

## ORIGINAL ARTICLE

## Barriers to Implementing Online Assessment in Medical and Dental Undergraduates

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## ABSTRACT

**Objective:** The objective of this scoping review is to identify the barriers and challenges faced in implementing remote assessment technological techniques in medical and dental schools in Asian countries during this ongoing pandemic.

**Study Design:** A scoping review.

**Place and Duration of Study:** The study was carried out at the Armed Forces Institute of Dentistry (AFID), Rawalpindi, Pakistan June 2022 to September 2022.

**Materials and Methods:** The Scoping review was conducted using Arksey and O'Malley framework, and literature was searched in electronic databases for relevant peer-reviewed studies over the last ten years. For grey literature, keywords were used in PubMed, ERIC, PsycINFO, and Google Scholar. After screening and assessing for eligibility, 1490 publications were retrieved, and only 18 articles were included in the study. Data were synthesized to present the findings.

**Results:** The themes identified after data synthesis broadly described the barriers to the implementation of online assessment in medical and dental undergraduate curricula. The themes were faculty perspective on remote assessment, IT issues, reliability of online exams, student difficulties, and psychological impact. Insufficient resources and inadequate logistic support for IT staff led to a slow internet connection, technical failures, formatting limitations, bandwidth issues when using images and videos, longer duration of exams, and non-visibility of the screen.

**Conclusion:** The scoping review will guide the medical and dental educationist in identifying challenges in implementing electronic assessment and pave the way for its design and operation.

**Keywords:** Barriers, Challenges, E-assessment, Online Assessment Remote Assessment.

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## Introduction

During the COVID-19 pandemic, didactic activities shifted to an online environment as precautionary measures were planned and applied in the academic environment leading to partial and complete stoppage of face-to-face activities in physical

classrooms.<sup>1</sup> Conventional invigilated examination pattern was reformed into an online assessment to gauge student's learning domains.<sup>2</sup>

In the current scenario of Covid-19, the psychomotor domain of undergraduates can be assessed by utilizing the latest computerized technologies like virtual reality, augmented reality, and haptic technology with feedback in medical and dental undergraduate training.<sup>3</sup> This mode of assessment is challenging due to its cost and insufficient training of faculty, undergraduates, and associated staff, especially in the case of detailed assessment tools.<sup>4</sup> A scoping review was carried out to identify different online assessment tools used in medical and dental undergraduate programs in academic institutes across Asian countries and to indicate the barriers

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affecting the planning and execution of electronic assessment in medical and dental undergraduate curricula. The rationale was to help medical and dental educationists recognize the challenges in implementing the electronic assessment. Identifying challenges and barriers impeding the smooth implementation of online assessment can help design and execute online assessment programs by making evidence-based recommendations to improve academic, administrative, organizational, and instructional policies.

1. Mapping literature on online assessment tools used in undergraduate medical and dental curricula.

2. To outline challenges faced by faculty members, undergraduates, and associated staff regarding using online assessment in the medical and dental curriculum.

Research Questions:

What is the various E-assessment tools used by medical and dental undergraduate graduates?

What challenges and barriers are faced in implementing online assessment and technological techniques in medical and dental undergraduate curricula during the COVID-19 pandemic in Asian

countries?

**Materials and Methods**

The scoping review search strategy was applied, and studies included in the review were traced from different databases. It maps the body of all published and grey literature to answer the research question. Ethical approval for the study was optional because it did not involve patients and interventions.

After identifying the problem, the research question was formulated, and Arksey O'Malley's scoping review framework was used as it provides necessary guidelines for educational research.<sup>4</sup>

The review objective was to map the existing literature on barriers and challenges to remote assessment in Asian countries.

**Eligibility Criteria**

An eligibility criterion of inclusion and exclusion was prepared with the authors' consent, and studies were identified. Literature was pre-screened for heterogeneity; thus search was not restricted to a particular study design. Relevant quantitative and qualitative analyses, surveys, and evaluation reports were included in the review.

<b>Inclusion Criteria</b>	<b>Exclusion Criteria</b>
Abstracts only Studies published in the last 10 years (2012-2021) Records on online assessment in medical and dental undergraduate curriculum Grey literature and manual search Systematic reviews Literature reviews Records in English Free full-text articles	Book chapters Newspaper Dissertation Conference Proceedings Editorials Records other than English

**Search Strategy**

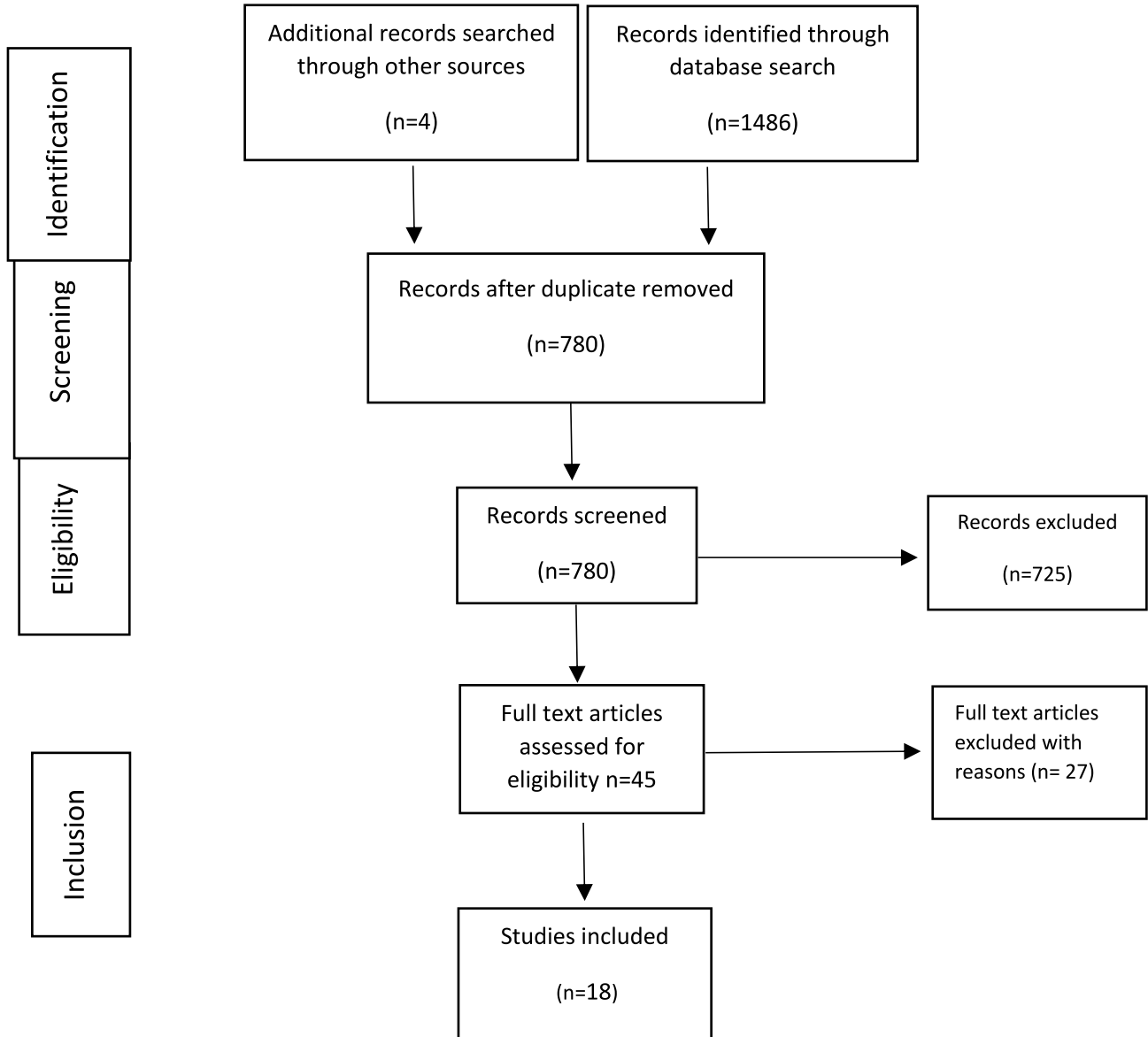
The reviewers developed the electronic database search strategy by defining the key concepts and answering the review question demonstrated in Figure 1 with the help of a Prisma flowchart.

**Electronic database sources, keywords, and phrases**

Databases used for relevant literature search were Education Resources Information Center (ERIC), PubMed, PsycINFO, and Google Scholar. Investigation was conducted for grey literature so

relevant articles were noticed. A total of 1490 search results were identified through database search using key terms. 72 percent of included references (n=1079) were found in ERIC, 23 percent (n=352) articles were found in PubMed, and 0.03 percent (n=55) articles were found in PsycINFO. An additional search for grey literature in Google Scholar yielded (n=4) articles.

The keywords and phrases used for searching were 'challenges to online assessment,' 'barriers to remote assessment,' 'challenges to remote



**Fig 1: PRISMA Flowchart**

assessment,' 'barriers to online assessment,' and 'barriers to E-assessment.' Boolean operators AND, and OR were used for joining multiple words. All the included literature was imported into Mendeley citation management software, where duplicate citations were removed. The Table 1 indicates studies included in the scoping review. Figure 2 shows the countries whose articles have been included.

**Study Selection**

The scoping review included articles with study designs that were quantitative, cross-sectional, systematic review, and descriptive surveys. The

authors comprehensively reviewed the articles to perform a thematic analysis of the data.<sup>5</sup>

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart reports several articles searched, screened, selected, and reviewed for analysis.<sup>6</sup>

One researcher identified 1486 records in the electronic databases using the keywords or combinations mentioned, and 04paperss were identified through grey literature.

Duplicates were removed in the screening phase, after which 18 full-text articles remained.

**Publication Year**

Barriers to implementing online assessment have

<b>Author(s), Country, Title of Study</b>	<b>Online Assessment Method</b>	<b>Challenge</b>
Elzainy A, El Sadik A, Al Abdulmonem W. Experience of e-learning and online assessment during the COVID-19 pandemic at the College of Medicine, Qassim University. KSA	Webinars and virtual classrooms on online assessments were conducted for staff and students—an e-assessment committee comprised of 13 members (9 basic scientists and four clinical staff).	Inadequate knowledge of online assessment tools of some staff. Inefficiency of IT technicians. Technical problems faced by students like inefficient internet coverage.
Elsalem L, Al-Azzam N, Jum'ah AA, Obeidat N, Sindiani AM, Kheirallah KA. Stress and behavioral changes with remote E-exams during the Covid-19 pandemic: A cross-sectional study among undergraduates of medical sciences. Jordan	Survey based asking students opinion.	Student stress was a barrier caused due to first experience and remote accessibility.
Eltayeb LB, Alharthi NS, Elmosaad YM, Waggiallah HA. Students' perception of E. Learning and Remote Exams during COVID-19 Outbreak 2020. KSA	A questionnaire with 22 Closed-ended questions with each divided into five domains	Inadequacies of online tools. Discontentment of students towards Interactive technique, online exams. Inexplicit objectives of each lecture and grading policy.
El-Kishawi M, Khalaf K, Al-Najjar D, Seraj Z, Al Kawas S. Rethinking assessment concepts in dental education. Sharjah, UAE	PubMed, ScienceDirect, Google Scholar, and Embase were used. A computerized dental simulator (CDS) and virtual self-assessment (VSA) can be used for assessment	Computerized dental simulator (CDS) and virtual self-assessment (VSA) resources require trained faculty calibration; and cost were a challenge.
Ayub MH, Ali MH, Hamza U, Jahangir K. Comparison of Online Assessment with Traditional Assessment of Ophthalmology Students: Experience from Public Sector Medical College in Pakistan	Online Google Assessment Forms with 50 test items with varying difficulty levels and pictures were used. Results were compared with traditional exams	The use of unfair means by candidates during examinations couldn't be assessed. The difficulty level of items could not be evaluated. The lack of IT staff, posed a challenge in invigilation.
Shaiba LA, Alnamakani MA, Temsah MH, Alamro N, Alshime F, Alrabiaah A, Alanazi SN, Alhasan K, Alherbish A, Mobaireek KF, Bashiri FA. Medical Faculty's and Students' Perceptions toward Pediatric Electronic OSCE during the COVID-19 Pandemic in Saudi Arabia. KSA	The e-OSCE examination is designed for final-year medical students by the pediatrics department. It was administered by Zoom™ video conferencing, where students and faculty participated on their laptops or computers.	Due to the small sample size, the study's findings cannot be generalized. Slow-internet speed was a challenge for students who perceived the experience of e-OSCE to be negative.
Park JC, Kwon HJ, Chung CW. Innovative digital tools for new trends in teaching and assessment methods in medical and dental education. Korea	New trends in medical education assessment, like Google Forms, are used for evaluating students' performance.	The unacceptability of professors and staff towards change. The technical and psychological burden of digital transformation.
Alshammari E. Implementing e-OSCE during COVID-19 lockdown. Saudi Arabia	An examiner questionnaire was used with questions evaluating their e-OSCE experience and satisfaction through the blackboard method	Electronic OSCE is unable to cover all learning domains. Examiner's attitude and method of evaluation, cannot be assessed assessment.
Elsalem L, Al-Azzam N, Jum'ah AA, Obeidat N. Remote E-exams during Covid-19 pandemic: A cross-sectional study of students' preferences and academic dishonesty in faculties of medical sciences. Annals of Medicine and Surgery Jordan	A 29-item E-questionnaire on Google Forms was prepared and distributed among students at Faculties of Medical Sciences (Medicine, Dentistry, Pharmacy, Nursing, and Applied Medical Sciences) at Jordan University of Science and Technology.	The unfamiliarity of educators and students and the lack of essential requirements in the E-exam platforms. The stress of students regarding E-exam.

Haroon Z, Azad AA, Sharif M, Aslam A, Arshad K, Rafiq S. COVID-19 era: challenges and solutions in dental education. Pakistan	Soft wares like Canvas and Exam soft can be used to conduct examinations remotely	Poor internet connection combined with regular power outages has caused the failure of this concept.
Khalaf K, El-Kishawi M, Moufti MA, Al Kawas S. Introducing a comprehensive high-stake online exam to final-year dental students during the COVID-19 pandemic and evaluating its effectiveness. Sharjah, UAE	Blackboard and MS Teams programs were used to implement online exams containing 4 components: MEQs, MCQs, OSCE and an oral exam. Stakeholders' perception of the online- exam was attained	Students & faculty reported facing technical problems like slow internet and noise from using the MS Teams as a platform for invigilating.
Khalaf K, El-Kishawi M, Mustafa S, Al Kawas S. Effectiveness of technology-enhanced teaching and assessment methods of undergraduate preclinical dental skills: a systematic review of randomized controlled clinical trials. Sharjah, UAE	Technology-enhanced assessment systems like augmented-reality systems, virtual systems and digital scanners were all used to check their efficacy	The same assessment system with different machines does sometimes work differently There is difficulty in applying the findings of one system to another with a certain degree of accuracy.
Farooq A, Rizwan S, Qureshi SF, Hassan U. COVID-19 the disruptor; Challenges and opportunities in Medical Education. Pakistan	Communication platforms such as LMS, Zoom and MS Teams etc. were used for assessment in medical universities.	The reliability of these modalities of assessment need to be worked.
Hassan B, Shati AA, Alamri A, Patel A, Asseri AA, Abid M, Al-Qahatani SM, Satti I. Online assessment for the final year medical students during COVID-19 pandemics; the exam quality and students' performance. KSA	The assessment was done through the university Blackboard system. Assessment methods were online MCQs tests and (OSPE) and/or (OSCE)	The challenge in this study was increased due to easy items in the online MCQs test.
Fatima SS, Idrees R, Jabeen K, Sabzwari S, Khan S. Online assessment in undergraduate medical education: Challenges and solutions from a LMIC university. Pakistan	Three pilot assessments were conducted. Commercially available lockdown browser, ZOOM and University's VLE page were used for online assessment.	Students faced challenges of Overheating equipment, incompatibility of electronic gadgets with soft wares, bandwidth issues. Faculty faced formatting limitations, technical failure, and bandwidth issues.
Kavitha Nagandla SS, NALLIAH S. Online formative assessments: exploring their educational value. Malaysia	Online assessments used were One best answer (OBA), OSPE and Short answer question (SAQ) with feedback	Student's low motivation in the online formative exams was cause by low participation and a challenge.
Sarkar S, Mishra P, Nayak A. Online open-book examination of undergraduate medical students—a pilot study of a novel assessment method used during the coronavirus disease 2019 pandemic. India	An Online open book exam was conducted on 4th-year students in otolaryngology, and two teachers scored and collated, and marks were averaged for each candidate.	The real challenge was network connectivity issues and convincing the medical educators who would not like the change and preferred existing tested methods followed by internet connectivity issues and logistic problems.
A Sa'di R, Abdelraziq A, A Sharadgah T. E-Assessment at Jordan's Universities in the Time of the COVID-19 Lockdown: Challenges and Solutions. (AWEJ) Special Issue on Covid. Jordan	Plagiarism software, invigilation software to prevent cheating, Summative and formative assessment validity and reliability issues. Online, assessment needs to be implemented.	Conducting the e-assessment process is painstaking and time-consuming as compared to traditional assessment.

become an important topic in the recent COVID-19 pandemic.<sup>7</sup> However, the past ten years of studies were chosen.

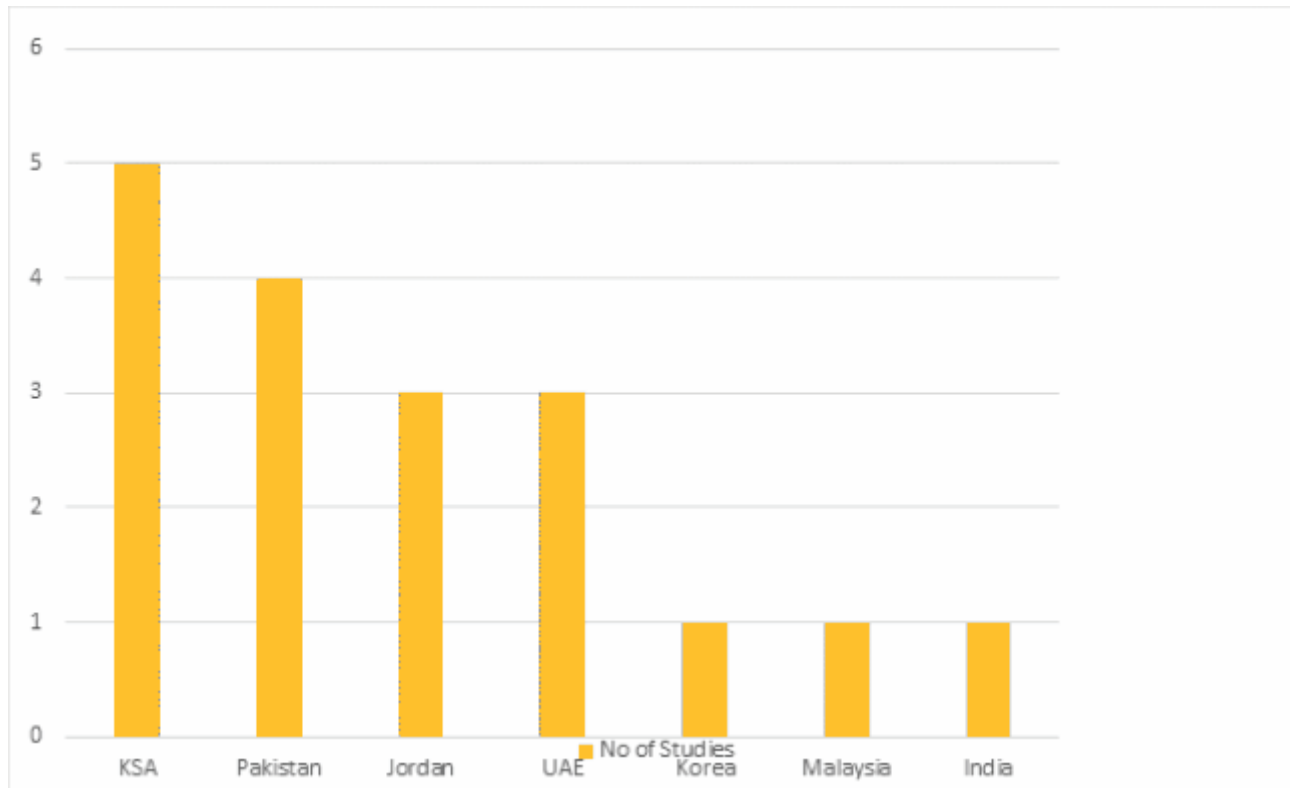
### Outcome Measures

The main objective of this scoping review was to

identify the barriers faced in undergraduate medical and dental colleges in Asian countries.

### Screening

The screening was done by two reviewers in two rounds. In the first round, reviewers independently



**Fig 2: Country of origin of the studies in the scoping review**

screened the titles and abstracts of literature by applying the inclusion and exclusion criteria. Records partially fulfilling inclusion criteria were retained for comprehensive review later. Full-text article reviews were done in the second round of screening. In the review process, full-text articles completely fulfilling inclusion criteria were selected.

#### **Data Extraction**

Name of author(s), title of article, year of publication, country of origin, purpose, study population, sample size, methodology, outcome measures, and study results were included in data extraction.<sup>8</sup>

#### **Analysis/synthesis of Data**

Data were analyzed descriptively according to different study designs, study populations, and barriers stated in the included studies relevant to the research question.<sup>9-10</sup> The authors reviewed the articles, and the characteristics of the full-text articles were extracted. The different patterns across the included studies were identified by tabulating the results by study design, results, and any other additional information.

#### **Findings**

Study designs of selected articles in the scoping review are qualitative methods, systematic review, and descriptive surveys. The authors reviewed the articles comprehensively and conducted a thematic analysis of the data. Concepts were identified by open coding. Categories and their related sub-categories were reached by axial coding giving a precise explanation to generate themes and sub-themes.

The findings are arranged in broad themes explaining challenges in the implementation of online exams. These are as follows:

1. Faculty perspective: Technical failures, formatting limitations, bandwidth issues when using images and videos, and longer duration of exams and screen time are some issues faced by faculty. This theme addresses the lack of knowledge and skill towards technology-enhanced tools of teachers and faculty staff.
2. IT Issues: This theme deals with insufficient resources and inadequate logistic support for IT staff and departments.
3. Reliability of online exams: This theme tackles

significant aspects of assessment: reliability and validity and cost effectiveness of exams.

4. Student perspective: This theme highlights technical difficulties faced by undergraduates and staff members, such as slow internet connection, non-visibility of screen.

5. Psychological impact: This theme deals with emotional and psychological pressures faced by candidates, like stress and low motivation toward the new exam system.

### **Discussion**

This scoping review study was conducted to collect evidence on the challenges experienced during online and technology-enhanced assessment in undergraduate medical and dental curricula. The scoping review will give the insight to recognize core concepts, gaps in research, and evidence to inform practice, policymaking, and research. The academic world was not ready to switch to online assessment completely, so urgent measures were taken to combat the academic crisis and devise ways to assess undergraduate medical and dental students efficiently.

### **Faculty Perspective**

Literature review indicates that undergraduate medical and dental institute faculty felt overwhelmed by the sudden shift; some were reluctant and needed to gain knowledge of different electronic academic soft-wares and gadgets available.<sup>11</sup> Technology implementation enhanced learning and assessment caused technical failures, formatting limitations, bandwidth issues when using images and videos, and longer duration of exams and screen time.<sup>12</sup> Although the implementation of technology-enhanced learning and assessment fulfilled the of need for more clinical educators in institutes however IT facilities needed to be improved.<sup>13</sup> There are various valuable tools with advanced features, but this increases the burden on the instructor to adapt and prepare the electronic exam for assessment.<sup>14</sup> Electronic OSCE was used in medical and dental institutes to assess clinical skill, but qualities of electronic assessments were a concern for aged faculty members.<sup>15-17</sup>

### **Information Technology Challenges**

In preclinical dentistry, the financial aspect of supplying an entire preclinical skills lab with

technology-enhanced teaching and assessment is not manageable for some dental schools.<sup>4</sup> Recommendations of IT administrative staff to upgrade the system need to be heard, and relevant suggestions must be carried to deciding authorities so they can be catered to.<sup>11</sup> There seems to be a communication gap between the IT department and relevant Policy-makers in fulfilling the requirement pointed out by IT staff.<sup>18</sup>

### **Reliability of Online exams**

Electronic assessments, like traditional exams, need to be safe, valid, reliable, acceptable, feasible, and fair.<sup>19</sup> Studies indicate students' unacceptability of preventing them from backtracking in the electronic MCQ exam.<sup>20</sup> Electronic invigilation software needs to be designed to keep candidates from using unethical means, which is a barrier to maintaining the quality of E-assessment and fulfilling Van Vleuten's utility index.<sup>21-22</sup>

### **Student Perspective**

Poor internet connection, along with frequent power outages, especially in low-socio-economic countries, may fail an online assessment.<sup>23</sup>

Equipment overheating, inadequate charge, incompatible gadgets (personal computers and laptops, etc.), insufficient bandwidth when viewing images and video, and background noise if all microphones are kept mute are some technical difficulties students face.<sup>12</sup> When designing an online assessment, the needs of all stakeholders should be considered. Resources, cost, and time also need to be considered and planned ahead of time so that exams run smoothly, and feedback from students' needs to be taken into consideration.<sup>13,21</sup>

### **Psychological Impact**

Due to the prevailing COVID-19 crisis, stress and low motivation of undergraduates while attempting electronic exams have been reported by some studies.<sup>22,24</sup> Students who succeeded in online exams were motivated and consistently studied critically.

### **Conclusion**

The scoping review will guide medical and dental educationists in identifying the hurdles in implementing online assessment tools. These barriers will give insight into how assessments can be designed in the future and executed. It will pave the way for undergraduates, faculty members, IT staff,

and medical and dental educationists to be at par globally and improve students' cognitive, psychomotor, and affective domains.

## REFERENCES

1. Iurcov R, Pop LM, Iorga M. Impact of COVID-19 Pandemic on Academic Activity and Health Status among Romanian Medical Dentistry Students; A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*. 2021; 18: 6041. doi: 10.3390/ijerph18116041
2. Kaurani P, Batra K, Hooja HR, Banerjee R, Jayasinghe RM, Bandara DL, et al. Perceptions of Dental Undergraduates Towards Online Education During COVID-19: Assessment from India, Nepal and Sri Lanka. *Advances in Medical Education and Practice*. 2021; 12: 1199-210. doi: 10.2147/AMEP.S328097
3. Lee M, Lee SA, Jeong M, Oh H. Quality of virtual reality and its impacts on behavioral intention. *International Journal of Hospitality Management*. 2020; 90: 102595. doi: 10.1016/j.ijhm.2020.102595
4. Khalaf K, El-Kishawi M, Mustafa S, Al Kawas S. Effectiveness of technology-enhanced teaching and assessment methods of undergraduate preclinical dental skills: a systematic review of randomized controlled clinical trials. *BMC Medical Education*. 2020; 20: 1-3. doi: 10.1186/s12909-020-02211-4
5. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International journal of social research methodology*. 2005; 8: 19-32. doi: 10.1080/1364557032000119616
6. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group\* T. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of internal medicine*. 2009; 151: 264-9. doi: 10.7326/0003-4819-151-4-200908180-00135
7. Yan L, Mir M, Sanchez P, Beg M, Peters J, Enriquez O, et al. COVID-19 in a Hispanic Woman Autopsy Report With Clinical-Pathologic Correlation. *Archives of Pathology & Laboratory Medicine*. 2020; 144: 1041-7. doi: 10.5858/arpa.2020-0217-SA
8. Warrens MJ. Five ways to look at Cohen's kappa. *Journal of Psychology and Psychotherapy*. 2015; 5: 1. doi: 10.4172/2161-0487.1000197
9. Daudt HM, van Mossel C, Scott SJ. Enhancing the scoping study methodology: a large, inter-professional team's experience with Arksey and O'Malley's framework. *BMC medical research methodology*. 2013; 13: 1-9. doi: 10.1186/1471-2288-13-48
10. Pham MT, Rajić A, Greig JD, Sargeant JM, Papadopoulos A, McEwen SA. A scoping review of scoping reviews: advancing the approach and enhancing the consistency. *Research synthesis methods*. 2014; 5: 371-85. doi: 10.1002/jrsm.1123
11. Elzainy A, El Sadik A, Al Abdulmonem W. Experience of e-learning and online assessment during the COVID-19 pandemic at the College of Medicine, Qassim University. *Journal of Taibah University Medical Sciences*. 2020; 15: 456-62. doi: 10.1016/j.jtumed.2020.09.005
12. Fatima SS, Idrees R, Jabeen K, Sabzwari S, Khan S. Online assessment in undergraduate medical education: Challenges and solutions from a LMIC university. *Pakistan Journal of Medical Sciences*. 2021; 37: 945-51. doi: 10.12669/pjms.37.4.3948
13. El-Kishawi M, Khalaf K, Al-Najjar D, Seraj Z, Al Kawas S. Rethinking assessment concepts in dental education. *International Journal of Dentistry*. 2020. doi: 10.1155/2020/8672303
14. Park JC, Kwon HJ, Chung CW. Innovative digital tools for new trends in teaching and assessment methods in medical and dental education. *Journal of Educational Evaluation for Health Professions*. 2021; 18: 13. doi: 10.3352/jeehp.2021.18.13
15. Shaiba LA, Alnamnakani MA, Tamsah MH, Alamro N, Alshohime F, Alrabiaah A, et al. Medical faculty's and students' perceptions toward pediatric electronic OSCE during the COVID-19 pandemic in Saudi Arabia. *In Healthcare* 2021; 9: 950. doi: 10.3390/healthcare9080950
16. Alshammari E. Implementing eOSCE during COVID-19 lockdown. *Journal of Advanced Pharmacy Education and Research*. 2020; 10: 175.
17. Sarkar S, Mishra P, Nayak A. Online open-book examination of undergraduate medical students—a pilot study of a novel assessment method used during the coronavirus disease 2019 pandemic. *The Journal of Laryngology and Otology*. 2021; 135: 288-92. doi: 10.1017/S0022215121000141
18. Ayub MH, Ali MH, Hamza U, Jahangir K. Comparison of Online Assessment with Traditional Assessment of Ophthalmology Students: Experience from Public Sector Medical College in Pakistan. *Pakistan Journal of Ophthalmology*. 2021; 37; 164. doi: 10.36351/pjo.v37i4.1330
19. Sajjad M, Khan RA, Yasmeen R. Measuring assessment standards in undergraduate medical programs: Development and validation of AIM tool. *Pakistan journal of*



- medical sciences. 2018; 34: 164-9. doi: 10.12669/pjms.341.14354
20. Khalaf K, El-Kishawi M, Moufti MA, AlKawas S. Introducing a comprehensive high-stake online exam to final-year dental students during the COVID-19 pandemic and evaluation of its effectiveness. *Medical Education Online*. 2020; 25: 1826861. doi: 10.1080/10872981.2020.1826861
  21. Beattie M, Lauder W, Atherton I, Murphy DJ. Instruments to measure patient experience of health care quality in hospitals: a systematic review protocol. *Systematic reviews*. 2014; 3: 1-8. doi: 10.1186/s13643-015-0089-0
  22. Elsalem L, Al-Azzam N, Jum'ah AA, Obeidat N. Remote E-exams during Covid-19 pandemic: A cross-sectional study of students' preferences and academic dishonesty in faculties of medical sciences. *Annals of Medicine and Surgery*. 2021; 62: 326-33. doi: 10.1016/j.amsu.2021.01.054
  23. Haroon Z, Azad AA, Sharif M, Aslam A, Arshad K, Rafiq S. COVID-19 era: challenges and solutions in dental education. *Journal of College of Physicians and Surgeons of Pakistan*. 2020; 30: 129-31. doi: 10.29271/jcsp.2020.supp2.129.
  24. Nagandla K, Sulaiha S, Nalliah S. Online formative assessments: exploring their educational value. *Journal of advances in medical education and professionalism*. 2018; 6: 51-7. doi: 10.30476/jamp.2018.41011
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