Perception and knowledge of augmented reality in prosthodontics among postgraduates and interns in Tamil Nadu.

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Abstract

Aim: The aim of the study is to determine the perception and knowledge about the application of "Augmented reality in prosthodontics" among the postgraduates and interns in Tamil Nadu.

Materials and methodology: From August to December 2021, a web- based cross-sectional survey inquiry was performed to collect responses from postgraduates and interns across Tamil Nadu. The survey consisted of ten questions and took approximately five minutes to complete. A Google form was used to create the questionnaire. The results of the statistical analysis of the data from the completed questionnaires were used to finish the study.

Results: A total of 200 responses were received, the majority of the participants were interns (131), Post graduates (79). The majority of participants - 48% agreed, 17% strongly agreed and 27% were undecided about the implementation of Augmented Reality (AR) in Prosthodontics.

Further, 41% agreed and 21% strongly agreed that AR would improve the quality of treatment provided while 47% agreed and 17% strongly agreed that errors in fabrication can be avoided. A vast majority 44.5% stated that AR can be used in Diagnosis, Treatment planning, Teaching and Prediction of Treatment Success.

Keywords: Augmented Reality, Tele-dentistry, Prosthodontics, Digital Dentistry, Virtual Reality, CAD CAM.

Introduction

"A technology that superimposes a computer-generated image on a user's view of the real world, thus producing a composite view," according to the definition of augmented reality. However, augmented reality and virtual reality are sometimes mistaken because they share many characteristics, despite the fact that their outputs are vastly different. As the name implies, virtual reality is a virtual immersive environment in which the user's senses are engaged by computer-generated sensations and feedbacks, resulting in a "interaction." Instead, augmented reality creates a connection between the real world and virtual objects.[1]

AR is beneficial because it improves a user's perspective and engagement with the real environment. AR is a real example of intelligence amplification, which involves using computers as tools to assist humans in performing tasks.[1]

Virtual and real elements are combined in a single realistic environment via the AR technology. It has the ability to record both virtual and actual items in a reciprocal manner. It

is interactive and takes place in real time. AR creates a composite vision by superimposing a computer generated image over an operator's view of the actual world. Many prosthetic treatment methods have been simplified thanks to the invention of augmented reality, which easily matches the patient's expectations. [2]

AR offers a wide range of uses. It's utilized as a reference to help with comprehension. Smart learning, interactive tutoring, diagnosis, and treatment planning are all possible with AR technology. Digital radiography, dental scans, computer aided design computer aided manufacturing (CAD-CAM) restorations, orthodontic aligners, oral surgery, and implantology are all examples of where AR is employed. AR creates the algorithm to serve the dental or prosthodontic needs by storing and computing information acquired from a variety of sources. The increased working period of these AR machines, as well as the fact that they execute jobs without human tiredness, is a big benefit.[3]

AR is used actively in prosthodontics, including CADCAM restorations, implantology, and aesthetic planning. It helps with restoration design and mills a restoration with remarkable precision for enhanced function and aesthetics. Furthermore, the concepts are being used to develop various craniofacial prostheses that will be available in the near future. [4]

In Prosthodontics, augmented reality is a new technology. Although it is excellent in learning and CADCAM applications, it will have broader applications in the future for effective clinical procedures. To take use of its benefits, it is necessary to understand these principles and practices.[5]

Because augmented reality is the way of the future in dentistry, it will be critical to adapt and integrate the technology into practice in order to increase treatment accuracy and efficacy. Its impact on both patients and dental professionals in terms of time and quality of care is unrivalled.

Methodology:

The current cross-sectional study involves distributing web-based surveys to a variety of interns and postgraduates across Tamil Nadu. The questionnaire survey was completed by 200 people in total. Given the crucial nature of the pandemic, data was collected using an online questionnaire, avoiding the need for direct interaction with participants. The questionnaire was divided into three sections, the first of which included questions about the participant's qualifications and skills. Section 2 contained questions about AR knowledge and understanding, whereas Section 3 contained questions about AR perception. The questionnaire had a total of ten questions, and the completed questionnaires were checked for accuracy and statistically analysed.

In the current study, out of 200 people who took part in the web-based survey, every single one of them agreed to participate voluntarily and completed the questionnaire, resulting in a 100% response rate.

Among 200 respondents, seventy nine (39.5%) were post graduates and one hundred twenty one (60.5%) were interns , ninety eight (48%) admitted to using digital technology in their dental practice, one hundred two (52%) denied using digital technology with AR (Table 1).

Eighty nine (44.5%) of the participants said that AR can be used in Diagnosis, Teaching, Treatment Planning and Prediction of treatment success. Twenty one (10.5%) said that AR can be used in only Diagnosis and Treatment Planning while seventeen (8.5%) said that AR can only be used in Treatment Planning and Prediction of treatment success (Chart 1).

Eighty (40%) participants said that AR benefits include accuracy, patient satisfaction, Time saving and provides real time display of post operative treatment outcome. Thirty (15%) said that AR benefits include only accuracy, patient satisfaction and time saving while twenty one (10.5%) said it only helps in accuracy and

patient Satisfaction (Chart 2).

Thirty six (18%) of the dentists said that the drawbacks of AR include expensiveness, requires skills and precision, needs staff need to be trained and is time consuming. Thirty five (17.5%) said that the drawbacks include only expensiveness, requires skills and precision and needs staff need to be trained while Thirty three (16.5%) said that it is only requires skills and precision and needs staff need to be trained (Chart 3).

53% agreed and 32% strongly agreed that AR will help in better visualization of dental anatomy and understanding of concepts than textbooks can be achieved. 47% agreed and 17% strongly agreed that errors in fabrication can be avoided with AR. 46% agreed and 16% strongly agreed that explanation of treatment plan to the patient is easier with AR and 41% agreed and 21% strongly agreed that AR will improve the quality of treatment provided and 48% agreed that AR should be implemented (Chart 4).

Discussion

AR demonstrates cutting-edge dental and prosthetic rehabilitation technology. The accuracy, time savings, and improved communication with the patient and laboratory technician are all key advantages of AR in prosthetic rehabilitation because it completes tasks with minimal human weariness. In dynamic implant navigation, augmented reality has had a lot of success. It's a promising smile design tool that allows for treatment pre-visualization and active patient participation in decision-making. Nonetheless, greater developments are needed in picture quality, software flexibility, and simplicity of integration in the everyday dentistry workplace. Three-dimensional conception, video analysis, functional movement evaluation, and prosthesis design all require further development.[6]

There are very few studies on AR in dentistry, and conclusive methods will necessitate more established designs and long-term research. It is useful for interactive learning and objective evaluation, according to studies. There were positive results in maxillofacial surgery, CAD-CAM, and implantology. On the other hand, the literature emphasized the significance of developing approved applications for dental/prosthodontic AR devices and establishing technological standards with high data quality for convenient clinical use. The AR systems are expensive have a few features that require comprehension, and make the conversions from clinical practice difficult and requires extensive research and development.

Conclusion:

Within the limitation of the study it can be concluded from the cross-sectional study that the interns and postgraduates have an acceptable level of knowledge regarding AR and are aware of the benefits of AR and wish to implement it in their dental offices. They understand that it will increase the accuracy, save time, and improve the communication with the patient and will also help in better visualization of dental anatomy and in understanding of concepts and also help in avoiding errors in fabrication. They seemed to be slightly skeptical about the expenditure involved in the implementation of AR and also the extent of skills training that will be required for the staff.

However, to further enhance the knowledge regarding AR and other digital technologies, efforts should be made to encourage the practitioners to be aware of the recent advances through state-of-the-art continuous education programs.

References

1. Azuma RT. A survey of augmented reality. Presence Teleoperators Virtual Environ. 1997;6(4):355–85.
2. Kwon HB, Park YS, Han JS. Augmented reality in dentistry: A current perspective. Acta Odontol Scand 2018;76:497-503.
3. Huang TK, Yang CH, Hsieh YH, Wang JC, Hung CC. Augmented reality (AR) and virtual reality (VR) applied in dentistry.
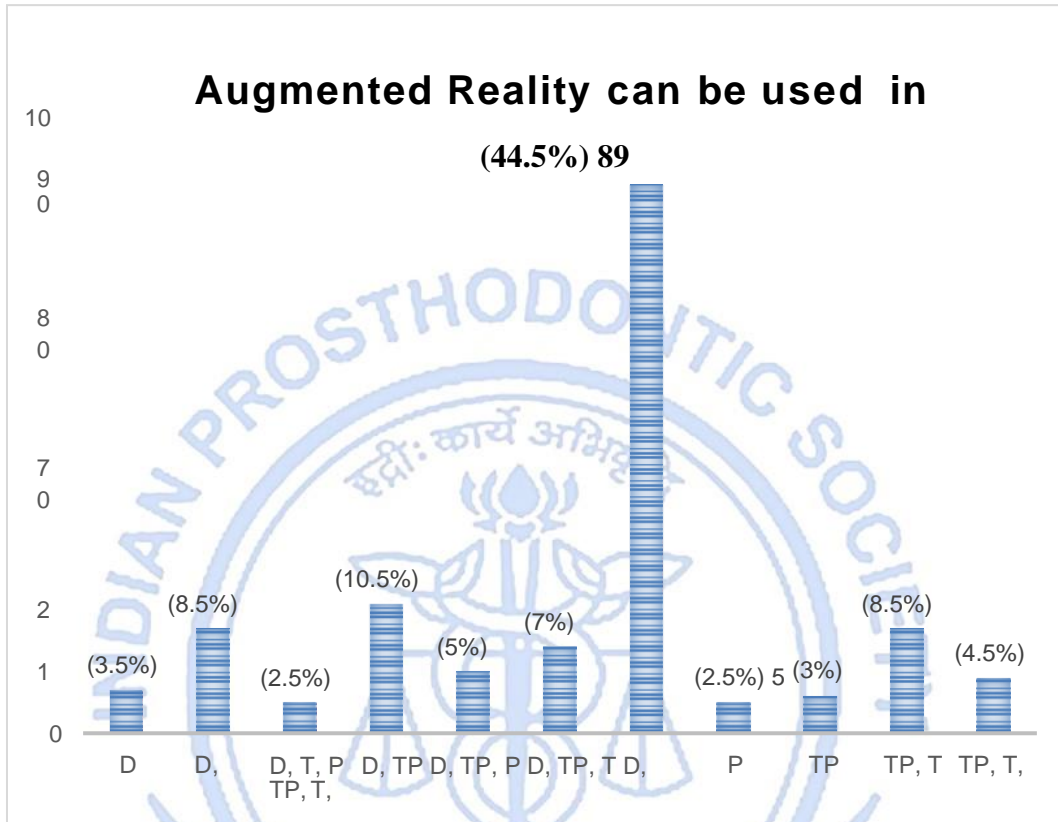
Kaohsiung J Med Sci 2018;34:243-8.

4. Albuha Al-Mussawi RM, Farid F. Computer-based technologies in dentistry: Types and applications. J Dent (Tehran) 2016;13:215-22.
5. Chander NG. Augmented reality in prosthodontics.J Indian Prosthodont Soc 2019;19:281-2.
6. Rania Moussa. "Augmented Reality Innovation in Prosthodontics and Smile
7. Design". Scientific Archives Of Dental Sciences 4.12 (2021): 19-22.

Tables

QUESTIONS	CHOICES	COUNT	FREQUENCY
Qualification	POST GRADUATE STUDENT	79	39.5%
	INTERNS	121	60.5%
Do you use digital technology with AR in daily practice	YES	98	49%
	NO	102	51%

CHARTS

Chart No. 1

Augmented Reality can be used in

(44.5%) 89

	Value
(3.5%)	D
(8.5%)	D,
(2.5%)	D, T, P TP, T,
(10.5%)	D, TP
(5%)	D, TP, P
(7%)	D, TP, T
	D,
(2.5%) 5	P
(3%)	TP
(8.5%)	TP, T
(4.5%)	TP, T,

LEGENDS:

D – DIAGNOSIS T- TEACHING

TP – TREATMENT PLANNING

P – PREDICTION OF TREATMENT SUCCCESS
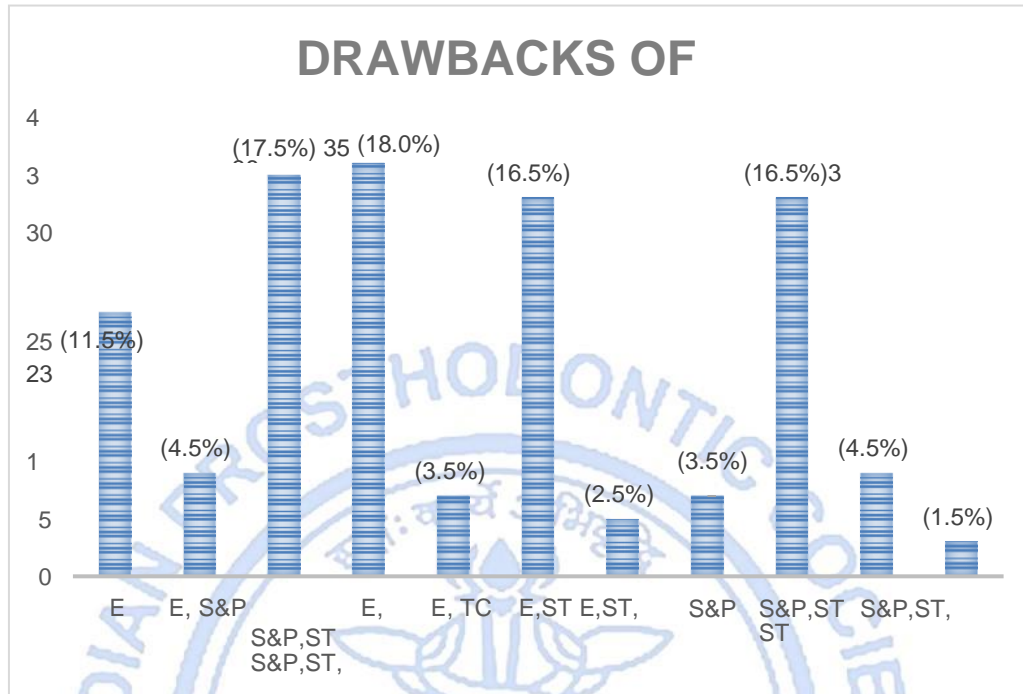
Chart No. 2

BENIFITS OF Augmented Reality
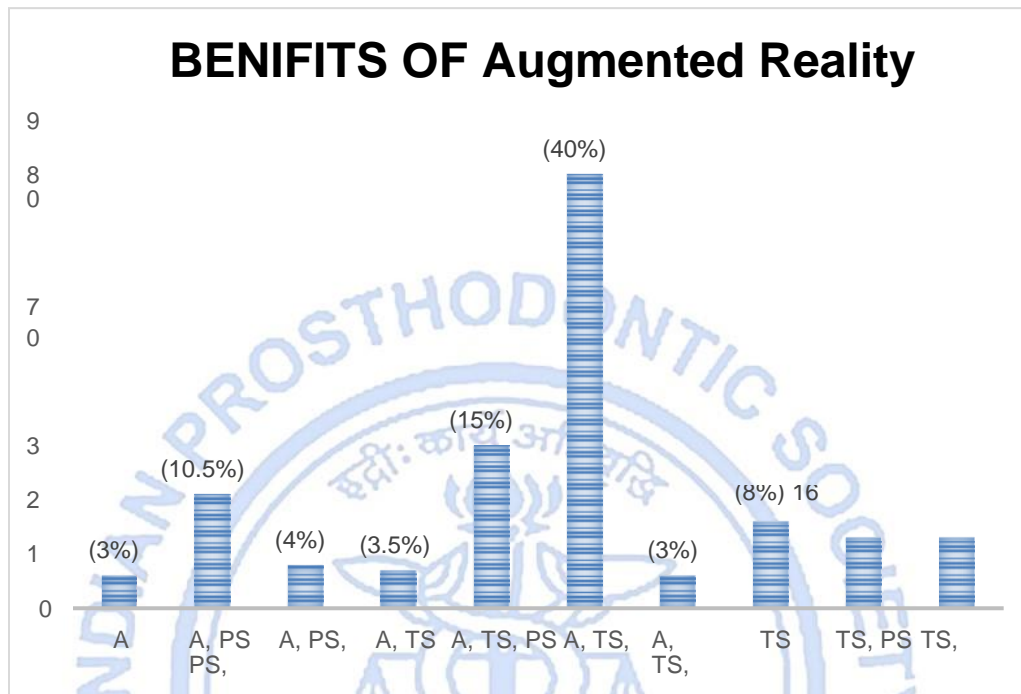
LEGEND:

A – ACCURACY

PS – PATIENT SATISFACTION

TS – TIME SAVING

RTD – REAL TIME DISPLAY OF POST OP TREATMENT OUTCOME

Chart No. 3

DRAWBACKS OF

Legend
LEGEND:
E – EXPENSIVE
S&P – REQUIRES SKILLS AND PRECISION
ST – STAFF NEED TO BE TRAINED
TC – TIME CONSUMING

Chart No. 4

OPINION ON AR

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