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RESEARCH ARTICLE

Perceptions and attitudes towards Artificial Intelligence in Periodontal Surgery: A cross sectional survey among Periodontists

Dr Deepa Subramaniam[1], Dr Bhuminathan Swamikannu[2], Dr Narasimha Raghavan[3] ,Dr Ramankrishnan Kesavan [4], Dr Karthikeyan Rajendran Pandiyambakkam[5], Mr Arumugam Shanmugavelayutham[6] ,Ms Jeevika S[7], Arunkumar Shanmugavelayutham[8]

[1]Degree – MDS Designation – Research Scholar Department: Department of Dental Science Institution / affiliation – Bharath Institute of Higher Education and Research
[2] MDS., PhD Registrar Bharath Institute of Higher Education and Research Chennai
[3] BDS., M Sc., PhD Director RNR Research Service Chennai
[4] Professor Department of Public Health Dentistry Thai Moogambigai Dental College and Hospital Chennai
[5] BDS., M Sc., Research Coordinator Schizophrenia Foundation (I) Chennai
[6] Founder bFacet Automation Private Limited Chennai
[7] Intern bFacet Automation Private Limited B Tech., CS core, Vellore Institute of Technology Vellore
[8] B Tech ML Engineer bFacet Automation Private Limited Chennai

*Corresponding Author
Dr Deepa Subramaniam

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Abstract: ***Background:*** Nowadays the application of artificial intelligence (AI) has expanded to the healthcare sector, with its use extending into periodontal surgical procedures. It is essential to understand the perception of periodontists towards the AI usage to adopt it in clinical practice.***Aim:*** This study assessed the periodontists' attitudes and perceptions on the implementation of AI in periodontal surgery.***Methods:*** This cross-sectional survey was carried out among 100 periodontists, who were either practitioners or college staffs or postgraduate students. The perception on AI utilization in pre-surgical and surgical procedures, detection of complications, planning soft tissue graft, assistance by robots, stimulation of outcome, selection of donor site, intraoperative analysis, quantifying parameters and enhancing images were evaluated in this survey. ***Results:*** Most of the periodontists showed positive attitudes towards AI application in periodontal surgeries. AI usage for pre-surgical planning (77%) received highest acceptance followed by surgical navigation systems (73%). AI-assisted robotics (63%) received moderate acceptance and complication detection (56%) received mixed response. More positive attitude was shown by the postgraduate students in comparison to the experienced practitioners and staff members.***Conclusions:*** Overall positive perception was demonstrated by the periodontists towards the integration of AI in periodontal surgery, especially when used for planning or navigation purposes. However, there was difference in acceptance based on the level of experience as well as AI utilization for different procedures, which necessitates further education on AI usage and gradual implementation in clinical practice.

Keywords: Artificial intelligence, periodontal surgery, periodontists, survey, attitudes, perceptions

INTRODUCTION

The utilization of AI in the healthcare has been a revolutionary movement in various medical specialities, extending to even the dental field [1]. In periodontics, the application of AI has evolved from theoretical concepts to practical application for clinical procedures. Earlier, it was utilized for assistance in diagnosis, to analyse radiographic images and to know the bone loss patterns of periodontal region in patients [2].

The AI systems have expanded beyond diagnosis in periodontic practice encompassing planning of the treatment, guidance in surgical procedures, and outcome prediction. These machine learning models are capable of predicting healing patterns and also provides suggestions in modifying the surgical protocols depending on different patient parameters [3]. The AI integrated navigation system for surgical procedures provides feedback continuously during the procedures by providing live footage of the surgical procedure integrated with preoperative image and thereby guides the practitioner for proper instrument placement. [4].

The robotic systems controlled by AI perform tasks that are repetitive which was accurate consistently, which aids in reducing fatigue of the practitioner while performing procedures for long time [5]. Although AI is a promising development, certain challenges exist that affects its utilization for treatment procedures. Various barriers affecting technologically are requirement of well-built infrastructure, we need to ensure that it fits well with the already existing clinical workflows and different AI systems shows smooth interoperability [6]. Another important factor responsible for the success of incorporating AI into dental practice is the acceptance by the practitioners. The attitude of a healthcare provider towards new innovations are affected by

perception of usefulness, the ease in using it as well as trust in the recommendations provided by AI systems [7].

Therefore, this study aimed to evaluate the attitude and perceptions of periodontists regarding various AI applications in periodontal surgical procedures and also the overall acceptance levels for different AI applications, and identified the factors associated with positive or negative attitudes toward AI implementation.

MATERIALS AND METHODS

Study design and setting

This study is a cross-sectional survey conducted from May - July 2025, among 100 periodontists of South India and was designed as per STROBE guidelines [8]. The participants were from various dental institutions and clinical settings, including academic dental colleges, postgraduate training centres, and private dental practices.

Study participants

The target population comprised periodontists with exposure to periodontal surgical procedures, including faculty members, postgraduate students in periodontology, general dentists with periodontal surgery experience, and specialist periodontists. Qualified periodontists (Master's or equivalent) who were practising with a minimum of 6 months of clinical experience, those under training and were willing to provide informed consent were included in this study. Undergraduate dental students, periodontists without periodontal surgery exposure and survey responses which were incomplete (>20% missing data) were excluded.

Sample size and sampling

Sample size was calculated assuming a 70% proportion of positive attitudes, with ±10% precision and 95% confidence level, yielding a minimum of 81 participants. 100 participants were recruited to account for potential non-response. A convenience sampling approach was employed with stratified recruitment across different professional categories.

Survey instrument and data collection

A structured questionnaire consisting of demographic information and 10 questions assessed perceptions towards specific AI applications in periodontal surgery: Pre-surgical planning (incision lines, flap designs), surgical navigation systems, early complication detection, AI-assisted robotics and guided surgery, intraoperative photo/video analysis, soft tissue graft planning, aesthetic outcome simulation, automated donor site selection, post-surgical parameter quantification and AI-enhanced imaging and magnification. A 5-point Likert scale was used for each question, which include: Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5). An online platform was used for data collection for this survey after obtaining informed consent from all the participants. The study protocol was reviewed and approved by the Institutional Ethics Committee. Data was collected anonymously with no personal identifiers, stored on encrypted servers with restricted access.

Data Analysis

Descriptive statistics were calculated for all variables. Three responses were recorded: positive (Agree/Strongly Agree), neutral, or negative (Disagree/Strongly Disagree). Chi-square tests assessed associations between participant characteristics and attitudes. Statistical significance was set at $p < 0.05$.

RESULTS AND OBSERVATIONS:

Participant characteristics

Around 100 periodontists participated in this survey. Graph1 showed that there were 39 male participants and 61 female participants. The majority were postgraduate students (n=63), followed by staff members (n=22) and practising dentists (n=15), as shown in graph 2. Overall, 0 - 38 years of professional experience was noticed, with a mean of 8.4 years (SD ± 9.2). Staff members had mean experience of 16.8 years (SD± 8.1), postgraduate students 1.8 years (SD ± 0.9), and practicing dentists 10.2 years (SD ± 6.4) (table 1).

Overall attitudes toward AI applications

Overall, 68.7% of respondents expressed positive attitudes toward AI integration in periodontal surgical practice, while 19.4% remained neutral and 11.9% expressed negative attitudes (as seen in graph 3). The distribution consistently reflected favourable reception across all ten AI applications.

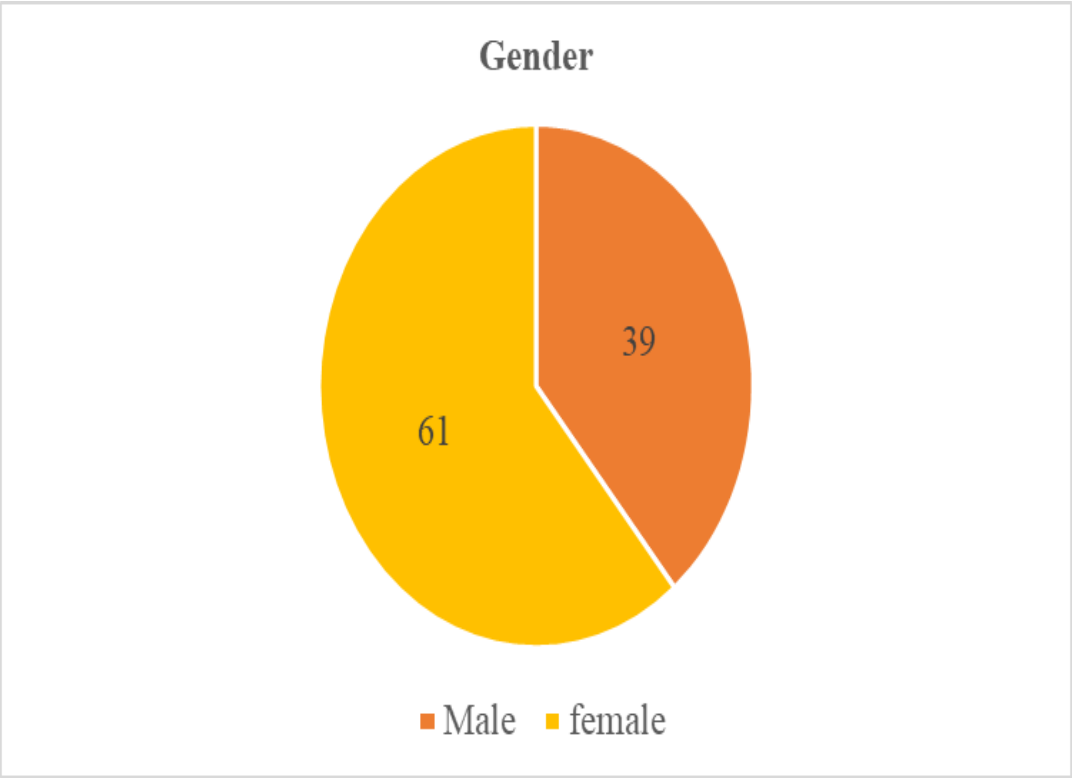
Application-specific results

Graph 3 and table 2 show that pre-surgical planning received the highest acceptance (77% agree/strongly agree), with only 6% disagreeing and 21% neutral, followed by surgical navigation with second-highest acceptance (73% agree/strongly agree) (5% disagreeing and 23% neutral) and soft tissue graft planning (70% agree/strongly agree), with 5% disagreeing and 25% neutral. Complication detection (62% agree/strongly agree) and AI-assisted robotics (63% agree/strongly agree) received moderate acceptance.

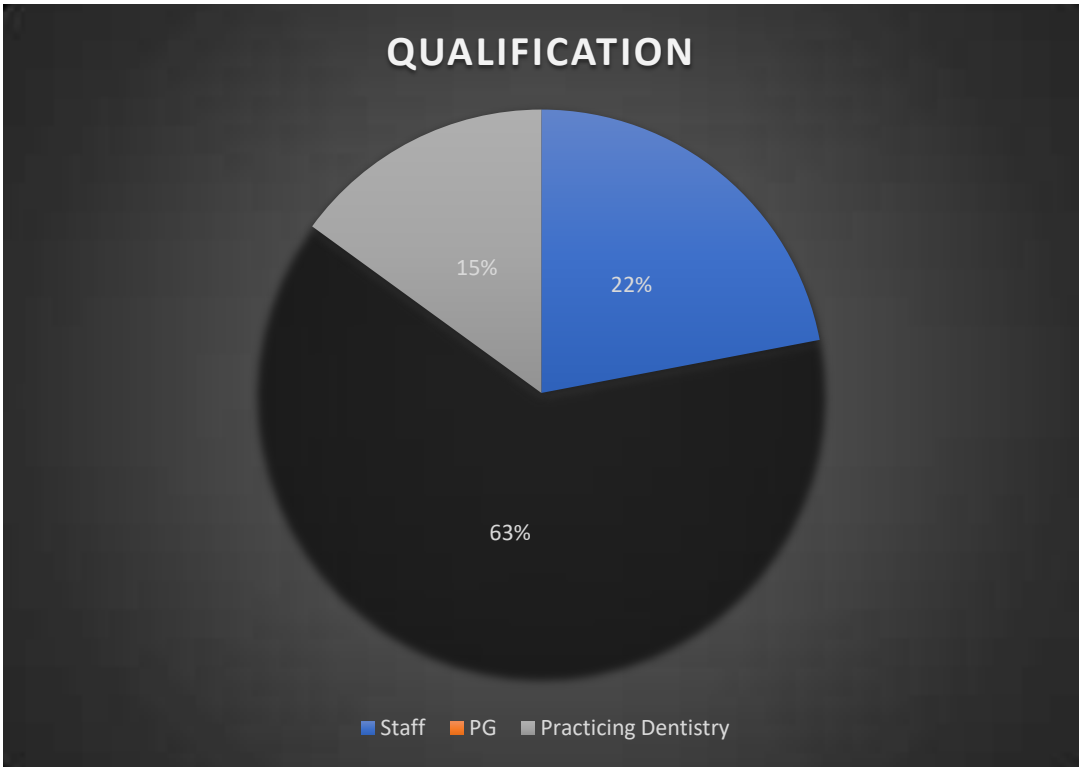
Subgroup analysis by professional category

Table 3 reveals that highest acceptance of AI application in periodontal surgery was demonstrated by the postgraduate students, across all the domains as compared to the practitioners and staff. Perception towards three domains assisted by AI, that is, fatigue reduction due to robotics (p=0.032), soft tissue graft planning (p=0.011) and simulation of aesthetic outcomes (p=0.037) showed significant association.

GRAPH 1. GENDER OF THE PERIODONTISTS



GRAPH 2. PROFESSIONAL CATEGORY OF THE PERIODONTISTS



GRAPH 3. OVERALL ATTITUDE TOWARDS DIFFERENT AI APPLICATIONS

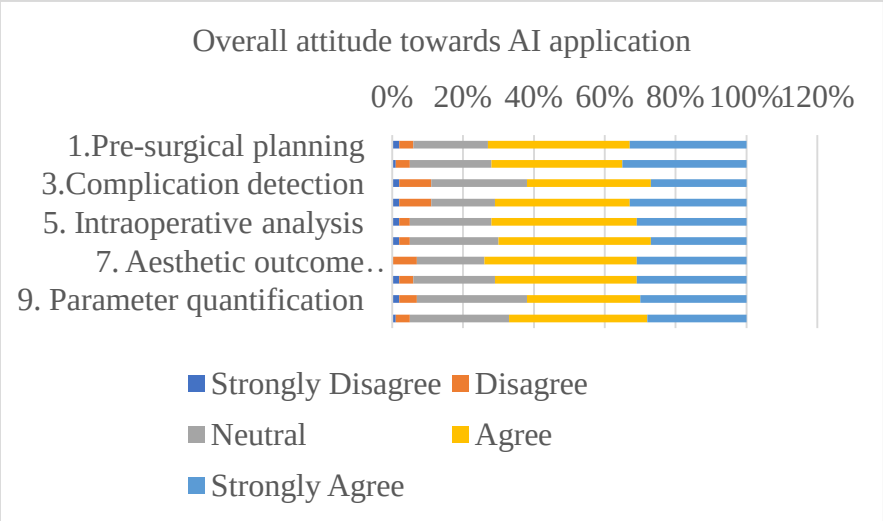


TABLE 1. YEARS OF EXPERIENCE BY QUALIFICATION

QUALIFICATION	N	MEAN ± SD
Staff	22	15.62 ± 9.18
PG	63	2.37 ± 2.50
Practicing Dentistry	15	8.87 ± 6.70

TABLE 2: DESCRIPTIVE STATISTICS ON PERCEPTIONS TOWARD AI IN PERIODONTAL SURGERY

AI-related question	Strongly Agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly Disagree n (%)
AI could assist in pre-surgical planning	33 (33.0 %)	40 (40.0 %)	21 (21.0 %)	4 (4.0 %)	2 (2.0 %)
AI-powered surgical navigation improves accuracy	35 (35.0 %)	37 (37.0 %)	23 (23.0 %)	4 (4.0 %)	1 (1.0 %)
AI helps early detection of complications	27 (27.0 %)	35 (35.0 %)	27 (27.0 %)	9 (9.0 %)	2 (2.0 %)
AI-assisted robotics improve workflow/reduce fatigue	33 (33.0 %)	38 (38.0 %)	18 (18.0 %)	9 (9.0 %)	2 (2.0 %)
AI analysis of intra-operative photos/videos valuable	31 (31.0 %)	41 (41.0 %)	23 (23.0 %)	3 (3.0 %)	2 (2.0 %)
AI assists soft-tissue graft planning	27 (27.0 %)	43 (43.0 %)	25 (25.0 %)	3 (3.0 %)	2 (2.0 %)
AI simulates esthetic outcome pre-surgery	31 (31.0 %)	43 (43.0 %)	19 (19.0 %)	7 (7.0 %)	0 (0.0 %)
AI suggests donor site and graft dimensions	31 (31.0 %)	40 (40.0 %)	23 (23.0 %)	4 (4.0 %)	2 (2.0 %)
AI quantifies root-coverage/tissue-gain outcomes	30 (30.0 %)	32 (32.0 %)	31 (31.0 %)	5 (5.0 %)	2 (2.0 %)
AI-enhanced imaging aids precise suturing	28 (28.0 %)	39 (39.0 %)	28 (28.0 %)	4 (4.0 %)	1 (1.0 %)

TABLE 3: ASSOCIATION BETWEEN QUALIFICATION AND PERCEPTION TOWARD AI IN PERIODONTAL SURGERY

AI-related question	Staff n (%)	PG n (%)	Practicing Dentists n (%)	Total n (%)	P value
AI assists pre-surgical planning	6 (18.2 %)	24 (72.7 %)	3 (9.1 %)	33 (33.0 %)	0.104
AI-powered navigation improves accuracy	6 (17.1 %)	25 (71.4 %)	4 (11.4 %)	35 (35.0 %)	0.325
AI detects surgical complications	3 (11.1 %)	23 (85.2 %)	1 (3.7 %)	27 (27.0 %)	0.068
AI-assisted robotics reduce fatigue	5 (15.2 %)	24 (72.7 %)	4 (12.1 %)	33 (33.0 %)	0.032
AI analyzes intra-operative photos/videos	7 (22.6 %)	22 (71.0 %)	2 (6.5 %)	31 (31.0 %)	0.412
AI helps soft-tissue graft planning	4 (14.8 %)	21 (77.8 %)	2 (7.4 %)	27 (27.0 %)	0.011
AI simulates esthetic outcomes	4 (12.9 %)	20 (64.5 %)	7 (22.6 %)	31 (31.0 %)	0.037
AI suggests donor site/graft dimensions	5 (16.1 %)	23 (74.2 %)	3 (9.7 %)	31 (31.0 %)	0.054
AI quantifies post-surgical parameters	5 (16.7 %)	22 (73.3 %)	3 (10.0 %)	30 (30.0 %)	0.447
AI-enhanced imaging aids suturing	6 (21.4 %)	20 (71.4 %)	2 (7.1 %)	28 (28.0 %)	0.138

DISCUSSION

AI application acceptance hierarchy

The results showed clear hierarchy in the acceptance of AI application in periodontal practice, providing important insights for implementation prioritization. Pre-surgical planning received the highest acceptance (77%), followed by surgical navigation (73%). This pattern suggests periodontists are most comfortable with AI applications that enhance existing decision-making processes rather than replacing clinical judgment [9] .

This likely reflects periodontists' familiarity with digital treatment planning workflows and recognition of the complexity involved in optimal incision line and flap design selection.

Professional experience and technology acceptance

The post graduates exhibited the highest positive perception towards utilization of AI in periodontal surgery. This is in line with the findings of previous research stating that younger professionals are inherently more technology-receptive [10]. In addition, their recent exposure to academics might have influenced their outlook towards incorporating AI into clinical practice.

The predominance of postgraduate students (62%) with relatively low experience levels provides unique insights into early-career attitudes toward AI. While younger practitioners might be expected to embrace new technologies, it must be noted that clinical experience and understanding of procedural complexities may be more important factors than age alone [11].

Implications for implementation strategy

The difference in the rate of acceptance aids in promoting strategic implementation of AI. The applications with highest acceptance level (pre-surgical planning, surgical navigation) must be given priority for initial development and introduction into the clinical practice.

Applications with moderate level of acceptance (soft tissue graft planning, intraoperative analysis) are part of the second-phase of implementation strategy. More extensive studies as well as educational programs are required to validate and incorporate the procedures like AI- assisted complication detection and parameter quantification, which received lower acceptance [11].

Implications in education and training

The difference in the level of acceptance based on experience indicates the need for targeted educational approaches. Education focussing on understanding how common clinical challenges are addressed by AI would be helpful for postgraduate students. For experienced practitioners, approaches should emphasize how AI enhances existing expertise rather than replacing clinical judgment [12] .

The number of neutral responses (16-25%) suggest that demonstration and educational opportunities could have significant influence on the future acceptance rate.

Sufficient knowledge regarding the capability of AI in forming definitive opinions are lacking in many practitioners, indicating that educational programs and hands-on experience are necessary [13].

Limitations

This study has certain inherent limitations. The sample size was less and thus, affects generalizability. Geographic limitation to India may not reflect global attitudes. The cross-sectional design of this study provides only a short view of current attitudes. The survey relied on self-reported perceptions without assessing actual hands-on AI experience. The predominance of academic-affiliated respondents may not fully represent private practice attitudes.

CONCLUSION

Periodontists demonstrated overall positive perception towards AI integration in periodontal surgery, with particularly strong support for planning and navigation applications. However, there was significant variation in acceptance depending on the type of AI applications used as well as the level of experience of the practitioner. These data suggest that successful AI implementation requires prioritized development of high-acceptance applications; comprehensive training programs addressing reliability concerns; gradual implementation strategies, building from planning to real-time applications and experience-based educational approaches recognise different professional needs. This study acts as a basis for targeted development of technologically enhanced treatment approaches by incorporating AI in periodontal surgery, which aims at improving patient outcome.

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