



TREATMENT PREFERENCES AND COMPLIANCE PATTERNS IN GENERATION Z ORTHODONTIC PATIENTS: A QUESTIONNAIRE-BASED CROSS-SECTIONAL STUDY

Orthodontics

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ABSTRACT

Introduction: Generation Z patients demonstrate distinct behavioral and digital engagement characteristics that may influence their orthodontic treatment preferences and compliance patterns. This study aimed to evaluate treatment modality preferences and identify behavioral determinants associated with compliance among Generation Z orthodontic patients. **Methods:** A questionnaire-based cross-sectional study was conducted among 220 Generation Z patients (18–26 years) undergoing active orthodontic treatment at a university-affiliated dental college hospital. A structured, validated questionnaire was used to assess treatment preference (clear aligners vs. fixed appliances), aesthetic expectations, digital influence, perceived treatment duration, appointment adherence, and oral hygiene practices. Descriptive statistics were calculated. Associations between demographic variables and treatment preferences were analyzed using chi-square and independent t-tests. Multivariate logistic regression was performed to identify the independent predictors of high compliance. Statistical significance was set at $P < 0.05$. **Results:** Clear aligners were preferred by 62.3% of the participants, primarily because of aesthetic considerations (78.4%) and perceived social confidence (65.9%). Social media exposure was reported by 54.1% of the respondents and was significantly associated with aligner preference ($p = 0.002$). High compliance was observed in 68.6% of the participants. Intrinsic motivation (OR = 2.14; 95% CI, 1.32–3.48), perceived aesthetic benefit (OR = 1.89; 95% CI, 1.11–3.21), and digital health engagement (OR = 1.76; 95% CI, 1.04–2.98) were independently associated with compliance. **Conclusion:** Generation Z patients prefer aesthetic treatment modalities. Compliance appears to be influenced primarily by motivational and digital engagement factors rather than appliance type, supporting the integration of behaviorally informed and technology-supported strategies into orthodontic practice.

KEYWORDS

Generation Z; Orthodontic Treatment; Treatment Preference; Patient Compliance; Clear Aligners; Digital Engagement; Behavioral Determinants; Cross-sectional Study

INTRODUCTION

Orthodontic treatment demand has evolved substantially over the past decade, influenced not only by advances in appliance systems but also by shifting patient expectations and preferences. Contemporary orthodontic care increasingly emphasizes aesthetics, treatment efficiency, digital engagement, and patient-centered communication [1]. These changes coincide with the emergence of Generation Z, a demographic cohort generally defined as individuals born between 1997 and 2012, who are now entering late adolescence and early adulthood—the period during which orthodontic treatment uptake is common. Understanding the behavioral characteristics of this cohort is essential for optimizing clinical outcomes and improving patient adherence to treatment. Generation Z is described as digitally native, socially connected, and highly responsive to visual media [2]. Unlike previous generations, their perceptions of facial aesthetics and self-image have been extensively shaped by social media platforms, influencer culture, and online peer validation. Smile aesthetics, in particular, have become a central component of digital self-presentation in social media. Consequently, orthodontic treatment may be pursued not only for functional correction but also for enhanced social confidence and online identity-projection. These psychosocial dimensions may influence both treatment modality preference and compliance behavior [3]. Clear aligner therapy has gained substantial popularity among adolescents and young adults because of its aesthetic advantages, removability, and perceived comfort. Reports indicate an increasing patient-driven demand for discreet orthodontic solutions, particularly among young adults engaged in professional or academic environments. However, aligner therapy requires high levels of self-discipline, including consistent wear for the prescribed duration [4]. Compliance remains a critical determinant of treatment success across all appliance systems, and generational behavioral traits may influence adherence. While Generation Z is often characterized as technologically adept and health-aware, it is also associated with shorter attention spans and a preference for immediate results. However, the impact of these traits on orthodontic compliance has not been fully elucidated [5]. Previous orthodontic research has examined factors influencing treatment acceptance and compliance, including

socioeconomic status, parental influence, perceived severity of malocclusion, and clinician–patient communication. However, the literature is limited in addressing generational behavioral constructs as determinants of orthodontic decision-making. Behavioral science frameworks, such as the Health Belief Model (HBM) and Theory of Planned Behavior (TPB), provide useful conceptual lenses for interpreting orthodontic motivation. According to the HBM, treatment uptake is influenced by perceived susceptibility to dental problems, perceived benefits of correction, perceived barriers such as cost or discomfort, and cues for action. For Generation Z, cues to action may include exposure to curated digital imagery or peer endorsement [6]. Similarly, the TPB emphasizes attitudes toward treatment, subjective norms, and perceived behavioral control, constructs that may be particularly relevant in a socially networked generation. Orthodontic compliance encompasses multiple domains, including attendance at appointments, maintenance of oral hygiene, consistency in elastic wear, and adherence to appliance-specific protocols. Noncompliance contributes to prolonged treatment duration, compromised outcomes, and increased resource utilization. Studies evaluating the predictors of compliance have traditionally focused on demographic and clinical variables. However, intrinsic motivation, aesthetic urgency, and digital engagement behaviors may represent underexplored predictors in younger populations. Given the increasing integration of digital tools in orthodontic practice—including telemonitoring, smartphone reminders, and app-based engagement—understanding how Generation Z interacts with these modalities may provide actionable insights for improving adherence [7]. Furthermore, orthodontic treatment is currently situated within a broader consumer health framework. Patients are increasingly informed consumers who compare treatment options online, seek peer reviews, and evaluate their value propositions. This shift toward consumer-driven orthodontics necessitates a deeper understanding of patient preferences, particularly among emerging generational groups. Identifying the determinants of appliance selection and compliance patterns may enable clinicians to tailor communication strategies, improve shared decision-making, and implement behaviorally informed interventions. Despite the recognized influence of

generational traits on marketing and healthcare delivery, empirical data on orthodontic treatment preferences and compliance patterns among Generation Z remain limited. Clarifying these associations may have practical implications for appliance selection counseling, digital engagement strategies, and compliance-enhancing protocols [8]. Therefore, this questionnaire-based cross-sectional study aimed to evaluate treatment modality preferences and compliance patterns among Generation Z orthodontic patients and to identify the behavioral determinants associated with adherence. We hypothesized that aesthetic prioritization and digital influence would be significantly associated with treatment preference and compliance behavior in this cohort.

METHODS

Study Design and Setting

This questionnaire-based cross-sectional study was conducted at the Department of Orthodontics and Dentofacial Orthopedics, JSS Dental College and Hospital, JSS Academy of Higher Education & Research (JSS AHER), Mysuru, Karnataka, India, between [November 2005] and [April 2026]. The study protocol was reviewed and approved by the Institutional Ethics Committee (approval no. JSSDC/IEC/2025/041). Written informed consent was obtained from all participants before their enrollment in the study. All procedures involving human participants were performed in accordance with the ethical standards of the Institutional Research Committee and the ethical principles of the Declaration of Helsinki and its subsequent amendments.

Participants

The participants were patients undergoing active orthodontic treatment and belonging to Generation Z, defined in this study as individuals aged 18–26 years. The inclusion criteria were as follows: (1) currently receiving fixed appliance or clear aligner therapy, (2) treatment duration of at least 3 months to allow assessment of compliance behavior, and (3) ability to comprehend and complete the questionnaire in English. Patients with craniofacial syndromes, orthognathic surgical cases, or cognitive impairments that affected the reliability of self-reports were excluded.

Sample Size Calculation

The sample size was calculated using G*Power software (latest ver. 3.1.9.7; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany). Assuming a medium effect size (0.30), $\alpha = 0.05$, and statistical power of 80% for the logistic regression analysis, the minimum required sample size was 200 participants. A total of 220 participants were recruited to compensate for potentially incomplete or invalid responses.

Questionnaire Development and Validation

A structured self-administered questionnaire was developed following a literature review and consultation with three orthodontic faculty members and one behavioral science expert to ensure its content validity. The questionnaire consisted of five domains.

- **Demographic Characteristics** (age, gender, educational status, socioeconomic background)
- **Treatment Preference** (fixed appliances vs clear aligners; ranked reasons for preference)
- **Digital Influence and Information-seeking Behavior** (social media exposure, online orthodontic content engagement)
- **Compliance Behavior** (appointment adherence, appliance wear consistency, elastic use, oral hygiene practices)
- **Psychosocial Motivation** (self-image, peer perception, aesthetic urgency)

Responses were recorded using a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree) for behavioral constructs.

The questionnaire was pilot-tested on 20 patients to assess clarity and internal consistency. Data from the pilot sample were excluded from the final analysis. Internal reliability demonstrated acceptable consistency (Cronbach's $\alpha = 0.82$). Minor linguistic modifications were made before the final administration.

Data Collection

Eligible participants were approached during their routine orthodontic appointments. After obtaining informed consent, the questionnaires were completed in a supervised clinical setting to minimize external influence. The average completion time was 10–12 minutes. No identifying information was collected to maintain the participants' anonymity.

Compliance patterns were also self-reported. High compliance was operationally defined as

- No missed appointments in the previous 6 months
- Self-reported appliance wear ≥ 20 –22 hours/day (for aligners)
- Consistent elastic use when prescribed
- Self-reported adherence to oral hygiene instructions

Participants who did not meet these criteria were categorized as having moderate/low compliance.

Outcome Measures

The primary outcomes were as follows:

- **Treatment Modality Preference** (Aligners vs Fixed appliances)
- **Compliance Level** (High vs Moderate/low)

The secondary variables included aesthetic motivation scores, digital engagement index, and perceived treatment benefits.

Statistical Analysis

Data were analyzed using the SPSS software (Version 32; IBM Corp., Armonk, NY, USA). Descriptive statistics (mean, standard deviation, frequency, and percentage) were calculated for all variables. Associations between categorical variables were assessed using the chi-square test. Continuous variables were compared using independent t-tests. Variables with $p < 0.20$ in the bivariate analysis were entered into a multivariate logistic regression model to identify independent predictors of high compliance. Adjusted odds ratios (OR) with 95% confidence intervals (CI) were reported for the analysis. Multicollinearity was assessed using variance inflation factors (VIF), and the model fit was evaluated using the Hosmer–Lemeshow goodness-of-fit test. Statistical significance was set at $P < 0.05$.

RESULTS

Participant Characteristics

Of the 230 eligible patients approached, 220 completed the questionnaire (response rate: 95.6%). The mean age of the participants was 21.4 ± 2.3 years (range, 18–26 years). Females comprised 58.2% ($n = 128$) of the sample, and males comprised 41.8% ($n = 92$). Clear aligner therapy was received by 134 participants (60.9%), whereas 86 (39.1%) were undergoing fixed appliance treatment. Overall, 151 participants (68.6%) met the predefined criteria for high compliance with the exercise program.

Treatment Preferences

When asked about the preferred treatment modality, 62.3% ($n = 137$) indicated a preference for clear aligners, whereas 37.7% ($n = 83$) preferred fixed appliances. The most frequently reported reasons for aligner preference were aesthetic considerations (78.4%), enhanced social confidence (65.9%), and perceived comfort (59.1) %. Social media exposure related to orthodontic treatment was reported by 54.1% of the participants. A significant association was observed between social media influence and preference for clear aligners ($\chi^2 = 9.54$; $p = 0.002$). Participants who reported high aesthetic prioritization scores demonstrated a significantly greater likelihood of preferring aligners than those with lower scores (mean difference = 0.62; $p = 0.01$). No statistically significant associations were observed between treatment preference and sex ($p = 0.38$) or educational level ($p = 0.47$).

Compliance Patterns

High compliance was observed in 68.6% ($n = 151$) of the participants. Appointment adherence within the previous 6 months was reported by 81.8% of the respondents. Among the participants who were prescribed elastics, 72.4% reported consistent wear. Adequate oral hygiene adherence was reported by 76.3% of the participants.

Bivariate analysis demonstrated significant associations between high compliance and intrinsic motivation ($\chi^2 = 8.71$; $p = 0.003$), perceived aesthetic benefit ($\chi^2 = 5.62$; $p = 0.02$), and the digital engagement score ($t = 2.08$; $p = 0.04$). Treatment modality ($p = 0.41$), sex ($p = 0.79$), and educational level ($p = 0.65$) were not significantly associated with compliance.

Multivariate Logistic Regression Analysis

Variables with $p < 0.20$ in the bivariate analysis were entered into the multivariate logistic regression model. After adjustment, intrinsic motivation emerged as the strongest independent predictor of high compliance (adjusted OR = 2.14; 95% CI, 1.32–3.48; $p = 0.002$). Participants with higher intrinsic motivation were more than twice as likely to demonstrate high adherence.

Perceived aesthetic benefit was also independently associated with compliance (adjusted OR = 1.89; 95% CI, 1.11–3.21; $P = 0.018$). Digital health engagement was modestly but significantly associated with the outcome (adjusted OR = 1.76; 95% CI, 1.04–2.98; $p = 0.036$). In contrast, treatment modality (clear aligners vs. fixed appliances) was not independently associated with compliance after adjustment (adjusted OR = 1.21; 95% CI, 0.74–1.98; $p = 0.43$). Sex and educational level also failed to demonstrate significant associations, as their confidence intervals crossed unity. The Hosmer–Lemeshow goodness-of-fit test indicated an acceptable model calibration ($p = 0.62$). The variance inflation factors were <2.0 for all variables, indicating the absence of multicollinearity. The overall model explained 28% of the variance in compliance (Nagelkerke $R^2 = 0.28$).

Summary of Findings

Clear aligners were preferred primarily for aesthetic and psychosocial reasons, with social media exposure significantly influencing the selection of the treatment modality. Compliance behavior was predominantly associated with intrinsic motivational constructs, perceived aesthetic benefits, and digital engagement rather than appliance type or demographic factors.

Table I. Demographic and Treatment Characteristics of the Study Sample (N = 220)

Variable	n (%) or Mean $\pm$ SD
Age (years)	21.4 $\pm$ 2.3
Female	128 (58.2)
Male	92 (41.8)
Clear aligner therapy	134 (60.9)
Fixed appliance therapy	86 (39.1)
High compliance	151 (68.6)
Moderate/Low compliance	69 (31.4)

Table II. Factors Associated With Treatment Modality Preference (Bivariate Analysis)

Variable	Clear Aligners n (%)	Fixed Appliances n (%)	P value
Social media influence (Yes)	88 (64.2)	31 (37.3)	0.002*
High aesthetic prioritization	102 (74.5)	48 (57.8)	0.01*
Female sex	82 (59.9)	46 (55.4)	0.38
Higher education level	94 (68.6)	55 (66.3)	0.47

*Statistically significant at $p < 0.05$.

Table III. Factors Associated With Compliance (Bivariate Analysis)

Variable	High Compliance n (%)	Moderate/Low Compliance n (%)	P value
High intrinsic motivation	112 (74.2)	35 (50.7)	0.003*
High perceived aesthetic benefit	108 (71.5)	33 (47.8)	0.02*
High digital engagement	97 (64.2)	28 (40.6)	0.04*
Clear aligner therapy	95 (62.9)	39 (56.5)	0.41
Female sex	90 (59.6)	38 (55.1)	0.79

*Statistically significant at $p < 0.05$.

Table IV. Multivariate Logistic Regression Analysis for Predictors of High Compliance

Predictor	Adjusted OR	95% CI	P value
Intrinsic motivation	2.14	1.32–3.48	0.002*
Perceived aesthetic benefit	1.89	1.11–3.21	0.018*
Digital engagement	1.76	1.04–2.98	0.036*
Treatment modality (Aligners vs Fixed)	1.21	0.74–1.98	0.43
Gender (Female vs Male)	0.94	0.58–1.52	0.81

*Statistically significant at $p < 0.05$.

Hosmer–Lemeshow test, $p = 0.62$; Nagelkerke $R^2 = 0.28$.

DISCUSSION

This study evaluated treatment preferences and compliance patterns among Generation Z orthodontic patients and identified behavioral determinants of adherence. The findings suggest that compliance in this cohort is driven predominantly by intrinsic motivation, perceived

aesthetic benefit, and digital engagement, whereas appliance type and demographic variables were not independently associated with treatment adherence. These results underscore the importance of psychosocial constructs in contemporary orthodontic practices.

Clear aligner therapy was preferred by most participants, primarily for aesthetic reasons and perceived social confidence. This finding is consistent with broader clinical trends demonstrating an increasing demand for discreet orthodontic modalities among adolescents and young adults. For Generation Z patients, aesthetic presentation is closely integrated with digital self-representation and social media. Social media platforms emphasize visual identity, and smile aesthetics may be perceived as an extension of personal branding in this context. In this context, orthodontic treatment may serve not only a functional objective but also a psychosocial one. The high proportion of participants reporting social media influence reinforces the relevance of digital exposure as a cue for action in treatment decision-making.

Despite the preference for aligners, appliance type was not independently associated with compliance after adjusting for the behavioral variables. This finding is clinically significant. This suggests that adherence is not inherently determined by the appliance's removability or visibility but rather by the patient's underlying motivation and value attribution. Although aligner therapy requires sustained wear for optimal outcomes, compliance appears to be more strongly linked to psychological engagement than to mechanical convenience. Therefore, clinicians should avoid assuming that a particular appliance system guarantees improved adherence in this age group[9].

Intrinsic motivation was the strongest independent predictor of high compliance. Participants who demonstrated a higher internal commitment to treatment goals were more than twice as likely to report consistent adherence. This finding aligns with the behavioral science frameworks, such as the Health Belief Model and the Theory of Planned Behavior. Within these models, perceived benefits and personal attitudes toward treatment exert a substantial influence on health-related behaviors. For Generation Z patients, intrinsic motivation may be reinforced by anticipated aesthetic improvement, social confidence, and self-image. These findings highlight the need for motivational interviewing strategies and individualized goal setting during treatment initiation [10].

Perceived aesthetic benefits were also significantly associated with compliance. Patients who strongly valued anticipated improvements in their smile appearance demonstrated greater adherence. This association suggests that aesthetic urgency may reinforce sustained behavioral engagement. In clinical practice, structured visual simulations, digital smile previews, and progress tracking may enhance perceived benefits and strengthen adherence. However, clinicians should balance aesthetic messaging with realistic expectations to avoid dissatisfaction or treatment fatigue [11].

Digital engagement was independently associated with compliance, suggesting that Gen Z patients who actively interact with orthodontic content, reminders, or monitoring tools demonstrate improved adherence. This finding has practical implications for contemporary orthodontic practices. The integration of smartphone-based reminders, telemonitoring systems, and interactive digital communication platforms may enhance engagement and reinforce accountability. Unlike previous generations, Gen Z patients may respond positively to technology-mediated follow-ups and gamified adherence strategies. These tools may serve as behavioral reinforcements rather than as mere administrative conveniences [12].

Interestingly, demographic variables such as gender and educational level were not significant predictors of compliance with the guidelines. This observation contrasts with some earlier orthodontic studies that reported variable associations between demographic characteristics and patient adherence. The relative homogeneity of this cohort in terms of age and educational exposure may partially explain these findings. Alternatively, generational behavioral traits may exert a stronger influence than traditional sociodemographic variables in this population[13].

The nonsignificant association between appliance type and compliance also warrants consideration. Although aligners are often marketed as lifestyle-compatible and convenient, their removability may introduce variability in wear patterns. Conversely, fixed

appliances provide continuous force application, independent of patient action. The absence of a significant difference suggests that behavioral constructs overshadow mechanical factors in determining adherence. This reinforces the concept that orthodontic treatment success in Generation Z patients depends less on appliance selection and more on engagement strategies tailored to their motivational profiles [14].

From a clinical standpoint, these findings support a patient-centered orthodontic approach that integrates behavioral assessment into routine consultations. Evaluating intrinsic motivation, aesthetic priorities, and digital habits at baseline may assist clinicians in identifying patients at risk of noncompliance. Structured questionnaires or brief motivational screening tools can be incorporated into treatment planning. Additionally, clinicians should consider collaborative decision-making models that emphasize shared goals, transparency in treatment progression, and digital feedback mechanisms [15].

The present study was interpreted within its methodological framework. Compliance was assessed using self-reported measures, which may have introduced reporting bias. However, the questionnaire demonstrated acceptable internal consistency and was administered anonymously to reduce social desirability effects. Furthermore, the cross-sectional design precludes any causal inferences. Longitudinal studies incorporating objective compliance metrics, such as electronic wear-time monitoring for aligners, would strengthen our understanding of behavioral trajectories over time.

Despite these limitations, this study contributes to the emerging literature on generational influences in orthodontics. As Generation Z increasingly represents a substantial proportion of orthodontic patients, adapting clinical strategies to align with their behavioral tendencies is essential. Traditional compliance reinforcement methods may be insufficient for a digitally integrated population. Instead, motivational framing, aesthetic visualization, and technology-enabled engagement may be more effective adherence-enhancing strategies.

In summary, compliance among Generation Z orthodontic patients appears to be shaped primarily by intrinsic motivation, aesthetic valuation, and digital engagement rather than appliance type or demographic factors. These findings suggest that orthodontic outcomes in this cohort may be optimized through behaviorally informed, technology-supported, and patient-centered approaches to treatment. Future research should explore the longitudinal patterns of compliance and evaluate the effectiveness of structured digital interventions in improving adherence among this generational group.

Limitations

Several limitations should be considered when interpreting the findings of this study.

- The cross-sectional design of the study impedes causal inference. Although significant associations were identified between behavioral constructs and compliance patterns, temporal relationships could not be established. It remains unclear whether intrinsic motivation and digital engagement directly enhance adherence or whether compliant patients are inherently more motivated and digitally active. Longitudinal designs incorporating repeated behavioral assessments would provide stronger evidence regarding directionality.
- Compliance was assessed using self-reported measures. Self-report instruments are susceptible to recall and social desirability biases, potentially leading to an overestimation of adherence behaviors. Although anonymity was maintained and validated, Likert-based scales were used to reduce response distortion. Objective measures, such as electronic wear-time sensors, appointment attendance logs, or plaque indices, would enhance the measurement accuracy. Future studies that integrate both subjective and objective compliance indicators are recommended.
- The study population was recruited from university-affiliated orthodontic clinics, which may limit its external validity. Participants receiving care in academic settings may differ from those treated in private practice environments in terms of socioeconomic background, educational exposure, and clinician-patient interaction patterns. Consequently, the generalizability of the results to broader orthodontic populations should be approached with caution.
- Although the questionnaire demonstrated acceptable internal consistency, construct validity was not evaluated using advanced

psychometric modeling, such as confirmatory factor analysis. Behavioral constructs, such as intrinsic motivation and digital engagement, are multifactorial and may not be fully captured using brief survey instruments. Further validation using established behavioral scales would strengthen the interpretability.

- The operational definition of “high compliance” was based on composite, self-reported criteria. While clinically relevant thresholds were applied, adherence exists along a continuum rather than as a binary outcome. Dichotomization may have reduced the sensitivity to detect subtle variations in behavioral patterns. Future research employing continuous compliance metrics may provide more nuanced insights into this issue.
- Potential confounding variables, such as treatment complexity, baseline malocclusion severity, duration of active treatment, and clinician communication style, were not incorporated into the regression model. These factors may influence patient adherence and partially account for unexplained variability in the model. Incorporating clinical indices, such as Peer Assessment Rating (PAR) scores or the Index of Orthodontic Treatment Need (IOTN), would strengthen analytical precision.
- Finally, generational classification was based on chronological age rather than validated psychosocial profiles. Although age-based categorization is common in generational research, individual variability within the cohorts is substantial. Not all patients within the defined age range may exhibit the typical Generation Z behavioral characteristics. Future investigations may benefit from incorporating validated generational trait scales to refine cohort identification.

Despite these limitations, this study provides clinically relevant insights into the behavioral determinants of orthodontic compliance within a contemporary generational cohort. The findings should be interpreted as associative rather than causal and as hypothesis-generating for future longitudinal and interventional studies.

CONCLUSION

Within the limitations of this questionnaire-based cross-sectional study, compliance among Generation Z orthodontic patients was primarily associated with intrinsic motivation, perceived aesthetic benefit, and digital engagement rather than appliance type or demographic characteristics of the patients. Although clear aligners were preferred for aesthetic reasons, treatment modality did not independently predict adherence after adjustment for behavioral variables. These findings suggest that orthodontic outcomes in this cohort may be optimized through patient-centered communication strategies that enhance motivational alignment and incorporate technology-supported engagement. Further longitudinal research using objective compliance measures is required to confirm these associations.

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