



The effect of Ramadan fasting on plaque count of Streptococcus Mutans in patients wearing fixed orthodontic appliance. A clinical study

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Abstract

Aim: This clinical study is to investigate the effect of fasting (Sawm) Ramadan on the count of streptococcus mutans in plaque surrounding fixed orthodontic appliances.

Materials and Methods: Fifteen patients with orthodontic appliances were participated in this study. Plaque specimens were collected from those patients at two occasions, during Ramadan fasting (Sawm) and after they break there fasting after Ramadan. The plaque Streptococcus mutans number of colony-forming units (CFU) was analyzed by using Dentocult SM Strip mutans test.

Results: This study demonstrated highly significant difference in Streptococcus mutans (CFU) counts in plaque between the values obtained from fasting patients during Ramadan and when they are breaking the fast after Ramadan.

Conclusions: during Ramadan fasting, persons change timing and types of their food and beverages consuming as well as teeth cleaning habits. Therefore orthodontist should be aware of their patients' oral hygiene during Ramadan by promoting and maintaining satisfactory teeth cleaning during fasting (Sawm) and Iftar hours.

Key words: Ramadan fasting, plaque, Streptococcus Mutans, fixed orthodontic appliance.

Introduction

Fasting (Sawm) during Ramadan is one of the five pillars of Islam. Approximately over one billion Muslims fast during month of Ramadan in the world. Muslims who fast during Ramadan must abstain from eating, drinking, taking oral medications, and smoking from early dawn (Sohur) until sunset (Iftar). They have two heavy meals, the main meal, Iftar is taken at sunset and usually heavy meal with extra sweet foods and deeply fried food to replenish energy

and fluid levels. Sohur is taken before sunrise with lighter meal with complex carbohydrate^{1,2}.

Fixed orthodontic appliances can prevent both effective tooth brushing and the mechanical cleaning action of mastication³. Therefore, patients undergoing fixed orthodontic treatment are more prone to retaining dental plaque⁴. Microbiological changes have also been associated with these appliances. Studies indicated an increase in Streptococcus mutans after

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the bonding of fixed appliance⁵. The presence of *Streptococcus mutans* in dental plaque are recognized as the principal cause of enamel demineralization, dental caries and periodontal disease⁶. In those patients with fixed orthodontic appliances, intensive brushing and careful cleaning with dental floss of the spaces around brackets, under archwires and between the teeth, leads to a significant increase in the level of oral hygiene. However, these measures were insufficient to decrease *S. mutans* level. Thus, patients with fixed appliances have a higher caries risk⁷. Therefore numerous studies carried out to establish an effective regime for maintaining proper oral hygiene and gingival health in patient wearing fixed orthodontic appliances. One of these studies concluded that the use of interdental tooth brushes should be mandatory to remove plaque in these patients³. Other studies assumed that oral hygiene training with different devices as well as a motivation and remotivation in oral hygiene using brochures, verbal methods and tablets for plaque identification⁸⁻⁹. Moreover Fluoride mouthwashes and Mastic gum also used for maintaining oral hygiene during orthodontic treatment^{6,10}.

Ramadan fasting entails major changes in dietary patterns and frequency¹¹. Fasting people not only change their dietary habits but they change the preventive measures like stopping tooth brushing and mouth wash during fasting hours as they consider that these practices breaks the fast. From this point the present study aimed to investigate whether this change in oral hygiene measures during one month fasting in Ramadan may affect the count of streptococcus mutans in the plaque surrounding fixed orthodontic appliances.

Materials and methods

Volunteer were recruited from orthodontic patients of Al Dawoody specialist center of orthodontics and prosthodontics in Baghdad city. Randomly selected 15 patients (7 male and 8 female) were participated in this prospective clinical study after signing an informed consent according to the ethics of human research. All patients were worn fixed orthodontic appliances and the plaque samples were taken during their routine follow up appointments.

Plaque specimens were collected from those patients at two occasions, firstly when they were fast during Ramadan 1436 (18th of June to 17th of July, 2015), secondly after they break there fasting after Ramadan. Selected teeth for plaque sampling were isolated with cotton rolls and dried. Plaque specimens were collected from the labial surfaces immediately surrounding the orthodontic brackets with a sterilized dental scaler with the same tip dimensions.

Analysis of the number of *Streptococcus mutans* was performed by using Dentocult SM Strip mutans test. The plaque *Streptococcus mutans* number of colony-forming units (CFU) was determined with the site-specific modified Stripmutans[®] technique (Orion Diagnostica, Finland) according to Wallman and Krasse¹².

Sampled plaque was immediately spread in a thorough and gentle manner on the rough surface of the square-tipped strip from the kit. Strips were allowed to dry for 5 minutes at room temperature and then incubated in a selective culture vial at 37° C for 48 hours in a liquid medium. Results were presented as colony-forming units (CFU). The data was analyzed via student paired t test.

Results

The mean, standard deviation and the significance of difference values of *Streptococcus mutans* (CFU) counts in plaque of both fasting and non-fasting samples are summarized in Tables 1.

According to data analysis via student paired t test, there was highly significant difference in *Streptococcus mutans* (CFU) counts in plaque between the values obtained from fasting patients and those obtained after breaking the fast.

Discussion

It is well known that after placement of fixed orthodontic appliances it becomes more difficult to keep the teeth clean and maintain a high oral hygiene level therefore it induce specific changes in the oral environment, such as an increase in plaque accumulation, a reduction in pH, greater accumulation of cariogenic species that further increase the risk of demineralization and gingival inflammation^{6,8}. Thus considerable oral hygiene care and discipline is required to eliminate plaque around fixed orthodontic appliances for overcoming these problems. This could be accomplished by perfect mechanical cleaning of teeth for at least ten minutes after each meal with using interdental brush and mouth wash liquid^{4,13}.

During Ramadan month which lasts 29 to 30 days each year, fasting entails major changes in dietary patterns and frequency¹¹. Fasting people also change their measures for keeping good oral hygiene during Ramadan. Therefore the present study conducted to investigate whether these changes affect the number of *streptococcus mutans* colonies in dental plaque surrounded fixed orthodontic

appliances of fasting patients during Ramadan.

According to the results of the present study, the significance increase in the plaque count of *streptococcus mutans* colonies around fixed orthodontic appliance may be explained by the people perception about tooth brushing and mouth wash. They think that tooth brushing and mouth wash may break the fasting. Therefore fasting patients wearing fixed orthodontic appliances brush their teeth either one time after the suhur meal or very rarely two times after Iftar and suhur. From this point of view another research is needed by applying oral hygiene and tooth brushing regime on the sample patient during Ramadan fasting.

Other explanation is that, people consumed sugar rich food and beverages frequently when they break the fast after the Iftar. This may enhance the growth of *Streptococcus mutans* due to the presence of fermentable monosaccharides according to Moynihan and Petersen. This also agree with the results of Marsh¹⁴, Filocheet al.¹⁵, Mobley and Rethman¹⁶ which concluded that frequent high sucrose meals, combined with factors involving oral hygiene practices, create conditions in the plaque that favor the propagation of *mutans streptococci*.

Moreover the mastication and gustation stimulate salivary flow¹⁷. Because of the long fasting hours, so this may affect the salivary flow and the growth of *streptococcus mutans*. These suggestions are supported by observations made in the study of Almståhl and Wikström¹⁸ how concluded that, there was a tendency toward a higher proportion of *mutans streptococci* accompanied with a low salivary secretion rate.

Conclusions

- ü There was significant increase in the level of *Streptococcus mutans* bacteria in plaque around orthodontic brackets in Ramadan Fasting patients.
- ü Repetitive reinforcement of oral hygiene instructions before Ramadan is crucial for patients wearing fixed orthodontic appliances. This may be performed by frequent tooth brushing even without toothpaste and mouth irrigation only with water during fasting hours which may be successful in plaque elimination.
- ü Further study is needed by applying oral hygiene and tooth brushing regime on the sample patients.

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Table 1: Descriptive statistics of the number (CFU) of *Streptococcus mutans* in plaque of fasting and non-fasting samples and their levels of significance determined by student paired t test analysis.

| Sample | Mean | N | Std. Deviation | P value |
|---------|-------|----|----------------|---------|
| post | 21.33 | 15 | 12.315 | <0.001 |
| fasting | 30.47 | 15 | 12.626 | |