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Students' Perception of Artificial Intelligence in Dentistry: Preparing for a Technological Future

Dr. Afreen Bilgrami¹, Dr. Faiza Hasan², Dr. Syed Munawar Alam³, Dr. Madiha Pirvani⁴,
Dr. Maria Moin⁵, Mohammad Zubair Khan⁶

¹Department of Dental Materials Science, Fatima Jinnah Dental College, Karachi, Pakistan

²Department of Pharmacology, Fatima Jinnah Dental College, Karachi, Pakistan

³Department of Biochemistry, Fatima Jinnah Dental College, Karachi, Pakistan

⁴Associate Professor, BDS, MSc Dental Materials (UK), Department of Dental Materials, Dow International Dental College, Pakistan

⁵Department of Community and Preventive Dentistry, Bahria University Dental College, Karachi, Pakistan

⁶Dentistry, Fatima Jinnah Dental College, Karachi, Pakistan

*Corresponding author: Dr. Afreen Bilgrami,

Department of Dental Materials Science, Fatima Jinnah Dental College, Karachi, Pakistan

E-mail: dragha25@gmail.com

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ABSTRACT

Introduction: Although integrating artificial intelligence (AI) into dentistry has the potential to improve patient care, dental professionals', especially students', adoption of this technology is still unclear. The purpose of this study is to evaluate Fatima Jinnah dental college students' attitudes, knowledge, and worries about AI uses in dental care.

Methodology: 109 dental students answered a cross-sectional survey. Participants completed a structured questionnaire asking how much they understood about AI, how concerned they were about its probable impacts, how much they felt it would benefit, and how receptive they were to employing AI in dentistry. Descriptive statistics and Chi-square tests let one examine the outcomes.

Results: According to the results, 46.8% of students stated they understood artificial intelligence well enough; 32.1% indicated they believed they lacked sufficient understanding of it. The accuracy of the diagnosis, data security, and impact on the workforce were most concerns of most respondents. Especially, 41.3% of those who responded felt oral health improved and 39.4% felt artificial intelligence improved therapy. Strong correlations between students' perceptions of the advantages of artificial intelligence and their knowledge of how it may be applied generally were found by statistical analysis.

Conclusion: Despite having a reasonable knowledge of artificial intelligence, dental students express significant concerns about its application. Targeted educational initiatives addressing these issues will equip students to apply artificial intelligence technologies in their future dental offices, therefore enhancing their readiness and hence improving patient care.

Keywords: artificial intelligence, dental students, perceptions, knowledge, patient care, fatima jinnah dental college.

INTRODUCTION

By means of improved patient care, faster treatment planning, and increased diagnosis accuracy, artificial intelligence (AI) is transforming several healthcare industries, including dentistry. Artificial intelligence is probably becoming more important as dental technology develops in determining the direction of dentistry [1, 2]. This might greatly influence dental education and clinical practice. Artificial intelligence has the power to revolutionize the dentistry field by enabling more accurate, efficient, patient-centered treatment through anything from automating tedious administrative chores to helping difficult diagnosis procedures [3, 4]. Using artificial intelligence in dentistry raises significant questions about the impressions left on current dental students, who will be the future generation of practitioners. Knowing their points of view and expectations on artificial intelligence can help dentists to more successfully introduce information and methods connected to artificial intelligence into their courses [5–7]. Artificial intelligence might be applied for these students in support of clinical decision-making, patient treatment program personalizing, early dental disease diagnosis aid [8]. These expanding opportunities highlight how future dentists must have a strong foundation in dentistry as well as be able to access, use, and evaluate AI tools in their daily work [9].

The uses of artificial intelligence in healthcare—especially in dentistry—become progressively more wide and significant as technology develops. To help with diagnosis and prognosis tasks in dentistry, including recognizing early indications of oral diseases, developing 3D models for surgery planning, and even prediction of treatment results [10], artificial intelligence-based image analysis, predictive analytics, and even treatment result prediction are being developed. By permitting more tailored treatment options, these advancements may improve patient outcomes, reduce operation times, and increase accuracy. For dental students, artificial intelligence offers both a teaching tool and a prospective career advantage [11]. Virtual simulations and diagnostic software driven by artificial intelligence are among the tools some dental institutions now include into their courses. Still, students' desire and ability to welcome and use this technology will determine how effectively artificial intelligence is used in dentistry offices moving forward. Analyzing how students see artificial intelligence enables us to better understand the current attitude and mindset toward it as well as any uncertainty or worries that could prevent its acceptability [12]. This study intends to investigate these views to determine if students feel sufficiently ready to engage with AI-driven systems in their future employment. We have to understand these concepts if we want to change dental education to reflect the technical developments characterizing modern dentistry.

This study is to evaluate dental students' views and perspectives on the use of artificial intelligence in dentistry moving forward with particular attention on how it affects their clinical training, learning, and career aspirations.

METHODOLOGY

Study Design: One of the top dental colleges in Pakistan, Fatima Jinnah dental college conducted the study. The survey was conducted using a cross-sectional poll, which is an excellent approach to provide a brief snapshot of opinions on artificial intelligence and mouth health at a given moment.

Study location: The study was conducted at Fatima Jinnah dental college, Pakistan. This institution is an excellent site to see how future dentists view artificial intelligence and how it influences mouth health since it is known for having a varied student body.

Participants: Fatima Jinnah dental college dental students (1st year and 2nd year BDS students) were among the target population. To find participants, a non-probability convenience sampling method was

applied. Participants had to be enrolled in the college at the time of the study in order to be eligible, and those who had not yet started their dental education were excluded.

Sample Size: A representative sample of the college's student population was ensured by the 109 students who took part in the survey. It was decided that this sample size would provide the analyses enough statistical power.

Data Collection Tool: A structured questionnaire was developed to gather data on the following key areas:

- **Demographic Information:** Age, gender, year of study, and frequency of dental visits.
- **Importance of Oral Health:** Participants rated the importance of oral health on a scale from "Not at all" to "High."
- **Past Dental Treatments:** Participants reported any previous dental treatments they had received.
- **Knowledge of AI and Digital Technologies:** Respondents indicated their level of knowledge regarding AI and the digital world.
- **Concerns and Advantages of AI:** Participants identified their concerns about AI in dental health and its perceived advantages.
- **Perceptions of AI Use:** Respondents expressed their views on the potential of AI to improve treatment quality, doctor-patient relationships, and overall oral health.
- **AI Error Tolerance:** Participants indicated the level of error they would tolerate in AI diagnostic systems.
- **Endorsement Procedure:** Respondents expressed whether they would endorse AI procedures in dental practice.

The questionnaire was validated through a pilot study involving a small group of dental students prior to the main data collection.

Data Collection Procedure: Data was gathered at Fatima Jinnah Dental College throughout a predetermined time frame. Because the questionnaire was self-reported, individuals may fill it out whenever it was convenient for them. When required, researchers were on hand to offer advice and clarity.

Data Analysis: Statistical software, such as SPSS, was used to analyze the data. To compile perceptions, knowledge levels, and demographic traits, descriptive statistics were calculated. Relationships between categorical variables were investigated using chi-square tests, with a significance level of $p < 0.05$.

Ethical Considerations: Before the study was carried out, ethical permission was acquired from Fatima Jinnah Dental College's institutional review board. All participants gave their informed permission, guaranteeing that they were aware of the goals, methods, and consequences of withdrawing from the research at any time.

RESULTS

The purpose of this study was to investigate the knowledge, worries, benefits, and treatment of student respondents about oral health and artificial intelligence. The conclusions drawn from the data gathered are outlined in the sections that follow, where pertinent frequencies, percentages, and statistical significance are highlighted in tables. A youthful demographic participated in this survey, as evidenced by the fact that the majority of respondents (84.4%) were between the ages of 18 and 25. As seen in table 1, the majority of respondents (83.5%) stated that their primary reason for seeing the dentist was an emergency, which may indicate a lapse in routine dental treatment.

Table 1: Demographic Distribution of Respondents by Age and Dental Visit Frequency

Category		Frequency	Percent	Valid Percent	Cumulative Percent	p-value (Chi-Square)
Age Group	18 to 25	92	84.4%	84.4%	84.4%	.347
	26 to 35	11	10.1%	10.1%	94.5%	
	36 to 50	6	5.5%	5.5%	100.0%	
Dental Visit Frequency	Semiannual	1	0.9%	0.9%	0.9%	< 0.001
	Annual	9	8.3%	8.3%	9.2%	
	Biannual	8	7.3%	7.3%	16.5%	
	Emergency	91	83.5%	83.5%	100.0%	

The findings show that whereas a sizable part of respondents (71.5%) thought oral health was either normal or very essential, another fraction (28.4%) said it was not important at all. When it came to previous dental procedures, the majority of respondents—26.6%—had received RCT (Table 2).

Table 2: Importance of Oral Health and Past Dental Treatments

Category		Frequency	Percent	Valid Percent	Cumulative Percent	p-value (Chi-Square)
Importance of Oral Health	Not at all	14	12.8%	12.8%	12.8%	.131
	Low	17	15.6%	15.6%	28.4%	
	Normal	41	37.6%	37.6%	66.1%	
	High	37	33.9%	33.9%	100.0%	
Past Dental Treatment	Fillings	19	17.4%	17.4%	17.4%	0.0005
	RCT	29	26.6%	26.6%	44.0%	
	Bleaching	14	12.8%	12.8%	56.9%	
	Prosthetics	8	7.3%	7.3%	64.2%	
	Apicectomy	11	10.1%	10.1%	74.3%	
	Extraction	7	6.4%	6.4%	80.7%	
	None	21	19.3%	19.3%	100.0%	

While most people (46.8%) evaluated their understanding of AI as average, a sizable number (21.1%) said they knew nothing about it, according to the examination of knowledge about AI and the digital world. Additionally, as shown in figure 1, over half (55.0%) reported having an average awareness of the digital world, highlighting the need for improved educational programs in these areas.

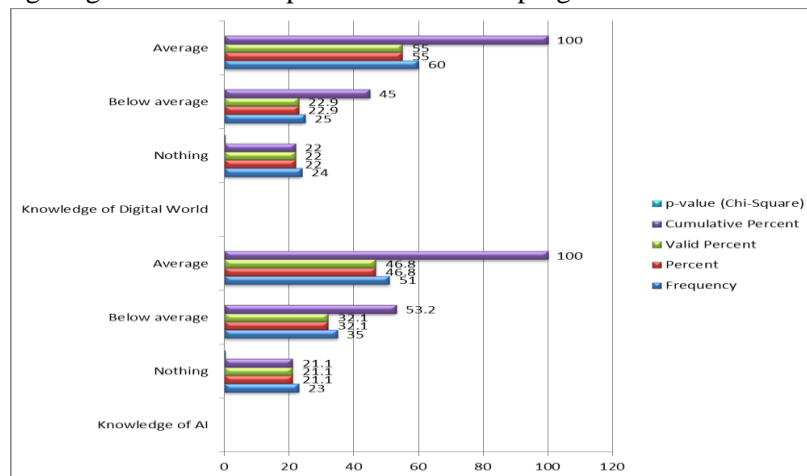


Figure 1: Knowledge of AI and the Digital World

Although there were several different concerns regarding AI in dental health, the influence on workforce demands was the most important one (26.6%). Many respondents acknowledged benefits in spite of these worries, namely safe diagnoses (11.9%) and positive doctor-patient interactions (34.9%).

Table 3: Concerns about AI and Its Advantages

Category		Frequency	Percent	Valid Percent	Cumulative Percent	p-value (Chi-Square)
Concerns About AI	No	13	11.9%	11.9%	11.9%	.451
	Impact on workforce need	29	26.6%	26.6%	38.5%	
	Data security	13	11.9%	11.9%	50.5%	
	New challenges for dr & patients	13	11.9%	11.9%	62.4%	
	Cost	6	5.5%	5.5%	67.9%	
	Lack of accuracy in clinical diagnosis	11	10.1%	10.1%	78.0%	
	Technology giant influence	12	11.0%	11.0%	89.0%	
	Others	12	11.0%	11.0%	100.0%	
Advantages of AI	Time saving	12	11.0%	11.0%	11.0%	.623
	Good doctor-patient relation	38	34.9%	34.9%	45.9%	
	Safe diagnosis	13	11.9%	11.9%	57.8%	
	High treatment quality	14	12.8%	12.8%	70.6%	
	Improved health	11	10.1%	10.1%	80.7%	
	More uniformity	16	14.7%	14.7%	95.4%	
	Other	5	4.6%	4.6%	100.0%	

In general, a sizable portion of respondents believed AI may enhance doctor-patient relationships (31.2%), treatment quality (39.4%), and dental health (41.3%). Strong evidence for AI's possible contribution to oral health was provided by the statistically significant p-values for these views (Table 4).

Table 4: Perceptions of AI Use in Treatment and Implementation

Variable	Response	Frequency	Percent	Valid Percent	Cumulative Percent	p-value
AI Use for Shorter Treatment Time	Yes	36	33.0	33.0	33.0	0.131
	No	32	29.4	29.4	62.4	
	Not sure	41	37.6	37.6	100.0	
AI Improves Oral Health	Yes	45	41.3	41.3	41.3	0.010
	Less	34	31.2	31.2	72.5	
	No	30	27.5	27.5	100.0	
AI Improves Treatment Quality	Yes	43	39.4	39.4	39.4	0.005
	Less	49	45.0	45.0	84.4	
	No	17	15.6	15.6	100.0	

AI Improves Doctor-Patient Relation	Yes	34	31.2	31.2	31.2	0.001
	Less	40	36.7	36.7	67.9	
	No	21	19.3	19.3	87.2	

With 31.2% of respondents prepared to accept a system that performed no better than a dentist with the lowest performance, respondents demonstrated a considerable tolerance for AI faults. 39.4% of respondents, however, voiced doubt about supporting AI operations, highlighting the need for more training and confidence-boosting about AI's application in dental clinics.

Table 5: AI Error Tolerance and Endorsement Procedure

Variable	Response	Frequency	Percent	Valid Percent	Cumulative Percent	p-value
Level of Error Tolerable in AI Diagnostic System	Equivalent to worst-performing dentist	34	31.2	31.2	31.2	0.045
	Equivalent to average-performing dentist	25	22.9	22.9	54.1	
	Superior to average-performing dentist	34	31.2	31.2	85.3	
	Equivalent to best-performing dentist	5	4.6	4.6	89.9	
	Superior to best-performing dentist	11	10.1	10.1	100.0	
Endorsement Procedure	Yes	36	33.0	33.0	33.0	0.060
	No	43	39.4	39.4	72.5	
	Not sure	30	27.5	27.5	100.0	

DISCUSSION

This study's significant conclusion is that a sizable percentage of participants assessed their level of AI understanding as "average." This is consistent with other studies showing that although a large number of dental practitioners are aware of AI technology, there is still a lack of thorough comprehension [13, 14]. Since AI is still developing quickly, educational institutions must improve their AI-related curriculum offerings to make sure that students are prepared to use these tools in their future work. Most research participants agreed that dental health is important, and many of them rated it as "normal" or "high." This illustrates the increasing tendency among dental students to give oral health top priority in their coursework and future careers. However, given the noted worries on how AI may affect job security and the requirement for clinical accuracy, further education and training in AI applications may be necessary to allay anxieties and boost confidence among aspiring dentists [15].

Respondents' biggest worries were about artificial intelligence, especially in relation to clinical diagnostic accuracy and data security. This is in line with results of previous studies pointing out similar worries [16, 17]. These concerns highlight the need of giving complete training in data management and ethical artificial intelligence techniques to foster confidence in AI uses. Educational institutions should provide comprehensive frameworks to manage these challenges so that students are ready to meet the problems given by artificial intelligence in their employment. Students' opinions of artificial intelligence's advantages—particularly in terms of improving doctor-patient relations and treatment quality—

suggestive of a positive attitude toward its application in dentistry. Earlier studies have also shown AI's capacity to streamline processes and offer timelier healthcare [18].

Limitations and Future Suggestions: This study has various limits even if it offers interesting facts. First, because the study depends on self-reported data, individuals may overstate their knowledge or attitudes of artificial intelligence, therefore fostering prejudice. Second, the sample included just of students from one dental college, which might affect the general applicability of the results to other institutions or sectors. Furthermore, challenging to determine the causal link between opinions and knowledge regarding artificial intelligence is the cross-sectional approach of the study.

To get over these limitations and enhance understanding of artificial intelligence in dental education, future research may use a longitudinal approach to track changes in views and knowledge over time. If the research is enlarged to include a more diverse sample from various colleges, the results could be more generally relevant. Moreover, qualitative study exploring students' opinions on artificial intelligence might provide more nuanced knowledge of their motivations and concerns. The curriculum ought to incorporate seminars, workshops, and practical training focused on artificial intelligence so that students have the knowledge and confidence they need to implement AI technologies in their future dental offices. Cooperation between academic institutions and artificial intelligence developers might lead to the creation of tailored instructional materials that fit the particular needs of dental students, therefore preparing a future workforce better educated and prepared.

CONCLUSION

This paper highlights the opinions and knowledge of Fatima Jinnah Dental College students on artificial intelligence in dental health. Although students understand artificial intelligence to a substantial degree, the results reveal that there are major concerns over how technology may influence data security, employment stability, and clinical diagnosis accuracy. Though these issues exist, students see the possible advantages of artificial intelligence in improving the quality of treatment and increasing the relationship between physicians and patients. The curriculum ought to include thorough education and teaching on artificial intelligence technologies if we want to equip next dental practitioners to include AI into their daily work. Dealing with students' concerns and stressing the benefits of artificial intelligence would help to change their perspective on its application in dentistry, therefore enhancing the patient care over time.

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