

ORIGINAL RESEARCH

Evaluation of the Effect of Fixed and Removable Appliances on Salivary Parameters (Salivary Flow Rate pH and Buffering Capacity) in Children Aged 5–12 Years: An In Vivo Study

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ABSTRACT

Background: This study was conducted for the Evaluation of the Effect of Fixed and Removable Appliances on Salivary Parameters (Salivary Flow Rate pH and Buffering Capacity) in Children Aged 5–12 Years. **Material and methods:** A total of 50 participants, ranging in age from 5 to 12 years and representing both genders, were selected for the study. These participants required intervention with either fixed or detachable appliances, such as space maintainers or habit-breaking appliances. **Results:** The gender distribution of participants in group I and II revealed that 60% (30) of the participants were males, while 40% (20) were females. The gender distribution was shown to be comparable in both study cohorts. In the first month, group I experienced a drop of 0.02 ± 0.06 mL/min, followed by a rise in the second and third month. Group II had a consistent increase at all subsequent assessment periods. An unpaired "t" test demonstrates a statistically significant disparity between the study groups in terms of saliva flow rate and buffering capacity after 1 month, as well as buffering capacity after 2 months. **Conclusion:** Fixed and detachable space maintainers or appliances can serve as areas where plaque can easily accumulate in youngsters, so it is important to maintain proper oral hygiene and stress its importance. Neglecting to follow a rigorous oral hygiene routine can result in significant loss of enamel minerals and the buildup of plaque, which can lead to changes in the bacteria present in the mouth and have harmful consequences.

Keywords: orthodontics, children, salivary parameters.

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INTRODUCTION

Orthodontic treatment effectively improves people's quality of life by restoring regular and stable occlusion, optimal chewing function, and dentofacial aesthetics.¹ However, the use of fixed orthodontic devices can have adverse effects on soft tissues, teeth, and saliva.² Nowadays, ensuring good oral hygiene with fixed orthodontic appliances remains a significant challenge, as the areas around brackets are difficult to clean and prolonged plaque retention, which may cause white enamel spot lesions and gingivitis.^{3,4} Saliva typically consist of water (99%), and organic and non-organic elements (1%).⁵ During orthodontic treatment, plaque stagnation can lead to

changes in the qualitative and quantitative indicators of saliva. The concentration of cariogenic bacteria, such as *Streptococcus mutans* and *Lactobacillus*, may increase due to the increased plaque retention, which promotes the development of active tooth decay.^{6,7} Hence, this study was conducted for the Evaluation of the Effect of Fixed and Removable Appliances on Salivary Parameters (Salivary Flow Rate pH and Buffering Capacity) in Children Aged 5–12 Years.

MATERIAL AND METHODS

A comprehensive case history, clinical examination, and radiographic investigations were documented, and the patients were instructed to undergo any necessary

general dentistry procedures. Prior to delivering the appliance, a comprehensive oral prophylaxis, restorations, pulp therapy, and any other necessary clinical procedures were carried out and successfully completed. Oral hygiene guidelines were provided and emphasized during each appointment. The parameters of unstimulated salivary flow rate, pH, and buffering capacity of saliva were analysed to determine their mean and standard deviation. A comparison between the study groups was conducted using an unpaired t-test. Paired "t" tests were used to make comparisons within the group. The significance test is defined with a threshold of $p < 0.05$.

INCLUSION CRITERIA

1. Individuals aged 5 to 12 years
2. Individuals who are in a condition of good health, free from any systemic illnesses or disabilities.
3. Patients who have healthy gums at the time when the appliances are delivered
4. Patients without prior orthodontic treatment.

EXCLUSION CRITERIA

1. Individuals receiving pharmacotherapy for any long-term medical conditions
2. Patients who have taken medications that modify the natural production and amount of saliva within the three months before to participating in the trial.
3. Existence of systemic conditions that could impact the patient's adherence to appliance usage and oral hygiene evaluation, such as cognitive impairment, physical limitations, etc.
4. Individuals having abnormalities in the structure and alignment of their teeth and facial bones.

RESULTS

Table 1: Gender-wise distribution of subjects.

Gender	Number of subjects
Males	60
Females	40
Total	100

The gender distribution of participants in group I and II revealed that 60% (30) of the participants were males, while 40% (20) were females. The gender distribution was shown to be comparable in both study cohorts.

In the first month, group I experienced a drop of 0.02 ± 0.06 mL/min, followed by a rise in the second and third month. Group II had a consistent increase at all subsequent assessment periods. An unpaired "t" test demonstrates a statistically significant disparity between the study groups in terms of saliva flow rate and buffering capacity after 1 month, as well as buffering capacity after 2 months.

DISCUSSION

A healthy mouth and aesthetic teeth are not only important for a person's self-esteem but also because they reflect a person's general state of health. The

interest in scientific studies related to dentistry, especially in the orthodontic field, has grown over the past 50 years with the advent of new analysis techniques concerning biological samples, notably saliva.⁷

Saliva is a valuable biological fluid essential to overall well-being and is implicated in a wide variety of biological processes essential to the proper effectiveness of oral functions. It preserves oral health by participating in the body's oral defence and maintaining ecological balance.⁸⁻¹⁰ The placement of orthodontic appliances introduces a new material in the oral cavity.

Orthodontic biomaterials influence the oral environment and have a complex interaction with different components. In addition, their impact on various salivary parameters is not yet elucidated in a tangible way, despite the current innovations of orthodontic biomaterials and the characterization of tissue-material interactions.¹¹ Previous investigations did not determine the specific correlation between the placement of orthodontic appliances and biological and clinical outcomes.¹²

Hence, this study was conducted for the Evaluation of the Effect of Fixed and Removable Appliances on Salivary Parameters (Salivary Flow Rate pH and Buffering Capacity) in Children Aged 5–12 Years.

In this study, the gender distribution of participants in group I and II revealed that 60% (30) of the participants were males, while 40% (20) were females. The gender distribution was shown to be comparable in both study cohorts. In the first month, group I experienced a drop of 0.02 ± 0.06 mL/min, followed by a rise in the second and third month. Group II had a consistent increase at all subsequent assessment periods. An unpaired "t" test demonstrates a statistically significant disparity between the study groups in terms of saliva flow rate and buffering capacity after 1 month, as well as buffering capacity after 2 months.

Li et al.¹³ found an increase in the non-stimulated salivary flow rate during the first month, followed by a return to the norm after 3 months. Three other authors^{14,15,16} presented one month and half-year results of unstimulated salivary flow, where a significant increase was observed; however, in one study, the authors did not provide accurate measurements of salivary flow, and results were presented in the ranges (<3.5 mL, $3.5-5$ mL, >5 mL).¹⁵ Considering an even longer treatment period, such as one year, Alessandri Bonetti et al.¹⁷ found an increased salivary flow rate, but these results were not statistically significant.

CONCLUSION

Fixed and detachable space maintainers or appliances can serve as areas where plaque can easily accumulate in youngsters, so it is important to maintain proper oral hygiene and stress its importance. Neglecting to follow a rigorous oral hygiene routine can result in

significant loss of enamel minerals and the buildup of plaque, which can lead to changes in the bacteria present in the mouth and have harmful consequences.

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