Galaxy Publication

Transition from Traditional Text to E-Text: Medical, Dental, and Allied Health Students' Perceptions of E-Learning

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ABSTRACT

Over a year ago, the global pandemic compelled higher education institutions in Pakistan to rapidly shift to digital learning, marking students' first extensive exposure to e-learning. This study investigates how medical, dental, and allied health students in Pakistan perceive and respond to this transition. A nationwide descriptive, cross-sectional study was carried out. Participants were invited to complete a pre-validated, anonymous online questionnaire covering demographics, prior e-learning experience, perceived advantages and disadvantages, and overall attitudes toward e-learning. Descriptive statistics summarized all demographic data. The Chi-square test was applied to assess differences in perceptions between pre-clinical and clinical students, as well as to compare category-wise positive and negative responses. Additionally, associations between participant demographics and their perceptions of e-learning were evaluated using the Chi-square test. The study included 1,200 participants, of whom 797 (66.4%) were pre-clinical students and 403 (33.6%) were in clinical years. Across the cohort, the most frequently cited benefit of e-learning was a "comfortable learning environment" (70%), whereas the predominant drawback was "technical difficulties with IT equipment" (89%). Pre-clinical students primarily reported "anxiety stemming from social isolation" as a major challenge (p < 0.05), while clinical students highlighted "insufficient patient interaction" as their key concern (p < 0.05). Overall, 72% of respondents expressed a negative perception of e-learning. Following over a year of online education, medical and allied health students in Pakistan have reported significant dissatisfaction with e-learning. To improve engagement and alleviate stress related to the pandemic, initiatives such as faculty and student training, counseling programs, and the adoption of innovative teaching strategies should be implemented.

words: COVID-19, Pandemic, E-learning, Undergraduate, Medical, Perception

Introduction

In December 2019, COVID-19 emerged in China and rapidly spread worldwide, culminating in a global pandemic declared on March 11, 2020 [1]. By October 2022, over 615 million cases had been reported globally, with approximately 6.5 million deaths across more than 180 countries [2]. The pandemic disrupted not only healthcare systems but also medical education, as the highly contagious nature of the virus rendered traditional face-to-face teaching unsafe [3]. Medical and allied health schools suspended routine classes, while clinical rotations were interrupted due to the necessity of direct patient interaction [4]. Institutions were compelled to find urgent solutions.

The enforcement of social distancing pushed students to study from home, necessitating the adoption of e-learning in higher education [5]. This transition required robust infrastructure, advanced technology, specialized software, online platforms, and comprehensive training for both faculty and students [6]. By April 2020, several medical schools in the USA and UK had rapidly adapted their curricula to e-learning, overcoming time constraints through institutional support, accelerated technical training, and stakeholder cooperation [7]. Other institutions in Western

countries soon followed [8, 9]. This swift adaptation was facilitated by the pre-existing e-learning market, which generated USD 46.7 billion in the USA in 2016 and grew globally to USD 286.62 billion by 2018 [8].

In Australia and New Zealand, diverse platforms were employed for synchronous and asynchronous teaching of pre-clinical years [10], policies for e-learning were formalized [11], and Imperial College London conducted the first fully online final-year medical examination [12]. For clinical students, online patient interviews, remote teaching from hospitals, and telemedicine technologies were implemented in the UK [13]. Student responses in these regions were largely positive, demonstrating high satisfaction and engagement [14–16]. Consequently, e-learning has been widely endorsed in well-resourced countries due to its benefits [17].

However, the situation differed in less-developed nations. In Bangladesh, students reported low satisfaction with online learning, attributed to limited preparedness for virtual education during the pandemic [18, 19]. Similarly, Iranian educators expressed concerns about curriculum suitability and content delivery, with students experiencing significant mental distress [20, 21]. In Saudi Arabia, some institutions delayed adopting learning management systems due to older faculty lacking technical skills [22]. Early studies from India and the Philippines also highlighted widespread student and faculty dissatisfaction with e-learning [23–25]. Pakistan faced comparable challenges.

The pandemic exacerbated Pakistan's economic fragility, reducing GDP growth from 5.8% to 0.98% in 2020 [26], with high poverty (79%) and rising unemployment negatively impacting education and healthcare [27]. Before the pandemic, e-learning in Pakistan was limited, mainly confined to government tele-courses in the social sciences [28]. The shift to online learning revealed significant challenges, particularly in remote areas of FATA, Balochistan, and Gilgit-Baltistan, which lacked reliable internet access [27]. Weak institutional policies, minimal technical training, and economic constraints led to inconsistent and experimental online teaching methods in medical, dental, and allied health schools. Despite these hurdles, most institutions implemented e-learning, which has continued for over a year. Students across urban and rural regions experienced varying levels of access and quality, resulting in an uneven learning experience.

Overall, the effectiveness of e-learning in developing countries remains under-explored. This study aims to examine the perceptions of medical, dental, and allied health students in Pakistan regarding online education.

Materials and Methods

Study design

Between January and May 2021, a descriptive cross-sectional study was carried out to examine how undergraduate students in Medicine (MBBS), Dentistry (BDS), and Allied Health Sciences (AHS) perceived and accepted e-learning **(Figure 1).** The research followed the ethical guidelines outlined in the Declaration of Helsinki, with formal approval obtained from the institutional ethics committee (ANDC/RAC/20/04).
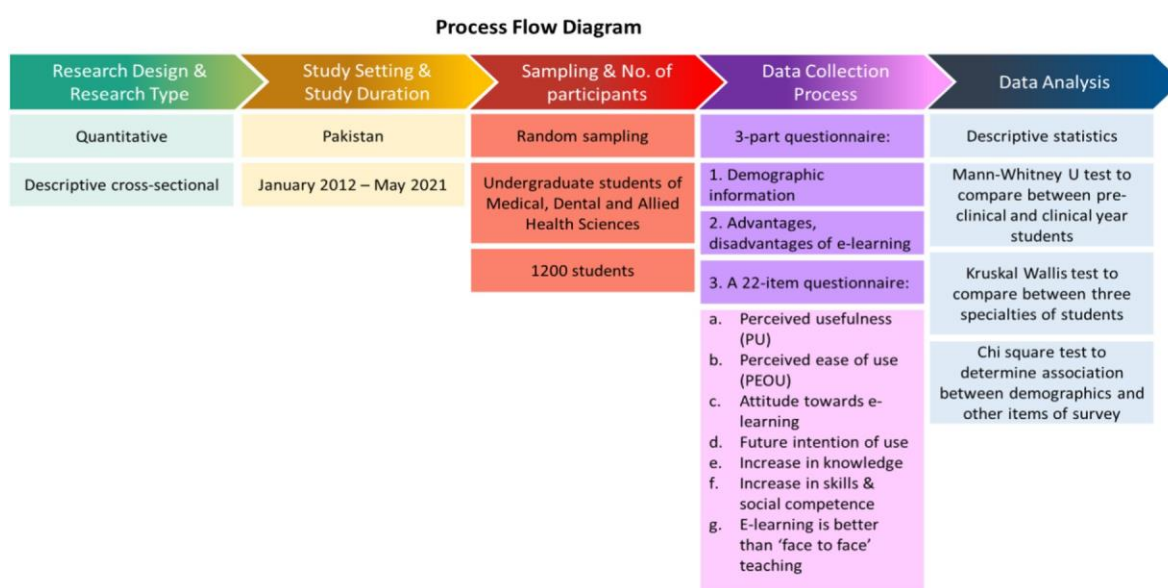
Figure 1. Process flow diagram of research.

Sampling

Participants were recruited using purposive, virtual snowball sampling through WhatsApp and Facebook groups [29]. In Pakistan, the MBBS program spans five years, while BDS and Allied Health Sciences bachelor's programs are four years in duration. The study included only undergraduate students from Pakistani institutions who transitioned to e-learning during the pandemic.

Questionnaire

For this study, a pre-validated online questionnaire developed by Mamattah [30] was employed. The instrument was adapted to suit medical and allied health students and reviewed by five experts for content validity. A pilot test involving 20 students was conducted to ensure face validity, assessing clarity, comprehensiveness, and cognitive understanding. The finalized questionnaire was distributed to undergraduate students in medical, dental, and allied health programs across Pakistan's four provinces via WhatsApp, social media groups, and email. As English is the official language of instruction and assessment in these programs, the questionnaire was not translated into local languages.

The questionnaire comprised three sections. The first provided an introduction to the study, explained its objectives, and included a consent statement. A participant information sheet clarified that participation was voluntary and would not influence academic assessment. Students were asked about their demographics and prior e-learning experience. To maintain confidentiality, personal identifiers and institution names were not collected. The second section asked participants to select from multiple options regarding the perceived advantages and disadvantages of e-learning. The third section included a 22-item questionnaire using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) covering seven domains: perceived usefulness (PU), perceived ease of use (PEOU), attitude toward e-learning, future intention to use, knowledge acquisition, skill and social competence development, and the perceived superiority of e-learning over traditional face-to-face instruction.

The survey was implemented using Google Forms (Google LLC) and distributed in three waves: January 10, February 10, and March 10, 2021. Data collection concluded on April 10, 2021, upon reaching time saturation.

Data analysis

All questions in the online questionnaire were required to prevent missing responses [31]. A total score was calculated by summing the 22 items, yielding a range of 22 to 110, with an overall mean of 55. Participants scoring above 55 were classified as having a positive perception of e-learning, while those scoring below 55 were considered to have a negative perception. The questionnaire items were further organized into seven categories, each with its own mean score.

a. Perceived usefulness (PU) of e-learning – 4 items (score 4–20, mean 10).
b. Perceived ease of use (PEOU) – 4 items (score 4–20, mean 10).
c. Attitude towards e-learning – 4 items (score 4–20, mean 10).
d. Future intention of use – 4 items (score 4–20, mean 10).
e. Increase in knowledge – 1 item (score 1–5, mean 3).
f. Increase in skills and social competencies – 2 items (score 2–10, mean 5).
g. E-learning is better than 'face to face' teaching – 3 items (3–15, mean 8).

Responses above the mean score were classified as positive, while those below were considered negative. Descriptive statistics, including means, frequencies, and percentages, were calculated for all demographic variables. The Chi-square test was applied to examine differences in perceptions between pre-clinical (Years 1–2) and clinical (Years 3–5) students, as well as across the three academic programs. It was also used to analyze category-wise positive and negative responses and to assess the association between student demographics and e-learning perceptions. All statistical analyses were conducted using IBM SPSS version 24 (IBM Corporation, New York) and Microsoft Excel 2013 (Microsoft Corporation, Redmond, WA), with a significance threshold set at $p < 0.05$.

Results and Discussion

Characteristics of respondents

The study included 1,200 participants, comprising 564 males (47%) and 636 females (53%). Among them, 363 students (30.2%) were enrolled in medical (MBBS) programs, 420 (35%) in dental (BDS), and 417 (34.7%) in allied health sciences (AHS). Pre-clinical students represented 66.4% (n = 797), while clinical-year students made up 33.6% (n = 403). The questionnaire showed good internal consistency, with a Cronbach's alpha of 0.81. Detailed demographics are presented in **Figure 2.** Nearly all students (~94%) rated themselves as competent in information technology, but only 37.8% had previous exposure to e-learning.
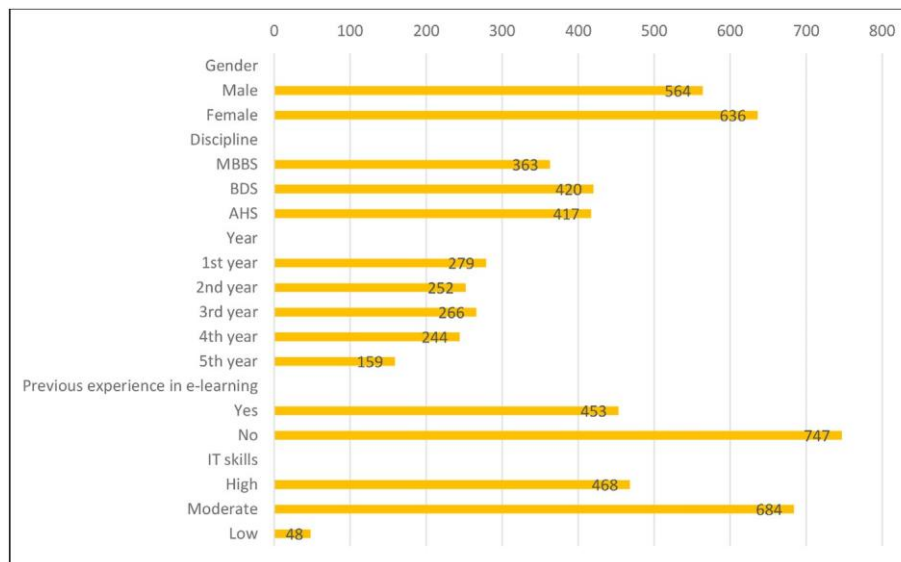
Figure 2. Demographic characteristics of participants and their prior experience with e-learning.

Advantages and disadvantages of E-learning
The most commonly reported benefit of e-learning among students was the comfort of the learning environment (70%), followed closely by the ability to study from home (69%) and the flexibility to learn at one's own pace (64%). Technical difficulties with IT equipment were identified as the primary drawback by 89% of participants. The second most cited disadvantage differed between pre-clinical and clinical students. Clinical-year students primarily reported limited patient interaction as a significant challenge ($p < 0.05$), whereas pre-clinical students highlighted increased anxiety due to social isolation and reduced interaction with instructors ($p < 0.05$) **(Table 1)**. No significant differences were observed across the three academic programs.

Table 1. Advantages and disadvantages of e-learning.

Variable	Pre-Clinical Years (n = 531)	Clinical Years (n = 669)	p-value	MBBS (n = 363)	BDS (n = 420)	AHS (n = 417)	p-value	Total
Advantages of E-Learning								
Access to online material	187	221	0.428	121	140	147	0.800	408 (34%)
Learning at own pace	350	418	0.219	242	256	270	0.232	768 (64%)
Ability to stay at home	410	418	<0.001	271	290	267	0.005	828 (69%)
Class interactivity	51	45	0.067	33	29	34	0.526	96 (8%)
Improvement in technical/virtual skills	211	149	<0.001	127	122	111	0.034	360 (30%)
Comfortable environment	450	390	<0.001	281	259	300	0.001	840 (70%)
Disadvantages of E-Learning								

Reduced interaction with teachers	346	158	<0.001	177	178	149	0.001	504 (42%)
Frequent technical problems	510	558	<0.001	346	365	357	<0.001	1068 (89%)
Lack of interaction with patients	40	660	<0.001	252	231	217	<0.001	700 (58.3%)
Poor learning conditions at home	136	128	0.007	89	84	91	0.312	264 (22%)
Lack of self-discipline	107	133	0.907	97	80	63	0.000	240 (20%)
Anxiety due to social isolation	478	194	<0.001	209	230	233	0.729	672 (56%)

MBBS: medical students, BDS: dental students, AHS: allied health sciences students.

∗p-value is significant i.e., less than 0.05.

Perception of students towards E-learning

Table 2 presents student perceptions of e-learning. A majority of participants (72%, n = 863) expressed an overall negative view of e-learning. Although there was no significant difference in perceived knowledge gain between traditional and online learning (p > 0.05), students reported notably unfavorable opinions in several areas: perceived usefulness (80% negative), perceived ease of use (70.8% negative), overall attitude toward e-learning (68% negative), intention to continue using e-learning in the future (71.8% negative), and development of skills and social competencies (81.2% negative) (p < 0.05).

Analysis by demographic factors revealed that male students scored significantly higher than females in perceived usefulness, ease of use, attitude, future intention, and skill/social competency development (p < 0.05). Furthermore, MBBS students demonstrated significantly more positive responses in overall perception, perceived usefulness, ease of use, knowledge gain, and skill development. No statistically significant differences were observed between pre-clinical and clinical year students (p > 0.05), and therefore these comparisons were not detailed.

Table 2. Overall perception of students and domain-specific responses toward e-learning.

Category	Responses	Male n/%		Female n/%		p-value	MBBS n/%		BDS n/%		AHS n/%		p-value
Overall Perception	+ve = 337 (28%)	150	27%	187	29%	0.281	159	44%	119	28%	59	14%	<0.001 ∗
	−ve = 863 (72%)	414	73%	449	71%		204	56%	301	72%	358	86%	
Perceived Usefulness (PU) of e-learning	+ve = 241 (20%)	131	23%	110	17%	0.010∗	105	29%	90	21%	46	11%	<0.001 ∗
	−ve = 959 (80%)	433	77%	526	83%		258	71%	330	79%	371	89%	
Perceived ease of use (PEOU)	+ve = 350 (29.1%)	200	35%	150	24%	<0.001 ∗	140	39%	105	25%	105	25%	<0.001 ∗
	−ve = 850 (70.8%)	364	65%	486	76%		223	61%	315	75%	312	75%	
Attitude toward e-learning	+ve = 384 (32%)	200	35%	184	29%	0.015∗	126	35%	125	30%	133	32%	0.337
	−ve = 816 (68%)	364	65%	452	71%		237	65%	295	70%	284	68%	
Future intention of use	+ve = 339 (28.3%)	180	32%	159	25%	0.007∗	110	30%	121	29%	108	26%	0.376
	−ve = 861 (71.8%)	384	68%	477	75%		253	70%	299	71%	309	74%	
Increase in knowledge	+ve = 628 (52.3%)	290	51%	338	53%	0.551	225	62%	205	49%	198	47%	<0.001 ∗
	−ve = 572 (47.7%)	274	49%	298	47%		138	38%	215	51%	219	53%	

Increase in skills and social competencies	+ve = 226 (18.8%)	126	22%	100	16%	0.003∗	89	25%	67	16%	70	17%	0.003∗
	−ve = 974 (81.2%)	438	78%	536	84%		274	75%	353	84%	347	83%	
'E-learning' is better than 'face to face' teaching	+ve = 192 (16%)	92	16%	100	16%	0.781	67	18%	55	13%	70	17%	0.107
	−ve = 1008 (84%)	472	84%	536	84%		296	82%	365	87%	347	83%	

∗p-value is significant i.e., less than 0.05.

This study explored perceptions of e-learning among medical, dental, and allied health students in Pakistan. Only 37.8% of participants reported prior e-learning experience, in contrast to students in the USA and UK, where most had previous exposure to online education [32–34]. Developed countries, including the USA, UK, and Australia, had established online courses before COVID-19 [35], whereas Pakistan had limited e-learning infrastructure, with only the Virtual University of Pakistan offering such programs until recently [36]. Our findings align with reports from other developing nations such as India, Nepal, Jordan, and Nigeria, where online medical education was largely novel [25]. Students reporting prior experience likely refer to courses taken during the COVID-19 lockdown. Limited institutional preparedness and constrained resources forced many schools to rapidly adopt e-learning, which was unfamiliar to both students and faculty.

Most students (96%) reported confidence in their IT skills, though the questionnaire did not specify skill types. This may reflect frequent use of digital platforms or improvements in technical competence over the past year [32, 37–39]. Despite this, 72% of students expressed an overall negative perception of e-learning, likely linked to the challenges they reported. The most frequently cited disadvantage was technical issues, contrasting with studies in other settings where engagement and feedback were primary concerns [40, 41]. Reliable internet and electricity are prerequisites for online learning, yet Pakistan continues to face infrastructure challenges, particularly in rural areas [42–44]. Frequent technical problems have been associated with anxiety and reduced learning outcomes [45], highlighting the need for investments in digital education infrastructure [46–49].

Lack of interaction with instructors and patients was another key limitation, consistent with studies from Malaysia, Saudi Arabia, Jordan, and India [50–53]. Clinical education, which relies heavily on patient contact, is particularly affected [32, 54]. Despite innovations such as virtual patients, 3D simulations, and telemedicine [55], students still experience significant gaps. Countries like China have implemented specialized online clinical modules using virtual reality, MOOC platforms, and video-conferencing to maintain engagement and assessment quality [56, 57]. In Pakistan, effective online clinical teaching would require faculty training in advanced educational technologies and collaboration with tech providers.

The primary advantages reported were a comfortable learning environment and the ability to study at one's own pace, which aligns with prior research [58, 59]. Self-directed e-learning allows students to manage their time effectively [60, 61]; however, it may also contribute to social isolation, particularly among pre-clinical students [62–66]. Recent studies provide strategies for enhancing engagement, conducting clinical sessions online, and addressing pandemic-related stress [67–70]. Faculty training, student counseling, and continuous monitoring of academic progress are essential to mitigate anxiety and disengagement.

To our knowledge, this is the first study in Pakistan assessing student perceptions after a year of e-learning. Despite prolonged exposure, satisfaction remains low, and students perceive minimal gains in clinical or social skills. Interestingly, no significant difference was observed in knowledge acquisition between e-learning and traditional teaching. Future longitudinal and qualitative studies are recommended to better understand student attitudes, emotional responses, and strategies for improving e-learning outcomes. Limitations of this study include not addressing time management, faculty training on digital platforms, effective feedback mechanisms, isolation-related anxiety, or perceptions of other stakeholders such as faculty, administrators, and parents.

Conclusion

Our study demonstrates that although undergraduate students in medical, dental, and allied health programs recognized certain benefits of e-learning, such as a comfortable learning environment and the flexibility to study

from home, the perceived disadvantages were more prominent. Even after more than a year of exposure, the majority of students in Pakistan remained dissatisfied with e-learning. Given Pakistan's status as a middle- to low-income country, it is unrealistic to expect nationwide, high-speed internet access—particularly in rural regions—within the next five years. Considering these limitations, it is imperative that government bodies and institutional stakeholders collaborate to address these challenges and prepare for the continued integration of e-learning in medical education.

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