

# METaverse IN DENTISTRY: ASSESSMENT OF KNOWLEDGE REGARDING ITS APPLICATION AMONG DENTAL STUDENTS AND DENTAL PROFESSIONALS

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## ABSTRACT

The metaverse, a convergence of digital technologies is reshaping various industries and holds significant potential to revolutionize dentistry. The study aimed to appraise the knowledge, understanding, and awareness of dental students and professionals regarding the application of the metaverse in dental practice. A cross-sectional study was administered to gather insights from both dental students and professionals, evaluating their familiarity with metaverse technologies such as XR, Blockchain, Cloud Computing, Digital Twins, and AI, and their perceived potential in patient care, education, and training. A total of 328 participants were involved in the study. The questionnaire link was distributed via WhatsApp Groups and targeted dental students, both undergraduates and postgraduates, and dental faculty. It consisted of 28 questions, regarding demographic details, general information, metaverse in patient care and education, metaverse application in dental training, and conclusive questions. The results revealed varying levels of awareness among participants, with a majority expressing interest and enthusiasm towards integrating metaverse technologies into their practice and education. However, concerns regarding technical proficiency, privacy, and data security were also identified as potential barriers to adoption. The findings highlight the need for targeted educational initiatives to enhance awareness and proficiency in metaverse technologies among dental professionals, ensuring they are well-equipped to leverage its transformative potential for improved patient care and education in dentistry.

**Key words:** Metaverse, Dentistry, Dental education, Patient care, Patient education.

## Introduction

In the constantly developing settings of technological advancements, the concept of the metaverse has emerged as a ground-breaking paradigm, transcending traditional boundaries, and redefining the way we interact with information and engage in virtual environments. The word "Metaverse" – originated from two words -meta and universe, delineates a digital realm blending elements from both the virtual and physical domains. The metaverse, originating from Neal Stephenson's speculative fiction, "Snow Crash," [1] has transcended its fictional origins to become a dynamic amalgamation of digital technologies reshaping various industries, including dentistry. With XR, Blockchain, Cloud Computing, Digital Twins, and AI at its core [2], the metaverse introduces a new era in patient care, where virtual consultations bridge distances [3], immersive VR experiences soothe anxieties, wearable devices monitor oral health remotely, and Blockchain ensures secure record-keeping [4]. Additionally, patient education can also undergo a revolution, leveraging interactive campaigns, immersive journeys, VR tutorials, gamified apps, and virtual clinics to empower individuals with oral health knowledge. With regard to dental education and training, the metaverse offers lifelike simulations and collaborative environments, preparing professionals for real-world challenges and propelling the field towards higher standards of care through

innovative technological integration. This metamorphosis underscores the transformative capability of the metaverse in reshaping the landscape of dental practice, education, and patient engagement. The present study aims to assess the knowledge regarding the effectiveness, usability, and attitude regarding the acceptance of metaverse in various dental contexts, such as patient care and education and dental training and education.

## Materials and Methods

### Study participants

After obtaining the Institutional Ethical Clearance, The questionnaire, comprised of 28 meticulously validated inquiries categorized into sections including demographic details, general questions, and aspects related to metaverse applications in dentistry, was administered via Google Forms through WhatsApp links to both undergraduate and postgraduate dental students, as well as dental faculty members. A total of 328 respondents actively participated in the study, which commenced on 22 January 2024 and concluded on 31 January 2024. The survey was developed based on a literature review, along with drafting, and validating the questionnaire, and conducting pilot testing for clarity. Participants were duly briefed on questionnaire completion protocols, and consent was obtained before their involvement, ensuring adherence to ethical standards.

Stringent measures were enforced to safeguard the confidentiality of participants' demographic information. Frequency distributions and percentages were meticulously scrutinized to discern patterns and trends within the dataset, facilitating a nuanced understanding of participants' perspectives and knowledge domains. The collected data underwent statistical analysis by using different methods such as frequency percentage, chi-square analysis, and multiple logistic regression analysis.

**Results and Discussion**

The participants were largely in the age group of 21-25 Years (49.39%) followed by <=20 Years (39.94%). The majority were females (74.09%). Around 63.11% belonged to the undergraduate category followed by post-graduates (18.29%) and then interns (15.55%).

Half of the participants (57.6%) were aware of Metaverse. Regarding knowledge about tools and technology used in the metaverse, the majority of them i.e. around 78.5% were aware of artificial intelligence followed by 52.25% were aware of extended reality (AR, VR, and AV). As high as (79.3%) of participants were not aware of the use of metaverse technology in the field of dentistry, but almost all of them believed that its incorporation in various fields of dentistry such as patient care (58.5%), patient education (57%) and dental education and training (68.6%) can augment proficiency, skills, and efficiency in the field of dentistry (Table 1).

**Table 1.** Characteristics of the study respondents (n=328).

Category	Number (%)
<b>Age</b>	
<=20 years	131(39.94%)
21-25years	162(49.39%)
>=26 years	35(10.67%)
<b>Gender</b>	
Male	85(25.9%)
Female	243(74.1%)
<b>Occupation</b>	
Undergraduate	207(63.11%)
Interns	51(15.55%)
Postgraduates	60(18.29%)
Faculty	10(3.05%)
Total	328(100%)

<b>Have you heard of Metaverse previously?</b>	
Yes	189(57.6%)
No	139(42.4%)
<b>Are you aware of any of the following tools/technology of Metaverse?</b>	
Extended reality (AR=augmented reality, VR=virtual reality, AV= augmented virtual)	149(52.5%)
Blockchain	33(11.6%)
IoT (internet of things)	38(13.4%)
Digital twinning	49(17.3%)
Artificial Intelligence	223(78.5%)
<b>Are you aware of the use of Metaverse in Dentistry?</b>	
Yes	68(20.7%)
No	260(79.3%)
<b>Can any of these different fields of dentistry is Metaverse useful in?</b>	
Patient care	192(58.5%)
Patient Education	187(57%)
Dental training and education	225(68.6%)

With regards to different applications of metaverse technology in patient care, most participants said that it was useful for the provision of interactive, immersive, and tailored service experiences designed to meet the individual needs of patients(62%), effective treatment planning, and diagnosis (59.1%), providing a walk through on procedure the patient would undergo (47.1%), patient anxiety management (33.8%), Access to dental experts globally – Help in Tele dentistry (31.8%) and to a lesser extent for pain management (23.1%), patient record management (23.1%) and surgery reconstruction and planning (26.6%). The majority of them (84.8%) said that they would be willing to incorporate different interfaces of metaverse applications in their respective clinical practices. In a separate inquiry, respondents demonstrate confidence in metaverse applications for pain management (72.6%) and improving the accuracy of surgical procedures (85.7%). Despite a notable lack of awareness (69.2%) regarding blockchain in record keeping, those familiar recognize its advantages, including ease of maintenance (62.4%), data protection (52.2%), interoperable health records (31.7%), and disaster victim identification (22%). A substantial majority (63.4%) expresses interest in incorporating blockchain into their practices (Table 2).

**Table 2.** Component Analysis

Component	Number (%)
<b>METAVERSE IN PATIENT CARE</b>	
<b>Do you think that metaverse application could be most beneficial in-patient care in any of the following?</b>	

Provide a service experience that is interactive, immersive, and customized to meet the patient's needs.	191(62%)
Effective treatment planning and diagnosis.	182(59.1%)
Provide a walk-through on the procedure the patient would undergo.	145(47.1%)
Access to dental experts globally – Help in Tele dentistry	98(31.8%)
Patient anxiety management	104(33.8%)
Pain management	71(23.1%)
Surgery and reconstruction planning	82(26.6%)
Patient record management	71(23.1%)
<b>Would be willing to incorporate different interfaces of metaverse applications in your clinical practice?</b>	Yes 278(84.8%)
	No 50(15.2%)
<b>Do you think Metaverse can be used for effective pain management?</b>	Yes 238(72.6%)
	No 89(27.4%)
<b>Do you think that metaverse can improve the accuracy and precision of surgical procedures?</b>	Yes 281(85.7%)
	No 47(14.3%)
<b>Are you aware of the use of Blockchain in record keeping and maintenance?</b>	Yes 101(30.8%)
	No 227(69.2%)
<b>What according to you are the advantages of Blockchain?</b>	
Ease in record keeping and maintenance	128(62.4%)
Data protection	107(52.2%)
Interoperable electronic health records	65(31.7%)
Disaster victim identification	45(22%)
<b>Would you like to use Blockchain in your practice?</b>	Yes 208(63.4%)
	No 120(36.6%)
<b>METAVVERSE IN PATIENT EDUCATION</b>	
<b>Do you think the Metaverse application can be used for oral health promotion?</b>	Yes 294(89.6%)
	No 34(10.4%)
<b>Metaverse application might help in the reduction of dental anxiety. Do you agree with this statement?</b>	Yes 283(86.3%)
	No 45(13.7%)
<b>Do you think the Metaverse application will help patients in developing oral hygiene habits?</b>	Yes 287(87.5%)
	No 41(12.5%)
<b>Do you think the use of Gamification, will make people more aware and enthusiastic regarding their oral health?</b>	Yes 264(80.5%)
	No 64(19.5%)
<b>Do you think with the help of the Metaverse application it would be easier to make the patient understand the treatment procedure he/she would be undergoing?</b>	Yes 294(89.6%)
	No 34(10.4%)
<b>Would you be willing to use the Metaverse application for patient education and oral health promotion?</b>	Yes 294(89.6%)
	No 34(10.4%)
<b>METAVVERSE APPLICATION IN DENTAL TRAINING</b>	
<b>Are you aware of the use of the Metaverse application (extended reality), for dental training?</b>	Yes
	No
<b>In which context do you think that Metaverse would be beneficial for dental education?</b>	
Provides students with realistic experiences of physical world learning scenarios.	202(66%)
Hands-on learning possibilities for students to practice.	155(50.7%)
Use of Haptic technology to get a command of manual dexterity.	123(40.2%)
Provision of virtual simulations of dental surgeries.	141(46.1%)
Use of VR to obtain 360 <sup>0</sup> reconstructions of the anatomical structures.	148(48.4%)

Creation of an interactive environment with Real life case scenarios.	93(30.4%)
<b>Do you think Metaverse will help in increasing the skills and confidence of the students?</b>	Yes 299(91.2%)
	No 29(8.8%)
<b>Do you think it will provide global access to education for the students?</b>	Yes 292(89%)
	No 36(11%)
<b>What could be the advantages of the Metaverse application?</b>	
Skill based learning	238(76.8%)
Visualized learning	168(54.2%)
Gamification	105(33.9%)
Delightful learning environment	158(51%)
<b>Do you think the Metaverse application should be incorporated into the dental education curriculum?</b>	Yes 296(90.2%)
	No 32(9.8%)
<b>Would you be willing to use the Metaverse application for dental training?</b>	Yes 296(90.2%)
	No 32(9.8%)

In the realm of patient education, a robust 89.6% see potential in using metaverse for oral health promotion. Respondents also highlight its efficacy in reducing dental anxiety (86.3%) and facilitating patient understanding of treatment procedures (89.6%). Most respondents (87.5%) said that metaverse applications will help the patient in developing oral hygiene habits and (87.5%) believed that with the use of gamification, awareness, and enthusiasm regarding oral health will increase among the general population. More than half of the population (89.6%) is willing to use metaverse applications for patient education and oral health promotion (**Table 2**).

With regards to the role of metaverse application in dental training, 66.2% were aware of the use of Xtended reality for dental training. Most respondents said that Metaverse would be beneficial in offering students authentic learning experiences in real-world scenarios (66%), along with opportunities for hands-on learning to enable student practice (50.7%), use of VR to obtain 360<sup>0</sup> reconstructions of the anatomical structures (48.4%), provision of virtual simulations of dental surgeries (46.1%), use of haptic technology to get a command on manual dexterity (40.2%) and creation of an interactive environment with real-life case scenarios (30.4%). A staggering 91.2% believe metaverse applications will enhance students' skills and confidence,

and 89% envision globally accessible education. Participants recognize advantages such as skill-based learning (76.8%), visualized learning (54.2%), a delightful learning environment (51%), and, to a lesser extent, gamification (33.9%). Around (90.2%) believed that metaverse applications should be made part of the dental curriculum and would be willing to use them for dental training (**Table 2**).

Around (91.8%) thought that the metaverse application with its innovative technological advancements offers the promise of a brighter future in dentistry. When considering the limitations of metaverse application, possible limitations were expensive equipment (59.5%), network security and privacy concerns (53.1%), and to some lesser extent challenges and ethical consideration (39.5%), usability and accessibility issues (39.5%), expertise deficiency (37.6%) and absence of legislative concern (27.7%). The majority of them (88.4%) would like to incorporate the Metaverse application in Dental education, Patient care, and Patient education. Notable 63.7% of respondents indicate a lack of awareness regarding the Dentaverse platform, a specialized Metaverse application tailored for dentistry (**Table 3**).

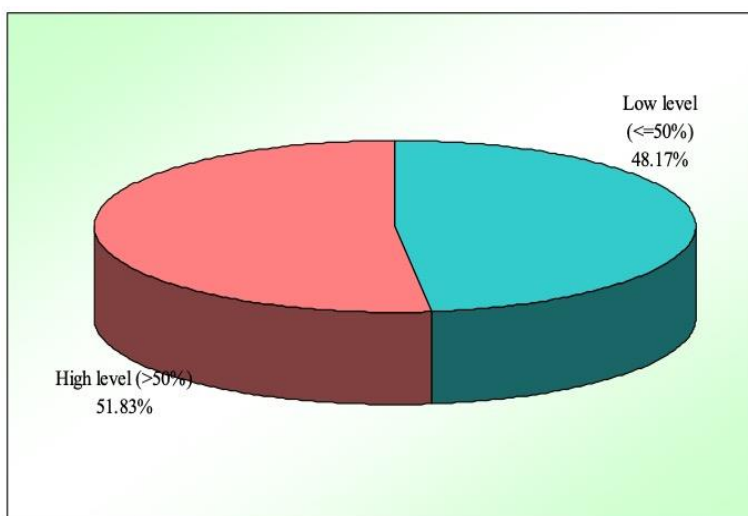
**Table 3. Conclusive Questions**

<b>Conclusive Questions</b>	
	<b>Number (%)</b>
<b>Do you think the Metaverse application with its cutting-edge technological advancements holds the promise of a better future for dentistry?</b>	Yes 301(91.8%)
	No 27(8.2%)
<b>What could be the possible limitations of metaverse applications?</b>	
Expensive equipment's	185(59.5%)
Usability and accessibility issues	123(39.5%)

Challenges and ethical considerations	123(39.5%)
Network security and privacy concerns	165(53.1%)
Absence of legislative restrictions	86(27.7%)
Expertise deficiency	117(37.6%)
<b>Would you like to incorporate metaverse applications in Dental Education, patient education, and care?</b>	Yes 290(88.4%)
	No 38(11.6%)
<b>Are you aware of the Dentaverse platform and Dental Design studio (sandbox), metaverse application for dentistry?</b>	Yes 119(36.3%)
	No 209(63.7%)

On analyzing the level of Knowledge, out of 328 participants, 158 (48.17%) had a low level of knowledge ( $\leq 50\%$ ). Whereas the rest 170 (51.83%) have a high level of knowledge ( $>50\%$ ) (**Figure 1**). The level of knowledge was significantly associated with educational qualifications

with postgraduates having the highest level as compared to undergraduates and faculty both on univariate as well as multivariate analysis with OR 2.55 and CI ranging from 1.03 to 6.27 ( $p=0.0420^*$ ) (**Tables 4 and 5**).



**Figure 1.** Graph depicting the level of Knowledge related to Metaverse in Dentistry among the respondents.

**Table 4.** Association between levels of knowledge with demographic profile of participants with chi-square analysis

	Levels of knowledge				Total	Chi-square	p-value
	Low level	%	High level	%			
<b>Age groups</b>							
$\leq 20$ yrs	58	44.27	73	55.73	131	4.4890	0.1060
21-25 yrs	81	50.00	81	50.00	162		
$\geq 26$ yrs	19	54.29	16	45.71	35		
<b>Gender</b>							
Male	33	38.82	52	61.18	85	1.5550	0.2120
Female	125	51.44	118	48.56	243		
<b>EQ</b>							
First-year	42	50.60	41	49.40	83	35.5210	0.0001*
Second year	14	35.90	25	64.10	39		
Third year	16	42.11	22	57.89	38		
Fourth-year	17	36.17	30	63.83	47		
Interns	28	54.90	23	45.10	51		
Postgraduates	36	60.00	24	40.00	60		

Staff	5	50.00	5	50.00	10		
<b>EQ</b>							
Undergraduates	89	43.00	118	57.00	207		
Interns	28	54.90	23	45.10	51		
Postgraduates	36	60.00	24	40.00	60	10.4190	0.0150*
Staff	5	50.00	5	50.00	10		
Total	158	48.17	170	51.83	328		

\*p<0.05

**Table 5.** Multiple logistic regression analysis of knowledge scores by other factors

Factors	High-level Knowledge	%	Adjusted OR	95% C.I. for OR		P-value
				Lower	Upper	
<b>Age groups</b>						
<=20yrs	58	44.27	0.61	0.18	2.05	0.4270
21-25yrs	81	50.00	0.68	0.23	1.98	0.4810
>=26yrs	19	54.29	Ref.			
<b>Gender</b>						
Male	33	38.82	Ref.			
Female	125	51.44	1.36	0.83	2.24	0.2280
<b>EQ</b>						
Undergraduates	89	43.00	1.44	0.45	4.65	0.5430
Interns	28	54.90	0.87	0.27	2.83	0.8110
Postgraduates	36	60.00	2.55	1.03	6.27	0.0420*
Staff	5	50.00	Ref.			

\*p<0.05

The metaverse constitutes a complex of interconnected simulated worlds that are immersive and shared, where individuals can connect with friends, engage in creative endeavors, play games, work, and shop [5]. A computer-accessed virtual and digital realm made possible by immersive technologies like virtual reality, augmented reality, and mixed reality is known as the "metaverse." This three-dimensional virtual environment is meant to be a communal, shared area where avatars—digital representations of real people—flow naturally from one experience to the next [6]. Metaverse, said simply, is a simulation of the real world. The metaverse's development relies on six core technologies: extended reality for immersive experiences, artificial intelligence for dynamic interactions, digital twin for virtual replicas, telecommunication for connectivity, blockchain for security, and cloud storage for scalability. These technologies collectively enable the metaverse to blend physical and virtual worlds seamlessly, facilitating collaboration and innovation across diverse industries and applications.

Bansal *et al.* [7]: The survey concluded with a vision of a future where digitalized experiences are more interactive, embodied, and multimodal due to advanced technology and wearables. The author advocates for a wide-ranging approach to construct the metaverse, foreseeing it as an

analogous world to our own, and offers a framework to shape its future in healthcare.

Ullah *et al.* [4]: stated that the healthcare industry grapples with challenges like limitations in resources, funding constraints, and geographic barriers. The incorporation of the metaverse into healthcare is seen as a prospective resolution to overcome all the above-mentioned problems. This study explores the metaverse’s transformative potential, focusing on academic discussion and research. It delves into the metaverse fundamentals and their applications in medical domains, from education to clinical care situations and surgical procedures. The study also identifies a shifting mindset, marked by rising telehealth adoption indicating an increase in the embrace of technology within the healthcare sector. Virtual reality, blockchain, and digital twins stand out as critical elements in reshaping the healthcare industry.

Taking a cue from medical health practices in their exploration of the metaverse, use in dentistry will surely evolve in the future [8]. The requirement to travel to hospitals and clinics could be eliminated by substituting routine dental consultations with sessions in virtual clinics. Infection risk for physicians and patients will also be decreased with fewer in-person visits, particularly during



disease outbreaks (COVID-19) [3]. With Metaverse, people can consult a dentist sitting at home just by using headsets which will help in reducing anxiety and fear. It will help in the reduction of the white coat anxiety.

The integration of metaverse technology within dentistry represents a transformative shift in patient care and professional development. The demographics of the respondents in this study provide valuable insights into the demographic distribution of individuals interested in or engaged with the concept of the Metaverse, particularly within the context of dentistry. The predominance of respondents within the age group of 21-25 years, followed closely by those aged  $\leq 20$  years, suggests a strong interest or familiarity with emerging technologies among younger generations.

Furthermore, the educational background of the respondents reveals that most of them belong to the undergraduate category, indicating that the younger, early-career demographic is particularly engaged with investigating the potential applications of Metaverse technology in dentistry. The presence of postgraduates and interns also suggests that individuals at various stages of their academic and professional careers are interested in or exploring the possibilities offered by the Metaverse.

#### *Applications in patient care and education*

The application of metaverse in healthcare is still in its infancy and has not yet gained widespread traction. AR and VR have the potential to enhance patient involvement and education. VR and AR technology can help patients comprehend their medical and dental illnesses and treatments better, which may improve adherence to treatment regimens and eventually result in better health results [9]. The findings from this study shed light on the multifaceted potential of Metaverse technology in both patient care and education within the field of dentistry. Respondents overwhelmingly recognized the benefits of incorporating Metaverse applications into clinical practices, citing advantages such as interactive and customized service experiences, effective treatment planning and diagnosis, and providing walkthroughs of procedures. This indicates a strong acknowledgment of the value that immersive and interactive technologies can bring to enhancing patient care and experience.

Moreover, respondents expressed a willingness to embrace various interfaces of Metaverse applications in their clinical practices, highlighting a readiness to integrate these technologies into their workflows. This openness is further evidenced by respondents' confidence in Metaverse applications for pain management and improving surgical procedure accuracy, underscoring the potential for Metaverse technology to contribute to enhanced clinical outcomes and patient well-being.

While there was a notable lack of awareness regarding Blockchain technology in record-keeping among respondents, those familiar with it recognized its advantages, including ease of maintenance, data protection, and interoperable health records. This suggests a potential for Blockchain to revolutionize record-keeping practices in dentistry, with a substantial majority expressing interest in its incorporation into their practices. In the aspects of patient education, respondents overwhelmingly recognized the potential of Metaverse technology for oral health promotion, reducing dental anxiety, and facilitating patient understanding of treatment procedures.

#### *Applications in dental training*

According to Chen *et al.* [10], using an immersive, blended learning approach that combines traditional classroom instruction with immersive learning experiences in the metaverse can enhance learning outcomes and increase student engagement, particularly in the fields of scientific inquiry and patient care. The results of this study highlight how profoundly Metaverse applications can transform dentistry education and training.

A substantial majority of respondents demonstrated awareness of Extended reality (XR) for dental training purposes, indicating a foundational understanding of immersive technologies within the educational context.

Respondents highlighted several key benefits of incorporating Metaverse applications into dental training programs. These include providing students with authentic experiences in real-world learning scenarios, providing opportunities for hands-on learning practice, utilizing VR for 360-degree anatomical reconstructions, and facilitating virtual simulations of dental surgeries. Additionally, acknowledging the potential of Haptic technology to improve manual dexterity and the development of interactive environments with real-life case scenarios were also recognized as valuable aspects of Metaverse-based dental training. Participants also recognized various advantages of Metaverse-based learning, such as skill-based learning, visualized learning, and the creation of a delightful learning environment. The notion of gamification, although to a lesser extent, was also acknowledged as a potential strategy for engaging students in dental training activities.

Importantly, most respondents expressed a strong desire for Metaverse applications to be integrated into dental curricula, emphasizing the perceived importance and relevance of these technologies in modern dental education.

#### *Challenges*

It is important to recognize and tackle the potential limitations and challenges linked with the integration of Metaverse applications into dental practice. The identified limitations, such as expensive equipment, network security and privacy concerns, and ethical considerations, highlight the practical and ethical complexities that may arise during

the implementation of Metaverse technologies. These challenges necessitate careful consideration and proactive measures to ensure that the benefits of Metaverse applications are maximized while mitigating potential risks and drawbacks. Moreover, respondents also expressed concerns regarding usability and accessibility issues, expertise deficiency, and the absence of legislative concern, indicating additional areas that require attention and intervention to facilitate the effective adoption and utilization of Metaverse technologies in dentistry. Addressing these challenges will be crucial to ensuring equitable access to Metaverse-based solutions and promoting their seamless integration into dental practice.

Despite these challenges, most respondents expressed a strong desire to incorporate Metaverse applications into dental education, patient care, and patient education. The dentistry community can fully utilize Metaverse technology to usher in a new era of innovation and excellence in dental practice by addressing these issues and encouraging increased awareness and expertise among dental practitioners.

#### *Assessment of knowledge*

The data reveals that a significant portion of respondents, approximately 48.17%, possess a low level of knowledge regarding Metaverse applications, indicating a need for education and awareness initiatives to bridge this knowledge gap.

On the other hand, around 51.83% of respondents demonstrate a high level of knowledge about Metaverse applications, suggesting a considerable portion of the dental community is already well-informed and engaged with these technologies. Interestingly, educational credentials seem to exert a significant role in determining the level of knowledge, with postgraduates exhibiting the highest level compared to undergraduates and faculty members. This association underscores the importance of advanced education and training in fostering understanding and proficiency with emerging technologies like the Metaverse. Overall, the study reveals varying levels of knowledge among respondents about Metaverse applications in dentistry, yet there's significant interest in integrating these technologies into dental education, patient care, and patient education.

#### *Implications and future directions*

The findings of this study underscore the growing interest and enthusiasm for integrating Metaverse technology into healthcare delivery, patient education, and dental training. As these technologies continue to evolve, further research and development efforts are warranted to explore their full potential and address any associated challenges. Future studies could focus on evaluating the effectiveness of Metaverse-based interventions in improving patient outcomes, enhancing health literacy, and optimizing training experiences for healthcare professionals. Additionally,

efforts should be made to ensure equitable access to Metaverse applications and address potential barriers to adoption, particularly in resource-limited settings. Overall, the findings suggest a promising future for metaverse technology in transforming healthcare and education paradigms.

#### **Conclusion**

In conclusion, the survey reveals a prevailing optimism among respondents regarding the transformative impact of Metaverse applications in dentistry. While there is widespread enthusiasm for integrating this technology into dental education, patient care, and practice, several significant limitations were identified. These include concerns regarding equipment costs, network security, privacy issues, as well as challenges related to ethics, usability, accessibility, expertise, and legislative frameworks. Despite these obstacles, there is a clear desire among participants to examine the integration of Metaverse technology into multiple facets of dental practice. Notably, a considerable portion of respondents expressed unfamiliarity with specialized platforms like Dentaverse, suggesting a potential awareness gap within the dental community. These findings underscore the importance of addressing both the opportunities and challenges associated with Metaverse applications in dentistry. Moving forward, concerted efforts to mitigate limitations and enhance awareness are essential for fully realizing the potential of this innovative technology within the field.

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