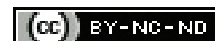


# Referral Patterns for Furcation Management among Dental Clinicians in an Academic Setting- A Preliminary Study

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## ABSTRACT

**Introduction:** A critical prognostic factor in multirooted teeth is the involvement of furcation. This can often pose challenges to the clinicians which makes them lean towards extraction and replacement rather than a comprehensive periodontal treatment.

**Aim:** To evaluate the choice of treatment and referral pattern for advanced Furcation Involvement (FI) among dental clinicians.

**Materials and Methods:** This was a cross-sectional study conducted in the Department of Periodontics, Ragas Dental College and Hospital, Chennai, Tamil Nadu, India from August 2018 to September 2019. In this study, two complete case details of furcation involved teeth (C1 and C2) were distributed among the dental faculty of different specialities other than periodontics from various dental colleges in Chennai, India. Both cases were complex and manageable by experienced Periodontists. A total of 414 clinicians completed a closed-ended questionnaire consisting of 15 questions. The questions were grouped under 4 domains, evaluating their diagnosing capability, treatment planning expertise, referral pattern to Periodontist and their insight on periodontal treatment outcomes. The collected data were analysed using Statistical Package for the Social Sciences (SPSS) software 23.0 version. Pearson's Chi-square test was carried out to find association between specialties, years of experience and age with all questions regarding case scenario

and periodontal disease management. The p-value of  $\leq 0.05$  was considered to be statistically significant.

**Results:** A total of 414 dental clinicians completed the questionnaire, the response rate being 95.2%. Of the total, 178 (43%) were males and 236 (57%) were females. The participants who opted for periodontal treatment accounted for 57.7% for C1 and 86% for C2. Total 31.2% for C1 and 5.8% for C2 opted for extraction and Fixed Partial Denture (FPD), whereas, only 8.7% for C1 and 3.9% for C2 opted for extraction and implant placement. The endodontists opted more for periodontal management. The prosthodontists, for C1 (48.1%) and oral surgeons for C2 (11.4%) showed more interest towards extraction and FPD. The clinicians with 10-20 years experience identified the defect more appropriately (82.5% for C1 and 47.5% for C2), (p-value  $< 0.001$ ) and suggested appropriate management {57.5% for C1 (p-value  $< 0.001$ ) and 65% for C2}. Of the cohort, 20.8% of the entire population and 50% with  $> 20$  years of experience constantly referred their patients for periodontal opinion and management (p-value  $< 0.001$ ).

**Conclusion:** Periodontal therapy for furcation involved molars seemed to be widely accepted by the survey respondents than extraction of the tooth followed by implants or FPD. The important factors affecting referral were the speciality of the dental clinicians and the number of years of clinical experience.

**Keywords:** Clinical experience, Decision making, Fixed partial denture, Implant, Periodontal management, Periodontists

## INTRODUCTION

The Furcation Involvement (FI) is considered to be an important negative predictor of periodontal disease. The therapeutic challenges involved in the management of furcation defects are well documented [1-3]. In spite of a plethora of resective and regenerative surgical techniques being available for management of FI, treatment outcomes continue to be equivocal.

In general, the decision making process for the maintenance of compromised teeth is multifaceted and depends on various factors, viz., degree of FI, mobility, endodontic status, residual amount of bone, as well as the estimated time of treatment [4]. Additionally, the strategic value of the tooth in the comprehensive treatment planning has to be considered for predictable treatment outcomes [5]. With the predictability of implant therapy [6,7] and the seeming lack of it with periodontal therapy [8,9], treatment planning for furcation involved teeth has leaned heavily towards extraction and implant placement [10]. However, in literature, there are only a few well-designed studies that have compared the long-term results of implant placement and furcation management [11,12].

A previous study evaluated the success rates of implant and root resection therapy over a period of fifteen years and demonstrated

a comparable cumulative success rate of 97% for dental implants and 96.8% for root resection therapy [11]. Whereas another study suggested that there was no marked difference in treatment complications between the two forms of therapy [12]. The referral for extraction and implant-based management of early to moderate furcation involved teeth may therefore be somewhat excessive and not altogether backed by literature. Anecdotal evidence suggests that in a country like India where many specialists also maintain general dental practice, implant-based treatment planning had completely overshadowed periodontal management of even grade II FI.

Hence, this questionnaire-based study was designed as a preliminary study to gather information about the referral patterns of clinicians faced with furcation involved teeth. This survey was restricted to clinicians who also occupy teaching positions in dental colleges in the city of Chennai on the assumption that closer proximity to periodontal literature may prompt more referrals for periodontal management rather than extraction.

## MATERIALS AND METHODS

This cross-sectional questionnaire-based study was conducted in the Department of Periodontics, Ragas Dental College and

Hospital, Chennai, Tamil Nadu, India. The study was carried out from August 2018 to September 2019. The study was approved by the Institutional Ethics Committee (ECR/1163/Inst/TN/2018) and informed consent was obtained from all the participants.

The participants constituted the dental faculty with a minimum five years of clinical experience who belonged to different areas of specialisation in dentistry except Periodontics. A total of 435 participants aged 25 to 60 years, from 10 dental colleges in Chennai, India, were included in the study. The sample size was estimated using data from the study by Junges R et al., [13]. A sample of 200 was obtained from calculations using G Power software version 3.1.9.2 assuming,  $\alpha$  error at 0.05, power at 80%, moderate effect size as 0.4 and constant proportion as 0.5. Being a questionnaire-based study, the sample size was doubled in order to compensate for non response or incomplete response. On the whole, a total of 435 clinicians were approached and all the responses received were analysed.

### Questionnaire

Two different clinical case descriptions were distributed to the participants and were asked to complete a closed-ended questionnaire consisting of 15 questions. The selection of the two cases was based on the opinion from experienced Periodontists from two different institutions who suggested a reasonable chance for successful periodontal therapy.

**Clinical case description:** Two different clinical cases of grade II FI with complete clinical and radiographic description along with the photographs [Table/Fig-1a-d] were distributed. These cases were chosen from the patients undergoing periodontal therapy in the Department of Periodontics, Ragas Dental College, Chennai. The clinical parameters were evaluated by a single calibrated examiner using William's periodontal probe and Naber's probe. The first clinical case (C1) presented tooth number 46 (right mandibular first molar) with Probing Pocket Depth (PPD) of 6 mm, Clinical Attachment Loss (CAL) of 7 mm and Glickman's grade II, subclass B furcation defect of 4 mm [14]. The radiograph revealed angular bone loss extending till the apical third of the distal root of 46 with inter-radicular bone loss. The second clinical case (C2) presented tooth number 46 with PPD of 5 mm, CAL of 7 mm and Glickman's grade II, subclass B furcation defect of 5 mm. The corresponding radiograph revealed horizontal bone loss extending till the cervical third of mesial and distal roots and bone loss in the inter-radicular region. Both the cases were recognised as cul-de-sac FI as the probe could not pass through and through in the furcation defect due to the attachment of lingual bone to the dome of the furcation.



**[Table/Fig-1]:** Clinical cases- a and b: Case 1, grade II Furcation Involvement in 46 and corresponding IOPA; c and d: Case 2, Furcation Involvement 46 and corresponding IOPA.

The PPD was measured from the gingival margin to the base of the probable pocket and CAL from the Cementoenamel Junction (CEJ) to the base of the probable pocket. Six sites, the mesio-buccal, mid-buccal, disto-buccal, mesio-lingual, mid-lingual and disto-lingual were measured and the highest PPD and CAL were recorded. The patients presented non contributory medical and dental history. It was clearly informed that there were no financial limitations for the treatment.

**Validity:** The questionnaire was formulated in English language by the authors and a pilot survey was conducted among 30 participants prior to the beginning of the study and the data was used to validate the questionnaire. The internal consistency was good and the Cronbach's alpha value was found to be 0.82. Face validity of the questionnaire was evaluated according to Lawshe CH 1975 [15] by producing the questionnaire design to a pre-test group consisting of eminent and experienced Periodontists. Hence, the questionnaire used in the pilot study was used in the main study as well. The questionnaire along with the case descriptions were distributed to each participant by the examiner and a maximum period of 30 minutes was given to fill it.

**Design of the questionnaire:** The questionnaire consisted of 15 questions divided into 4 domains.

- In the first domain (Question, Q1-4), demographic data and professional characteristics of the clinician were assessed. This included age, gender, number of years of clinical experience and the speciality they belonged to.
- The second domain (Q5-7) consisted of questions based on the two clinical situations. The participants were asked to indicate the type of bone loss or the lesion, the appropriate treatment modality and the reason for choosing that particular treatment option.
- In the third domain (Q8-11), the sources of obtaining the information regarding the current status of furcation management; any participation in periodontal or implant lectures provided by Periodontists or non Periodontists and the referral pattern to Periodontists were assessed.
- The fourth domain (Q12-15), questioned about their experience on the successful management of furcation and recession defects by Periodontists and their definition and perception on the success of periodontal management.

### STATISTICAL ANALYSIS

The collected data were analysed using Statistical Package for the Social Sciences (SPSS) software 23.0 version. Descriptive statistics were calculated as frequency percentage for all entered variables. Pearson's Chi-square test was used to find the association between specialties, years of experience and age with all questions regarding case scenario and periodontal disease management. The p-value  $\leq 0.05$  was considered to be statistically significant.

### RESULTS

A total of 414 dental clinicians completed the questionnaire, the response rate being 95.2%. 178 (43%) were males and 236 (57%) were females [Table/Fig-2]. Each domain is comprehended separately.

#### Domain 1: Professional and demographic characteristics:

Of the total population, 63% had a clinical experience of <5 years; 25.1% with 5-10 years; 9.7% with 10-20 years and 2.2% with >20 years [Table/Fig-2]. With respect to the specialisation, endodontists were the most predominant accounting for 20.8% followed by the orthodontists (16.4%); prosthodontists (12.6%), Oral Medicine and Radiology (OMR) was 11.1%, Paedodontics (10.4%), Oral Pathologists and Community Dentists, each with 10.1% and the least oral surgeons (8.5%).

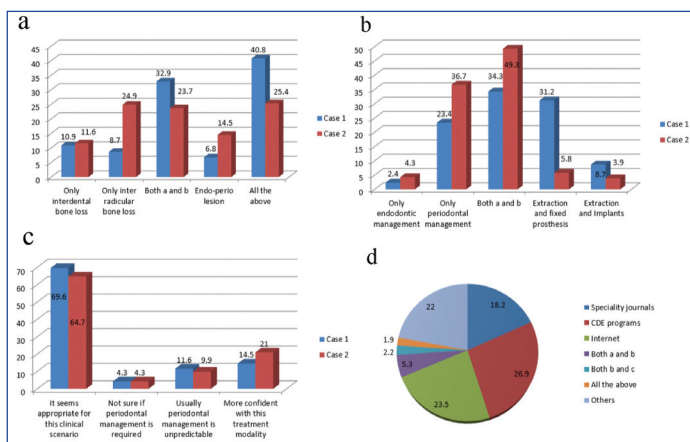
Question	Frequency n (%)
<b>Age</b>	
<30 years	237 (57.3)
31-40 years	138 (33.3)
41-50 years	34 (8.2)
>50 years	5 (1.2)
<b>Gender</b>	
Male	178 (43)
Female	236 (57)
<b>Area of specialisation</b>	
Endodontics	86 (20.8)
Paedodontics	43 (10.4)
Orthodontics	68 (16.4)
Prosthodontics	52 (12.6)
Oral Medicine and Radiology	46 (11.1)
Oral and Maxillofacial Pathology	42 (10.1)
Oral and Maxillofacial Surgery	35 (8.5)
Community Dentistry	42 (10.1)
<b>Experience</b>	
<5 years	261 (63.0)
5-10 years	104 (25.1)
11-20 Years	40 (9.7)
>20 Years	9 (2.2)

**[Table/Fig-2]:** Descriptive statistics of demographic variables of study participants.

**Domain 2: Diagnosis and treatment recommendations.**

Overall, 40.8% of the respondents for C1 and 23.7% for C2 furnished the appropriate diagnosis [Table/Fig-3a]. About 34.3% of participants for C1 and 36.7% for C2 opted for the correct line of management viz., both endodontic and periodontal therapy for C1 and periodontal therapy for C2. The participants, who opted for periodontal therapy in their line of treatment, accounted for 57.7% for C1 and 86% for C2. Total 31.2% for C1 and 5.8% for C2 opted for extraction and FPD, whereas, only 8.7% for C1 and 3.9% for C2 opted for extraction and implant placement [Table/Fig-3b]. About 69.6% and 64.7% participants for C1 and C2 expressed that the chosen treatment line was appropriate for the clinical scenario [Table/Fig-3c].

About 26.9% of the respondents gained information through Continuing Dental Education (CDE) lectures, 23.5% through internet sources and 18.2% through speciality journals [Table/Fig-3d].



**[Table/Fig-3]:** a: Clinical and radiographic findings and Diagnosis; b: Line of treatment recommended; c: Reason for treatment selection; d: Source of information for periodontal disease and management.

With respect to the clinical experience, 82.5% of the participants for C1 and 47.5% for C2 with clinical experience of 10-20 years could identify the defect characteristics appropriately. Among them, 57.5% for C1 and 65% for C2 suggested the appropriate treatment plan. However, 25% for C1 and none for C2 have opted for extraction and

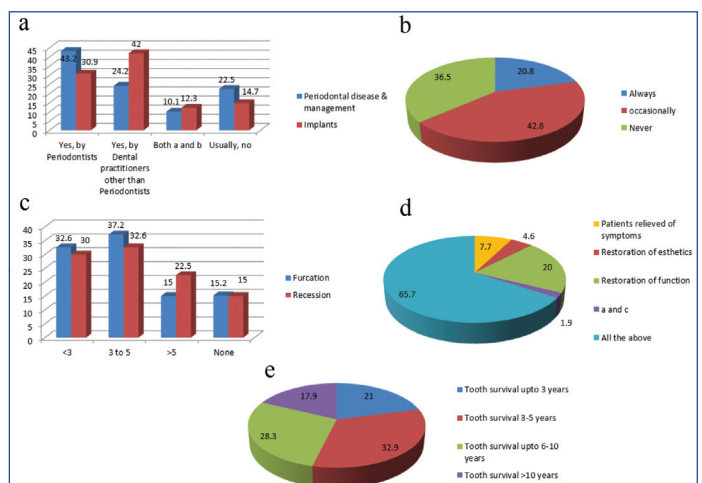
FPD and only 10% for C1 and 5% for C2 have opted for extraction and implant placement. Also, there was a statistically significant association between years of experience and diagnosis with appropriate line of treatment for both the clinical scenarios (p-value <0.05). Similarly, age and specialty had a statistically significant association with case observation and treatment selection with a p-value <0.05 [Table/Fig-4].

Variables		Case 1		Case 2	
		χ <sup>2</sup> value	p-value	χ <sup>2</sup> value	p-value
Specialty	Observation	47.522	0.012*	49.670	0.007*
	Treatment line	79.140	<0.001**	49.888	0.007*
	Reason for treatment suggestion	39.069	0.010*	30.141	0.089
Years of experience	Observation	65.244	<0.001**	43.870	<0.001**
	Treatment line	38.629	<0.001**	24.902	0.072
	Reason for treatment suggestion	36.081	<0.001**	24.502	0.017*
Age	Observation	67.979	<0.001**	40.292	<0.001**
	Treatment line	36.892	<0.001**	24.456	0.018*
	Reason for treatment suggestion	24.198	0.004*	23.549	0.005*

**[Table/Fig-4]:** Association of specialty, years of experience and age with case observation, treatment line and the reason for treatment suggestion. Chi-square test; level of significance at p-value ≤0.05

**Domain 3 and 4: Acquiring knowledge and referral pattern and Clinician's view of defining periodontal success.**

Total 43.2% had attended Continuing Dental Education (CDE) lectures by Periodontists on periodontal disease and management, 30.9% had attended implant lectures from Periodontists and 42% had attended from non Periodontists [Table/Fig-5a]. With regard to the periodontal referral pattern, of the total participants, only 20.8% always referred to Periodontists and 36.5% never referred [Table/Fig-5b]. On the whole, about 37.2% and 32.6% participants in their respective clinical experience had seen 3 to 5 patients managed successfully by Periodontists for furcation and recession respectively [Table/Fig-5c]. About 32.3% felt that, relief from symptoms, restoration of function and aesthetics attribute to success of periodontal therapy [Table/Fig-5d]. Also, 32.9% felt tooth survival of 3-5 years was sufficient to consider as success and 28.3% felt 6-10 years survival was needed to consider for success of periodontal therapy [Table/Fig-5e].



**[Table/Fig-5]:** a: CDE programs on periodontal disease and management and implants by Periodontists and non Periodontists; b: referral pattern to Periodontists; c: number of furcation and recession cases seen successfully managed by Periodontists; d and e: definition of success of periodontal management.

[Table/Fig-6] shows that the source of information on periodontal disease and management was significantly influenced by the specialty, age and years of experience (p-value ≤0.05). It was further found that, information gained from CDE programs on periodontal

disease and management and implants had a significant association with years of experience.

Variables		$\chi^2$ value	p-value
Specialty	Source of information	69.010	0.005*
	CDE program on periodontal disease and management	26.208	0.199
	CDE program on implants	36.745	0.018*
	Referral	42.631	0.004*
	Furcation management success	45.626	0.001*
	Recession management success	51.680	<0.001**
	Periodontal management success definition	24.840	0.473
Years of experience	Source of information	49.375	0.002*
	CDE program on periodontal disease and management	22.018	0.013*
	CDE program on implants	21.293	0.046*
	Referral	45.832	<0.001**
	Furcation management success	20.134	0.065
	Recession management success	30.665	0.002*
	Define success of periodontal management	17.947	0.327
Age	Source of information	42.427	0.004*
	CDE program on periodontal disease and management	14.249	0.114
	CDE program on implants	14.809	0.096
	Referral	66.763	<0.001**
	Furcation management success	16.896	0.050*
	Recession management success	22.988	0.006*
	Periodontal management success definition	35.861	<0.001**

**[Table/Fig-6]:** Association of specialty, years of experience and age with source of information, CDE program, referral, furcation, recession management success and periodontal success definition.

Chi-square test; level of significance at p-value  $\leq 0.05$ \*; highly significant p-value  $< 0.001$ \*\*

There was no statistically significant association of specialty and years of experience with definition of periodontal management success (p-value  $> 0.05$ ) but age had a significant association. However, there was a statistically significant association of specialty, age and years of clinical experience with periodontal referral (p-value  $\leq 0.001$ ) [Table/Fig-6&7]. The [Table/Fig-7,8] has details of the statements and the responses by the participants.

## DISCUSSION

Evidence from the literature and clinical experience has shown that the molars are susceptible to periodontal disease progression and attachment loss and thus are more subjected to extraction [16,17]. The main objective of this study was to assess if there was a shift in the treatment paradigm, from periodontal therapy to implant therapy. Although, studies have previously shown that periodontal treatment of natural teeth with markedly reduced periodontal support can be maintained for a sufficiently long period of time and have indeed shown 90% survival rates with adequate maintenance program [18,19], a recent study has demonstrated that the longevity of implant therapy is much higher than the periodontally involved teeth [20]. Hence, there tends to be an inclination for extraction of teeth with periodontal disease that might have had a good prognosis after appropriate periodontal treatment.

Nevertheless, in this study, the treatment option of selecting extraction followed by FPD or implant supported restoration was limited. Hence, it can be inferred that periodontal management of furcation involved teeth was widely accepted by the respondents and more among the older age group. This may be due to the fact that, since all the participants are attached to an academic institution, they are in proximity to Periodontists and tend to have greater exposure to periodontal literature. This in turn may have provided them the awareness on different modalities of furcation management and an insight on successful management norms. This is in accordance to a previous study by Cobb CM et al., who had shown that dentists

Statement	Specialisation								p-value
	Endo-dontics (%)	Paedo-dontics (%)	Ortho-dontics (%)	Prosthodontics (%)	Oral medicine and radiology (%)	Oral pathology (%)	Oral surgery (%)	Community dentistry (%)	
<b>What do you observe in case 1?</b>									
a. Only interdental bone loss	14.0	14.0	19.1	0	8.7	7.1	2.9	14.3	<0.012*
b. Only inter-radicular bone loss	10.5	11.6	0	9.6	15.2	9.5	5.7	9.5	
c. Both a and b	24.4	18.6	48.5	34.6	32.6	33.3	42.9	28.6	
d. Endo-perio lesion	8.1	2.3	5.9	5.8	13.0	7.1	2.9	7.1	
e. All the above	43.0	53.5	26.5	50.0	30.4	42.9	45.7	40.5	
<b>What line of treatment do you recommend for case 1?</b>									
a. Only endodontic management	5.8	2.3	2.9	0	2.2	0	0	2.4	<0.001**
b. Only periodontal management	27.9	27.9	26.5	15.4	28.3	4.8	25.7	26.2	
c. Both a and b	54.7	30.2	26.5	21.2	28.3	40.5	17.1	40.5	
d. Extraction and fixed prosthesis	8.1	25.6	44.1	48.1	28.3	42.9	42.9	23.8	
e. Extraction and Implants	3.5	14.0	0	15.4	13.0	11.9	14.3	7.1	
<b>Why do you suggest this treatment plan for case 1?</b>									
a. It seems to be appropriate for this clinical scenario	67.4	74.4	60.3	65.4	84.8	66.7	62.9	81.0	0.01*
b. Not sure if periodontal management is required	10.5	0	2.9	1.9	0	2.4	2.9	9.5	
c. Usually periodontal management is unpredictable	7.0	14.0	14.7	9.6	13.0	16.7	14.3	7.1	
d. More confident with this treatment modality	15.1	11.6	22.1	23.1	2.2	14.3	20.0	2.4	
<b>What do you observe in case 2?</b>									
a. Only interdental bone loss	16.3	14.0	16.2	7.7	6.5	2.4	14.3	9.5	0.007*
b. Only inter-radicular bone loss	32.6	30.2	17.6	17.3	28.3	23.8	22.9	23.8	
c. Both a and b	18.6	34.9	25.0	30.8	17.4	21.4	34.3	11.9	
d. Endo-perio lesion	8.1	9.3	7.4	21.2	15.2	28.6	20.0	16.7	
e. All the above	24.4	11.6	33.8	23.1	32.6	23.8	8.6	38.1	

What line of treatment do you recommend for case 2?									
a. Only endodontic management	8.1	4.7	0	5.8	2.2	4.8	2.9	4.8	0.007*
b. Only periodontal management	48.8	48.8	22.1	28.8	34.8	31.0	40.0	38.1	
c. Both a and b	34.9	39.5	70.6	61.5	47.8	54.8	42.9	40.5	
d. Extraction and fixed prosthesis	7.0	7.0	0	1.9	8.7	7.1	11.4	7.1	
e. Extraction and Implants	1.2	0	7.4	1.9	6.5	2.4	2.9	9.5	
Why do you suggest this treatment plan for case 2?									
a. It seems to be appropriate for this clinical scenario	67.4	67.4	60.3	65.4	71.7	52.4	54.3	76.2	0.089
b. Not sure if periodontal management is required	4.7	7.0	0	3.8	2.2	7.1	8.6	4.8	
c. Usually periodontal management is unpredictable	17.4	4.7	13.2	7.7	4.3	9.5	5.7	7.1	
d. More confident with this treatment modality	10.5	20.9	26.5	23.1	21.7	31.0	31.4	11.9	
Where do you obtain information related to periodontal disease and management?									
a. Only speciality journals	25.6	16.3	17.6	9.8	19.6	23.8	17.1	9.5	0.005*
b. Only CDE programs	20.9	27.9	19.1	33.3	28.3	33.3	31.4	31.0	
c. Only internet	24.4	34.9	30.9	13.7	21.7	19.0	2.9	33.3	
d. a+b	11.6	2.3	1.5	3.9	0	2.4	14.3	4.8	
e. b+c	0	7.0	1.5	0	2.2	2.4	2.9	4.8	
f. All the above	2.3	2.3	1.5	3.9	0	2.4	2.9	0	
g. Others	15.1	9.3	27.9	35.3	28.3	16.7	28.6	16.7	
Have you attended CDE program lectures on periodontal disease and management?									
a. Yes, by Periodontists	45.3	39.5	41.2	46.2	39.1	45.2	42.9	45.2	0.199
b. Yes, by dental practitioners other than Periodontists	22.1	11.6	20.6	21.2	39.1	31.0	25.7	26.2	
c. a+b	11.6	11.6	19.1	3.8	6.5	4.8	11.4	7.1	
d. Never	20.9	37.2	19.1	28.8	15.2	19.0	20.0	21.4	
Have you attended CDE program lectures on implants?									
a. Yes, by Periodontists	31.4	20.9	26.5	24.6	30.4	40.5	34.3	31.0	0.018
b. Yes, by dental practitioners other than Periodontists	30.2	60.5	30.9	51.9	50.0	40.5	42.9	45.2	
c. a+b	17.4	4.7	25.0	7.7	6.5	7.1	11.4	7.1	
d. Never	20.9	14.0	17.6	5.8	13.0	11.9	11.4	16.7	
How often do you refer/consult a Periodontist for periodontal management?									
a. Always	16.3	14.0	17.6	32.7	13.0	19.0	31.4	28.6	0.004*
b. Occasionally	37.2	37.2	36.8	44.2	56.5	50.0	48.6	40.5	
c. Very rare	38.4	20.9	33.8	13.5	23.9	21.4	11.4	16.7	
d. Never	8.1	27.9	11.8	9.6	6.5	9.5	8.6	14.3	
How many cases of Furcation Involvement (FI) have you seen successfully managed by Periodontists?									
a. <3	25.6	16.3	33.8	34.6	41.3	42.9	40.0	33.3	<0.001**
b. 3 to 5	48.8	30.2	35.3	36.5	37.0	33.3	34.3	31.0	
c. >5	14.0	18.6	23.5	1.9	15.2	11.9	17.1	16.7	
d. None	11.6	34.9	7.4	26.9	6.5	11.9	8.6	19.0	
How many cases of recession have you seen successfully managed by Periodontists?									
a. <3	31.4	14.0	27.9	44.2	26.1	33.3	31.4	28.6	<0.001**
b. 3 to 5	27.9	32.6	30.9	40.4	37.0	31.0	40.0	26.2	
c. >5	22.1	16.3	35.3	1.9	28.3	19.0	25.7	28.6	
d. None	18.6	37.2	5.9	13.5	8.7	16.7	2.9	16.7	
How do you define success of periodontal management?									
Patients relieved of symptoms	8.1	7.0	2.9	5.8	10.9	11.9	8.6	9.5	0.473
Restoration of esthetics	5.8	7.0	4.4	1.9	6.5	2.4	2.9	4.8	
Restoration of function	12.8	34.9	11.8	25.0	21.7	19.0	28.6	19.0	
a and c	3.5	0	1.5	1.9	0	0	2.9	4.8	
All the above	69.8	51.2	79.4	65.4	60.9	66.7	57.1	61.9	
What will you consider success of periodontal management?									
Tooth survival upto 3 years	19.8	11.6	7.4	34.6	19.6	35.7	28.6	19.0	<0.001**
Tooth survival 3-5 years	33.7	23.3	19.1	42.3	32.6	28.6	48.6	42.9	
Tooth survival upto 6-10 years	26.7	34.9	48.5	17.3	37.0	19.0	14.3	16.7	
Tooth survival >10 years	19.8	30.2	25.0	5.8	10.9	16.7	8.6	21.4	

[Table/Fig-7]: Questionnaire response with respect to specialisation.  
\*p-value <0.05 was considered as statistically significant; \*\*p-value <0.001 was considered as statistically highly significant

Statement	Clinical experience				p-value
	<5 years	5-10 years	10-20 years	>20 years	
<b>Respondents</b>					
<b>What do you observe in case 1?</b>					
a. Only interdental bone loss	11.9	9.6	0	37.5	<0.001*
b. Only inter-radicular bone loss	10.3	5.8	7.5	0	
c. Both a and b	40.6	25.0	7.5	12.5	
d. Endo-perio lesion	6.9	7.7	2.5	12.5	
e. All the above	30.3	51.9	82.5	37.5	
<b>What line of treatment do you recommend for case 1?</b>					
a. Only endodontic management	1.9	3.8	0	12.5	<0.001**
b. Only periodontal management	31.0	12.5	7.5	0	
c. Both a and b	28.7	38.5	57.5	50.0	
d. Extraction and fixed prosthesis	29.1	37.5	25.0	37.5	
e. Extraction and Implants	9.2	7.7	10.0	0	
<b>Why do you suggest this treatment plan for case 1?</b>					
a. It seems to be appropriate for this clinical scenario	75.9	63.5	55.0	25.0	<0.001**
b. Not sure if periodontal management is required	5.0	3.8	2.5	0	
c. Usually periodontal management is unpredictable	8.4	18.3	12.5	25.0	
d. More confident with this treatment modality	10.7	14.4	30.0	50.0	
<b>What do you observe in case 2?</b>					
a. Only interdental bone loss	16.1	2.9	2.5	25.0	<0.001**
b. Only inter-radicular bone loss	25.7	26.9	20.0	0	
c. Both a and b	21.5	19.2	47.5	37.5	
d. Endo-perio lesion	15.7	17.3	2.5	0	
e. All the above	21.1	33.7	27.5	37.5	
<b>What line of treatment do you recommend for case 2?</b>					
a. Only endodontic management	4.6	3.8	5.0	0	0.072
b. Only periodontal management	35.2	30.8	65.0	25.0	
c. Both a and b	51.3	51.0	25.0	75.0	
d. Extraction and fixed prosthesis	6.1	7.7	0	0	
e. Extraction and Implants	2.7	6.7	5.0	0	
<b>Why do you suggest this treatment plan for case 2?</b>					
a. It seems to be appropriate for this clinical scenario	71.3	54.8	55.0	25.0	0.017
b. Not sure if periodontal management is required	5.0	3.8	2.5	0	
c. Usually periodontal management is unpredictable	7.3	15.4	12.5	12.5	
d. More confident with this treatment modality	16.5	26.0	30.0	62.5	
<b>Where do you obtain information related to periodontal disease and management?</b>					
a. Only speciality journals	19.2	21.4	7.5	0	0.002*
b. Only CDE programs	27.6	33.0	12.5	0	
c. Only internet	21.8	20.4	40.0	25.0	
d. a+b	6.9	1.9	5.0	0	
e. b+c	0.8	2.9	10.0	0	
f. All the above	1.9	1.0	2.5	11.9	
g. Others	21.8	19.4	22.5	62.5	
<b>Have you attended Continuing Dental Education (CDE) program lectures on periodontal disease and management?</b>					
a. Yes, by Periodontists	44.8	39.4	42.5	50.0	0.037*
b. Yes, by dental practitioners other than Periodontists	23.8	31.7	12.5	0	
c. a+b	10.3	9.6	7.5	12.5	
d. Never	21.1	19.2	37.5	37.5	

<b>Have you attended CDE program lectures on implants?</b>					
a. Yes, by Periodontists	30.3	35.6	25.0	25.0	0.046*
b. Yes, by dental practitioners other than Periodontists	38.3	45.2	60.0	37.5	
c. a+b	14.2	9.6	2.5	25.0	
d. Never	17.2	9.6	12.5	12.5	
<b>How often do you refer/consult a Periodontist for periodontal management?</b>					
a. Always	16.9	25.0	30.0	50.0	<0.001
b. Occasionally	41.0	51.9	35.0	12.5	
c. Very rare	32.6	14.4	5.0	12.5	
d. Never	9.6	8.7	30.0	25.0	
<b>How many cases of Furcation Involvement (FI) have you seen successfully managed by Periodontists?</b>					
a. <3	36.4	28.8	17.5	37.5	<0.001**
b. 3 to 5	36.4	43.3	32.5	0	
c. >5	13.8	13.5	22.5	37.5	
d. None	13.4	14.4	27.5	25.0	
<b>How many cases of recession have you seen successfully managed by Periodontists?</b>					
a. <3	30.7	35.6	15.0	0	0.065
b. 3 to 5	30.7	40.4	27.5	25.0	
c. >5	25.7	12.5	25.0	37.5	
d. None	13.0	11.5	32.5	37.5	
<b>How do you define success of periodontal management?</b>					
a. Patients relieved of symptoms	8.4	5.8	10.0	0	0.327
b. Restoration of aesthetics	4.6	6.7	0	0	
c. Restoration of function	17.2	24.0	32.5	0	
d. a and c	1.1	3.8	2.5	0	
e. All the above	68.6	59.6	55.0	100.0	
<b>What will you consider success of periodontal management?</b>					
a. Tooth survival upto 3 years	23.8	16.3	17.5	12.5	0.194
b. Tooth survival 3-5 years	31.0	41.3	27.5	0	
c. Tooth survival upto 6-10 years	26.4	28.8	32.5	62.5	
d. Tooth survival >10 years	18.8	13.5	22.5	25.0	

**[Table/Fig-8]:** Questionnaire response according to clinical experience. \*p-value <0.05 was considered as statistically significant; \*\*p-value <0.001 was considered as statistically highly significant.

who were attached to dental schools had more awareness of periodontal diagnosis and management due to their proximity to the Periodontists [21].

A study conducted among the dentists in Europe and Brazil assessed their awareness and decision making by means of original clinical cases of FI [22]. In that study, for the treatment of grade III FI in maxillary molar, around 63.9% of the respondents opted for periodontal surgery; whereas Periodontists, who were also included in that study, opted more for resective periodontal therapy and extraction with augmentation. Results further showed that dental faculty preferred regenerative therapies more frequently for periodontally involved teeth [14].

Another study with 10 years follow-up in well-maintained patients showed that the longevity of implants does not exceed that of natural teeth with or without periodontal involvement [23]. It should also be kept in mind that, patients with history of periodontal disease indeed pose a higher risk of acquiring peri-implant disease [24]. The host immune inflammatory response that contributed to the progression of periodontal disease may act as predisposing factor for the development of peri-implant disease [25]. Studies have proved that, within eight years of placement, around 60% dental implants have developed biological complications, and hence warrants strict maintenance visits [26,27].

The current study showed a variance in treatment selection between different specialities. The Endodontists opted more for periodontal

management. The results of this study also showed that, Endodontists had attended more CDE programs on periodontal disease and its management conducted by Periodontists. Hence, along with their conservative line of management could have had an influence on selection of periodontal treatment modalities.

The Prosthodontists and Oral Surgeons on the other hand, showed higher interest in extraction and FPD (C1) as they are characteristically integrated with edentulous sites. In addition, they could also have acquired the information from attending CDE programs on Implants conducted by non Periodontists. However, only a minority of the respondents (8.7% for C1 and 3.9% for C2) have opted for extraction with implant placement, which may be suggestive of the fact that opinion and therapeutic preferences may not necessarily be consistent with actual practices. Also, the differences in treatment decisions may be reflective of the differences in interpretation of radiographs and also the respondent's perception on periodontal regeneration.

The dental clinicians with 10-20 years' experience have identified the defect more appropriately and have suggested periodontal management. For C1, half of the dental clinicians with 5-10 years' experience have opted for extraction and FPD and the other half for periodontal management. For C2, most of the dental clinicians have opted for periodontal management. There was a statistically significant association of age and years of experience with periodontal referral because of the greater exposure to periodontal literature as well as increased exposure to implant related complications [21]. The important source of information for the dental clinicians with 0-5 years and 5-10-years' experience seemed to be from CDE programs and speciality journals, whereas, for more than 10 years' experience, the source is mainly from the internet and other unknown sources. All the dental clinicians have attended lectures on periodontal disease and management conducted by Periodontists and all except more than 20 years' experience, have attended Implant lectures by non Periodontists. Despite their knowledge in implantology, the percentage of younger clinicians (upto 10 years of experience), who have opted for extraction and implant placement is very less. Though they would have started their career after implants became an important aspect of treatment modality, most of them felt that periodontal management to be appropriate for the given 2 clinical scenarios. Hence, it shows that various CDE programs and other sources have influenced the understanding and decision-making ability of the treatment process [28].

Even though there is a high response for periodontal management, the referral for periodontal therapy is very less, only 20.8% of the total respondents always referred their patients to Periodontists and around 42.8% occasionally referred. The reason for fewer referral could be speculated due to the non symptomatic nature of periodontal disease, the patient could not have been convinced for periodontal management or would have been managed by the dental clinicians (non Periodontists) themselves. Also, in the absence of state sponsored access to free dental help and non participation of medical insurance for dental claim, there is increased non compliance of patients towards periodontal treatment [29]. Another study which evaluated referral pattern found that 63% of the general dentists did not refer their patients to Periodontists, the reason being lack of motivation of the patients [30].

Research has also suggested that multiple non clinical factors associated with the referral to periodontal specialists were practice-related, patient-related, general dentist-related and periodontist-related [31]. Hence, the referral process is a complex entity and several factors like clinical, personal and cost play a significant role in the referral to periodontist [32], the most important one being technical competence of the periodontist [33]. To improve the referral, the dental clinician and the periodontist should be educated about each other's needs [34].

## Limitation(s)

The limitation of this study was that the study population may not be an original representation of the practising population. In future, the study could be expanded to include the general dentists and specialists (non Periodontists) who do not have an academic affiliation.

## CONCLUSION(S)

The important factors affecting referral were the speciality of the dental clinicians and the number of years of clinical experience. There is a need to sensitise the dental clinicians about periodontal therapy and its effectiveness. Further studies covering a larger population of clinicians are warranted to elucidate the actual referral pattern among the dental clinicians. The incongruent referral in the current study may be considered as an additional indicator that the various dental education programmes should be revisited to emphasise on proper referral protocol. There is also a need for the Periodontists to showcase their advanced and complex periodontal cases which have been successfully treated and have a long-term therapeutic outcome.

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