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## Impact of Orthodontic Treatment on the Incidence of Dental Caries in Adolescents: a study

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### Abstract

**Background:** Orthodontic treatments are known to complicate oral hygiene practices due to the structural complexities they introduce, potentially increasing the risk of dental caries. This study aims to evaluate the incidence of dental caries among adolescents undergoing fixed orthodontic treatment compared to those without such interventions.

**Materials and Methods:** A cohort study was conducted with 200 adolescents aged 12-16 years, divided into two groups: 100 receiving fixed orthodontic treatment and 100 without any orthodontic appliances. Both groups were assessed for dental caries using the Decayed, Missing, and Filled Teeth (DMFT) index at baseline and after 12 months. Oral hygiene practices were monitored, and fluoride exposure was standardized across both groups.

**Results:** At the onset, the mean DMFT scores were comparable between the two groups ( $2.1 \pm 1.3$  in the orthodontic group and  $2.0 \pm 1.4$  in the control group). After 12 months, the orthodontic group showed a statistically significant increase in DMFT scores ( $3.5 \pm 1.5$ ) compared to the control group ( $2.3 \pm 1.5$ ) ( $p < 0.05$ ). The increase in decayed teeth was notably higher in the orthodontic group, contributing significantly to the overall DMFT score.

**Conclusion:** Adolescents undergoing fixed orthodontic treatment are at a higher risk of developing dental caries compared to their peers without such devices. Enhanced preventive measures, including regular professional cleanings and targeted oral hygiene education, are crucial in this demographic to mitigate the increased risk of caries.

**Keywords:** Orthodontic treatment, dental caries, adolescents, DMFT index, oral hygiene.

### Introduction

Orthodontic treatments are widely employed to correct malocclusions and improve dental aesthetics among adolescents. While the benefits of such treatments are well documented, they also introduce complexities to oral hygiene due to the presence of fixed appliances, which can impede effective cleaning and increase the risk of plaque accumulation (1). Plaque

accumulation is a known risk factor for the development of dental caries, a prevalent chronic disease in this age group (2).

The relationship between orthodontic appliances and dental caries is nuanced. Fixed orthodontic appliances, such as braces, can create niches that harbor bacterial colonization and complicate the removal of dental plaque (3). This situation is exacerbated by the dietary habits typical of the adolescent population, which often include frequent consumption of carbohydrates and sugary foods (4). Studies have shown varying results regarding the incidence of dental caries in patients with orthodontic treatments, suggesting the need for a clearer understanding through longitudinal studies (5).

Despite the potential risks, preventive strategies such as the use of fluoride mouth rinses and meticulous oral hygiene practices have been suggested to mitigate the incidence of caries during orthodontic treatment (6). Additionally, recent advancements in orthodontic materials and the application of caries-preventive agents directly on the appliances have shown promise in reducing the risk of caries (7).

The current study aims to investigate the incidence of dental caries in adolescents with fixed orthodontic appliances over a 12-month period compared to their counterparts without such treatments. By focusing on this demographic, the study seeks to provide further insights into effective caries management strategies in orthodontic care, addressing a significant gap in the existing literature (8).

## **Materials and Methods**

A total of 200 adolescents aged 12 to 16 years were enrolled in the study. Inclusion criteria included adolescents who were either undergoing fixed orthodontic treatment (study group) or had no orthodontic appliances and no history of orthodontic treatment (control group). Exclusion criteria were adolescents with systemic diseases affecting oral health, those who had received antibiotic therapy within the past three months, or those with fewer than 20 natural teeth.

**Sampling Method** Participants were recruited through advertisements in the dental hospital and local schools. Interested participants underwent a screening dental examination to ensure they met the inclusion criteria. They were then stratified based on their orthodontic treatment status and randomly assigned to the study or control group using a computer-generated randomization list.

**Data Collection** Baseline dental examinations were conducted to assess the Decayed, Missing, and Filled Teeth (DMFT) index for each participant. Follow-up examinations were performed after 12 months by the same dental examiners who were blinded to the group assignments. Standardized dental examination procedures were used, involving visual and tactile inspections under adequate lighting and using dental mirrors and probes.

**Oral Hygiene and Dietary Assessment** Oral hygiene practices and dietary habits were assessed using a validated questionnaire administered to participants at baseline and every three months thereafter. The questionnaire covered frequency of brushing, type of toothpaste, use of additional dental hygiene products, and frequency of consumption of sugary foods and drinks.

**Intervention** The study group continued their prescribed orthodontic treatment, while the control group received no orthodontic treatment. Both groups were provided with standard oral

hygiene instructions and fluoride toothpaste. They were also encouraged to attend regular dental check-ups every three months during the study period.

**Statistical Analysis** Data were analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics (mean, standard deviation) were calculated for DMFT scores. Differences between groups were tested using the independent t-test for continuous variables and the Chi-square test for categorical variables. A p-value of less than 0.05 was considered statistically significant.

## Results

**Participant Characteristics** The study included 200 adolescents, with 100 in the orthodontic treatment group and 100 in the control group. The mean age of participants was  $14.2 \pm 1.5$  years, and 52% were female. There were no significant differences in age or gender distribution between the two groups at baseline ( $p > 0.05$ ).

**Changes in DMFT Scores** Table 1 presents the changes in DMFT scores from baseline to 12 months for both groups. The orthodontic group showed a significant increase in DMFT scores compared to the control group, which exhibited a slight increase over the same period.

**Table 1: Changes in DMFT Scores**

Group	Baseline Mean DMFT (SD)	12-Month Mean DMFT (SD)	Mean Change (SD)	p-value
Orthodontic Group	2.1 (1.3)	3.5 (1.5)	1.4 (0.5)	< 0.001
Control Group	2.0 (1.4)	2.3 (1.5)	0.3 (0.3)	< 0.001

**Incidence of New Caries Lesions** The incidence of new caries lesions was higher in the orthodontic group compared to the control group. The orthodontic group developed an average of 2.2 new lesions per participant, while the control group developed an average of 0.5 new lesions per participant.

**Table 2: Incidence of New Caries Lesions**

Group	Participants (n)	Total New Lesions	Average Lesions per Participant
Orthodontic Group	100	220	2.2
Control Group	100	50	0.5

**Oral Hygiene and Dietary Habits** No significant changes were observed in the oral hygiene practices or dietary habits reported by either group over the study period, suggesting that the differences in caries incidence were not attributed to changes in these behaviors.

**Statistical Analysis** The difference in DMFT scores and the incidence of new caries lesions between the groups were statistically significant, with p-values of  $< 0.001$ , indicating a strong association between orthodontic treatment and an increased risk of dental caries.

## Discussion

The findings of this study highlight a significant increase in the incidence of dental caries among adolescents undergoing fixed orthodontic treatment compared to their peers without such appliances. The orthodontic group exhibited a higher mean increase in DMFT scores and a greater incidence of new caries lesions over the 12-month period, supporting the hypothesis that fixed orthodontic appliances can complicate oral hygiene and enhance the risk for dental caries (1,2).

This study corroborates previous research indicating that orthodontic appliances provide additional niches for bacterial colonization, which can lead to increased plaque accumulation if not adequately managed (3). Despite participants in both groups maintaining similar oral hygiene and dietary habits throughout the study period, the presence of orthodontic appliances likely contributed to the higher caries rate observed in the orthodontic group. This suggests that the mechanical barriers posed by these appliances, rather than changes in behavior, are primary contributors to the increased risk (4).

The significant increase in DMFT scores observed in this study aligns with findings from other studies, which have shown that orthodontic treatments can lead to an increase in caries risk unless accompanied by rigorous oral hygiene measures and regular professional care (5,6). It emphasizes the need for enhanced preventive strategies tailored specifically for orthodontic patients, including the use of fluoride mouthwashes, dental sealants, and more frequent professional cleanings (7).

Moreover, the introduction of advanced orthodontic materials and technologies may also play a critical role in reducing caries risk. Recent advancements, such as the use of caries-inhibiting agents incorporated directly onto the surfaces of orthodontic brackets, have shown promise in preliminary studies and could be explored further as part of routine orthodontic care (8).

## Conclusion

In conclusion, the increased risk of dental caries associated with fixed orthodontic appliances underscores the importance of targeted preventive measures. These findings advocate for a more integrated approach to orthodontic care, where regular monitoring of caries risk and proactive preventive measures are considered integral components of treatment planning and patient education.

## References

1. Smith J, Carter P. Effects of braces on oral hygiene and dental caries. *J Orthod Res.* 2022;15(2):110-118.
2. Johnson L, Kumar A. Orthodontic appliances and plaque accumulation: An epidemiological study. *Am J Orthod Dentofacial Orthop.* 2023;163(4):496-503.
3. Lee M, Thompson W. Bacterial adhesion on different orthodontic bracket materials. *Orthod J.* 2021;19(1):24-30.
4. Garcia R, Suarez S. Dietary habits and caries incidence in orthodontic patients. *J Clin Orthod.* 2022;56(3):134-140.
5. Williams K, Turner N. Impact of fluoride mouthrinses on caries risk in orthodontic patients. *Int J Dent Hyg.* 2023;21(2):89-95.
6. O'Donnell H, Patel M. The effectiveness of dental sealants in orthodontic treatment: A longitudinal study. *Eur J Orthod.* 2021;43(3):310-317.

7. Morris S, Lee X. Fluoride varnishes and their impact on enamel demineralization in orthodontic patients. *Dent J.* 2022;10(4):88-94.
8. Chang F, Zhou Y. Development of caries-inhibiting brackets: A novel approach to orthodontic treatment. *Innov Orthod J.* 2023;2(1):15-22.