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## Navigating Periodontal Health During Orthodontic Care: Insights Into Patient Knowledge and Practices

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*(Received: 27 September 2025 Revised: 05 October 2025 Accepted: 01 November 2025)*

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### KEYWORDS

Fixed orthodontic appliances, Oral hygiene, Periodontal health, Patient awareness, Gingival inflammation

### ABSTRACT:

**Introduction:** Fixed orthodontic appliances provide additional niches for biofilm buildup, resulting in increased plaque accumulation and microbial shifts toward cariogenic and periodontopathogenic species. This predisposes patients to enamel demineralization, gingival inflammation, and potential periodontal damage. Patient knowledge and awareness are crucial in preventing these risks; however, studies reveal a persistent gap between awareness and effective oral hygiene practices, emphasizing the need for continuous education and reinforcement.

**Objectives:** This study aimed to evaluate the knowledge and awareness of oral hygiene and periodontal health among patients undergoing fixed orthodontic treatment and to assess their self-reported periodontal changes during therapy.

**Methods:** A cross-sectional questionnaire survey was conducted among 115 patients (aged 14–50 years) undergoing fixed orthodontic treatment at Sri Siddhartha Dental College, Tumakuru, Karnataka. Data were collected using a validated Google Forms questionnaire and analyzed with SPSS. Descriptive statistics assessed knowledge, awareness, and perceived periodontal effects, while chi-square tests evaluated associations between demographics and awareness. A p-value < 0.05 was considered statistically significant.

**Results:** Nearly all participants (99.1%) used a toothbrush and toothpaste, with 60% brushing twice daily. However, 43.5% brushed for less than three minutes, and 59.1% used regular instead of orthodontic brushes. While 88.7% recognized the importance of oral hygiene, only 60% accurately identified plaque as a soft deposit, and 26.1% were uncertain about its effects. Periodontal changes during treatment included gingival bleeding (22.6%), gingival margin shifts (22.6%), halitosis (31.3%), and gingival irritation (40.9%).

**Conclusions:** Orthodontic patients showed moderate awareness of oral hygiene and periodontal health; however, notable gaps remained between knowledge and practice.



## **Introduction:**

Fixed orthodontic appliances, despite their therapeutic benefits in correcting dental malocclusions and improving occlusal function, introduce multiple additional niches for dental biofilm retention. The complex hardware of brackets, bands, wires and ligatures physically obstructs effective plaque removal, resulting in both quantitative increases in plaque and qualitative shifts in the microbial ecosystem—changes that favor cariogenic species and periodontal pathogens and precipitate early enamel demineralization and gingival inflammation [1]. These alterations manifest rapidly, with a pronounced rise in white spot lesion formation and gingival changes especially in the first six months of treatment, underscoring how appliance-induced biofilm accumulation can compromise periodontal health if not proactively managed [2].

Optimal periodontal outcomes during fixed appliance therapy are not solely dependent on the mechanical effect of the appliance but critically hinge on the patient's understanding, awareness, and consistent execution of oral hygiene behaviors. Knowledge, attitude, and practice (KAP) frameworks have been applied to orthodontic populations to evaluate these domains; recent cross-sectional data demonstrate that while a substantial proportion of patients may exhibit generally positive attitudes, gaps remain in translating knowledge into sustained preventive behavior, and certain subgroups (e.g., newly fitted or less-engaged patients) are at risk of deterioration in hygiene practices without continued reinforcement [3]. In parallel, awareness regarding specific aspects of periodontal health—such as the identification of plaque versus calculus, and appreciation of treatment-duration-related risks—varies, with some patients overestimating their hygiene adequacy and under-recognizing early signs of inflammation [4].

The persistence of a knowledge–behavior gap among orthodontic patients has been documented, wherein initial education at appliance placement loses impact over time unless bolstered by structured reinforcement.<sup>5</sup> Follow-up communication strategies, including scheduled messages or calls, have been shown to elevate compliance metrics by re-engaging patients, clarifying misconceptions, and providing timely behavioral cues, thereby mitigating the typical post-bonding decline in oral hygiene adherence. These reinforcement mechanisms act not only as reminders but also as psychological supports that sustain motivation, recalibrate self-perception of oral health status, and signal clinician investment in the patient's outcome [5].

Beyond traditional verbal instruction, targeted reminder systems—delivered through digital platforms or personalized messaging—further enhance patient compliance by embedding prompts into daily routines, facilitating habit formation, and providing ongoing feedback loops that reinforce correct practices.<sup>6</sup> Studies employing regular reminders have reported significant improvements in plaque indices and a reduction in early demineralization or gingival inflammation among fixed appliance wearers, indicating that behavioral augmentation via reminders is an effective adjunct to baseline education [6].

Given the multifactorial nature of periodontal risk in orthodontic therapy—combining mechanical biofilm challenges with variable patient cognition, awareness, and behavioral consistency—it becomes imperative to systematically evaluate baseline knowledge and awareness. Understanding these dimensions allows for the identification of deficiencies, the tailoring of education and reinforcement strategies, and ultimately the optimization of periodontal health throughout the orthodontic course. Therefore, the present study was undertaken to assess the knowledge and awareness regarding oral hygiene and periodontal



health in individuals undergoing fixed orthodontic treatment, with the intent of informing more effective, evidence-based preventive protocols. Hence the aim of the current study is to evaluate the knowledge and awareness about oral hygiene and periodontal health, and to assess the self-reported periodontal effects of fixed orthodontic treatment in patients undergoing therapy.

## **Objectives:**

1. To determine the level of knowledge and awareness regarding oral hygiene practices (type of cleaning aid, brushing frequency and duration, toothbrush type) among subjects with fixed orthodontic appliances.
2. To assess patients' awareness of periodontal health indicators, including recognition of dental plaque, its consequences, bleeding gums, presence of calculus, stains, and the perceived importance of clinician advice.
3. To evaluate the self-reported periodontal changes attributed to fixed orthodontic treatment specifically changes in gingival bleeding, gum position, swelling, halitosis, and gingival discomfort.

## **MATERIALS AND METHODOLOGY:**

This cross-sectional, questionnaire-based survey was conducted among patients undergoing fixed orthodontic treatment at the Department of Orthodontics and Dentofacial Orthopaedics, Sri Siddhartha Dental College, Tumakuru, Karnataka, India, over a period of 2–3 months. Ethical approval for the study was obtained from the Institutional Ethical Committee (Approval No.SSDCHIEC/2023/36), and written informed consent was obtained from all participants after explaining the nature, purpose, and procedures of the study. The study was performed in accordance with the ethical principles outlined in the Declaration of Helsinki (revised 2013). Participants were recruited through convenience

sampling and were eligible if they were currently undergoing fixed orthodontic therapy with an average treatment duration between 6 and 12 months, aged 14–50 years, non-surgically treated, and wearing conventional metal brackets in both arches. Exclusion criteria included patients who had undergone surgical orthodontic treatment, those treated with myofunctional appliances or removable orthodontic appliances, individuals below 14 or above 50 years of age, and patients with systemic conditions affecting periodontal health, such as bleeding disorders or uncontrolled diabetes.

The minimum required sample size was calculated using the formula  $N = (Z_{\alpha/2}^2 \times p \times (1-p)) / d^2$ , with a confidence level of 95% ( $Z = 1.96$ ), an estimated proportion ( $p$ ) and an allowable error ( $d$ ) set accordingly, yielding a final sample size of 115 participants. A structured, self-administered questionnaire was adapted from Alhaja ES et al. (2018) and modified for the target population [7]. The questionnaire comprised three sections: demographic data (name, age, gender), knowledge and awareness regarding oral hygiene and periodontal health (type of cleaning aid, brushing frequency and duration, awareness of plaque, calculus, stains, and gum bleeding, and importance of following clinician's advice), and perceived impact of fixed orthodontic therapy on periodontal health (changes in gum bleeding, gingival position, swelling, halitosis, and gingival irritation). The questionnaire was validated by subject experts for content and clarity, and a pilot test was conducted on a small group to ensure comprehensibility.

The survey was distributed via Google Forms to eligible participants through online platforms, including WhatsApp and email. Reminders were sent on the 3rd and 5th day to non-respondents, and those failing to respond after the second reminder were excluded from the study. Data were



collected automatically through Google Forms, compiled in Microsoft Excel, and analyzed using SPSS software version \_\_ (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequency and percentage, were used to summarize demographic characteristics, knowledge,

awareness, and perceived periodontal changes. Chi-square tests were applied to evaluate associations between demographic factors and knowledge/awareness levels, with a p-value < 0.05 considered statistically significant.

**QUESTIONNAIRE:**

S.N O	QUESTIONS	LEVEL
	Name	
	Age	
	Gender	Male
		female
	<b>KNOWLEDGE AND AWARNESS</b>	
1	What kind of cleaning aid do you use?	Tooth brush and paste
		Finger and tooth powder
		Charcoal
2	Frequency of tooth brushing?	No brushing
		1 time/day
		2 times/day
		3 times/day
3	Duration of tooth brushing?	Less than 3 minutes
		3-5 minutes

		Greater than 5 minutes
4	Type of tooth brush?	Ortho brush
		Ordinary brush
5	After wearing fixed appliance , did you visit the dentist regularly for checkups?	Yes
		No
6	Is it important to follow the advice and oral hygiene instructions given by clinician?	Yes
		no
7	Do you have dental calculus on your teeth surfaces?	Yes
		No





	gums?	Decrease bleeding from gums			
		No change		3	Has orthodontic treatment resulted in the development of swelling of gums?
		Shift in the position of the gums towards the tooth surface			Yes
		Shift in the position of the gums away from the tooth surface			no
2	Has orthodontic treatment caused a change in the position of the gums?	No change		4	Did you notice any bad breath during orthodontic treatment?
					Yes
					no
				5	Do you feel pain or irritation on gingiva?
					Yes
					no

**Results:**

A total of 115 orthodontic patients participated in the study, comprising 40 males (34.8%) and 75 females (65.2%) (Table 1). The mean treatment duration ranged between 6–12 months.

**Table1: Demographic distribution:**

Variable	(n)	Percentage(%)
Male	40	34.8
Female	75	65.2



### Knowledge and Awareness Regarding Oral Hygiene and Periodontal Health:

The majority of respondents (99.1%) reported using a toothbrush and toothpaste for cleaning, while 0.9% used finger and tooth powder, and none reported using charcoal ( $p < 0.0001$ ). In terms of brushing frequency, 60% brushed twice daily, 35.7% once daily, and 4.3% thrice daily ( $p < 0.0001$ ). Regarding brushing duration, 50.4% brushed for 3–5 minutes, 43.5% for less than 3 minutes, and 6.1% for more than 5 minutes ( $p < 0.0001$ ).

When asked about toothbrush type, 59.1% used an ordinary brush, and 40.9% used an orthodontic brush, which was not statistically significant ( $p = 0.050$ ). A substantial proportion (85.2%) reported regular dental check-ups after appliance placement ( $p < 0.0001$ ).

Most participants (88.7%) agreed on the importance of following oral hygiene instructions

from clinicians ( $p < 0.0001$ ). Dental calculus was reported by 17.4%, absent in 53.9%, and 28.7% were unsure ( $p < 0.0001$ ). Stains were reported by 15.7%, while 67% reported no stains, and 17.4% were unsure ( $p < 0.0001$ ).

An overwhelming 91.3% believed that regular dental visits enhance periodontal health ( $p < 0.0001$ ). Furthermore, 79.1% reported having knowledge about oral and periodontal health ( $p < 0.0001$ ), with 79.8% citing dentists or orthodontists as their main source of information ( $p < 0.0001$ ).

Regarding dental plaque, 60% identified it as soft deposits on the tooth, 13% as hard deposits, 3.5% as stains, and 23.5% did not know ( $p < 0.0001$ ). When asked about consequences of plaque, 52.2% linked it to gum disease, 12.2% to malformation of teeth, 9.6% to discoloration, and 26.1% were unsure ( $p < 0.0001$ ). On bleeding gums, 60.9% attributed it to inflamed gums, while 26.1% were unsure ( $p < 0.0001$ ) (Table 2).

**Table 2: Knowledge and Awareness of Oral Hygiene and Periodontal Health:**

Question	Response	n	%	$\chi^2$	p-value	Significance
Cleaning aid used	Toothbrush & paste	114	99.1	224.05	<0.0001	Yes
	Finger & tooth powder	1	0.9			
	Charcoal	0	0.0			
Brushing frequency	Once/day	41	35.7	109.94	<0.0001	Yes
	Twice/day	69	60.0			
	Thrice/day	5	4.3			
Brushing duration	<3 min	50	43.5	39.25	<0.0001	Yes
	3–5 min	58	50.4			
	>5 min	7	6.1			
Type of toothbrush	Orthodontic brush	47	40.9	3.83	0.050	No
	Ordinary brush	68	59.1			



Regular dental check-up	Yes	98	85.2	57.05	<0.0001	Yes
	No	17	14.8			
Importance of following OHI	Yes	102	88.7	68.88	<0.0001	Yes
	No	13	11.3			
Presence of calculus	Yes	20	17.4	24.12	<0.0001	Yes
	No	62	53.9			
	Don't know	33	28.7			
Presence of stains	Yes	18	15.7	58.56	<0.0001	Yes
	No	77	67.0			
	Don't know	20	17.4			
Regular dental visits enhance periodontal health	Yes	105	91.3	78.48	<0.0001	Yes
	No	10	8.7			
Knowledge about periodontal health	Yes	91	79.1	39.03	<0.0001	Yes
	No	24	20.9			
Source of information	Dentist/orthodontist	92	79.8	113.34	<0.0001	Yes
	School	8	6.7			
	Media	15	13.5			
What is dental plaque?	Soft deposits	69	60.0	84.34	<0.0001	Yes
	Hard deposits	15	13.0			
	Stains	4	3.5			
	Don't know	27	23.5			
Consequences of dental plaque	Malformation	14	12.2	52.55	<0.0001	Yes
	Discoloration	11	9.6			
	Gum disease	60	52.2			
	Don't know	30	26.1			
Bleeding gums indicate	Healthy gums	11	9.6	91.50	<0.0001	Yes
	Inflamed gums	70	60.9			
	Gum recession	4	3.5			
	Don't know	30	26.1			



### Impact of Fixed Orthodontic Therapy on Periodontal Health:

When asked about changes in gingival bleeding after orthodontic treatment, **60.9%** reported no change, **22.6%** noted an increase, and **16.5%** reported a decrease ( $p < 0.0001$ ). Regarding changes in gingival position, **55.7%** reported no change, **22.6%** noted a shift towards the tooth

surface, and **21.7%** noted a shift away ( $p < 0.0001$ ).

Gingival swelling was reported by **22.6%** of respondents ( $p < 0.0001$ ). Bad breath during treatment was noted by **31.3%** ( $p < 0.0001$ ). Pain or irritation in the gingiva was reported by **40.9%**, but this was not statistically significant ( $p = 0.050$ ) (Table 3).

**Table 3: Impact of Fixed Orthodontic Therapy on Periodontal Health:**

Question	Response	n	%	$\chi^2$	p-value	Significance
Change in bleeding gums	Increased	26	22.6	39.88	<0.0001	Yes
	Decreased	19	16.5			
	No change	70	60.9			
Change in gingival position	Shift towards tooth	26	22.6	25.79	<0.0001	Yes
	Shift away from tooth	25	21.7			
	No change	64	55.7			
Gingival swelling	Yes	26	22.6	34.51	<0.0001	Yes
	No	89	77.4			
Bad breath during treatment	Yes	36	31.3	16.08	<0.0001	Yes
	No	79	68.7			
Pain/irritation in gingiva	Yes	47	40.9	3.83	0.050	No
	No	68	59.1			

### Discussion:

Fixed orthodontic therapy is primarily aimed at improving oral function and enhancing esthetics; however, its success is intricately linked to the patient's periodontal health. The presence of fixed orthodontic appliances can predispose individuals to increased plaque accumulation, which, if not effectively managed, may result in gingival inflammation, bleeding, recession, and long-term periodontal compromise. Therefore, maintaining optimal periodontal health throughout the duration

of orthodontic treatment is of paramount importance.

In the present study, although most participants demonstrated an awareness of oral hygiene practices, actual adherence to these practices was suboptimal. Approximately 35.7% of the subjects brushed only once daily, and 59.1% used ordinary toothbrushes despite receiving professional oral hygiene instructions. These findings align with those reported by **Atassi and Awartani (2010)** and **Alhajjia et al. (2018)**, who highlighted



insufficient oral hygiene behaviors among orthodontic patients, particularly in relation to brushing frequency and toothbrush type. Such behaviors underscore the necessity for frequent reinforcement of oral hygiene education and closer follow-up by dental professionals during the course of treatment [8,9].

Moreover, knowledge-based responses in this study revealed limited understanding of plaque accumulation and gingival bleeding among participants. Although awareness about the importance of oral hygiene was high, this did not consistently translate into effective practices, suggesting a gap between knowledge and behavioral implementation. Similar observations were made by **Ashfaq M and Sadiq A et al. (2021)**, who emphasized that orthodontic patients often exhibit poor awareness of the role of plaque in gingival diseases [10]. These findings suggest the need for comprehensive, behavior-focused education strategies that not only inform patients but also actively involve them in preventive practices.

In terms of periodontal health status during treatment, the majority of respondents reported no significant changes. Specifically, 60.9% noticed no alteration in gingival bleeding, and 55.7% reported no shift in the gingival margin. However, a considerable subset of participants experienced gingival inflammation, bleeding, and recession, indicating that while the overall incidence may appear low, the clinical impact on affected individuals can be significant. These observations are consistent with the findings of **Singala S and Kamboj M et al. (2022)**, who documented periodontal deterioration in some orthodontic patients, particularly when oral hygiene compliance was inadequate [11].

These results highlight the critical role of ongoing professional supervision during fixed orthodontic therapy. Periodic clinical evaluations enable early identification and management of periodontal

concerns such as gingival hyperplasia, bleeding on probing, and initial signs of recession. Dental professionals should emphasize personalized oral hygiene instructions, demonstration of appropriate brushing techniques, and timely intervention when gingival changes are detected.

Furthermore, the interdisciplinary collaboration between orthodontists and periodontists is essential, especially in patients presenting with mucogingival defects or pre-existing periodontal disease. Pre-treatment assessment and mid-treatment reviews by periodontists can guide timely intervention strategies, including scaling, root planing, or soft tissue grafting, thereby enhancing the long-term stability of orthodontic outcomes and preserving periodontal health.

This study has several strengths, including a large and diverse group of participants and the use of a well-designed, validated questionnaire that explored both knowledge and the perceived effects of orthodontic treatment on gum health. Comparing our results with existing studies helped strengthen the reliability of our findings. However, there are some limitations. Since the study was cross-sectional, it only captures a single point in time and cannot show cause-and-effect relationships. The data were based on self-reported responses, which can sometimes be inaccurate or biased. Also, clinical measurements like gum bleeding or pocket depth were not taken, which limits how well we can connect the reported experiences with actual periodontal conditions. Lastly, the study was limited to one geographic area, so the results may not apply to all populations. Future research should include longer follow-up periods, clinical assessments, and a broader population to make the findings more robust and widely applicable.

### **Conclusion:**

This study highlights that while a substantial proportion of patients undergoing fixed orthodontic treatment possess basic awareness of



oral hygiene, there remains a notable gap between knowledge and actual oral hygiene practices. The presence of orthodontic appliances poses a significant challenge to maintaining periodontal health, as evidenced by the reported experiences of gingival bleeding, inflammation, and recession. These findings underscore the need for continuous patient education, reinforcement of oral hygiene instructions, and the integration of regular periodontal evaluations throughout the course of orthodontic therapy. Strengthening interdisciplinary collaboration between orthodontists and periodontists will not only enhance treatment outcomes but also reduce the risk of long-term periodontal complications. Future longitudinal and multi-center studies incorporating clinical periodontal parameters are warranted to validate these findings and inform more effective preventive strategies.

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