ORIGINAL ARTICLE

Identification of E-Examination and E-Learning Environment Related Factors during COVID-19 and its Association to Academic Failure in Dental Students of a Developing Country: a case-control Study

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ABSTRACT

Background: During COVID-19 all universities have shift their face to face teaching pattern to e-learning.
Objective: This study explores various factors of E-exams and learning associated to academic failure during Covid-19.
Material and Methods: A case-control study was conducted in March, 2021 among 225 dental undergraduate students out of which 75 were cases (failed) and 150 were controls (passed). Online questionnaire consisted of 24 items was filled by BDS students' from first year till final year. Hence, odds ratio was calculated by using SPSS version 23.
Results: The results of the study revealed that the rate of failure among the dental students from first year till final year was (60%), (11.1%), (13.9%) and (19.0%) respectively (p= 0.000). Significant E-exam related factors associated to academic failure were effort and time required to attempt exams (p=.000, OR=1.8), online OSPE/OSCE (p= .001, OR=2.7), technical IT skills (p= .009, OR=2.1), Student's presentation marks (p=0.05, OR=1.7) and cheating (p=0.03, OR=1.8), whereas lower risk factors were MCQ's (p=0.06), synchronous oral viva (p=0.5), internet connectivity issues (p=0.2), assignments (p=0.3) and online quizzes (p=0.7). Factors associated with highest risk of failing were pre-recorded didactic online lectures (p=0.03), less responsibility of learning online (p=0.04), dissatisfied bedside clinical skills (p=0.02) and poor attendance (p=0.05).
Conclusion: The results of the study conclude that faculty training is immediately required to conduct fair online E-assessments, OSCE/OSPE using appropriate technology and include presentation marks. While designing E-courses, interactive virtual sessions should be conducted to improve student engagement and attendance.
Keywords: Academic failure, Dental students, Remote E-exams, Undergraduate

INTRODUCTION

The world has witnessed a rapid transformation in undergraduate and postgraduate education modes in the past few years. E-learning has become a primary educational model that will go along with traditional face-to-face sessions in the future of dental curriculum. The consequences of online experiences during COVID-19 faced by dental students have been studied in various countries, including North America and Brazil [1,2].

In the current situation of COVID-19, E-learning in dental education has become the only mode of teaching during complete lockdowns. E-learning is based on pure scientific foundations such as the principles of educational techniques based on self-learning according to learners' characteristics [3]. The E-learning environment is an interactive remote instruction environment using information and communication technologies in the learning process to organize small group activities. Virtual learning sessions such as E-lectures in virtual classes, multi-media presentations, voices notes, discussions, and queries addressed in audio/ video student interactions. Hence, these all key features are responsible for make an individual learn, under the supervision of the teacher. In this situation planning and recognition of the educational tasks is an essential element. This can be achieved by searching the information through websites and course databases. Another way is teacher-student communications which is a continuous process in virtual problem solving by using discussion boards, e-mail, and other applications [4]. In Germany Schlenz, MA et al. found 36.8% of students preferred "face-to-face" learning in the dental curriculum instead of solely online due to COVID-19 [5]. In Italy, Di Giacomo P documented students' perceptions in COVID-19 in dental distance-based education. The most common complaints were the lack of a structured online curriculum, less interaction with professors, and a lower level of attention [6]. In Pakistan, Haroon Z et al. conducted a study among dental students to identify various challenges and its solutions and emphasized that there is a dire need for a comprehensive hybrid dental curriculum using technology-enhanced learning aids[7]. .Online assessment is a challenging task for virtual learning. In this transformation, the authorities must develop assessments with a quality similar to face-to-face teaching. It appears that E-assessment dependence is growing with each day as an irreplaceable need and will remain a permanent mode even after COVID-19. When the situation improves, the universities and colleges should focus on blended or hybrid learning. Therefore, it is essential for faculty members to gain experience in all the skills and core-competencies of E-assessments.

Literature review shows that little data is available on E-examination within E-learning, especially in the dental curriculum. In Jordan Hattar S et al. reported online experience and practice expectations among dental students during COVID-19 which prove that online assessment is not a suitable method for evaluation of students [8]. In the institutions of India and Saudi Arabia, Khan MA et al, found numerous hurdles in implementing e-exams such as security, validity, and impartiality from students who were enrolled in higher education [9]. The faculty needs to be aware of traits of Pakistani students' and making an E- assessment more effective for future. The examination structure, fairness, and time allocated to each question need to be planned according to availability of teaching strategies, adequate technological sources, and students' feedback. This study explores various factors of E-exams and E-learning environment-related factors in our setup to see how we can improve our dental curriculum assessment.

MATERIALS AND SUBJECTS

A case-control study was conducted in March, 2021 in a private medical college of Karachi among BDS students. A questionnaire was developed after a literature search, and it was piloted among 15 students. Furthermore, the questionnaire was modified depending on their feedback. The final questionnaire consisted of 24 items with demographics and other variables requiring answers yes or no. Students of all four years of BDS were given questionnaires online. Students, who obtained <50% marks in professional examinations, even once in their online teaching during Covid-19, gave consent and filled the questionnaire were labeled as cases, whereas all those who obtained more than 50% marks, gave permission, and filled the questionnaire were labeled as controls. Those who were reluctant and did not give consent were excluded. To keep anonymity, did not ask the Students' names and their roll numbers. Questionnaires filled inappropriately were discarded. The ethical approval was obtained from the Ethical review board of Sir Syed College of Medical Sciences for Girls. Data was taken from 75 cases and 150 controls. Data were analyzed by using SPSS version 23. Hence, the odds ratio was calculated to identify the relative risk of poor performance among the students. Chi-square test was applied to see the comparison among the students studying in different academic years (p-value<0.05).

RESULTS

Total 225 dental students were enrolled in the study, out of which 75 were cases, and 150 were controls. The results of our study showed that the students of the first year had the highest rate of failure (60%), followed by the students of the final year (19.0%). Hence, the loss rate was less among the second-year students (11.1%) and third-year (13.9%). Hence, there is a strong association of year (p=.000) in which students are studying in a medical college due to academic failure. The students of the first and fourth year of the medical college are at more risk of failing. (Bar diagram)
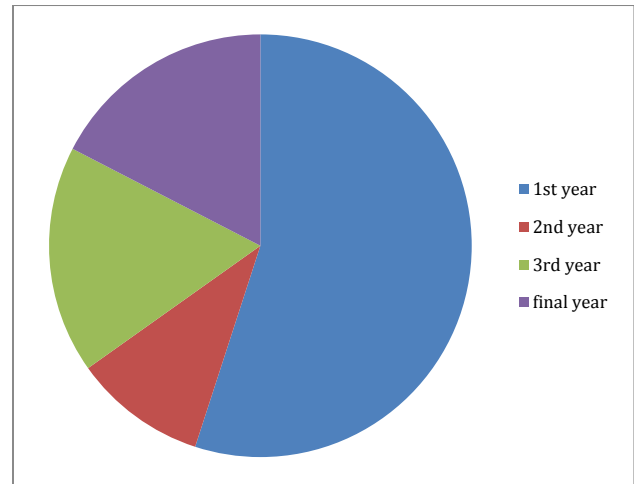

Figure 1: The rate of failure among first, second, third, and final year students.

Table 1: Association of E-examination related factors during COVID to academic failure of dental students

Variables	p-value	cases	controls	Odd ratio	95% of the confidence interval	
					lower	upper
More effort and time is required to attempt online exams than regular exams	.000*	53.1%	46.7%			
Online MCQs appropriately tested my knowledge according to learning objectives given in the study guide	.083	62.2%	37.8%	1.670	.932	2.990
Online OSPE/OSCE appropriately tested my skills according to the learning objectives of the study guide	.001*	68.9%	31.1%	2.771	1.491	5.148
Online oral exam (synchronous viva voce) tested my critical thinking skills (problem-solving skills)	.571	51.1%	48.9%	1.175	.673	2.051
Bandwidth/Internet connection was poor during the online exam	.206	67.8%	32.2%	1.456	.812	2.613
Adequate training was given on technical aspects (computer skills) for online exams.	.009*	60.0%	40.0%	2.190	1.205	3.982
Marked assignments and projects as a component of online exams will improve my scores in the exam.	.341	53.3%	46.7%	1.315	.748	2.315
online exams should include marks of presentations prepared by students in the overall assessment	.057*	60.0%	40.0%	1.740	.981	3.087
Online quizzes can gauge my performance better	.777	57.8%	42.2%	1.083	.622	1.888
Online exams give more chances to cheat than regular exams	.037*	53.3%	46.7%	1.835	1.034	3.255

*Significant values

Table 2: Association of learning environment related to academic failure in Online Exams during Covid -19.

Variables	p-value	Cases	controls	Odd ratio	95% of the confidence interval	
					lower	upper
Most teachers improved my understanding of subjects in online teaching	.393	53.7%	46.7%	.784	.449	1.369
I am physically less active during the lockdown, so I am lazy while studying	.341	55.6%	44.4%	1.315	.748	2.315
Discussion group chats (WhatsApp) improved my motivation to study online by peer learning (social interaction of class fellows)	.451	52.2%	47.8%	1.238	.710	2.160
Are recorded lectures better than live lectures (zoom) for improved understanding	.036*	58.9%	41.1%	1.846	1.037	3.288
Time on social media (e.g., Facebook, Twitter, etc.) other than for study wastes my time, so I scoreless	.704	60.0%	40.0%	1.114	.637	1.949
I feel less responsible for my studies and am willing to learn in online classes.	.046*	54.4%	45.6%	1.787	1.007	3.170
I feel less motivated to study in online classes.	.777	56.7%	43.3%	1.083	.622	1.888
I am not satisfied by bedside examination skills/ laboratory work in online teaching	.023*	57.8%	42.2%	1.936	1.091	3.434
I have too many family responsibilities when at home during Covid-19.	.777	54.4%	45.6%	.923	.530	1.608
I have too many social activities during lockdown in Covid-19.	.448	53.3%	46.7%	.806	.462	1.407
I am a hosteller with no family support during the lockdown.	.341	55.6%	44.4%	1.315	.748	2.315
I spend a lot of my time watching movies/TV in lockdown, which distracts me	.509	52.2%	47.8%	1.206	.692	2.103
My attendance in online classes is poor during Covid-19 than regular on-campus classes	.056*	58.9%	41.1%	1.750	.982	3.117
My sleep routine is disturbed in lockdown, so I cannot study well.	.509	33.7%	66.7%	1.207	.691	2.108

*Significant values

DISCUSSION

Out of 225 students who took part in this study, 75 were cases, and 150 were controls. The results of our study revealed that almost, 53.1% of failed students required more effort and time to attempt online exams than regular face-to-face exams as compared to 46.7% of controls, which shows a significant association (p=.000). Medical education in the COVID-19 outbreak is different from traditional education which was being practiced earlier. Online assessment is an essential aspect of modified curriculums used in virtual learning. This seems understandable as students were attempting it for the first time. Another study was conducted by Elsalem L et al. in Jordan which showed similar results that out of 730 students; approximately only one-third preferred remote E-exams which were significantly (P < 0.05) associated with efforts/time for small E-exam preparation [10]. Further the results of our study revealed that out of the three modes of assessment such as MCQ, OSPE/OSCE, and Oral viva voce which were used during online examination among our students were, 62.2%, 68.9%, and 51.1% of cases respectively as compared to controls. Hence, OSPE/OSCE out of three modes was significantly associated with academic failure (p=0.001). It is the biggest challenge to plan logistically and implement an Objective Structured Clinical Examination (OSCE), which itself is a valid a face-to-face exam. Similar results were found in a study conducted by Hannan TA et al., that zoom cannot be used as an efficient and smooth medium for carrying OSCE [11]. The three modes of online assessment were only used to determine how exam scores would be affected if assignments and presentations were also given credit in summative assessment. The results of our study revealed that a significant association of marked presentations with academic failure was found (p= 0.057). Students who got less than 50% marks may improve their results if their presentations marks were given. Around 57.8% of the students failed as compared to those students who passed were 42.2%. The results of our study revealed that almost 67.8% of the students failed due to poor internet connectivity and adequate technical training during online exams was significantly associated with academic loss (p=.009). The students of our study also revealed that the stress of E-learning depends on the internet for educational courses and activities. For this purpose every institute must establish resources for successful online assessments. Similar results were found in a study conducted by Launer J et al., that technology plays a significant role in successful online learning [12]. Further in our study, cheating in online exams as compared to regular face to face exams is significantly associated (p=.037) with low scores of less than 50%. . Preventing cheating in an E-exam is challenging as wireless networks, smart phones, and Bluetooth devices can easily be used to find the information which is required for online exam. Similarly Elsalem et al. reported that exam dishonesty/misconduct appears as one of the significant challenges with remote E-exams [10, 13].

The learning environment of online teaching during COVID-19 has an impact on online lessons. Online teaching skills and Whatsapp discussion groups have improved the motivation to study online through peer learning (social interaction of class fellows) in 53.7% and 52.2% of cases. Recorded lectures are found better than live lectures via zoom in 58.9% of cases than controls (p=0.036). This may be due to the poor internet connectivity factor identified earlier because live interactive

session depends on good internet. Many facets of E-examination and learning directly depend on institutional support. Agha Khan University from Pakistan published their unique medical education experience of conducting E-exams using a dynamic team of teaching associates (fresh Medical Graduates). It reflects the institutional support ranging from an optimistic team effort to IT support systems and financial investments [14].

In our study, less responsibility for learning in online classes is significantly associated with academic failure, while less motivation is reported by 56.7% of students who failed than 43.3% who passed. Online teaching should use technology to make sessions interesting and interactive. Similar results were found in a study conducted by Iurcov R et al. found that active participation using video cameras was strongly correlated with satisfaction with academic results [15]. The results of our study revealed that there is a significant association of dissatisfied bedside lab work in basic sciences with academic failure (p= .023). Hattar S et al. also reported that clinical training experience was most negatively affected by 87% of students in online education during COVID-19. During a pandemic, students who were close to graduation underwent an even more radical change due to the suspension of clinical training[8]. The lessons learned from teaching during the COVID-19 pandemic should tailor our online teaching methodology and curriculum to promote self-learning. It gave us invaluable insights into educational pedagogy for future dental education and assessments. Online assessments should ensure good planning for all three domains of knowledge, skill, and attitudes using technology-enhanced learning applications. The limitations of this study include dental students and sample size is small. Future studies can be designed to make results more generalizable. In the next phase of this research we would like to identify e-examination and e-learning factors and its association to academic failure among MBBS students

CONCLUSION

Students' feedback is valuable to solve the key issues from the questionnaire. These challenges identified by the students need careful attention regarding future planning for E- assessments and E-learning. The learning needs of our students require alignment with teaching strategies, technology, and institutional support.

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