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Original Article

Evaluation of Changes in Weight, Dietary Habits, and Daily Activities in Fixed Orthodontic Patients During the First Trimester of Orthodontic Treatment

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Abstract

Background: The aim of the present study was to evaluate the changes in weight, dietary habits, and daily activities in fixed orthodontic patients during the first trimester of orthodontic treatment.

Methods: This prospective cohort study was performed on patients referred to the dental clinics of Hamadan University of Medical Sciences who were candidates for fixed orthodontic therapy. The participants' weights, the frequency of fruit and fast food use, and their daily activities were registered through questionnaires. The participants were followed for three months, and the same data were collected one month and three months after the start of treatment. Repeated measure tests were employed to examine statistical significance using SPSS 22 software.

Results: The samples consisted of 125 subjects, including 32 (25.6%) males and 93 (74.4%) females, with a mean age of 22.75 ± 4.02 years old. Weight, fast food, and fruit intake significantly decreased in the first month after treatment compared to the first treatment session ($P<0.001$). At the third appointment, the mean weight, fast food/fruit consumption, and daily activities increased significantly in comparison to the first month of treatment. However, there was no significant difference between any of the parameters 3 months post-treatment or at baseline ($P>0.05$).

Conclusion: Fixed orthodontic treatment significantly reduced the average weight of patients and changed their eating habits during the first month of treatment, which all were retained to the baseline level in the following months. Considering the importance of a balanced diet, it is recommended that orthodontic-adaptive alternatives to nutrients be used in the early stages of orthodontic treatment.

Keywords: Fixed orthodontics, Weight, Dietary habits, Daily activity

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Background

Malocclusion is defined as the deviation of teeth from a normal position that results in intra-arch, or inter-arch discrepancies and is among the major oral health problems (1). There is a high reported prevalence of malocclusion (2), and this is increasing due to industrialization and alterations in lifestyle and diet construction (3,4). These issues, together with changes in esthetic perception, have led to a rise in orthodontic treatment demand (5).

Orthodontic treatment, similar to other therapeutic procedures, is not without any impact on individuals' lives, including effects such as pain, discomfort, physical stress, and the like. By reducing the side effects, specifically those sensed by patients (e.g., pain and eating inconvenience), we could assure patient compliance and improve treatment outcomes and services provided to patients (6).

Based on clinical experience, food choice is believed to change during orthodontic treatment for some reasons, among which are pain and discomfort, difficulty chewing, food stuck to braces, and the orthodontists' advice on choosing soft diets and avoiding biting specific foods. On the other hand, due to induced physical, psychological, and emotional stress and pain, the nutritional requirements of orthodontic patients raise, further complicating the issue (7).

Diet and eating habits are known as important factors regarding immune system function and disease response, intellectual ability, work efficiency, academic performance,

and quality of life (8-10). There is also evidence that periodontal tissue response to orthodontic forces is affected by the nutritional status of the patient through biochemical substance turnover (11). Orthodontics aims at improving oral health and specifically oral health-related quality of life (OHRQoL); therefore, nutrition as a significant factor in maintaining health and oral function with the same impact on the quality of life should not be overlooked during treatment (12).

Understanding the evidence-based alteration of eating habits during the first few months of treatment will greatly help clinicians provide better advice on food choices in this critical period, avoiding gross changes in essential element intake and achieving a balanced diet.

The current study has been designed to evaluate the effects of orthodontic therapy on body weight, dietary regime, and physical activity changes of fixed orthodontic patients admitted to the Dental Clinics of Hamadan University of Medical Sciences.

Methods

This prospective cohort study was approved by the Hamadan Ethical Committee (IR.UMSHA.REC.1397.778), and all participants signed written informed consents.

Employing the convenience sampling method, the sample was collected according to the following inclusion criteria:

1. Healthy candidates for fixed orthodontic treatment ranging between 18 and 35 years of age
2. No history of previous orthodontic treatment, craniofacial deformity, severe skeletal discrepancy, or any other somatic/psychological disorder
3. No active caries or periodontal disease
4. No food restrictions due to systematic disorders and/or nutritional regimes.

To detect a 0.7 kg ± 2 weight change (alpha of 5% and power of 90), the sample size was calculated to be 125 (13). The study sample consisted of patients attending the orthodontic departments of Hamadan Dental Clinics.

Participants completed questionnaires in three-time schedules (prior to the appointment receiving elastomeric separators (T0), one month after fixed orthodontic treatment initiation (T1), and 3 months after the start of treatment (T2). We asked about their demographic status, dietary regime, and physical activity (Tables 1-4). In the dietary section, participants answered how frequently they used fruits (Table 2), raw vegetables, fast and prepared foods (Table 3), and fried meals. They also responded about the oil and dairy products they used commonly. All attendees' uncertainties about the questionnaire were clarified by the responsible investigator. The validity and reliability of the questionnaires were confirmed in previous studies (14,15).

An examiner (F. S.) measured the patients' weights in each session before the orthodontic visit with a digital scale (Tokyo, Japan) with 0.1 kg accuracy. The measurements were performed while the participants were wearing minimum clothes and barefoot.

Statistical Analysis

All statistical analyses were performed using SPSS software, version 22. Data normality was assessed by the Kolmogorov–Smirnov test. Repeated measurement and Friedman tests were employed for data analysis, and a *P* value less than 0.05 was considered to be statistically significant.

Results

In this study, weight, food habit, and physical activity changes were evaluated at 3 time points during the first trimester of fixed orthodontic treatment.

The sample consisted of 93 (74.4%) female patients and 32 (25.6%) male patients, with a mean age of 22.75 ± 4.02.

Table 1 presents weight measures at the onset, 1 month, and 3 months of treatment. Weight reduction in the first month was statistically significant, as it was when comparing the first (w1) and third (w3) month weight gains (both *P* values < 0.001). Interestingly, the first measured weight (w0) was not significantly different from the final weight measurement (w3) (*P* = 0.085).

A similar pattern was also observed when evaluating fruit consumption (Table 2). Populations consuming fruits 5–7 times a week decreased significantly in the first month (*P* < 0.001); however, the percentage of patients not eating fruits at all increased as well. At the end of the study, the population of frequent fruit consumers (5–7 meals a week) increased again (*P* = 0.002). The comparison of the first and third measurements represented no significant changes (*P* = 0.074).

Table 1. Weight Record During the Study

Weight, Mean ± SD		*P* Value
First session (T0)	1 month after bonding (T1)	< 0.001*
61.95 ± 11.52	60.98 ± 11.92	
1 month after bonding	3 months after bonding (T2)	< 0.001*
60.98 ± 11.92	61.74 ± 11.01	
3 months after bonding	First session	0.085
61.74 ± 11.01	61.95 ± 11.52	

Note. * Significant; SD: Standard deviation.

Table 2. Fruit Consumption of Participants During the Study Period

Fruit Consumption of Participants/Weeks (Percentage)						*P* value
First session			1 month after bonding			
1	2	3	1	2	3	< 0.001*
0	44%	56%	5.6%	57.6%	36.8%	
1 month after bonding			3 months after bonding			
1	2	3	1	2	3	0.002*
5.6%	57.6%	36.8%	3.2%	46.4%	50.4%	
First session			3 months after bonding			
1	2	3	1	2	3	0.074
0%	44%	56%	3.2%	46.4%	50.4%	

Note. 1: Never (< 1/week), 2: 1-4 meals/week, 3: 5-7 meals/week.

Table 3. Fast and Prepared Food Consumption of Participants During the Study

Fast and Prepared Food Consumption of Participants								*P* Value
First session				1 month after bonding				
1	2	3	4	1	2	3	4	<0.001*
31.2%	34.4%	23.2%	11.2%	41.6%	39.2%	8%	11.2%	
1 month after bonding				3 months after bonding				
1	2	3	4	1	2	3	4	0.004*
41.6%	39.2%	8%	11.2%	29.6%	36%	24.8%	9.6%	
First session				3 months after bonding				
1	2	3	4	1	2	3	4	0.819
31.2%	34.4%	23.2%	11.2%	29.6%	39.2%	24.8%	9.6%	

Note. 1 = Never, 2 = 1 meal/week, 3 = 2 meals/week, 4 = 3 and more meals/week.

Table 4. Relative Physical Activity of Patients During the Survey

Physical Activity Report of Participants										*P* Value
First session of treatment					1 month after bonding					
1	2	3	4	5	1	2	3	4	5	0.055
9.6%	44.8%	24.8%	14.4%	6.4%	21.6%	39.2%	22.4%	12.8%	4%	
1 month after bonding					3 months after bonding					
1	2	3	4	5	1	2	3	4	5	0.001*
21.6%	39.2%	22.4%	12.8%	4%	11.2%	37.6%	25.6%	12.8%	6.4%	
First session of treatment					3 months after bonding					
1	2	3	4	5	1	2	3	4	5	0.113
9.6%	44.8%	24.8%	14.4%	6.4%	11.2%	37.6%	25.6%	12.8%	6.4%	

Note. 1: No physical activity-sedentary lifestyle.
2: Low activity :1-3 days of physical activity/week.
3: Moderate activity: 3-5 days of physical activity/week.
4: High activity: 6-7 days of physical activity/week.
5: Extremely high active: everyday high physical activity and hard body work.

No significant change was perceived when observing raw vegetable, dairy products, frying oil, and fried food consumption.

Evaluating fast food consumption in the observation period (Table 3) revealed an increase in populations not eating a fast meal per week. There was also a change in other groups' frequency; there was a decrease in groups eating one to two meals per week. Both trends were significant ($P<0.001$). Comparing the third month with the baseline data showed no significant changes.

Regarding physical activity (Table 4), a relatively similar pattern as weight change was observed. The proportion of high-activity to low-activity population decreased in the first month, though it was not significant ($P=0.055$); however, it significantly increased at the end of the third month ($P=0.001$). To our interest, there was no significant difference between the first and third measurements ($P=0.113$).

Discussion

Malocclusion, one of the most prevalent developmental deformities, is increasing, and so is orthodontic treatment need and demand (1). The significance of a balanced diet in maintaining proper organism function is not obscured, and this significance is twofold in orthodontic patients, as there is the up-regulation of base metabolism due to physiologic events involved in tooth movement and induced physical and psychological stress. Another problem is the introduction of the new appliance to the oral environment, which brings physical restrictions. The reported statement of chewing and biting difficulty and regime change in this group bears out this claim (16). Most orthodontic treatment is conducted during adolescence, years of rapid pubertal growth and increased nutritional requirements, adding to the importance of this issue (17).

In this study, a significant average weight reduction was found in the participants during the first month of the initiation of fixed orthodontic treatment and a significant weight gain from that point to the third month. The samples did not reach their initial weights, though the difference with the initial weight was insignificant. This weight loss is in line with the findings of several studies, and the amount of weight loss (1 kg) and the relative pattern of weight change were in conformity with the results of Sandeep et al, evaluating weight loss during the same period (13). Kilinç and Sayar reported a significant weight loss in the first week and first month but an insignificant change after the second and third months (18). This finding may be due to alterations in eating habits that can be attributed to orofacial pain, which is reported to be

the highest during the first month of treatment, together with the introduction of the new orthodontic appliance. They can cause physical difficulty in chewing and lengthen the process and issues such as food stuck that are uncomfortable and embarrassing to patients. Discomfort in eating resulting from pain contributes to appetite loss. In a study by Ajwa et al, the relative discomfort felt by the patients was positively correlated with weight loss (6). Another factor that should be mentioned is the fear of breaking appliances (19). By the time the pain level decreases, the patients adapt to the braces and learn which foods to eat and how to better handle chewing; thus, the initial weight reduction is not continuous, and they begin to gain weight.

The possible change in food selection was assessed to better understand the impact of orthodontic treatment on eating. In this order, we asked our patients, 'How frequently did they eat fruits?', and we realized that fruit consumption, on average, declined in the first month ($P<0.001$) and came back to its primary level by the end of the third month; this again may be explained by the formerly mentioned scenario since most fruits have hard consistency. Biting fruits with the rigid appliance is difficult and often prohibited by orthodontists, who recommend chopping the fruits and chewing them rather than snapping them with incisors. It is invaluable to mention that fruits, grains, nuts, and vegetables are the main sources of manganese, copper, and chromium, which have primary roles in bone health and metabolism. A significant decrease in these elements' intake has been reported to be linked with bone remodeling deceleration, low-density bone, and slower tooth movement (20,21). In light of this finding, it is advisable to underscore the significance of maintaining a regime with sufficient amounts of fruits and grains– which are often mistakenly noted in the red light of some sources (7)– to the patients and suggest convenient forms of fruits such as sugar-free juices, smoothies, boiled vegetables, and milled nuts and grains during the critical first months of treatment.

Regarding 'fast and prepared food' use, the respondents reported a lower frequency in the first month, which increased in the third month. We may be able to explain this finding when we consider the consistency of prepared foods (i.e., sandwiches, croquettes, and the like), which are hard and thus difficult to chew.

We asked about dairy products, types of oil, fried food, and raw vegetable use and found no significant change. As dairy products all have soft textures that are easy to eat, we expected this finding. In contrast to some studies (18,22), raw vegetable consumption did not show a significant change, but less than 10% of the sample reported a high frequency of vegetable use (more than 4 times a week). It can be explained that the majority of the sample did not use vegetables more often (i.e., 0–4 times a week), which could be as low as 1, so the treatment did not affect this habit. The second reason could be that not all raw vegetables have hard consistency; another explanation could be the heterogeneous sample employed in this study.

The impact of orthodontic treatment on physical activity is more intricate. An insignificant decrease in mean physical activity during the first month and a significant increase from the first month to the third month were observed in our study. This can sound confusing at first, but it can be figured out. Pain and physical stress, which are at their maximum in the first weeks and months, and fear of attending society because of their new appearance may be the possible contributing factors to decreased activity. There is evidence that pain can predict lower peak physical activity. However, it is noteworthy that there is no such relationship between pain and mean physical activity (23,24), which we assessed in this survey. By the third month, pain level decreased, and probable improved self-esteem, resulting from their altered appearance, could have contributed to the increased physical activity. There is a bi-directional relationship between perceived pain and physical activity, and physical activity can reduce the intensity of perceived pain (25). Thus, it would be worth suggesting that, by maintaining their regular daily activity, patients can reduce the stress and pain they feel.

Overall, we should emphasize this point that the main goal of orthodontic treatment is to improve OHRQoL. OHRQoL is shown to decrease in the first months after the start of orthodontic treatment, and clarifying this impact has proven to have a positive effect (19). By recognizing masticatory limitations as a major source of OHRQoL decrease (12), providing a healthy nutrition guideline, and informing the patient of the initial effects and limitations of orthodontic appliances, we wish to be able to improve the quality of our treatment, oppose this side-effect, and gain better patient compliance and satisfaction.

The main source of bias in this study could be diet questionnaires based on patients' records. Although patients may forget or misestimate the exact amount, such a bias is inherent in this type of study. Another source of bias could be the participants' knowledge of the responses being analyzed. We attempted to control this effect by not emphasizing individual data analysis.

Conclusion

The findings confirmed the significant impact of the first few months of fixed orthodontic treatment on eating behavior. By clarifying the reasons behind this change, specifying the shortcomings of the new regime, and consulting with expert nutritionists, orthodontists can provide their patients with improved dietary recommendations.

Authors' Contribution

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Competing Interests

None declared.

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