

Preferred Modalities on Prevention and Management of Iatrogenic Effects of Orthodontic Therapy Among Orthodontists

Dr. Akshaya K¹, Dr. Bharathi E², Dr. Dilip S³

¹Post graduate student, Department of Orthodontics, SRM Dental college, Ramapuram, Chennai, India

²Senior lecturer, Department of Orthodontics, SRM Dental college, Ramapuram, Chennai, India

³Professor, Department of Orthodontics, SRM Dental college, Ramapuram, Chennai, India

*Corresponding Author: Dr. Bharathi E

Senior lecturer, Department of Orthodontics, SRM Dental college, Ramapuram, Chennai, India

Email: bharathiek2016@gmail.com

ABSTRACT

Aim: To assess the preferred modalities for the prevention and management of iatrogenic effects of orthodontic therapy among orthodontists.

Materials and Methods: A cross-sectional questionnaire-based survey was conducted among 122 orthodontists using a predesigned structured questionnaire. Data were collected over 30 days and analyzed using SPSS software (IBM).

Results: Fluoride-based measures were the most preferred for preventing and managing enamel decalcification (68.85%). Oral prophylaxis before and during treatment was favored by 62.29% to maintain periodontal health. Reduced orthodontic forces were preferred in periodontally compromised patients (68.85%). Titanium archwires were commonly selected for managing nickel hypersensitivity (52.47%), while NSAIDs (56.56%) and muscle relaxants (35.25%) were preferred for managing orthodontic and TMJ pain, respectively.

Conclusion: Orthodontists demonstrate sound knowledge and evidence-based clinical practices for preventing and managing iatrogenic effects, emphasizing preventive care, biomechanical modifications, and the use of biocompatible materials for safer orthodontic outcomes.

Keywords: Orthodontics, Iatrogenic effects, Enamel decalcification, Periodontal health, Nickel hypersensitivity, TMJ pain, Orthodontic forces.

How to cite this article: Akshaya K, Bharathi E, Dilip S. Preferred Modalities on Prevention and Management of Iatrogenic Effects of Orthodontic Therapy Among Orthodontists. *Int J Drug Deliv Technol.* 2026;16(59s): 122-130. DOI: 10.25258/ijddt.16.59s.13

Source of support: Nil

Conflict of interest: None

INTRODUCTION:

Orthodontic treatment plays a significant role in enhancing dental aesthetics, improving occlusal function, and maintaining oral health. However, like any other dental intervention, it carries the potential risk of iatrogenic errors, which are unintentional complications or damage caused by the treatment process itself. [1] These iatrogenic errors can involve damage to the teeth, surrounding periodontal structures, or adjacent tissues possibly due to diagnostic errors, mechanical forces, or treatment procedures. Common iatrogenic complications in orthodontics include root resorption, enamel decalcification, gingival recession, periodontal damage, temporomandibular joint (TMJ) disorders, and undesirable tooth movements.[2]

Enamel demineralization is one of the most frequent complications associated with orthodontic treatment that involves the loss of mineral from the enamel surface, primarily due to acids produced by bacterial plaque metabolism. [3] The resulting white spot lesions (WSLs) are early signs of enamel demineralization that can develop due to poor oral

hygiene, frequent consumption of sugar rich foods, prolonged treatment duration, and the presence of interproximal caries. Among affected teeth, maxillary lateral incisors have been observed to show the highest prevalence of enamel demineralization.[4]

Robinson et al., in 2005 reported that among various toothbrush designs, only powered toothbrushes with a rotational movement were effective in significantly reducing plaque accumulation. [5] Additionally, the use of fluoride mouth rinses has been shown to decrease the incidence of white spot lesions by approximately 25% in patients who follow a home-based fluoride rinse regimen.[6] For enhanced enamel protection, fluoride gels or varnishes containing a minimum concentration of 22,300 ppm fluoride are advised to be applied at least once within the first eight weeks following the removal of fixed orthodontic appliances.[7] Chlorhexidine remains one of the most commonly used broad-spectrum antimicrobial agents in dental care.[1]

Root resorption is an unwanted but usually minimal consequence of certain orthodontic movements, especially intrusion, typically affecting only the

apical 1–2 mm. [8,9] Severe resorption (loss of over 25% of root length) is rare, seen in about 3% of cases. The apex is more prone to resorption due to concentrated forces, less mineralized cellular cementum, and vulnerable vascular supply.[10] Endodontically treated teeth can be orthodontically moved after 6 months if clinically and radiographically stable. If resorption occurs, a pause of 4–6 months is advised.[11] Persistent resorption after treatment may need sequential root canal therapy with calcium hydroxide, followed by permanent filling once stabilized.[12]

Studies show that pulpal blood flow initially decreases after orthodontic forces are applied but typically peaks around 7 days later.[13] These vascular changes can lead to altered cellular metabolism, temporary cell damage, or defence responses. The inflammation induced in the pulp by orthodontic forces usually resolves within 3 weeks, as demonstrated in animal studies. [14,15] Patients may experience transient pulp ischemia with mild pain or discomfort during the first few days of appliance activation, generally subsiding within a week. Although rare, pulp necrosis has been reported in some cases.[16] To reduce these risks, light forces should be used during the initial alignment phase, with smaller, round copper NiTi arch wires preferred.[17]

Healthy periodontal tissues may still show mild inflammation during orthodontic treatment, even with good oral hygiene, if forces are within optimal limits. Mandibular incisors are especially prone to gingival recession. Studies show increased plaque and probing depths in orthodontic patients, especially adults with tooth wear, restorations, or pre-existing periodontal disease.[18] Bone loss can alter tooth mechanics, increasing risks of extrusion, occlusal trauma, and mobility. Light orthodontic forces, regular periodontal check-ups, bonded attachments (instead of bands), and permanent retention are recommended. Patient motivation and hygiene are crucial, and shorter treatment plans may be necessary if oral hygiene is poor.[19]

Finishing and detailing the occlusion are key to maintaining post-treatment stability by ensuring proper cusp-to-fossa alignment. Effective anchorage planning at the start is essential to prevent unwanted forward movement of molars. [20,21] Teeth placed in unstable positions are more likely to relapse, especially if anchorage is lost, which can lead to an end-on molar relationship.[22] Rotated teeth have a high tendency to return to their original positions, so planned overcorrection is necessary depending on the degree of rotation. Midline diastemas are also prone to reopening, often requiring permanent fixed retention for long-term stability.[23]

Recognizing the causes, risk factors, and preventive measures for iatrogenic errors is essential for clinicians to reduce complications and achieve predictable treatment outcomes. As the demand for

orthodontic care continues to grow, particularly among adults with compromised periodontal conditions, greater emphasis on preventing iatrogenic effects has become increasingly important in contemporary orthodontic practice. Thus, the aim of the current study is to evaluate the preferred modalities on prevention and management of iatrogenic effects of orthodontic therapy among orthodontists.

MATERIALS AND METHODS:

The present study was a cross-sectional questionnaire study that was carried out to assess the preferred modalities on prevention and management of iatrogenic effects of orthodontic therapy among orthodontists. A total of 122 subjects participated in the study. The survey period extended for a period of 30 days in February 20124. The study involved completion of a predesigned questionnaire that had questions on prevention and management of various iatrogenic errors of orthodontic therapy. Orthodontists were included in the study and other dental specialists were not.

The study involved completion of a predesigned questionnaire containing 2 sections. Section 1 includes, demographic characteristics like name, age, gender and year of experience of the participants. Section two had questions prevention and management of enamel decalcification, dental caries, prevention of gingivitis and periodontitis, management of root resorption, alternatives for nickel allergy, management of TMJ pain and orthodontic pain. A total of 15 questionnaires, which had been designed based on the primary objective of the study, were used. The questionnaire was prepared in English. The participants were asked to put the responses in a questionnaire. The Data was Shortlisted, recorded in excel and was subjected to statistical analysis in SPSS by IBM.

S.No.	QUESTION	OPTIONS
1	What is your Preferred way of preventing Enamel Decalcification during orthodontic therapy?	<ul style="list-style-type: none"> a. Fluoride releasing bonding agents b. Elastic ligatures containing fluoride c. Prior application of topical fluoride d. Prescribing fluoridated toothpaste
2	How do you manage enamel decalcification post	<ul style="list-style-type: none"> a. Fluoride rinse or toothpaste (0.05% sodium fluoride daily rinse or 0.2%

Preferred Modalities on Prevention and Management of Iatrogenic Effects of Orthodontic Therapy Among Orthodontists

	orthodontic therapy?	<p>sodium fluoride weekly)</p> <p>b. Acid/Pumice micro abrasion</p> <p>c. Bleaching agents (18% HCl in fine pumice)</p> <p>d. Fluoride varnish</p>
3	What are your preferred methods to prevent Dental caries due to orthodontic therapy?	<p>a. Prior endodontic evaluation of traumatized or carious tooth</p> <p>b. Intra- op monitoring using IOPAs or OPGs</p> <p>c. Advising patient to reduce sugar intake</p> <p>d. Use of topical Fluorides</p>
4	What is your preferred method to manage open gingival embrasures?	<p>a. Bracket repositioning to converge maxillary anteriors roots</p> <p>b. Post therapy management with crowns or veneers</p> <p>c. IPR in triangular crowns</p> <p>d. Composite restoration in proximal surfaces</p>
5	Do you make Oral prophylaxis a routine to preserve normal gingival and periodontal health during orthodontic therapy?	<p>a. Yes, Oral prophylaxis only prior to therapy</p> <p>b. Oral prophylaxis prior and in between therapy</p> <p>c. Oral prophylaxis only prior to and post orthodontic therapy</p>
6	How do you manage periodontally compromise d patients	<p>a. Reduction in the magnitude of force proportional to</p>

	during orthodontic therapy?	<p>alveolar bone height</p> <p>b. Bonding of brackets more cervically to alter the position of center of resistance</p> <p>c. Use of extra alveolar mini implants for sagittal corrections.</p>
7	How do you manage root resorption when encountered during or post treatment?	<p>a. Using thyroxine</p> <p>b. Sequential RCT with CaOH2</p> <p>c. RCT with gutta percha</p> <p>d. Left untreated</p>
8	Which of the following do you prefer for IPR?	<p>a. Proximal strips</p> <p>b. Diamond burs</p> <p>c. Diamond discs</p> <p>d. Airoter with tungsten carbide burs</p>
9	What is your Preferred method to prevent interproximal caries post IPR?	<p>a. Fluoride mouth rinses, dentifrices</p> <p>b. Use of casein phosphopeptide -amorphous calcium phosphate (GPP-ACP)</p> <p>c. Part-time wear of a thermoformed retainer containing fluoridating solution</p> <p>d. Advising patients to use inter proximal toothbrush or dental floss</p> <p>e. Fluoride varnish</p>
10	What are your preferred ways to prevent mucosal trauma	<p>a. Using bumper sleeves on long spans of wire.</p> <p>b. Providing patients with wax to avoid mucosal</p>

Preferred Modalities on Prevention and Management of Iatrogenic Effects of Orthodontic Therapy Among Orthodontists

	during bonding procedures?	<p>irritation from the brackets.</p> <p>c. Using high volume suction and flushing with copious water after the acid etching procedure.</p> <p>d. Use of rubber dam during bonding</p>
11	Which arch wires do you prefer for patients with nickel allergy?	<p>a. Use of titanium wires as alternatives</p> <p>b. Use of epoxy coating on nickel wires</p> <p>c. Use of fiber-reinforced composite archwires</p>
12	Which brackets do you prefer for patients with nickel allergy?	<p>a. Ceramic bracket</p> <p>b. Polycarbonate brackets</p> <p>c. Titanium brackets</p> <p>d. Use of clear aligners</p>
13	How do you manage TMJ pain due to orthodontic therapy?	<p>a. NSAIDs and Anti-inflammatory agents</p> <p>b. Muscle Relaxants</p> <p>c. Oral splints</p> <p>d. Physical therapy</p>
14	What are your preferred ways of managing orthodontic pain?	<p>a. Prescribing NSAIDS</p> <p>b. Topical lidocaine/prilocaine application</p> <p>c. Advised patients to use Chewing gums, biting on wafers</p> <p>d. Use of Low-level laser therapy</p>
15	What are your preferred methods used to avoid	<p>a. Bonding under rubber dam</p> <p>b. Use of gauze pads distal to arch wires</p>

	accidental swallowing of appliance components?	<p>c. Use of high-volume suction</p> <p>d. Cinching of archwires whenever possible</p>
--	--	--

RESULTS:

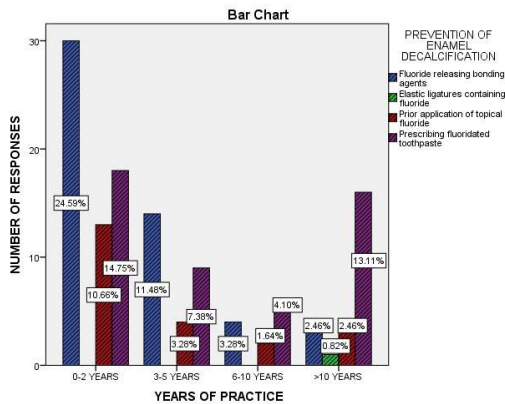
A total of 122 participants took part in the survey, comprising 82 females and 40 males. Regarding professional experience, 50% of the participants had 0 to 2 years of experience, 21.13% had 3 to 5 years of experience, 9.02% had 6 to 10 years of experience, and 18.85% had more than 10 years of experience in the field. (Table 1)

Regarding the preferred modalities for the prevention of enamel decalcification, 24.59% of participants with less than 2 years of experience and 11.48% of those with 3 to 5 years of experience recommended the use of fluoride-releasing bonding agents. Additionally, 4.10% of participants with 6 to 10 years of experience and 13.11% of those with more than 10 years of experience preferred prescribing fluoride mouthwashes (Graph 1). For the management of enamel decalcification, the majority of participants (68.85%) favored the use of fluoride rinses or toothpastes containing 0.05% sodium fluoride daily or 0.2% sodium fluoride once a week (Graph 2) For the prevention of dental caries, 58.2% of participants with up to 10 years of experience preferred conducting prior endodontic evaluation and managing carious or traumatized teeth. In contrast, the majority of participants with more than 10 years of experience (9.84%) favored the use of topical fluorides (Graph 3).

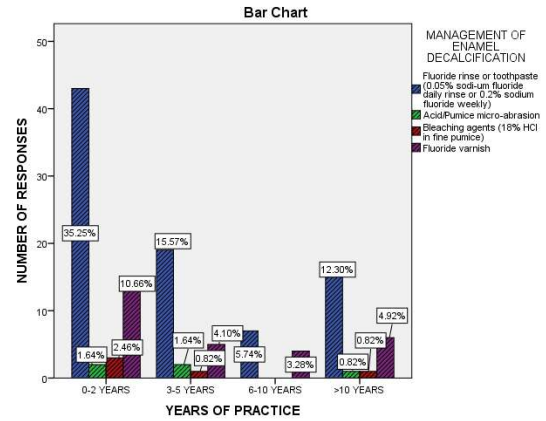
37.34% of participants with up to 5 years of experience preferred repositioning of brackets to converge maxillary anterior roots for the management of open gingival embrasures, while 9.84% of those with more than 5 years of experience favored the use of crowns or veneers following orthodontic therapy (Graph 4). Additionally, 62.29% of the total study population preferred performing oral prophylaxis prior to and during orthodontic treatment to maintain optimal gingival and periodontal health (Graph 5). For managing orthodontic treatment in periodontally compromised patients, the majority of participants (68.85%) across all experience levels recommended reducing the magnitude of orthodontic forces in proportion to the alveolar bone height. Furthermore, 23.77% suggested bonding brackets more cervically to alter the center of resistance, while 7.38% recommended

Preferred Modalities on Prevention and Management of Iatrogenic Effects of Orthodontic Therapy Among Orthodontists

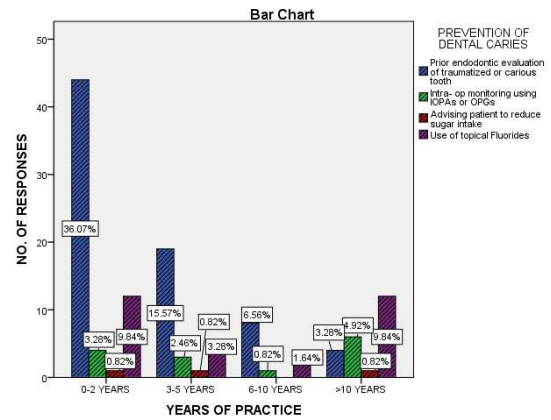
using extra-alveolar mini-implants for retraction in such cases (Graph 6). When addressing orthodontic root resorption, a majority of participants (59.02%) across various experience groups recommended root canal treatment with calcium hydroxide (Graph 7). For interproximal reduction, 71.32% of the participants reported using interproximal strips. Additionally, 33.61% of them recommended the use of interproximal brushes and dental floss to prevent interproximal caries. Interestingly, an equal percentage of participants with more than 10 years of experience suggested the use of both fluoride mouth rinses and dentifrices (Graphs 8 and 9). Regarding the prevention of mucosal trauma, the majority (35.25%) preferred using bumper sleeves over large spans of wires, while 34.43% advised their patients to use relief wax (Graph 10). For patients with nickel allergy, regardless of years of clinical experience, 52.47% of practitioners preferred using titanium archwires as an alternative, while 31.15% opted for fiber-reinforced composite archwires. Additionally, 47.55% recommended ceramic brackets, and 25.42% advised the use of clear aligners for patients with nickel hypersensitivity (Graphs 11 and 12). In the management of temporomandibular joint (TMJ) pain, 35.25% of participants prescribed muscle relaxants, and 26.23% recommended oral splints (Graph 13). For the management of orthodontic pain during therapy, 56.56% prescribed NSAIDs, while 21.31% advised the topical application of lidocaine (Graph 14). To prevent accidental swallowing of orthodontic components, the highest proportion of participants (30.33%) preferred bonding under a rubber dam, whereas 27.87% recommended placing gauze pads distal to the archwires (Graph 15).



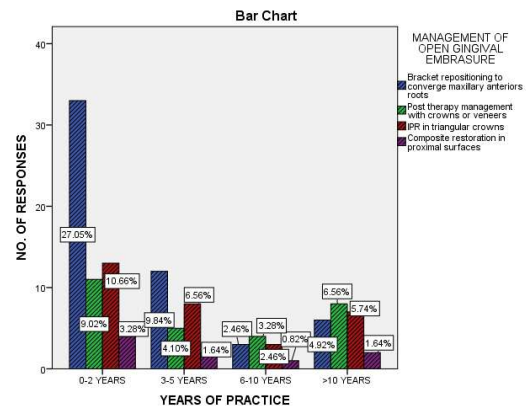
Graph 1: Preferred modality for prevention of enamel decalcification.



Graph 2: Preferred modality for management of enamel decalcification

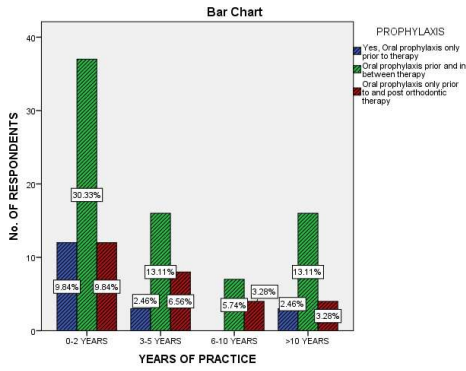


Graph 3: Preferred modality for prevention of Dental caries

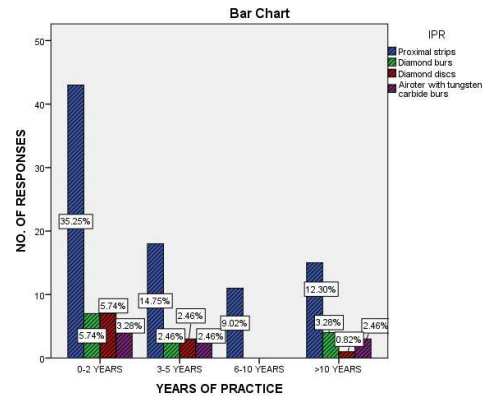


Graph 4: Preferred modality for management of open gingival embrasures

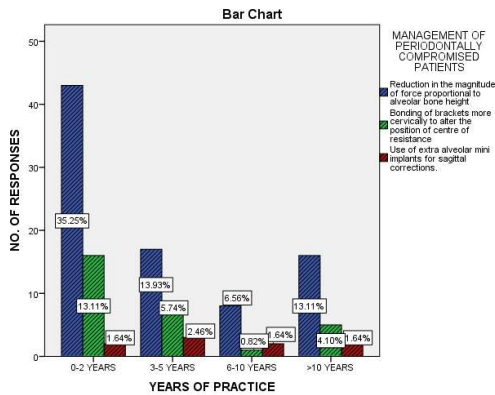
Preferred Modalities on Prevention and Management of Iatrogenic Effects of Orthodontic Therapy Among Orthodontists



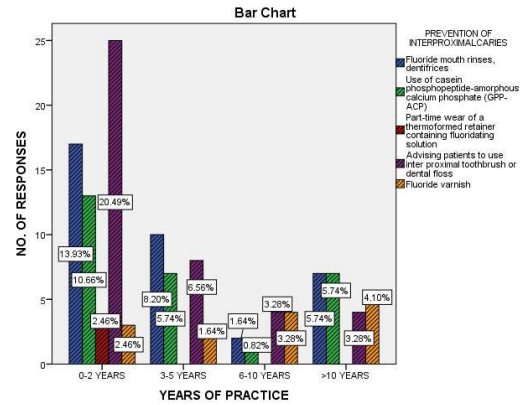
Graph 5: Preferred timing for oral prophylaxis



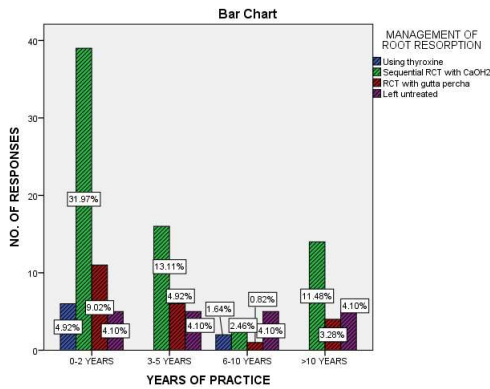
Graph 8: Preferred method of inter proximal reduction



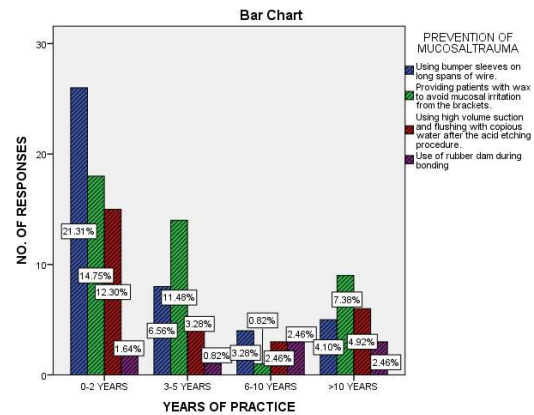
Graph 6: Preferred approach for management of periodontally compromised patients



Graph 9: Preferred approach for prevention of interproximal caries

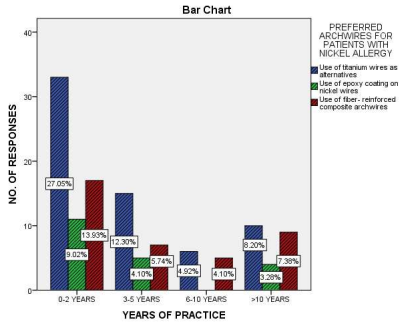


Graph 7: Preferred modality for management of root resorption



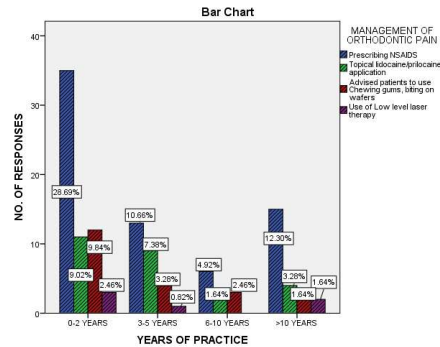
Graph 10: Preferred modality for prevention of mucosal trauma

Preferred Modalities on Prevention and Management of Iatrogenic Effects of Orthodontic Therapy Among Orthodontists



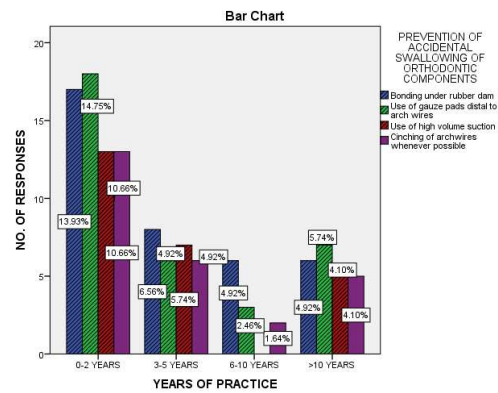
Graph 11: Preferred alternative archwires for patients with nickel allergy

Graph 13: Preferred therapeutic methods for management of TMJ pain



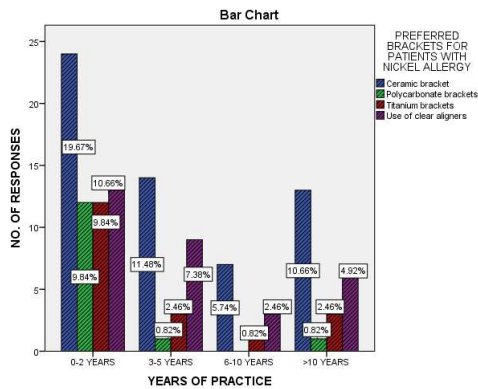
Graph 14: Preferred therapeutic methods for management of orthodontic pain

		YEARS OF PRACTICE			
		0-2 YEAR S	3-5 YEAR S	6-10 YEAR S	>10 YEAR S
GENDE R	MALE	19	9	1	11
	FEMAL E	42	18	10	12



Graph 15: Preferred modality for prevention of accidental swallowing of any orthodontic components.

Table 1 showing the total number participants in the survey

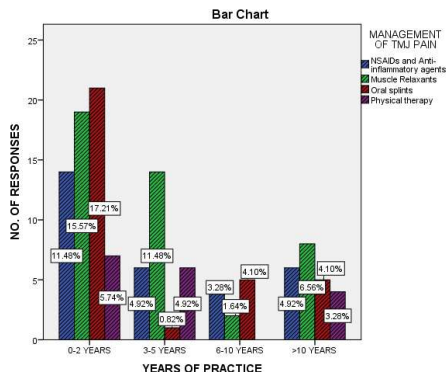


Graph 12: Preferred alternative brackets for patients with nickel allergy

DISCUSSION:

In the current study, 65.8% of the participants preferred using fluoride mouth rises for prevention of enamel decalcification. In agreement with the present findings, Umeh et al., in 2020 reported that oral hygiene instructions were the most commonly implemented preventive approach (51.7%), followed by the use of fluoride rinses. They further noted that, in cases of tooth demineralization occurring during or after orthodontic treatment, extraoral hygiene measures were most frequently advised. In addition, the protective role of fluoride through toothpastes and rinses has been well documented across studies, reinforcing its routine use to reduce decalcification and white spot lesions during fixed appliance therapy.[24]

Consistent with our results, the majority of participants agreed that parallel root positioning helps reduce the severity of open gingival embrasures, which otherwise contribute to the appearance of black triangles. This is supported by



Syed et al., who estimated that nearly one-third of adult orthodontic patients may present with such complications.[25]

A majority of orthodontists (68.85%) preferred adjusting the magnitude of orthodontic forces according to the reduced alveolar bone height in periodontally compromised individuals, while a smaller proportion (23.77%) advocated cervical positioning of brackets to alter the center of resistance. Also, majority of the participants in this study preferred to have oral prophylaxis done prior to, during and post orthodontic therapy.

Sanders conducted a comprehensive review of evidence-based literature in both periodontics and orthodontics to evaluate the relationship between orthodontic tooth movement and common periodontal conditions. The review concluded that, when optimum orthodontic forces are applied in patients with good oral hygiene and no pre-existing periodontal disease, orthodontic therapy does not present a significant periodontal risk. Careful assessment of the periodontal status prior to initiating fixed appliance therapy is therefore essential, and any existing periodontal concerns should be managed before treatment begins.[26] Furthermore, regular periodontal monitoring, including professional scaling and polishing, is strongly recommended to minimize the risk of disease progression. [27] In patients with compromised periodontal support, slight modifications in biomechanics are necessary, with emphasis on using light, controlled forces in consideration of the reduced root support. [28]

For patients with nickel allergy, regardless of years of clinical experience, 52.47% of practitioners preferred using titanium archwires as an alternative, while 31.15% opted for fiber-reinforced composite archwires. The findings of the present study was in concordance with the results of the study conducted by Kim et al, in 1999 who reported that titanium wires and brackets are highly inert and suitable for intraoral use in corrosive environments. Since they are free of nickel, they serve as an excellent alternative for orthodontic patients with nickel hypersensitivity. When the use of nickel-titanium wires is unavoidable, application of an epoxy coating is recommended to decrease their corrosive potential and the associated release of nickel. If these coatings remain intact throughout orthodontic therapy, both corrosion of the wire and the subsequent release of metal ions into the oral cavity can be significantly reduced. [29]

CONCLUSION:

Within the limitations of the present study, it can be concluded that orthodontists demonstrate a sound understanding on methods of prevention and management of iatrogenic effects associated with orthodontic therapy. Their choices reflect evidence-based approaches, emphasizing the importance of

maintaining oral hygiene, modifying biomechanics in periodontally compromised patients, and adopting biocompatible materials when required. The findings highlight that orthodontists possess adequate knowledge and clinical awareness to minimize iatrogenic risks, thereby promoting safer and more effective orthodontic care.

REFERENCES:

1. Abdulrazzaq AT, Sami T, Mukherjee P. Iatrogenic effects of orthodontic treatment: decision-making in diagnosis, treatment, and modalities of prevention. *EC Dental Science*. 2018;17(4):326-35.
2. Meeran NA. Iatrogenic possibilities of orthodontic treatment and modalities of prevention. *Journal of Orthodontic Science*. 2013 Jul 1;2(3):73-86.
3. Stratemann MW, Shannon IL. Control of decalcification in orthodontic patients by daily self-administered application of a water-free 0.4 per cent stannous fluoride gel. *Am J Orthod*. 1974 Sep;66(3):273-9.
4. Geiger AM., et al. "The effect of a fluoride program on white spot formation during orthodontic treatment". *American Journal of Orthodontics and Dentofacial Orthopedics* 93.1 (1988): 29-37.
5. Pallavi K et al. The Role of Dental Practitioners in Promoting Electric Toothbrushes: A Knowledge Practice Assessment Evaluation. *J Pharm Bioallied Sci*. 2025 May;17(Suppl 1):S397-S399. doi: 10.4103/jpbs.jpbs_1809_24
6. Gorelick L., et al. "Incidence of white spot formation after bonding and banding". *American Journal of Orthodontics* 81.2 (1982): 93-98.
7. Seppa L., et al. "The effect of fluoride application on fluoride release and the antibacterial action of glass ionomers". *Journal of Dental Research* 72.9 (1993): 1310-1314.
8. Cho R, Panariello B. Oral Microbial and Biofilm Changes in Response to Clear Aligners: A Scoping Review. *Oral Sphere J. Dent. Health Sci*. 2026;2(2):132-143. doi: 10.63150/osjdh.2026.19
9. Motokawa M, Sasamoto T, Kaku M, Kawara T, Matsuda Y, Terao A, et al. Association between root resorption incident to orthodontic treatment and treatment factors. *Eur J Orthod* 2012;34:350-6.
10. Brezniak N, Wasserstein A. Root resorption after orthodontic treatment: Part 1. Literature review. *Am J Orthod* 1993;103:62-6.

11. Linge BO, Linge L. Apical root resorption in upper anterior teeth. *Eur J Orthod* 1983;5:173-83.
12. Leonen V, Dermaut LR, Degreick J, De Pauw GA. Apical root resorption of upper incisors during the torquing stage of the tip-edge technique. *Eur J Orthod* 2007;29:583-8.1
13. Vandevska-Radunovic V, Kristiansen AB, Heyeraas KJ, Kvinnsland S. Changes in blood circulation in teeth and supporting tissues incident to experimental tooth movement. *Eur J Orthod* 1994;16:361-9.
14. Nixon CE, Saviano JA, King GJ, Keeling SD. Histomorphometric study of dental pulp during orthodontic tooth movement. *J Endod* 1992;19:13-6.
15. Hamersky PA, Weimer AD, Taintor JF. The effect of orthodontic force application on the pulpal tissue respiration rate in human premolar. *Am J Orthod* 1980;77:368-78.
16. Mostafa YA, Iskander KG, El-Mangoury NH. Iatrogenic pulpal reactions to orthodontic extrusion. *Am J Orthod Dentofacial Orthop* 1991;99:30-4.
17. Yamaguchi M, Kasai K. The Effects of Orthodontic Mechanics on the Dental Pulp. *Seminars Orthod* 2007;13:272-80.
18. Huser MC., et al. "Effects of orthodontic bands on microbiologic and clinical parameters". *American Journal of Orthodontics and Dentofacial Orthopedics* 97.3 (1990): 213-218.
19. Kurth JR and Kokich VG. "Open gingival embrasures after orthodontic treatment in adults: prevalence and etiology". *American Journal of Orthodontics and Dentofacial Orthopedics* 120.2 (2001): 116-123.
20. Roth RH. Functional occlusion for the orthodontist. Part III. *J Clin Orthod* 1981;1:32-50
21. Little RM. Stability and relapse of dental arch alignment. *Br J Orthod* 1990;17:235-41.
22. Zachrisson BU. Important aspects of long-term stability. *J Clin Orthod* 1997;31:562-83.
23. Taner TU, Haydar B, Kavuklu I, Korkmaz A. Short-term effects of fiberotomy on relapse of anterior crowding. *Am J Orthod Dentofac Orthop* 2000;118:617-23.
24. Umeh OD, Utomi IL, Ndukwe AN, Izuka M. Demineralization Preventive Practices among Nigerian Orthodontists–An Evidence-based Approach?. *Nigerian Journal of Clinical Practice*. 2020 May 16;23(5):589-95.
25. Syed R, Kumar Pradeep YG, Shriparna B, Prabhu SS, Chandrashekar BM, Rakesh MP. Iatrogenic damage to the periodontium caused by orthodontic treatment procedure: An overview *Dent Open J*. 2015;9:234–28
26. Sanders NL. Evidence-based care in orthodontics and periodontics: A review of the literature *J Am Dent Assoc*. 1999;130:521–7
27. Eliasson LA, Hugoson A, Kurol J, Siwe H. The effects of orthodontic treatment on periodontal tissues in patients with reduced periodontal support *Eur J Orthod*. 1982;4:1–9
28. Steffensen B, Storey AT. Orthodontic intrusive forces in the treatment of periodontally compromised incisors: A case report *Int J Perio Rest Dent*. 1993;13:433–41
29. Kim H. Corrosion of Stainless Steel, Niti, coated nickel titanium and titanium orthodontic wires *J Dent Res*. 1999;69:39–44