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Original article

Treatment Planning Challenges in Prosthodontics: Conventional Fixed Versus Implant-Supported Prosthodontics: A Cross-Sectional Survey of Dental Practitioners in Libya

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Abstract
This cross-sectional survey evaluated treatment-planning preferences, perceived barriers, and self-reported clinical confidence among practicing dentists in Libya when choosing between conventional fixed dental prostheses (FDPs) and implant-supported rehabilitations. Among 76 valid responses, practitioners strongly preferred implant-supported restorations in five of six clinical scenarios, including single missing posterior teeth (90.8%), single missing anterior teeth (81.6%), free-end saddles (76.3%), full-arch edentulism (71.1%), and 3–4-unit spans (55.3%). Conventional FDPs were preferred only when adjacent teeth required restoration (50.0% vs 43.4%). Experienced clinicians (>10 years) showed significantly higher implant preferences for full-arch edentulism (87.5% vs 50.0% for <5 years; p = 0.001) and compromised abutment cases (52.1% vs 27.8%; p = 0.039). Early-career dentists perceived inadequate bone volume as a greater obstacle than senior peers (mean 3.61 vs 2.92; p = 0.021). Highest-rated implant barriers were patient systemic health contraindications (mean 3.37), patient cost (3.14), and inadequate bone volume (3.09), whereas long-term biomechanical risk (2.72) concerned fixed prosthodontic options. Self-reported confidence in treatment planning was moderate for fixed prosthodontics (2.93) and implant therapy (2.92), with no significant differences by qualification level. Although 78.4% completed continuing education (CE) in implant dentistry, a marked desire for further training remained (3.43). In conclusion, participating dentists preferredimplant-supported rehabilitations, but clinical adoption remains constrained by patient-related factors and an ongoing need for hands-on, competency-based training.
Keywords. Dental Implants, Fixed Dental Prostheses, Treatment Planning, Clinical Decision-Making.

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Introduction

Prosthodontic rehabilitation plays a fundamental role in restoring oral function, aesthetics, mastication, and oral health-related quality of life in patients with missing or severely compromised teeth. Among the available treatment modalities, conventional tooth-supported fixed dental prostheses (FDPs) and implant-supported restorations are widely used approaches for the rehabilitation of partially and completely edentulous patients [1,2]. Selecting between these treatment options is not straightforward and requires careful consideration of the patient's oral and systemic condition, the number and distribution of missing teeth, periodontal status, residual bone volume, occlusal factors, aesthetic requirements, treatment time, financial considerations, and patient preference. Consequently, prosthetic treatment planning necessitates an individualized and comprehensive assessment rather than reliance on a single treatment modality [3,4].

Treatment choices are further complicated by variables dependent on both patients and practitioners. From the patient perspective, despite a high general awareness of missing tooth replacement options, detailed knowledge regarding implant therapy remains relatively limited [5]. Moreover, high out-of-pocket financial expenditures and the lack of comprehensive public health insurance coverage frequently serve as overriding barriers, driving patients toward less costly removable or conventional fixed alternatives often despiteof clinical superiority [6].

From the practitioner perspective, treatment decisions are heavily influenced by clinical judgment, technical confidence, fear of patient dropout during extended surgical-prosthetic phases, and variations in educational background [7]. Although an overwhelming a large proportion of participating dentists recognize single-tooth implants as the ideal first choice when adjacent teeth are sound, practical hurdles and inadequate hands-on surgical exposure in undergraduate curricula frequently force clinicians to adopt alternative treatment pathways [7,8]. Conventional fixed prosthodontics serve as a definitive treatment modality, provided that the available abutment teeth possess sufficient structural integrity and a favorable periodontal prognosis [9]. Although contemporary tooth-supported fixed restorations exhibit high long-term survival and acceptable clinical success rates, they remain susceptible to various biological and technical complications [8,9].

In contrast, implant-supported rehabilitation provides an alternative that can replace missing teeth without relying on adjacent natural teeth and may offer favorable functional and patient-reported outcomes [10]. Recent evidence indicates that implant-supported fixed rehabilitation can produce substantial improvements in oral health-related quality of life and patient satisfaction; however, treatment outcomes may be influenced by the prosthetic design, number and position of

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implants, biological conditions, and technical complications [11]. The increased use of implant therapy has also made treatment planning more complex, requiring prosthetically driven planning that integrates clinical, radiographic, surgical, and restorative considerations. [1,4]

In addition, advances in digital dentistry—including intraoral scanning, computer-aided design and manufacturing, three-dimensional planning, and digital smile design—have expanded the possibilities for diagnosis and treatment planning in both tooth-supported and implant-supported prosthodontics [15,16]. Nevertheless, the implementation of these technologies may be influenced by financial training and access to appropriate equipment [17]. Importantly, the evidence does not suggest that implant-supported rehabilitation should routinely replace conventional fixed prosthodontics. Instead, treatment selection should be based on a balance between clinical indications, expected long-term survival outcomes [18], patient expectations, available resources, and the clinician's knowledge and experience [19]. However, evidence on how practitioners weigh these factors in this context remains scarce [20,21]. Previous local studies have addressed patients' awareness of implants and clinicians' implant maintenance practices but, to our knowledge, none has compared conventional fixed and implant-supported treatment planning from the practitioner's perspective [22,23]. Therefore, this study aimed to assess dentists' treatment modality preferences across standardized clinical scenarios and evaluate their association with practitioner experience and self-reported confidence.

Methods

The study was designed as a descriptive cross-sectional survey; the target population comprised general dental practitioners and specialists actively involved in treatment planning in Libya, as well as certified dentists from both government and private dental clinics. Participation was voluntary, with assurances of confidentiality; this cross-sectional study was conducted between July 2026 and September 2026. The questionnaire was developed based on an extensive literature review, evaluated for content validity by expert academic faculty members, and pilot-tested on a small group of dentists to ensure clarity and reliability before final distribution. Informed electronic/paper consent was obtained from all respondents, and no personal identifiers were collected. Data were collected using a hybrid distribution method. Combining paper-based questionnaires and an online survey to expand participant reach, the survey was distributed. BDS students and interns who were not actively involved in implant treatment procedures or those who declined participation upon contact were excluded.

The first part of the survey succinctly reviews demographic and professional information (including age, sex, years of experience, qualification, and practice setting), The second part was composed of treatment modality preference across standardised clinical scenarios (e.g., single missing posterior tooth, free-end saddle, compromised abutment teeth, full-arch edentulism); In the third part of the survey, perceived clinical, financial, and patient-related barriers to implant-supported and fixed prosthodontic rehabilitation, rated on a five-point Likert scale; The last part of the research was explicitly about self-reported confidence in treatment planning and perceived adequacy of undergraduate/postgraduate training.

Descriptive statistics summarized all variables. Data were analysed using standard statistical software. The chi-square test (Fisher's exact test where appropriate) compared categorical preferences across subgroups. The Kruskal-Wallis H test compared Likert barrier ratings across three experience groups, and the Mann-Whitney U test compared confidence ratings by qualification. Significance was set at $p < 0.05$. Total number of responses per item varies slightly (ranging from N=74 to N= 76) due to occasional missing data from participants.

Results

Response Rate and Demographic Characteristics

A total of 76 completed questionnaires were included in the final analytical sample (N=76). The number of valid responses for individual items ranged between 74 and 76 due to occasional item non- response. The mean age of respondents was 37.8 ± 7.6 years (range: 25–60 years). The majority of participants were male 57.3% and had over 10 years of clinical experience 63.2%. Regarding professional qualifications, 42.7% held a Master's degree or specialty certification, 40.0% held a Bachelor's degree (BDS/DDS), 12.0% held a postgraduate diploma, and 5.3%held a doctoral degree. More than half of the practitioners worked in private practice (52.0% followed by academic institutions 21.3% and public hospitals 18.7% Nearly half of the respondents 48.6% planned fewer than five prosthodontic cases per month, while 78.4% reported completing continuing education (CE) in implant dentistry (Table 1).

Treatment Modality Preference by Clinical Scenario

Practitioner preferences for implant-supported versus fixed prosthodontic rehabilitation varied markedly according to the clinical scenario presented (Table 2). Implant-supported rehabilitation was the strongly preferred modality for single missing posterior tooth replacement with healthy adjacent teeth (90.8%), single missing anterior tooth with high aesthetic demand (81.6%), free-end saddle cases (76.3%), and full-arch edentulous (71.1%).

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Table 1. Demographic and professional characteristics of survey respondents)

Characteristic	category	N	%
Sex N=75	Male	43	57.3%
	Female	32	42.7%
Age (years)	Mean ± SD: 37.8 ± 7.6 | Range: 25–60 | Valid n = 74		
Years of experience	< 5 years	18	23.7%
	5–10 years	10	13.2%
	> 10 years	48	63.2%
Qualification N=75	BDS/DDS	30	40.0%
	Postgraduate diploma	9	12.0%
	MSc / Specialty certification	32	42.7%
	PhD / Doctoral degree	4	5.3%
Practice setting N=75	Private practice	39	52.0%
	Academic institution	16	21.3%
	Government / Public hospital	14	18.7%
	Other	6	8.0%
Cases per month N=74	< 5	36	48.6%
	5–15	18	24.3%
	16–30	11	14.9%
	> 30	9	12.2%
CE in implant dentistry N=75	Yes	58	78.4%
	No	16	21.6%

CE = continuing education; percentages calculated on valid responses.

The only clinical scenario in which practitioners showed a preference for conventional fixed prosthodontic rehabilitation over implant-supported treatment was a missing tooth with adjacent teeth already requiring restoration (50.0% vs 43.4%), reflecting a pragmatic approach wherein incorporating the abutment teeth into a fixed partial denture was considered the more rational treatment plan. For multiple missing teeth (3–4-unit span), implant-supported options were preferred by 55.3%, with 14.5% favoring conventional fixed partial dentures.

Table 2. Treatment modality preference by clinical scenario (N = 76)

Clinical Scenario	Implant-Supported n (%)	Fixed Prosthodontic n (%)	Removable/Other n (%)	No clear Preference n (%)
Single missing posterior tooth (healthy adjacent teeth)	69 (90.8%)	2 (2.6%)	0 (0.0%)	5 (6.6%)
Free-end saddle (missing terminal molar)	58 (76.3%)	0 (0.0%)	10 (13.2%)	8 (10.5%)
Missing tooth, adjacent teeth requiring restoration	33 (43.4%)	38 (50.0%)	0 (0.0%)	5 (6.6%)
Single missing anterior tooth (high aesthetic demand) N=75	62 (82.7%)	7 (9.3%)	0 (0.0%)	6 (8.0%)
Multiple missing teeth (3–4-unit span)	42 (55.3%)	11 (14.5%)	20 (26.3%)	3 (3.9%)
Full-arch edentulism N=75	24 (32.0%)	30 (40.0%)	18 (24.0%)	3 (4.0%)

N=76 unless otherwise indicated. Percentages are calculated based on the total valid responses per item

Perceived Barriers to Treatment Planning

Ratings of perceived barriers across all nine items are presented in (Table 3), ranked by mean score. For implant-supported rehabilitation, the highest-rated barrier was patient systemic health and medical contraindications (mean 3.37 ± 1.26), followed by cost to the patient (mean 3.14 ± 1.38) and inadequate bone volume or need for grafting (mean 3.09 ± 1.26). Long treatment and healing duration (mean 2.59 ± 1.09) and patient anxiety regarding surgery (mean 2.51 ± 1.05) were rated as moderate barriers.

For fixed prosthodontic rehabilitation, the most prominent perceived barriers were long-term biomechanical risk to abutment teeth (mean 2.72 ± 1.14) and aesthetic limitations (mean 2.70 ± 1.08). The need for sound abutment teeth (mean 2.53 ± 1.10) and the risk of secondary caries under retainers (mean 2.47 ± 1.10) were rated as moderate barriers. Notably, all fixed prosthodontic barrier items were rated lower on average than systemic health, cost, and bone volume barriers for

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implant therapy, suggesting that practitioners perceive greater overall clinical obstacles to implant-supported rehabilitation in the Libyan context.

Table 3. Perceived barriers to treatment planning, ranked by mean score (scale 1–5; N = 76)

Barrier Item	Modality	Mean	SD	Rank
Patient systemic health / medical contraindications	Implant-supported	3.37	1.26	1
Cost to patient	Implant-supported	3.14	1.38	2
Inadequate bone volume/need for grafting	Implant-supported	3.09	1.26	3
Long-term biomechanical risk to abutment teeth	Fixed prosthodontic	2.72	1.14	4
Aesthetic limitations	Fixed prosthodontic	2.70	1.08	5
Long treatment/healing duration	Implant-supported	2.59	1.09	6
Need for sound abutment teeth	Fixed prosthodontic	2.53	1.10	7
Patient anxiety regarding surgical procedures	Implant-supported	2.51	1.05	8
Risk of secondary caries under retainers	Fixed prosthodontic	2.47	1.10	9

Influence of Clinical Experience on Treatment Planning Preferences

Chi-square analysis revealed two statistically significant differences in treatment selection based on years of experience (Table 4). For full-arch edentulous (χ^2 = 22.761, df = 6, p = 0.001), clinicians with more than 10 years of experience demonstrated a significantly stronger preference for implant-supported fixed restorations compared to less experienced peers. Similarly, when replacing a missing tooth with adjacent teeth requiring restoration (χ^2 = 10.114, df = 4, p = 0.039), experienced practitioners were more inclined to choose single implants with independent restorations for adjacent teeth, whereas less experienced clinicians favored incorporating adjacent teeth into a conventional fixed partial denture.

Table 4. Scenario preference by years of clinical experience: chi-square analysis

Clinical Scenario	< 5 yrs implant %	< 5yrs fixed %	5-10 yrs Implant %	5-10 yrs Fixed %	>10 yrs Implant %	>10 yrs Fixed %	χ^2 (df)
Single missing posterior tooth (healthy adjacent teeth)	88.9%	5.6%	90.0%	0.0%	91.7%	2.1%	4.28 (4)
Free-end saddle (missing terminal molar)	72.2%	0.0%	80.0%	0.0%	77.1%	0.0%	4.01 (4)
Missing tooth, adjacent teeth needing restoration	27.8%	61.1%	40.0%	50.0%	52.1%	45.8%	10.11 (4)
Single missing anterior tooth (high aesthetic demand)	83.3%	11.1%	90.0%	10.0%	79.2%	8.3%	3.55 (6)
Multiple missing teeth (3–4-unit span)	55.6%	11.1%	60.0%	10.0%	52.1%	16.7%	5.41 (6)
Full-arch edentulism	50.0%	0.0%	40.0%	0.0%	87.5%*	0.0%	22.76 (6)

** p < 0.05 (statistically significant). Percentages represent the proportion of each experience subgroup selecting each modality. df = degrees of freedom. Chi-square analysis was conducted using the complete 4-category response matrix (implant-supported, fixed prosthodontics, removable other, and no preference) derived from Table 2. Percentages displayed represent only the selected modalities for each experience subgroup.*

Barrier Ratings by Years of Clinical Experience

As shown in Table 5, Kruskal-Wallis analysis demonstrated that perception of inadequate bone volume as an implant barrier differed significantly across experience groups (H = 7.688, p = 0.021). Practitioners with less than 5 years of experience perceived bone volume as a significantly greater obstacle (mean 3.61 ± 1.09) than those with over 10 years of experience (mean 2.92 ± 1.25). No other barrier items showed statistically significant variations across experience levels, suggesting that financial constraints and systemic health considerations represent universal challenges within this practice setting.

Self-Reported Confidence and Adequacy of Training

Overall confidence in treatment planning complex cases was moderate and virtually identical between fixed prosthodontics 2.93 ± 1.32 and implant therapy 2.92 ± 1.32 (Table 6). Mann-Whitney U testing indicated no significant differences in confidence levels between BDS/DDS holders and specialist/MSc degree holders (p > 0.05). Respondents demonstrated strong interest in further continuing education 3.43 ± 1.35. The persistent moderate confidence scores—despite 78.4% having previously undertaken implant CE—highlight a clear gap between continuing education participation and perceived clinical readiness.

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Table 5. Barrier scores by years of clinical experience: Kruskal-Wallis analysis

Barrier Item	< 5 yrs Mean (SD)	5–10 yrs Mean (SD)	> 10 yrs Mean (SD)	H statistic	p-value
Cost to patient – Implant	3.33 (1.33)	3.50 (1.27)	3.04 (1.42)	2.43	0.297
Systemic health – Implant	3.44 (1.10)	3.80 (0.92)	3.27 (1.34)	2.86	0.240
Bone volume – Implant	3.61 (1.09)	3.10 (1.45)	2.92 (1.25)	7.69	0.021*
Healing duration – Implant	2.94 (1.11)	2.90 (0.74)	2.42 (1.10)	5.86	0.053
Patient anxiety – Implant	2.83 (0.99)	2.80 (1.03)	2.35 (1.05)	4.77	0.092
Sound abutments – Fixed	2.61 (1.09)	2.80 (0.79)	2.44 (1.16)	3.10	0.213
Biomechanical risk – Fixed	2.61 (1.09)	3.20 (1.14)	2.69 (1.16)	3.15	0.207
Aesthetic limits – Fixed	2.78 (1.17)	2.70 (0.82)	2.67 (1.07)	0.39	0.824
Caries risk – Fixed	2.61 (1.04)	2.50 (1.08)	2.40 (1.13)	1.02	0.601

** p < 0.05 (statistically significant). SD = standard deviation.*

Table 6. Self-reported confidence in treatment planning by qualification group

Statement (1–5 Likert scale)	Overall Mean (SD)	BDS/DDS Mean (SD)	MSc/Specialty Mean (SD)	U statistic	p-value
I feel confident in treatment planning complex fixed prosthodontic cases	2.93 (1.32)	2.80 (1.30)	2.91 (1.29)	461.5	0.794
I feel confident in treatment planning complex implant-supported cases	2.92 (1.32)	2.73 (1.26)	2.88 (1.33)	457.0	0.746
I would benefit from further continuing education	3.43 (1.35)	3.20 (1.35)	3.50 (1.30)	407.5	0.293
CE in implant dentistry pursued (Yes)	78.4% (n=58/74)	—	—	—	—

Mann-Whitney U test used for BDS/DDS vs MSc/Specialty comparison. CE = continuing education. Scale: 1 = Strongly disagree, 5 = Strongly agree.

Discussion

The findings of this survey reveal a clear and consistent preference for implant-supported rehabilitation among dental practitioners in this study across five of the six clinical scenarios examined. The near-unanimous preference for implant placement in cases of a single missing posterior tooth with healthy adjacent dentition (90.8%) aligns with the current evidence base, which demonstrates that conventional fixed partial dentures (FPDs) require irreversible preparation of sound adjacent teeth and carry long-term risks of abutment pulpal necrosis, secondary caries, and mechanical failure [1,7]. Systematic reviews have widely reported 10-year implant-supported crown survival rates exceeding 95%, favourably comparable to conventional FPDs while preserving adjacent tooth structure [18]. Similarly, high implant preference rates were observed for free-end saddle cases (76.3%), single missing anterior teeth with high aesthetic demand (81.6%), and full-arch edentulism (71.1%), consistent with growing professional consensus across these clinical presentations [2, 19].

The sole exception was the scenario of a missing tooth with adjacent teeth already requiring restoration, in which 50.0% of respondents favoured an FPD incorporating those abutments compared with 43.4% preferring implant placement. This pragmatic preference reflects a clinically rational approach: when abutment teeth independently require restoration, incorporating them into an FPD simultaneously addresses multiple restorative needs, and this finding is consistent with established decision-making frameworks that contextualise implant candidacy against the restorative status of adjacent dentition [4, 7].

Despite clear preference for implant-supported rehabilitation across most scenarios, Practitioners reported a consistent prioritization of implementation barriers. Patient systemic health and medical contraindications ranked as the single greatest barrier, followed by financial cost to the patient and inadequate bone volume or need for augmentation. The primacy of systemic health over cost is clinically informative, suggesting that biological risk assessment rather than economic considerations alone represents the principal impediment to implant therapy in this cohort. The high rating of patient cost is consistent with practitioner survey findings from other low- and middle-income healthcare contexts in which the absence of public insurance reimbursement for implant prosthetics places the full financial burden on the patient [3,5, 20]. Barriers related to conventional fixed prosthodontic rehabilitation were consistently rated lower, with the highest-rated fixed prosthodontic concern being long-term biomechanical risk to abutment teeth. This comparative order supports the current interpretation that practitioners perceive implant therapy as the biologically preferred option but acknowledge that structural constraints, systemic, financial, and anatomical, limit its broad implementation in the Libyan clinical setting.

Clinical experience was associated with treatment planning preferences in the two most complex scenarios examined. For full-arch edentulism, practitioners with more than 10 years of experience were markedly more likely to prefer implant-supported rehabilitation (87.5%) compared with those with less than 5 years of experience (50.0%). For the compromised-

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abutment scenario, more experienced practitioners more frequently favoured implant placement with separate restoration of adjacent teeth (52.1% vs. 27.8%. (These associations suggest that sustained clinical exposure progressively consolidates a more differentiated and evidence-aligned treatment planning approach, particularly in presentations requiring advanced biomechanical reasoning and surgical planning [2,7].

Notably, no significant experience-related differences in preference were observed for simpler scenarios (all $p > 0.05$), indicating that the implant-supported treatment for routine single-tooth replacement has become broadly embedded across all experience levels in this cohort, irrespective of seniority.

Kruskal-Wallis analysis further revealed that the perceived barrier of inadequate bone volume differed significantly across experience subgroups, with less experienced practitioners rating it substantially higher than their more experienced counterparts. This finding likely reflects limited exposure to bone augmentation procedures among early-career clinicians, who may perceive ridge deficiency as a contraindication rather than a surgically manageable condition [2,7,21]. For all remaining barrier items, no significant differences across experience groups were identified, confirming that patient cost and systemic health represent common rather than experience-dependent constraints in this practice environment.

An important finding was the persistent gap between training participation and perceived clinical confidence: although 78.4% of respondents had pursued additional postgraduate training in implant dentistry, self-reported confidence in implant treatment planning remained only moderate and was statistically indistinguishable from confidence in fixed prosthodontic planning. Crucially, no significant difference in confidence was observed between BDS/DDS holders and MSc/specialty-certified practitioners for either modality ($p > 0.05$), suggesting that the issue extends beyond qualification level and may reflect systemic limitations in the practical component of prosthodontic curricula in Libya, consistent with reports from other North African dental education contexts [22,23].

Several limitations should be acknowledged. The cross-sectional design precludes causal inference; self-reported questionnaire data are inherently subject to social desirability and recall bias, and the use of standardised hypothetical clinical scenarios may not fully capture the complexity of real-world individual treatment planning decisions. Future research should employ prospective, multi-centre designs linking practitioner preferences to objective patient outcomes, and evaluate the effectiveness of competency-based educational interventions in standardising prosthodontic decision-making across Libya.

This study has several limitations that should be acknowledged. First, the sample size (N=76) is relatively small and relied on non-random convenience sampling, which limits the direct generalizability of the findings to all practicing dentists across Libya. Second, the absence of a broader nationwide regional breakdown restricts geographical comparisons between different provinces.

Conclusion

Practitioners in this sample preferred implant-supported rehabilitation in most clinical scenarios, favouring conventional fixed prostheses mainly when adjacent teeth required restoration. Systemic health, cost, and bone volume were the main perceived barriers to implant therapy. Greater experience was associated with a stronger preference for implants in complex cases, while confidence in treatment planning remained moderate despite continuing education, supporting the need for competency-based training and clinical guidelines.

Conflict of interest. Nil

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