

# Current Trends in Orthodontics Practices, Regarding the use of Fixed Appliances and its Components Amongst Specialist Orthodontist in Pakistan

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## Abstract

**Introduction:** Orthodontics has come a long way, with remarkable global advancements in appliances and materials that have transformed patient care. From cutting-edge bracket systems to innovative arch wires and bonding techniques, these developments have made treatments more comfortable and effective.

**Objective:** This study aimed to assess current trends in orthodontic practice in Pakistan by evaluating the usage patterns of fixed appliances and their components among practicing orthodontists.

**Material and Methods:** A cross-sectional, nationwide survey was conducted from September 2024 to February 2025, targeting orthodontic consultants, residents, and general dentists registered with PMDC. A total of 110 responses were collected via a structured digital questionnaire. Descriptive statistics, chi-square tests, and association analyses were used to evaluate the data.

**Results:** Conventional metal brackets (75.5%) with MBT prescription (81.8%) and metal material (97.3%) were the most commonly used. The 0.022-inch slot size (82.7%), light-cure composite resin (96.4%), and direct bonding technique (96.4%) were preferred. Bands were favored for molar attachments (70.9%), and continuous mechanics (80%) with elastomeric power chains (70%) were the preferred space closure strategies. Aligners (0.9%) and ceramic brackets (1.8%) had minimal adoption. Significant associations were found between demographic factors and preferences for bracket slot size and molar attachments.

**Conclusion:** Orthodontic practices in Pakistan align with global standards in many respects but lag in adopting advanced technologies like aligners and self-ligating brackets. Economic limitations, training gaps, and accessibility are major barriers. Future research should explore longitudinal trends, regional comparisons, and strategies to enhance the adoption of modern orthodontic tools and techniques.

**Keywords:** Orthodontic trends, Bracket systems, Bonding techniques, Aligners, Orthodontic materials

## Introduction

Orthodontics has come a long way, with remarkable global advancements in appliances and materials that have transformed patient care. From cutting-edge bracket systems to innovative arch wires and bonding techniques, these developments have made treatments more comfortable and effective.<sup>1,2</sup> As a result, orthodontists worldwide are tailoring their approaches to align with their treatment philosophies, a trend reflected in national surveys that track shifts in orthodontic practices.<sup>3</sup> Studies from developed countries often highlight the adoption of modern techniques, such as advanced bonding methods, diverse bracket types, and new arch wire materials, showcasing how the field is evolving to meet contemporary demands.

In Pakistan, however, the picture is less clear. Despite the global wave of innovation, there's little data on how orthodontic practices are adapting locally. The country's orthodontic scene is rapidly changing, fueled by a growing number of postgraduate programs training a new generation of orthodontists who are embracing different techniques compared to their predecessors.<sup>4</sup> Understanding these emerging trends is critical. It offers a window into how Pakistani orthodontists are integrating modern appliances, materials, and equipment, and whether they're keeping pace with global standards.<sup>5</sup>

While research from developed nations has thoroughly explored evolving orthodontic techniques, Pakistan lacks comprehensive insights into the preferences and material choices of its practitioners. Uncovering these trends and the factors driving them is vital for aligning local practices with international benchmarks and overcoming barriers to adopting advanced technologies. This study aims to fill this gap by examining the preferences for orthodontic appliances, bonding techniques, and material usage among a representative sample of Pakistani practitioners.

This study set out to explore current trends in orthodontic practice across Pakistan through a national survey. It focused on the use of fixed appliance materials—such as bracket types, bracket slots, bonding techniques, and arch wires—while considering key factors like cost-effectiveness, treatment efficiency, duration, and finishing quality.

## Material and Methods

A cross-sectional study conducted from September 2024 to February 2025. The survey will be conducted across multiple institutions with orthodontic departments, involving orthodontic consultants, orthodontic residents, and clinicians across Pakistan. The sample size estimation was based on an approximate population of 300 orthodontists in Pakistan. A census-based approach was adopted, distributing the questionnaire through professional networks, email, and direct contact. Using Cohen's  $w = 0.3$ ,  $\alpha = 0.05$ , and 80% power, the minimum required number for chi-square tests was determined to be 88 participants. The study successfully collected 110 responses (36.7% response rate), which was adequate for descriptive analysis, chi-square tests, and multinomial logistic regression. However, potential non-response bias remains a limitation. The survey was distributed among orthodontic consultants having fellowship or membership in the specialty, Resident orthodontists and General

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practitioners (Bachelor of Dental Surgery - BDS) registered with PMDC. However Practitioners without PMDC registration and individuals no longer engaged in clinical practice were excluded. This study was approved by the Ethical Review Board under approval number 198-ERB-024.

Descriptive statistics, including frequencies and percentages, were utilized to summarize respondent's demographic characteristics, educational backgrounds, and clinical preferences. Chi-square tests were applied to assess associations between categorical variables, identifying significant relationships between professional factors and orthodontic treatment choices.

A digital questionnaire was designed using Google Forms. It underwent an initial pilot test, followed by revisions based on feedback, and a second pilot test before final distribution. The survey was disseminated via social media platforms to maximize reach. The questionnaire consists of two main sections: **Demographic Information** (e.g., age, gender, institution, and experience) (see Annexure I) and **Fixed Appliances and Components Usage** (see Annexure I) Reminders were sent 2 weeks after the initial distribution to encourage participation. A follow-up reminder was sent to non-responders one month after the first reminder. The survey was thoroughly reviewed by the authors to ensure clarity and precise wording before final distribution.

Results

The gender distribution among respondents is nearly equal, with 51.8% male and 48.2% female. However the educational qualifications vary, with 34.5% enrolled in residency programs, and 52.8% having completed fellowship. A smaller percentage are holding only BDS degree.

Table 1: Sociodemographic, Academic, and Qualification Profile of the Respondents.

Question	Response	Count (n)	Percentage (%)
Gender	Female	53	48.2
	male	57	51.8
Age	30-40	46	41.8
	Above 40	9	8.2
	Below 30	55	50.0
Educational Qualification	General Dentist	14	12.7
	Consultant	58	52.8
	Resident Orthodontics	38	34.5

Table 2 shows most practitioners prefer conventional metal brackets as shown in Figure 1 (75.5%) with MBT prescription (81.8%) and metal bracket material (97.3%). The dominant bracket slot size is 0.022 inches (82.7%). Light-cure composite resin is the adhesive of choice (96.4%), and direct bonding is the most widely used technique (96.4%). Regarding molar attachments, bands (70.9%) are more commonly used than bonded molar tubes.

Table 3 is dedicated to the frequency analysis of treatment strategies in Orthodontics as depicted in Figure 2. Continuous mechanics (80.0%) and elastomeric power chains (70.0%) are preferred for space closure. Elastic separators (99.1%) are widely used.

Table 2: Distribution of Bracket and Bonding Preferences in Orthodontic Treatment

Question	Response	n	%
Which Orthodontic Modality Do You Use Most Frequently?	Aligners (e.g., Invisalign)	1	0.90
	Conventional metal brackets	83	75.5
	Edgewise metal brackets	24	21.8
	Self-ligating Brackets	2	1.8
Which Bracket Prescription Do You Use Most Frequently?	Andrews	5	4.5
	MBT	90	81.8
	Roth	15	13.6

Which Bracket Types Do You Use Most (Based on Material)?	Ceramic	2	1.8
	Metal	107	97.3
	Self-ligating	1	0.9
Slot Size of Brackets Used	0.018 inch	19	17.3
	0.022 inch	91	82.7
Which Adhesive Do You Most Commonly Use for Bonding?	Chemical-cure Composite Resin	2	1.8
	Glass Ionomer Cement	2	1.8
	Light-cure Composite Resin	106	96.4
Bonding Technique Most Commonly Used?	Direct Bonding	106	96.4
	Indirect Bonding	4	3.6
Type of Molar Attachments Used?	Bands	78	70.9
	Bonded Molar Tubes	32	29.1

Table 3: Distribution of Treatment Strategies in Ort

Question	Response	n	%	P-value
Space Closure Method Used?	Continuous Mechanics	88	80.0	0.0001
	Loop Mechanics	22	20.0	
Preferred Space Closure Technique?	Elastomeric Power Chain	77	70.0	
	NiTi Coil Spring	33	30.0	
Which Type of Separators Do You Use?	Elastic Separators	109	99.1	
	Metal Separators	1	0.9	

The distribution of bracket and bonding preferences in orthodontic treatment and distribution of treatment modalities preferences in orthodontic treatment are given in figure 1 and figure 2 respectively.

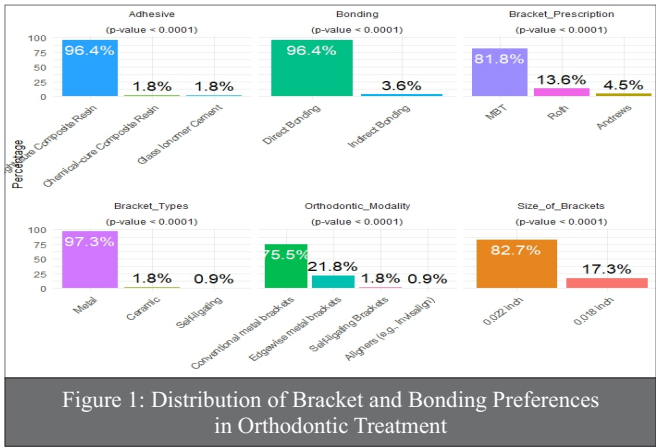
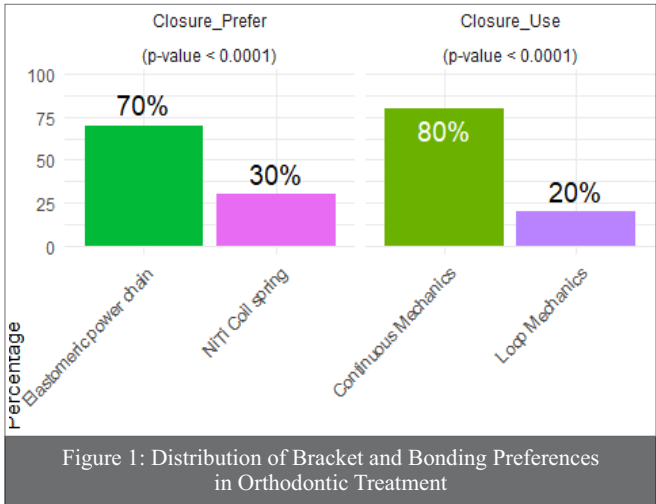


Table 4: Distribution and Association of Used Orthodontic Modalities with Demographic and Professional Characteristics

Demographic and Professional Factors		Which Orthodontic Modality Do You Use Most Frequently?								Chi-square (P-value)
		Aligners (e.g., Invisalign)		Conventional metal brackets		Edgewise metal brackets		Self-ligating Brackets		
		n	%	n	%	n	%	n	%	
Gender	Female	0	0.0	43	51.8	9	37.5	1	50.0	0.480
	Male	1	100.0	40	48.2	15	62.5	1	50.0	
Age	30-40	0	0.0	35	42.2	11	45.8	0	0.0	0.481
	Above 40	0	0.0	5	6.0	3	12.5	1	50.0	
	Below 30	1	100.0	43	51.8	10	41.7	1	50.0	
Educational Qualification	General Dentist	1	100.0	12	14.5	0	0.0	1	50.0	0.144
	Consultant	0	0.0	41	50.2	16	66.7s	1	50.0	
	Resident Orthodontist	0	0.0	30	36.1	8	33.3	0	0.0	

Table 5 and 6 shows non-significant association between demographic variables regarding bracket prescription, types of bracket material used. In contrast the chi-square tests for the table 7 show the significant association regarding choice of bracket prescription and molar band selection. Table 8 shows that none of the demographic factors have a statistically significant impact on the choice of bonding technique or adhesive ( $p > 0.05$ )

Table 5: Association between Demographic and Professional Characteristics and Bracket Prescription Preferences Among Orthodontists

Demographic and Professional Factors		Which Bracket Prescription Do You Use Most Frequently?						Chi-Square
		Andrews		MBT		Roth		
		n	%	n	%	n	%	
Age	30-40	0	0.00	39	43.33	7	46.67	0.286
	above 40	1	20.00	6	6.67	2	13.33	
	below 30	4	80.00	45	50.00	6	40.00	
Educational Qualification	General Dentist	3	60.00	4	4.44	7	46.67	0.000
	Consultant	1	20	50	55.55	7	46.66	
	Resident Orthodontist	1	20.00	36	40.00	1	6.67	

Table 6: Association between Demographic and Professional Characteristics and Bracket Type Preference Based on Material

Demographic and Professional Factors	Response	Which bracket types you use most based on material?						Chi Square (p-value)
		Ceramic		Metal		Self-Ligating		
		n	%	n	%	n	%	
Gender	Female	0	0.0	52	48.6	1	100.0	0.230
	Male	2	100.0	55	51.4	0	0.0	
Age	30-40	0	0.0	46	43.0	0	0.0	0.184
	Above 40	1	50.0	8	7.5	0	0.0	

Demographic and Professional Factors	Response	Which bracket types you use most based on material?						Chi Square (p-value)
		Ceramic		Metal		Self-Ligating		
		n	%	n	%	n	%	
Educational Qualification	Below 30	1	50.0	53	49.5	1	100.0	0.193
	General Dentist	1	50.0	12	11.2	1	100.0	
	Consultant	1	50.0	57	53.3	0	0.0	
	Resident Orthodontist	0	0.0	38	35.5	0	0.0	

Table 7: Association between Demographic and Professional Factors and Bracket Slot Size & Molar Attachment Preferences

Demographic and Professional Factors		Slot Size of Brackets Used				Chi-square (P-value)	Type of Molar Attachments you Use?				Chi-square (P-value)
		0.018 inch		0.022 inch			Bands		Bonded Tubes		
		n	%	n	%		n	%	n	%	
Gender	Female	7	(36.8)	46	(50.5)	0.277	44	(56.4)	9	(28.1)	0.007
	male	12	(63.2)	45	(49.5)		34	(43.6)	23	(71.9)	
Age	30-40	1	(5.3)	45	(49.5)	0.002	28	(35.9)	18	(56.3)	0.008
	above 40	2	(10.5)	7	(7.7)		4	(5.1)	5	(15.6)	
	below 30	16	(84.2)	39	(42.9)		46	(59.0)	9	(28.1)	
Educational Qualification	General Dentist	8	(42.1)	6	(6.6)	0.001	11	(14.1)	3	(9.4)	0.004
	Consultant	6	32.5	52	57.2		15	42.3	25	78.1	
	Resident orthodontist	5	(26.3)	33	(36.3)		34	(43.6)	4	(12.5)	

Table 8: Association Between Demographic and Professional Factors and Most Commonly used Bonding Technique & Adhesive Most Commonly Used for Bonding

Demographic and Professional Factors		Bonding Technique Most Commonly you Use?				Chi-square	Which Adhesive Do You Most Commonly Use for Bonding?						Chi-square (p value)
		Direct Bonding		Indirect Bonding			Chemical-cure Composite Resin		Glass Ionomer Cement		Light-cure Composite Resin		
		n	%	n	%		n	%	n	%	n	%	
		n	%	n	%		n	%	n	%	n	%	
Gender	Female	52	49.05	1	25.00	0.34	0	0.00	2	100.00	51	48.11	0.13
	male	54	50.94	3	75.00		2	100.00	0	0.00	55	51.88	
Age	30-40	46	43.39	0	0.00	0.12	1	50.00	1	50.00	44	41.50	0.23
	above 40	9	8.49	0	0.00		1	50.00	0	0.00	8	7.54	
	below 30	51	48.11	4	100.00		0	0.00	1	50.00	54	50.94	
Educational Qualification	General Dentist	14	13.20	0	0.00	0.47	0	0.00	1	50.00	13	12.26	0.21
	consultant	57	53.7	1	25.00		2	100.00	1	50.00	55	51.8	
	Resident	35	33.01	3	75.00		0	0.00	0	0.00	38	35.84	

The findings in Table 9 suggest that while age influences space closure method selection, space closure technique preference remains relatively stable across demographic groups.

Table 9: Association Between Demographic and Professional Factors and Preferred Space Closure Methods and Techniques

Demographic and Professional Factors		Space closure method you use commonly?				Chi-square (p-value)	Space closure technique you prefer?				Chi-square (p-value)
		Continuous Mechanics		Loop Mechanics			Elastomeric power chain		NiTi spring		
		n	%	n	%		n	%	n	%	
		n	%	n	%		n	%	n	%	
Gender	Female	42	47.72	11	50.00	0.84	38	49.35	15	45.45	0.70
	male	46	52.27	11	50.00		39	50.64	18	54.54	
Age	30-40	36	40.90	10	45.45	0.01	30	38.96	16	48.48	0.35
	above 40	4	4.54	5	22.72		8	10.39	1	3.03	
	below 30	48	54.54	7	31.81		39	50.64	16	48.48	
Educational Qualification	General Dentist	11	12.50	3	13.63	0.51	9	11.68	5	15.15	0.42
	Consultant	44	50	14	63.63		39	50.649	19	57.54	
	Resident Orthodontics	33	37.50	5	22.72		29	37.66	9	27.27	

Discussion

This study dives into the current state of orthodontic practices in Pakistan, shedding light on the tools and techniques orthodontists are using today. The findings reveal a clear preference for tried-and-true methods. Conventional metal brackets are the go-to choice for 75.5% of orthodontists, with the MBT prescription leading the pack at 81.8% and metal brackets dominating at 97.3%. This reliance on traditional techniques highlights their proven effectiveness, durability, and affordability. Orthodontists in Pakistan seem to trust these established methods to deliver solid results. Interestingly, studies from developed countries like the United States and the United Kingdom show a similar fondness for MBT prescriptions, praising their clinical efficiency and biomechanical advantages.<sup>6,7</sup> Another study by Brown and colleagues noted that MBT systems offer superior torque control and better finishing quality compared to other bracket types.<sup>8</sup> One striking finding is the slow uptake of aligners (0.9%) and ceramic brackets (1.8%), despite their growing popularity in places like North America and Europe. Why the lag? It likely comes down to cost,

limited access to specialized training, and lower patient demand for these options in Pakistan. Aligners, for instance, require advanced digital technology and extensive training, which may not yet be widely available. A study by Patel and team found that aligners are booming in developed regions due to their aesthetic appeal and removability, but developing countries face similar adoption hurdles.<sup>9</sup> Meanwhile, Wang and colleagues pointed out that while aligners boost patient compliance and look great, their effectiveness in complex cases is still up for debate.<sup>10</sup>

When it comes to bonding, Pakistani orthodontists overwhelmingly favor light-cure composite resin (96.4%) and direct bonding techniques (96.4%), aligning with global standards. These methods provide strong adhesion and precise bracket placement, making them a reliable choice. Similarly, 70.9% of orthodontists prefer bands for molar attachments over bonded molar tubes (29.1%), sticking with traditional anchorage methods they find dependable. Research by Williams and team confirms that direct bonding remains the gold standard worldwide, though indirect bonding is gaining traction for its time-saving benefits.<sup>11</sup> Carter and colleagues also highlighted that indirect bonding can improve accuracy and reduce bracket failures.<sup>12</sup> Pakistan's orthodontic field is buzzing with fresh talent. Half of the orthodontists surveyed are under 30, and 41.8% are between 30 and 40, with 34.5% still in postgraduate training and 52.8% working as consultants. This youthful, dynamic workforce points to a growing specialization in orthodontics. A similar trend was observed in India, where Sharma and team noted a surge of recent graduates entering the field, reflecting heightened interest in orthodontics across South Asia.<sup>13</sup> Roberts and colleagues added that younger orthodontists are often more open to experimenting with new treatment methods compared to their senior peers.<sup>14</sup>

#### Challenges in Adopting Advanced Technologies and Future Research Directions

Despite global advancements, technologies like self-ligating brackets (1.8%) and aligners (0.9%) remain rare in Pakistan, largely due to

economic constraints and limited training opportunities. Kim and team suggest that embracing digital workflows could pave the way for broader access to these modern treatments.<sup>15</sup> Looking ahead, longitudinal studies could track how these trends evolve, while comparing Pakistan's experience with other developing countries might uncover shared challenges and solutions. Exploring patient perspectives on affordability and treatment preferences could also provide deeper insights. Gonzalez and colleagues found that patient education and financial incentives can boost technology adoption, while Martinez and team emphasized that continuing education builds clinicians' confidence in using new tools.<sup>16,17</sup>

#### Conclusion

This study provides a detailed overview of current trends in orthodontic practice in Pakistan, focusing on the use of fixed appliances and their components among specialist orthodontists. The study reveals that conventional metal brackets with MBT prescription with 0.022-inch slot size remain the most widely used orthodontic modality reflecting international trends in biomechanics and treatment efficiency. Moreover light-cure composite resin and direct bonding is preferred by nearly all orthodontists. Loop and continuous mechanics are both used for space closure with elastomeric power chains widely favored over NiTi coil springs for space closure, suggesting a preference for cost-effective and patient-friendly solutions. Overall, the findings suggest that orthodontic practices in Pakistan align with international standards in many areas. However, barriers to adopting newer technologies remain. The study underscores the importance of continued professional development, expanded training opportunities, and increased accessibility to modern orthodontic solutions. Addressing these challenges will be key to enhancing orthodontic care in Pakistan and ensuring that practitioners are equipped with the latest tools and techniques to provide optimal patient outcomes.

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