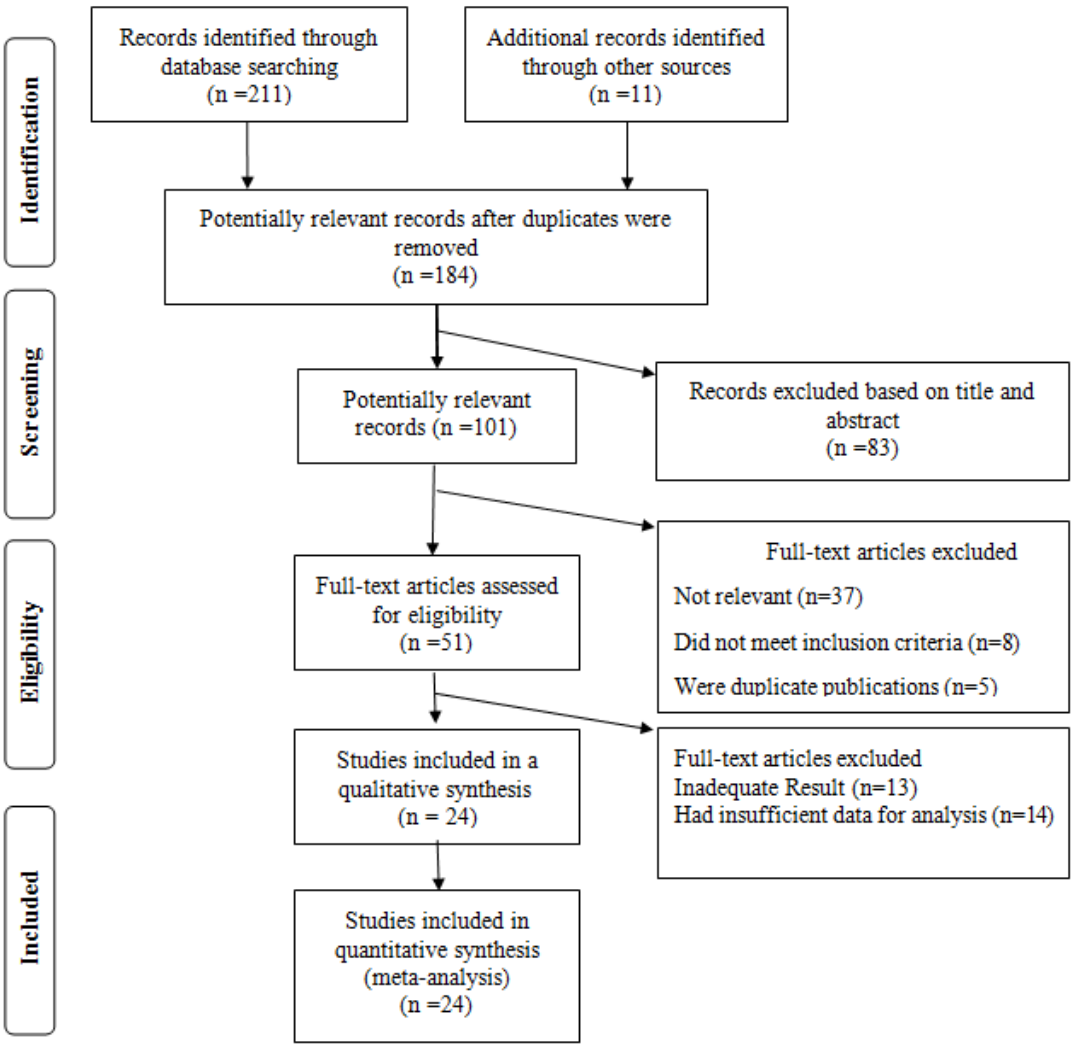

Fig. 1: The process of article searching based on PRISMA guideline

Overall E-Learning Satisfaction among medical and non-medical students

A total of 113761 students were evaluated; of which 7248 were medical and 106513 were non-medical students. Data on the selected studies, including the first author's name, references, number of participants, overall satisfaction, course title, and category, mean age and male percent of participants are presented in Table 1. The Forest plot is presented in Fig. 2.

The 95% confidence intervals for E-learning satisfaction in medical and non-medical students do not showed significant difference in E-Learning satisfaction between medical and non-medical students. The overall E-Learning satisfaction in addition to 95% Confidence Intervals (CI) for medical, non-medical and total (medical and non-medical students) were 58.1% (95% CI: 50.5%-65.7%) (Q=471.83, df=11, *P*<0.001, I2=97.7%, Tau2=0.0173), 70.1% (95% CI: 66.8%-73.5%) (Q=204.11, df=11, *P*<0.001, I2=94.6%, Tau2=0.0028) and 63.8% (95% CI: 58.9%-68.8%) (Q=1863.37, df=23, *P*<0.001, I2=98.8%, Tau2=0.0147) respectively.

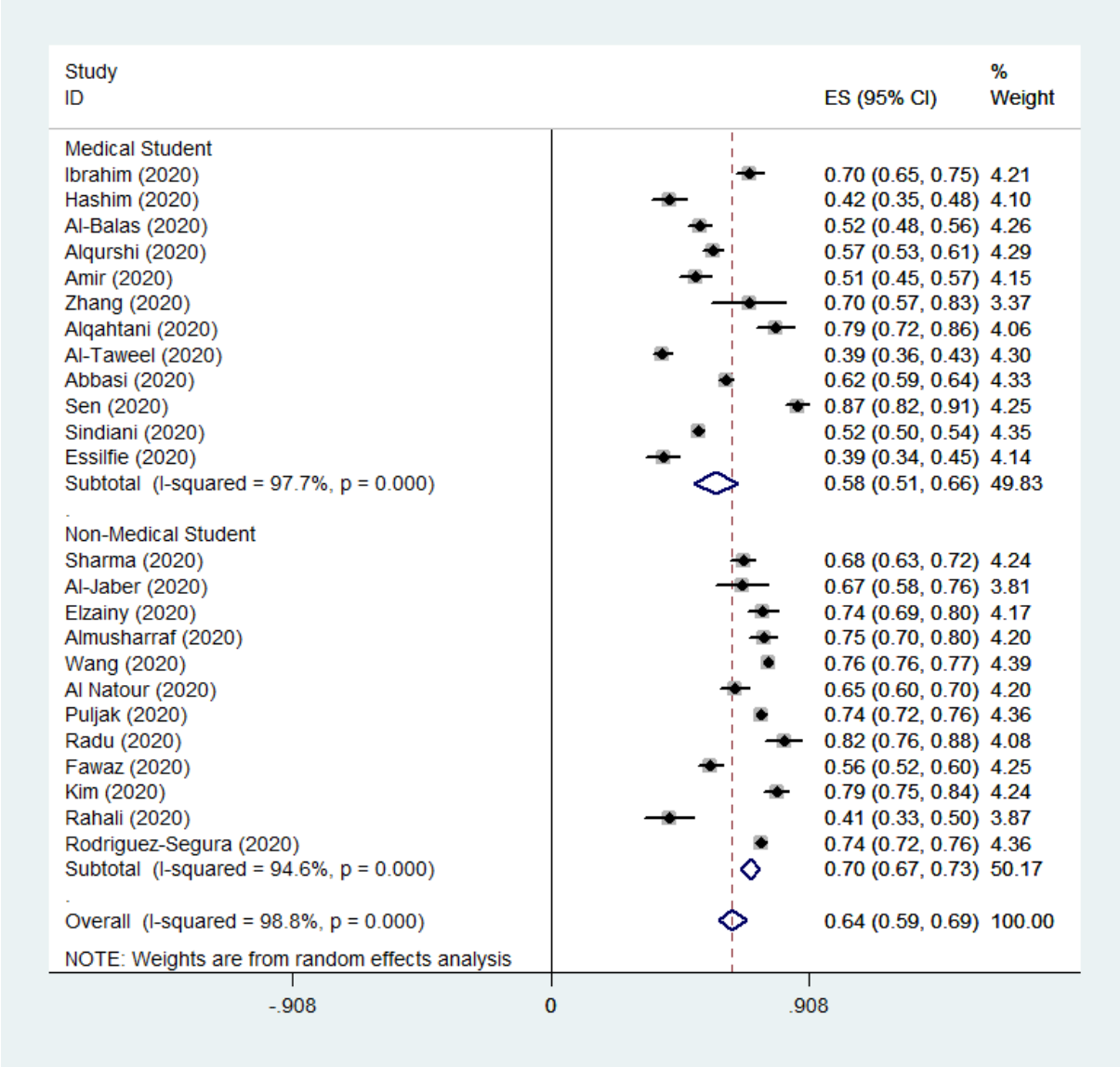

Fig. 2: The forest plot of meta-analysis study

Table 1: Characteristics of the included published E-Learning Satisfaction

Ref.	*Number of participants*	*Overal Satisfaction*	*Course title*	*Category*	*Country*	*Mean Age*	*Male Percent*
(19)	340	69.94%	medical students	MS	Saudi Arabia	21.91	36%
(20)	239	41.52%	BA physiotherapy	MS	Pakistan	21	21.8%
(32)	434	67.6%	undergraduate and postgraduate students	NMS	Nepal	21.8	22.4 %
(33)	100	67.25%	BA Student	NMS	Qatar	NM	NM
(34)	250	74.49%	BA Student	NMS	Saudi Arabia		59.2%
(21)	588	52.28%	Medical Student	MS	Jordan	22.7	41.4%
(35)	283	74.69%	Student	NMS	Saudi Arabia	21.86	46.6%
(22)	703	57.12%	pharmacy students	MS	Saudi Arabia	NM	58.89%
(36)	99559	76.4%	Student	NMS	China	NM	38.92%
(37)	353	64.6%	Students	NMS	Canada	NM	
(23)	301	51%	Dentistry	MS	Indonesia,	NM	14.9%
(24)	48	69.7%	Medical Bachelor, Bachelor of Surgery	MS	China	21.52	31.25%
(25)	139	79.2%	Nursing students	MS	Saudi Arabia	27.3	63.3%
(26)	832	39.19%	Dental students	MS	Iraq	20.95	42.9%
(27)	1328	61.73%	Health care students	MS	Pakistan, Saudi Arabia, UAE, USA, UK, Malaysia, Australia, Canada, Egypt, Nigeria, Iraq	22.05	29%
(38)	2520	74%	Student	NMS	Croatia	25.7	NM
(28)	250	86.6%	urology residents	MS	Turkey		
(39)	135	82%	bachelor's degree	NMS	Romania	NM	NM
(29)	2212	52.08%	clinical students and basic students	MS	Jordan	NM	NM
(40)	520	56.18%	Undergraduate university students	NMS	Lebanon	21.03	38.7%
(41)	318	79.4%	higher education	NMS	South Korea	NM	
(42)	123	41.4%	Student	NMS	Morocco	NM	46%
(30)	268	39.36%	orthopaedic surgery	MS	USA	NM	NM
(31)	1918	74%	Student	NMS	Mexico	NM	NM

NM: Not Mentioned, MS: Medical Student, NMS: Non-Medical Student

Discussion

Of 184 studies that were potentially relevant to E-learning Satisfaction, 24 studies met the criteria to be included in this study; 13 of which were on medical students (19-31) and 11 were on non-medical students (32-42).

The pooled E-learning satisfaction in addition to 95% Confidence Intervals (CI) for medical, non-medical and total population (medical and non-medical students) were 58.1% (95% CI: 50.5%-65.7%), 70.1% (95% CI: 66.8%-73.5%) and 63.8% (95% CI: 58.9%-68.8%) respectively.

The results of this study showed that the level of ELS of medical students was significantly lower than non-medical students.

Medical students had more practical courses in comparison with non-medical students. Presenting practical courses virtually is much more difficult than theoretical courses. The available evidence suggests that online learning for teaching clinical skills is no less effective than traditional means (43).

One way to increase the quality of students' education is to familiarize educators with new educational technologies. The qualitative data suggested that technological support and faculty familiarity with E-learning were substantial influences on students' satisfaction (44). Considering that virtual education can be implemented at different times and situations such as travel, and since it is much less expensive than face-to-face education due to not being dependent on a specific place and time, therefore this type of education is more extensive than face-to-face training. However, because of its virtual nature, this training should be accompanied by more planning to increase its efficiency compared to face-to-face training (45)

Previous experience in the field of e-learning has shown that combining this training with lectures, video clips and implementing a two-way training by question and answer can increase the efficiency of this educational system. In this training, the teacher has a key role to increase the ability and motivation of students in group work (46-48)

Satisfaction feedback also supported the use of clickers as a tool to engage students and enhance learning outcomes (48).

There are two limitations to be noted in the present study. Firstly, only studies in English and Persian have been used. Secondly, different educational systems and software have not been separated and analyzed in this research due to the small number of studies.

Conclusion

According to the results of this study and lower ELS in medical students in comparison with non-medical students, designing new E-Learning methods for medical students is suggested.

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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Conflict of interest

The authors declare that there is no conflict of interest.

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