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Original Article

Contemporary Orthodontic Retention Practices in Pakistan: A Nationwide Survey of Clinical Decision-Making, Protocols, and Determinants Among Orthodontists

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Abstract

Objective: To evaluate retention decisions and practices among orthodontists in Pakistan. The success of orthodontic treatment depends not only on achieving ideal alignment and occlusion but also on maintaining long-term stability. Because no universally accepted guidelines exist, retention protocols vary widely, and retention is essential to prevent relapse.

Methods: This descriptive cross-sectional survey was conducted at Nishtar Institute of Dentistry, Multan. 120 orthodontists from Pakistan participated voluntarily. We collected data through a structured, self-administered questionnaire. We recruited participants using non-probability and consecutive sampling. The study duration was 6 months, from 1st April 2025 to 30th September 2025. Data were analyzed using SPSS version 26, descriptive statistics, and Chi-square or Fisher's exact tests ($p \leq 0.05$).

Results: Most participants had FCPS qualifications (75.0%) and were working in both academic and private practice (58.3%). Vacuum-formed retainers were most popular in the maxillary arch (54.2%), and bonded retainers were most popular in the mandibular arch (45.8%). Several retention-related variables, such as maxillary retainer preference and retention duration, were significantly associated with clinical experience.

Conclusion: VFRs are frequently preferred by orthodontists in Pakistan for maxillary treatment, while bonded retainers are more commonly used for mandibular treatment, and combined and long-term retention strategies are becoming increasingly popular. Protocols vary widely, and a common set of standards and evidence-based retention recommendations is needed.

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Introduction

Orthodontic treatment is designed to achieve the best possible position of the teeth, occlusion, and facial esthetics. However, the results of active orthodontic treatment are not guaranteed to remain stable over the long term.[1] After tooth movement, the dentition remains susceptible to relapse due to periodontal remodeling, soft tissue pressures, craniofacial growth, and occlusal changes.[2] This retention period is therefore well recognized as an important component of orthodontic retention. Orthodontic relapse is one of the most challenging elements of orthodontic treatment. Rates of relapse after treatment in the mandibular anterior segment and in other segments have been different despite careful treatment planning and execution.[3] Long-term follow-up studies show that dental arches undergo physiologic changes throughout the life span, and retention is necessary to maintain treatment results.[4] Many orthodontists therefore prefer to keep retainers in place longer, or even for life, to reduce relapse and keep patients happy.[5] Several types of retention appliances are used, such as Hawley retainers, vacuum-formed retainers (VFRs), and bonded retainers. [6] Each retention modality has its own strengths and weaknesses in effectiveness, compliance, esthetics, cost, maintenance, and long-term stability.[7] Vacuum-formed retainers are popular for their better esthetics and patient acceptance, while fixed retainers may be preferred when stability is important and compliance is not guaranteed.[8] However, the type of retainer used, how long it is worn, follow-up times, and management of retainer failure vary widely by provider.[9] Retention protocols differ significantly worldwide. These surveys have shown large differences between countries regarding selected retainers, recommended wear patterns, length of retention, and monitoring.[10] These surveys have consistently shown significant disparities in retainer type, prescribed wear, retention duration, and monitoring frequency between countries.[11] Retention appliances are prevalent, but no generally accepted evidence-based guidelines exist on retainer type and retention duration.[11] Many orthodontists rely on their own experience, postgraduate training, clinical judgment, and patient-specific factors to make their retention decisions.[12]

A few studies have evaluated orthodontic retention in general, but information from Pakistan remains limited. Retention decisions made by orthodontists in Pakistan may be influenced by various clinical and demographic factors, including the patient's socio-economic status, the practice's clinical resources and infrastructure, practitioners' training backgrounds, and patients' demographics. Understanding current retention practices is crucial to identify patterns, differences in clinical practice, and opportunities to develop evidence-based guidelines. Thus, this study aimed to evaluate orthodontists' retention decisions and practices, including their preference for orthodontic retainers, other retention plans, retention duration, follow-up practices, and factors influencing clinical decisions.

Material and Methods

This descriptive cross-sectional survey, conducted from April 1, 2025, to September 30, 2025, at Nishtar Institute of Dentistry, Multan, and approved by the institutional ethics review committee, evaluated retention decision-making and practices among orthodontists. We determined the sample size using OpenEpi software (Version 3.0) for a cross-sectional study design. The calculation was based on a previously reported prevalence of orthodontists reporting vacuum-formed retainers as the most commonly used retention appliance (72.5%), with a 95% confidence level and a 5% margin of error.[13] The sample size was calculated as 120 orthodontists. The participants were recruited using a non-probability convenience sampling technique. Orthodontists who had attended a recognized postgraduate program in Orthodontics (FCPS, MDS, MSc, MOrth, or any other equivalent) and were currently using Orthodontics as their specialty in the treatment of orthodontic patients in Pakistan were included in the study, provided they were willing to participate in the survey, after obtaining informed consent. Orthodontists working in academic institutions, government hospitals, private clinics, or a combination of these were eligible.10 The study did not include dental practitioners who are not qualified orthodontists, postgraduate residents who are in the process of acquiring orthodontic specialty skills, general dentists with a particular interest in orthodontics but who do not have a recognized orthodontic qualification, or orthodontists practicing outside Pakistan. We also excluded incomplete questionnaires, duplicate responses, and surveys with substantial missing data from the final analysis. We adapted a structured, self-administered questionnaire based on previous surveys of orthodontic

retention practice to meet the objectives of the present study. The questionnaire included questions on participants' demographic and professional characteristics, such as years of orthodontic experience, educational qualification, gender, city of practice, and workplace setting. It also included questions about retention protocols, retainer preferences, bonded retainer designs and materials, retainer wear time, follow-up schedules, factors influencing retainer selection, stability and patient satisfaction with various retainers, and the use of adjunctive retention procedures. The questionnaire was created online using a survey platform and sent to orthodontists in Pakistan via professional networks, email correspondence, social media groups, and orthodontic associations. Participants completed the self-administered survey online after providing informed consent. The study respected participants' anonymity and confidentiality, and no personal data were collected.

We analyzed the data using the Statistical Package for the Social Sciences (SPSS) version 26.0. All study variables were categorical. Data were summarized using descriptive statistics. We collected demographic and professional data, including qualification, sex, city of practice, workplace, and years of orthodontic experience, and presented them as frequencies and percentages. Frequencies and percentages were also calculated for all variables related to the retention of the retainers, such as preferred maxillary and mandibular retainers, methods of bonded retainer fabrication, retainer designs, retainer materials, duration of retainer wear, retained by protocol, post-retainer follow-up schedules, perceived stability of the retainers, patient satisfaction, factors influencing retainer selection, and use of adjunctive retention procedures. We also reported the frequencies and percentages of specific clinical situations affecting retention selection (extraction cases, diastema closure, arch expansion, intrusion/extrusion of anterior teeth, severe rotations, anterior open bite, impacted teeth, root resorption, and retreatment cases). We analyzed retention preferences by year of orthodontic experience and tested associations using the chi-square test and Fisher's Exact test. We considered p-values < 0.05 statistically significant.

esults

All 120 orthodontists completed the survey. Participants represented a range of qualifications and practice settings; three-quarters held FCPS, just over half were women, and most combined academic or hospital work with private practice. The largest experience group had practiced for 10–20 years (Table 1).

Table 1. Demographic and professional characteristics of participants (n=120)

Variable	Category	n (%)
Qualification	FCPS	90 (75.0)
	FCPS + Morth	10 (8.3)
	MDS	8 (6.7)
	Morth	3 (2.5)
	Other/multiple	9 (7.5)
Workplace	Private clinic	13 (10.8)
	Hospital/university	37 (30.8)
	Both	70 (58.3)
Experience	0–5 years	23 (19.2)
	5–10 years	39 (32.5)
	10–20 years	43 (35.8)
	>20 years	15 (12.5)

Retainer choice differed clearly by arch. VFRs were used most often in the maxilla, whereas bonded retainers, either alone or with a VFR, dominated mandibular practice. Among the 120 orthodontic arches assessed, the most commonly used maxillary retainer was the vacuum-formed retainer (VFR), used in 65 cases (54.2%), followed by bonded + VFR in 24 cases (20.0%), Hawley retainers in 16 cases (13.3%), and bonded retainers in 13 cases (10.8%). Other maxillary retainer types accounted for 2 cases (1.7%). In the mandibular arch, bonded retainers were the most frequently used, occurring in 55 cases (45.8%), followed by bonded + VFR in 47 cases (39.2%) and VFR in 16 cases (13.3%). Hawley retainers were used in only 2 mandibular cases (1.7%). Overall, VFRs predominated in the maxillary arch, whereas bonded retainers were most common in the mandibular arch. Hawley retainers were uncommon as the routine first choice. Most respondents fabricated bonded retainers chairside. Both arches preferred six-tooth canine-to-canine designs, and stainless-steel coaxial round wire was the leading material. More than half had experienced inadvertent activation 1 to 5

times per year, while 59.2% recommended lifetime bonded retention (Table 2).

Table 2. Bonded-retainer design, fabrication, and wear protocols

Variable	Category	n (%)
Fabrication	Direct chairside	79 (65.8)
	Office laboratory	29 (24.2)
	Commercial laboratory	12 (10.0)
Maxillary design	13–23 (6 teeth)	99 (82.5)
	12–22 (4 teeth)	21 (17.5)
Mandibular design	33–43 (6 teeth)	90 (75.0)
	33–34 (6 teeth)	18 (15.0)
	Canines only	12 (10.0)
Material	SS coaxial round	72 (60.0)
	SS twisted round	30 (25.0)
	SS braided rectangular	11 (9.2)
	Other	7 (5.8)
Inadvertent activation	Never	50 (41.7)
	1–5 times/year	66 (55.0)
	5–10 times/year	4 (3.3)

SS: *stainless steel.*

Orthodontists advised full-time removable retainer wear more often for the maxillary than the mandibular arch. Once patients moved to part-time wear, night-time use was the usual recommendation. Orthodontists advised lifetime removable retention in 35.8% of cases. During the first year, most orthodontists scheduled one or two review visits for either bonded or removable retainers (Table 3).

Table 3. Removable-retainer wear and first-year follow-up protocols

Variable	Category	n (%)
Full-time maxillary wear	Yes	79 (65.8)
	No	41 (34.2)
Maxillary part-time wear	Night only	78 (65.0)
	Tapering	39 (32.5)
	Other	3 (2.5)
Full-time mandibular wear	Yes	69 (57.5)
	No	51 (42.5)
Mandibular part-time wear	Night only	77 (64.2)
	Tapering	34 (28.3)
	Other	9 (7.5)
Recommended duration	Lifetime	43 (35.8)
	Other durations	77 (64.2)
Bonded follow-up	1–2 visits	68 (56.7)
	2–4 visits	43 (35.8)
	Other	9 (7.5)
Removable follow-up	1–2 visits	59 (49.2)
	2–4 visits	48 (40.0)
	Other	13 (10.8)

Combined bonded and VFR retention was regarded as the most stable option by 65 respondents (54.2%) and as the option giving the greatest patient satisfaction by 52 (43.3%). Bonded retainers alone ranked second for both stability (27.5%) and satisfaction (30.0%), while 25.8% considered VFRs alone the most satisfactory. Clinicians based their judgment on pretreatment malocclusion (85.0%), periodontal condition (64.2%), patient motivation (62.5%), oral hygiene (58.3%), and age (55.8%). Patient or parent preference influenced 51.7% of the decisions. Treatment outcome (48.3%) and interdigitation post-treatment (39.2%) were also considered, while third molars (5.0%) were infrequently reported as a determining factor.
The preferred appliance also differed with the clinical situation. Most often after severe rotations, retreatment, extrusion, anterior open bite, and several mandibular movements, the combined bonded and VFR retention was chosen. Hawley retainers were still the best choice after maxillary expansion and in the presence of residual overjet (Table 4).

Table 4. Most frequently selected retainer for specific clinical situations

Clinical situation	Leading retainer	n (%)
Maxillary extraction	VFR	53 (44.2)
Mandibular extraction	Bonded + VFR	48 (40.0)
Maxillary diastema closure	Bonded + VFR	60 (50.0)
Mandibular diastema closure	Bonded	61 (50.8)
Maxillary expansion	Hawley	70 (58.3)
Mandibular expansion	Bonded + VFR	56 (46.7)

Maxillary intrusion	VFR	54 (45.0)
Mandibular intrusion	Bonded + VFR	50 (41.7)
Maxillary extrusion	Bonded + VFR	51 (42.5)
Mandibular extrusion	Bonded + VFR	62 (51.7)
Severe rotation	Bonded + VFR	79 (65.8)
Maxillary anterior open bite	Bonded + VFR	49 (40.8)
Mandibular anterior open bite	Bonded + VFR	52 (43.3)
Residual maxillary overjet	Hawley	69 (57.5)
Impacted anterior teeth	Bonded + VFR	56 (46.7)
Maxillary root resorption	Bonded	50 (41.7)
Mandibular root resorption	Bonded	51 (42.5)
Retreatment	Bonded + VFR	81 (67.5)

VFR: vacuum-formed retainer. The table presents the most frequently selected option for each situation.

Adjunctive procedures were used when indicated. The most frequently used approach was combined circumferential supracrestal fiberotomy (CSF) and interproximal reduction (IPR) (30.0%), followed by IPR alone (28.3%) and CSF alone (24.2%). 64.2% used CSF and/or IPR occasionally; 16.7% frequently, 16.7% infrequently, 1.7% constantly, and 0.8% never. Experience did not correlate with mandibular retainer preference (p=0.508). However, it was associated with maxillary retainer preference, fabrication method, bonded-retainer material, and recommended wearing time (Table 5). VFRs continued to be the most popular maxillary choice for all experience groups. Direct chairside fabrication was also the most common method overall, though it was least common among orthodontists with 10-20 years of experience (46.5%).

Table 5. Association of clinical experience with retention practices

Retention practice	p-value
Mandibular retainer preference	0.508
Maxillary retainer preference	0.042
Bonded-retainer fabrication method	0.016
Bonded-retainer material	0.014
Recommended bonded-retainer duration	0.012

Chi-square test; p<0.05 was considered statistically significant.

Discussion

This study provides an extensive picture of retention decisions and protocols among orthodontists practicing in Pakistan. The results show significant differences in retainer types, retention time, follow-up procedures, and the management of selected clinical cases. However, several trends emerged: First, the use of the vacuum-formed retainer (VFR) in the maxillary arch; second, the use of bonded retainers (BR) in the mandibular arch; and third, the use of multiple retention methods in high-risk relapse cases.

In the present study, the most selected retainer for the maxillary arch was VFRs (54.2%), while the most selected retainer for the mandibular arch was the bonded retainer (45.8%). Carneiro et al. (2022) reported similar results in a Canadian national survey, showing VFRs as the most popular choice in the maxilla and fixed bonded retainers in the mandible. The authors proposed that the rising popularity of the VFRs is related to their better esthetic quality, patient acceptance, and ease of fabrication.[14] The results also align with the Brazilian study by Maltagliati et al. (2024), which showed that despite advances in orthodontic procedures, the removable retainer remains the preferred option for the upper arch and the bonded retainer for the lower arch.[15]The high frequency of bonded retainers in the mandibular arch noted in the current study may reflect the known tendency for anterior teeth to relapse in the mandible. Other studies testing retention effectiveness found that fixed retainers maintained lower incisor alignment better than removable types.[16] An evaluation of retention protocols carried out in 2023 found bonded retainers to be the most effective treatment for maintaining mandibular position long term.[8]Most orthodontists (59.2%) in this study recommended bonded retainers for lifetime use, and more than one-third recommended lifetime use of removable retainers. These results align with recent international trends toward longer or indefinite retention. The Canadian survey showed that a high proportion of orthodontists preferred permanent or long-term retention, as more physicians recognized a continuum of tooth movement that occurs throughout life after treatment.[14] In the 2023 Brazil survey, most respondents also preferred longer retention periods, noting that there is no set time limit for keeping records.[17] About two-thirds of our respondents preferred

chairside fabrication. This preference may reflect lab cost savings, efficiency, and real-time appliance delivery. Few recent studies have specifically assessed fabrication methods, but the Brazilian survey showed that most orthodontists still fabricated retainers directly in their offices rather than in commercial labs.[18]For bonded retainer design, 82.5% and 75.0% of respondents favored bonded retainers in the maxillary and mandibular arches, respectively, that covered all six anterior teeth. These results are similar to a Lithuanian survey, where the most effective design for long-term stability was a retainer bonded to six anterior teeth.[19] Similarly, survival analysis of bonded retainers has shown good longevity and stability when the design includes multiple anterior teeth.[20] Most participants chose coaxial round wire for a bonded retainer. This finding aligns with reports from bonded retainer survival studies, which indicate that multistranded stainless-steel wires remain the most popular material because of their flexibility, durability, and good survival rates.[21] Rezaei et al. (2022) also found satisfactory long-term performance when they used multistranded stainless-steel retainers in both arches.[22] One interesting result was that 54.2% of orthodontists thought bonded retainers plus VFRs provided the most stability, and 43.3% believed bonded retainers and VFRs provided the highest patient satisfaction. International retention surveys support this, suggesting that patients at high risk of relapse should have fixed and removable retainers.[16,23] The Lithuanian survey found combined retention to be the most common retention strategy, especially for extractions, rotations, and complex malocclusions.[24] Recent research on retention effectiveness has made similar recommendations. In the current study, clinical factors significantly influenced retainer choice. Prescribed combined bonded and VFR retention was most frequently observed in diastema closure, severe rotations, VFR in cases following anterior tooth impaction, and in cases that were retreated. These results are consistent with other reports that have identified these as risk situations for relapse. Andriekute et al. reported increased use of combined retention after rotation and complex orthodontic treatment, and recent studies on the effectiveness of retention after tooth movement have also prioritized reinforced retention in relapse-prone cases.[25]

In our study, the maxillary expansion and residual overjet cases showed a preference for Hawley retainers. This is consistent with previous international surveys, which reported that Hawley retainers were used more after transverse expansion because they provide arch-width stability and occlusal settling.[26] Although VFRs are becoming more common, Hawley retainers remain beneficial in certain clinical situations.

The results of the present study mostly agree with recent international literature and confirm a trend toward using more VFRs in the maxilla and bonded retainers in the mandible, with extended retention time and a combination of different retention for patients with higher relapse risk. However, significant inter-orthodontist variability in retention length, appliance type, and other adjunctive procedures indicates an ongoing need for evidence-based clinical guidelines and consensus recommendations for orthodontic retention.

The results of the present study show that orthodontists in Pakistan prefer to follow a mix of clinical experience, patient-related factors, and treatment complexity when choosing retention protocols rather than standardized national guidelines. The high prevalence of using a combination of these retainers in the maxillary arch and bonded ones in the mandibular arch, as well as in high-risk clinical situations, illustrates the importance of retention planning in routine clinical practice. This can help clinicians compare their practice with current national trends and support more evidence-based decision-making, especially for long-term or lifetime retention plans to reduce the risk of post-treatment relapse. Furthermore, the differences in fabrication techniques, follow-up timetables, and additional procedures show a need to establish standardized retention protocols for the Pakistani orthodontic environment.

Conclusion

This study provides a detailed overview of current retention practices and modalities among orthodontists in Pakistan, showing consistency with international practices alongside significant variation in clinical approach. The overall preference for VFRs in the maxilla, bonded retainers in the mandible, and a combination of both in more complicated situations reflects an experience-based, practical approach to reducing relapse. However, retention length, follow-up plans, and

adjunctive procedures varied, indicating a need for more uniform clinical guidance. The present study highlights the critical need to establish evidence-based consensus guidelines to standardize retention protocols nationwide, achieve long-term treatment stability, and improve patient outcomes across clinical settings.

Ethical Approval

The Ethics Committee of the Nishtar Institute of Dentistry, Multan, Pakistan **(Reference No. 5909/NID)** approved this study on 17 June 2024.

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Conflict of Interest

The authors declare no competing interests or conflicts of interest related to this study.

Authors' Contributions

Ushna Ahmed: Protocol development and literature search strategy**. Zubair Hassan Awaisi:** Proofreading and final approval of the manuscript**. Sana Basheer:** Writing – review and editing**. Amna Malik: Writing** – review and editing**. Sabah Fatima:** Data extraction**. Fiza Ikhlaq:** Data analysis.

All authors should review and approve the final version of the manuscript and agree to be accountable for all aspects of the work, in accordance with **ICMJE authorship criteria**, provided they meet these requirements.

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