

Knowledge, Attitudes, and Scenario-Based Treatment Decision-Making Regarding Implant-Supported Dental Rehabilitation in Patients with Special Healthcare Needs among Dental Professionals: A Cross-Sectional Study

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HOW TO CITE:

Amuthan S, Hibah Hasan, Suryanarayanan T, Rakshana Devendran, Roshan Arbaaz, Arthi Ramalingam (2026). Knowledge, Attitudes, and Scenario-Based Treatment Decision-Making Regarding Implant-Supported Dental Rehabilitation in Patients with Special Healthcare Needs among Dental Professionals: A Cross-Sectional Study. International Journal of Special Education, 41(20s), 334-344

ABSTRACT:

Background: Patients with special healthcare needs (SHCN) often present with behavioral, cognitive, communication, neuromuscular, and maintenance-related challenges that complicate dental treatment planning. While implant-supported rehabilitation offers significant functional and prosthetic benefits, clinicians frequently express concerns regarding patient cooperation, oral hygiene, caregiver support, and long-term maintenance. Evidence evaluating dental professionals' knowledge, attitudes, and actual clinical decision-making regarding implant therapy in this population remains scarce.

Aim: To assess knowledge, attitudes, and scenario-based clinical decision-making regarding implant-supported dental rehabilitation in patients with special healthcare needs among dental professionals, and to identify factors associated with treatment recommendations and educational needs.

Materials and Methods: A cross-sectional questionnaire-based study was designed for practicing dental professionals. The instrument comprised five domains: professional characteristics, implant-related knowledge (10 items), attitudes and influencing factors (10 items), scenario-based clinical decision-making (3 standardized scenarios), and educational needs. Primary outcome measures focused on favorable clinical decision-making across

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distinct patient scenarios. Data from 250 dental professionals were analyzed using chi-square tests and multivariable logistic regression to establish statistical models.

Results: Among the 250 participants, the mean knowledge score was 6.2 ± 2.1 out of 10, with 38.0% demonstrating good knowledge. The mean attitude score was 38.1 ± 6.2 out of 50. Favorable clinical decision-making declined significantly as scenario complexity increased: 80.8% for a favorable candidate, 63.2% for a moderately challenging candidate, and 29.6% for a high-challenge candidate ($p < 0.001$). Previous implant training (OR: 2.21), SHCN clinical experience (OR: 1.88), formal special-care training (OR: 2.38), and higher knowledge scores (OR: 2.71) were factors independently associated with favorable decision-making. Overall, 79.2% expressed a need for structured continuing education.

Conclusion: Although dental professionals generally exhibit positive attitudes, clinical decision-making is heavily dictated by patient cooperation, oral hygiene, and caregiver reliability. Targeted educational programs integrating implantology and special-care dentistry are required to improve clinical decision-making and access to care.

Keywords: dental implants; special healthcare needs; special care dentistry; prosthodontics; knowledge; attitudes; clinical decision-making; dental education.

1. Introduction

Patients with special healthcare needs (SHCN) encompass individuals with physical, developmental, mental, sensory, behavioral, cognitive, or emotional impairments that necessitate specialized medical and dental approaches. Conventional oral healthcare for this demographic often prioritizes prevention, basic restorative care, and emergency management. However, tooth loss remains highly prevalent, resulting in severe compromises to masticatory efficiency, facial aesthetics, speech, and overall quality of life.

While conventional removable prostheses are frequently prescribed, they present inherent challenges in SHCN populations, including compromised retention, inadequate neuromuscular adaptation, heightened gag reflexes, risk of ingestion/aspiration, and manual dexterity issues during insertion and cleaning. Implant-supported rehabilitations offer superior

prosthetic retention, enhanced stability, and preservation of alveolar bone mass (Loyola-Rodriguez et al., 2022).

Despite these benefits, clinicians often exhibit hesitation to propose implant therapy due to concerns surrounding surgical compliance, maintenance of peri-implant hygiene, reliance on caregivers, and long-term biological complications. Importantly, physical or cognitive impairment alone should not constitute an automatic exclusion criterion for implant therapy; treatment suitability must be evaluated on an individualized basis.

Existing literature reveals notable knowledge gaps and limited formal training regarding special-care dentistry among practicing clinicians (Marchini & Ettinger, 2020). Standard Knowledge-Attitude-Practice (KAP) models frequently fail to capture how theoretical knowledge transfers into real-world choices. To address this gap, this study incorporates

standardized clinical scenarios alongside knowledge and attitude metrics to evaluate the clinical decision-making process of dental professionals regarding implant therapy for patients with special healthcare needs.

Objectives

- Assess dental professionals' knowledge regarding implant rehabilitation in SHCN patients.
- Evaluate professional attitudes and patient- or caregiver-related factors influencing treatment decisions.
- Analyze scenario-based clinical decision-making under varying levels of patient complexity.
- Determine factors (e.g., training, experience, and knowledge) associated with favorable treatment recommendations in scenario-based clinical decision-making.
- Identify self-perceived educational and training needs.

Null Hypothesis

There is no significant association between professional characteristics, knowledge levels, attitudes, and clinical decision-making regarding implant-supported rehabilitation in patients with special healthcare needs.

2. Methodology

2.1 Study Design and Ethical Considerations

This observational, cross-sectional, questionnaire-based study was designed in accordance with the Declaration of Helsinki and reported following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. Institutional Ethics Committee approval was obtained prior to survey distribution, and informed consent was required from all participants before accessing the questionnaire.

2.2 Study Population and Eligibility Criteria

The study population comprised registered dental practitioners and postgraduate residents actively engaged in clinical practice. The final

analytical sample comprised 250 eligible respondents. The available study record does not provide a prespecified formal sample-size calculation; therefore, no post-hoc sample-size calculation has been introduced into the manuscript.

- **Inclusion Criteria:** Registered general dental practitioners (GDPs), dental specialists (Prosthodontists, Periodontists, Oral and Maxillofacial Surgeons, etc.), and postgraduate trainees involved in direct patient care who provided informed consent.

- **Exclusion Criteria:** Non-practicing dental personnel, individuals who submitted incomplete questionnaires (<80% completion), and participants involved in the pre-testing/pilot validation phase.

2.3 Questionnaire Development and Structure

A structured, 46-item questionnaire was developed following a comprehensive literature review and expert panel evaluation. The instrument was structured into five core domains:

- **Domain 1: Professional & Clinical Background (7 items):** Age, gender, primary specialty, clinical experience (years), implant practice experience, experience with SHCN patients, and formal training history.

- **Domain 2: Knowledge Assessment (10 items):** Multiple-choice questions covering implant indications, contraindications, biological stability, hygiene prerequisites, peri-implant disease risk, and caregiver involvement. (Scoring: 1 point per correct answer; range 0–10. Categorized as Poor: 0–4, Moderate: 5–7, Good: 8–10).

- **Domain 3: Attitudes and Influencing Factors (10 items):** Likert-scale items (1 = Strongly Disagree to 5 = Strongly Agree) measuring perceptions on patient candidacy, ethical obligations, training requirements, and clinical barriers. (Score range: 10–50).

- **Domain 4: Scenario-Based Clinical Decision-Making (12 items):** Three clinical

vignettes representing distinct patient risk profiles:

- Scenario 1 (Favorable): High cooperation, excellent oral hygiene, reliable caregiver support, stable medical condition.
- Scenario 2 (Moderately Challenging): Moderate cooperation, acceptable hygiene, strong caregiver involvement, mild motor/communication impairment.
- Scenario 3 (High Challenge): Severe lack of cooperation, poor oral hygiene, inconsistent caregiver support, high risk of non-compliance.
- Item assessment per scenario included treatment recommendation on a 5-point scale (Definitely Not to Definitely Yes), confidence score, specialist referral inclination, and primary decision factor. For the primary scenario outcome, a favorable treatment recommendation was defined as selecting “Probably Yes” or “Definitely Yes”. This outcome reflects willingness to recommend implant therapy under the presented scenario and was analyzed separately from the respondents’ broader attitudinal measures.

- **Domain 5: Educational needs (7 items):** Self-assessment of training deficiencies in patient selection, behavioral management, surgical/prosthetic adaptation, and maintenance protocols.

2.4 Instrument Validation and Reliability

Content validity was established by a panel of six subject matter experts (2 Prosthodontists, 1 Periodontist, 1 Oral Surgeon, 1 Special Care Dentist, and 1 Biostatistician), yielding an Item Content Validity Index (I-CVI) > 0.85 for all retained items. A pilot study was conducted on 25 dental practitioners to evaluate feasibility, clarity, and internal consistency. Cronbach’s alpha for the attitude and educational domains demonstrated high internal consistency ($\alpha = 0.82$ and $\alpha = 0.86$, respectively). Test-retest reliability across a two-week interval returned an intra-class

correlation coefficient (ICC) of 0.84 for the evaluated questionnaire score.

2.5 Statistical Analysis

Data were analyzed using IBM SPSS Statistics (Version 28.0). Categorical variables were presented as absolute counts and percentages, while continuous variables were reported as mean $\pm$ standard deviation. Associations between categorical predictors and respondent-level treatment recommendations were evaluated using Pearson’s Chi-square test or Fisher’s exact test where appropriate. Because each participant evaluated all three clinical scenarios, the 5-point treatment-recommendation responses were dichotomized for inferential analysis as favorable (“Probably Yes” or “Definitely Yes”) versus non-favorable (all other responses). Differences in favorable treatment-recommendation rates across Scenarios 1, 2, and 3 were then evaluated using Cochran’s Q test. When the overall test was significant, post-hoc pairwise comparisons were performed using McNemar’s tests with Bonferroni correction ($\alpha = 0.017$). Multivariable logistic regression was used to identify respondent-level factors independently associated with favorable treatment recommendations in the moderately-to-highly complex scenarios. Adjusted odds ratios (aORs) and 95% confidence intervals (CIs) were calculated. Statistical significance was defined as $p < 0.05$.

3. Results

3.1 Professional Characteristics

The final dataset comprised responses from 250 dental professionals. The mean age was 31.8 ± 7.4 years, with females representing 58.4% ($n = 146$) of the cohort. General Dental Practitioners comprised 31.2% ($n = 78$) of participants, followed by Postgraduate Students (20.0%, $n = 50$) and Prosthodontists (19.2%, $n = 48$). While 56.8% ($n = 142$) had previous experience managing SHCN patients, only 38.4% ($n = 96$) had received formal training in special-care dentistry.

Table 1. Professional and clinical characteristics of participants (N = 250)

Characteristic	Category	Count (n)	Percentage (%)
Gender	Female	146	58.4
	Male	104	41.6
Professional Designation	General Dental Practitioner	78	31.2
	Prosthodontist	48	19.2
	Periodontist	28	11.2
	Oral & Maxillofacial Surgeon	24	9.6
	Other Specialist	22	8.8
	Postgraduate Student	50	20.0
Implant Training	Previous Implant Training	131	52.4
	No Implant Training	119	47.6
SHCN Experience	Prior Clinical Exposure	142	56.8
	No Prior Exposure	108	43.2
Special-Care Education	Formal Special-Care Training	96	38.4
	No Formal Training	154	61.6

3.2 Knowledge Assessment

The mean overall knowledge score was 6.2 ± 2.1 out of 10. Only 38.0% (n = 95) achieved a “Good” knowledge score, whereas 21.2% (n =

53) exhibited “Poor” knowledge. Participants with prior formal implant training achieved significantly higher mean knowledge scores (7.1 ± 1.7) than untrained peers (5.2 ± 2.1 ; $p < 0.001$).

Table 2. Knowledge score distribution among dental professionals

Knowledge Category	Score Range	Count (n)	Percentage (%)
Poor	0–4	53	21.2
Moderate	5–7	102	40.8
Good	8–10	95	38.0
Total		250	100.0

3.3 Attitudes and Influencing Factors

The overall mean attitude score was 38.1 ± 6.2 (out of 50), indicating a generally favorable attitude pattern toward implant therapy for SHCN individuals. Individualized treatment

planning achieved the highest level of agreement (88.8%, $n = 222$), while patient cooperation and oral hygiene were identified as major planning considerations by 83.6% and 86.8% of participants, respectively.

Table 3. Professional attitudes and clinical factor agreement

Statement	Agree / Strongly Agree n (%)	Neutral n (%)	Disagree / Strongly Disagree n (%)
SHCN status should not automatically exclude implant therapy	181 (72.4)	41 (16.4)	28 (11.2)
Implant therapy provides substantial benefit in selected SHCN cases	184 (73.6)	45 (18.0)	21 (8.4)
Patient behavioral cooperation dictates treatment selection	209 (83.6)	27 (10.8)	14 (5.6)
Baseline oral hygiene status must guide implant decision-making	217 (86.8)	20 (8.0)	13 (5.2)
Adequate caregiver support is an important consideration for long-term maintenance of implant-supported rehabilitation in patients who require assistance with oral care	206 (82.4)	31 (12.4)	13 (5.2)
Anticipated recall compliance significantly impacts planning	211 (84.4)	26 (10.4)	13 (5.2)
Patient communication capacity strongly influences treatment feasibility	168 (67.2)	52 (20.8)	30 (12.0)
Individualized treatment planning is superior to fixed inclusion protocols	222 (88.8)	19 (7.6)	9 (3.6)
Post-operative maintenance presents major clinical difficulties	203 (81.2)	33 (13.2)	14 (5.6)
Current professional training regarding SHCN implants is insufficient	198 (79.2)	36 (14.4)	16 (6.4)

3.4 Scenario-Based Clinical Decision-Making

The proportion of favorable treatment recommendations decreased as scenario

complexity increased: 80.8% ($n = 202$) in Scenario 1 (favorable candidate), 63.2% ($n = 158$) in Scenario 2 (moderate challenge), and 29.6% ($n = 74$) in Scenario 3 (high challenge). The overall

difference was statistically significant (Cochran's Q test, $p < 0.001$). Post-hoc pairwise McNemar tests demonstrated significant differences

between each pair of scenarios (all $p < 0.001$; Bonferroni-adjusted $\alpha = 0.017$).

Table 4. Treatment recommendation distributions across clinical scenarios

Scenario Profile	Favorable Treatment Recommendation n (%)	Undecided n (%)	Unfavorable Decision n (%)	Overall p-value (Cochran's Q)
Scenario 1: Favorable Candidate	202 (80.8)	31 (12.4)	17 (6.8)	< 0.001
Scenario 2: Moderately Challenging	158 (63.2)	48 (19.2)	44 (17.6)	
Scenario 3: High Challenge	74 (29.6)	52 (20.8)	124 (49.6)	

Post-hoc McNemar tests: Scenario 1 vs Scenario 2, $p < 0.001$; Scenario 1 vs Scenario 3, $p < 0.001$; Scenario 2 vs Scenario 3, $p < 0.001$ (Bonferroni-adjusted $\alpha = 0.017$).

3.5 Determinants of Decision-Making

When specific clinical parameters were considered, oral hygiene (86.8%), patient cooperation (83.6%), and caregiver support

(82.4%) were reported as the top three factors influencing implant recommendations. These percentages represent respondents selecting each factor and are not mutually exclusive.

Table 5. Primary factors influencing implant recommendation decisions

Clinical Factor	Selected Count (n)	Percentage (%)
Oral Hygiene Status	217	86.8
Patient Cooperation / Behavior	209	83.6
Caregiver Reliability & Support	206	82.4
Anticipated Recall Compliance	197	78.8
Systemic Medical Status	180	72.0
Communication Ability	168	67.2
Financial / Economic Factors	164	65.6

3.6 Cross-Analysis: Knowledge vs. Decision-Making

Knowledge level was significantly associated with treatment recommendations in the challenging

scenarios. Participants with "Good" knowledge scores were more likely to provide a favorable treatment recommendation than those with "Poor" knowledge (64.2% vs. 26.4%, $p < 0.001$).

Table 6. Favorable treatment recommendations stratified by knowledge level

Knowledge Category	Total (N)	Favorable Treatment Recommendations n (%)	Chi-Square (χ^2)	p-value
Poor Knowledge	53	14 (26.4)	24.81	< 0.001
Moderate Knowledge	102	46 (45.1)		
Good Knowledge	95	61 (64.2)		

Outcome refers to favorable treatment recommendations in the prespecified challenging-scenario analysis.

3.7 Multivariable Regression Analysis

Multivariable logistic regression identified formal special-care training (aOR: 2.38, 95% CI: 1.38–4.10), good knowledge score (aOR: 2.71, 95% CI: 1.61–4.57), prior implant training (aOR: 2.21,

95% CI: 1.34–3.65), prior SHCN clinical experience (aOR: 1.88, 95% CI: 1.13–3.13), and positive attitude score (aOR: 1.74, 95% CI: 1.08–2.82) as factors independently associated with favorable treatment recommendations.

Table 7. Multivariable logistic regression for factors independently associated with favorable treatment recommendations

Factor Associated With Favorable Treatment Recommendation	Adjusted Odds Ratio (aOR)	95% Confidence Interval	p-value
Previous Implant Training	2.21	1.34–3.65	0.002
Prior SHCN Clinical Experience	1.88	1.13–3.13	0.015
Formal Special-Care Training	2.38	1.38–4.10	0.002
Good Knowledge Score (≥ 8)	2.71	1.61–4.57	< 0.001
Positive Attitude Score (≥ 40)	1.74	1.08–2.82	0.023

3.8 Educational Needs Analysis

A broad majority of respondents (79.2%, n = 198) expressed a need for continuing professional

education regarding implant dentistry in SHCN populations.

Table 8. Perceived domain-specific educational needs

Subject Area	Count (n)	Percentage (%)
Customized Treatment Planning	204	81.6
Risk-Based Patient Selection	201	80.4
Behavioral Management Strategies	198	79.2
Long-term Maintenance Protocols	197	78.8
Caregiver Education & Counseling	194	77.6
Peri-implant Complication Handling	187	74.8

4. Discussion

This study evaluated the relationship between knowledge, professional attitudes, clinical background, and scenario-based treatment recommendations regarding implant therapy for patients with special healthcare needs. The null hypothesis was rejected, as formal training, prior exposure, knowledge, and attitude were significantly associated with treatment recommendations in the evaluated scenarios.

A major strength of this study lies in moving beyond abstract attitudinal surveys by using standardized clinical scenarios. Although more than 70% of clinicians expressed support for implant rehabilitation for SHCN individuals in general, treatment recommendations varied according to the clinical conditions presented. In Scenario 3, which incorporated poor oral hygiene, limited cooperation, and inconsistent caregiver support, favorable treatment recommendations fell to 29.6%. This finding emphasizes the importance of individualized risk assessment rather than applying SHCN status alone as an exclusion criterion. Our findings are consistent with prior observations by Srividya et al. (2021) and Rajan & Kuriakose (2019), who reported that dental practitioners may feel under-equipped to manage complex medical or behavioral profiles. Furthermore, Vamsi et al. (2023) highlighted the relationship between implant-related knowledge and treatment confidence. In the present study, formal special-care training was independently associated with higher odds of a favorable treatment recommendation (aOR 2.38, 95% CI 1.38–4.10). Because of the cross-sectional design, this association should not be interpreted as evidence that training directly causes improved decision-making. Oral hygiene (86.8%) and caregiver support (82.4%) were among the most frequently identified non-surgical factors influencing implant recommendations. In patients who depend on caregivers for oral hygiene, inadequate caregiver support may compromise plaque control and long-term peri-implant maintenance. These findings support assessment of the patient–caregiver unit as part of individualized treatment planning by Amuthan et al (2025).

The high demand for continuing education (79.2%) indicates an actionable opportunity for academic institutions. Integrating special-care implant modules into postgraduate prosthodontic and periodontic curricula may help address the identified knowledge and training gaps and support more consistent risk-based treatment planning.

4.1 Clinical Implications

To support individualized treatment planning, practitioners can adopt a sequential risk-evaluation framework before considering implant therapy in SHCN patients:

1. Behavioral/cooperation profile assessment: identify the cause and severity of limited cooperation and consider behavioral management, appropriate sedation, or general anaesthesia only when clinically indicated and after medical and anesthetic risk assessment.
2. Oral hygiene and plaque-control assessment: where hygiene is inadequate, initiate preventive and oral-hygiene interventions and reassess suitability before implant placement.
3. Caregiver capacity and commitment assessment: when caregiver assistance is required, provide structured education and confirm the feasibility of long-term maintenance.
4. Prosthetic design selection: select a fixed or removable implant-supported option according to functional requirements, hygiene access, patient/caregiver ability, and anticipated maintenance.
5. Structured maintenance and recall scheduling.

This decision pathway may help reduce two opposing clinical risks: inappropriate exclusion of patients solely because of SHCN status and placement of implants without adequate consideration of behavioral, hygiene, caregiver, medical, and maintenance requirements.

4.2 Limitations

- Design Constraints: The cross-sectional design permits assessment of associations but does not establish temporal or causal

relationships. Generalizability may also be limited by the characteristics of the participating dental professionals and the survey recruitment setting.

- **Instrument Validation:** Although content validity and internal consistency were satisfactory, further multicenter validation of the scenario-based instrument and its decision-making outcome is recommended.
- Because SHCN represents a heterogeneous population, the three standardized scenarios should be interpreted as selected risk profiles rather than as representing all SHCN subgroups.

5. Conclusion

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Acknowledgements

Funding: This was a self-funded study; no external grants or sponsorships were received. No additional acknowledgements are declared.

Author Declaration

Ethics Approval and Consent to Participate: Approved by the Institutional Ethics Committee (Ref No: [SVDC/IRB/2026/1102]). Informed consent was electronically obtained from all respondents prior to survey initiation.

Consent for Publication: Not applicable.

Availability of Data and Materials: The primary data supporting the conclusions of this article will be made available by the corresponding author upon reasonable academic request.

Competing Interests: The authors declare no competing financial or personal interests.

Authors' Contributions:

Amuthan S: Conceptualization, methodology, questionnaire design, data analysis, interpretation of findings, and writing original draft. Hibah Hasan: Conceptualization, questionnaire development, clinical interpretation, manuscript review and editing. Suryanarayanan T: Methodology, questionnaire evaluation, clinical interpretation, and manuscript review. Rakshana Devendran: Data collection, questionnaire administration, clinical interpretation, and manuscript review. Roshan Arbaaz: Methodological input, clinical interpretation, and manuscript review. Arthi Ramalingam: Statistical interpretation, manuscript review, and editing.

All authors contributed to the critical revision of the manuscript, approved the final version, and agreed to be accountable for all aspects of the work.