

Evaluation of Weight Alteration in Patients Undergoing Orthodontic Treatment in KIST Dental Hospital

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ABSTRACT

Introduction: Fixed orthodontic treatment is the most favoured treatment of choice for young individuals nowadays who are motivated to improve their appearance. Fixed orthodontic treatment usually takes around 1.5 to 3 years for its completion, and during this duration, many dietary restrictions and modifications are advised. The changes in dietary patterns might result in an increase or decrease in weight. This present study was conducted to assess the amount of weight loss in patients undergoing fixed orthodontic treatment.

Materials and Methods: The height and weight of the study participants was measured using a stadiometer and a digital weighing scale, respectively. The Body Mass Index (BMI) of each individual was calculated. These measurements were taken four times during the duration of the study; the first measurement was collected pretreatment, the second measurement in 1st follow-up after starting fixed orthodontic treatment; the third measurement was collected in 2nd follow-up i.e. after 2 months, and the fourth measurement was collected in 3rd follow-up, which was done after 3 months of starting treatment. The results were tabulated and analyzed with the Statistical Package for the Social Sciences software (SPSS). The mean changes between different parameters in three visits were compared.

Results: When we compared the pretreatment weight and weight at the 1st follow-up statistically significant difference was observed. Similarly, the difference in pretreatment weight and weight at the 3rd follow-up was found statistically significant. The difference in pretreatment BMI and BMI at the 2nd follow-up was statistically not significant. Similarly, the difference in pretreatment BMI and BMI at the 3rd follow-up was also statistically not significant.

Conclusion: This study confirms the reduction in weight seen in patients undergoing fixed orthodontic treatment in the first month after initiation of treatment. If the nutritional demand and the intake can be monitored during the treatment, proper health can also be maintained in the long run along with the proper treatment outcome.

Keywords: BMI, Fixed orthodontic treatment, Weight loss

INTRODUCTION

Younger generations nowadays are concerned about their dental appearance and consider it highly important to have straight and well-aligned teeth. Fixed orthodontic treatment is the most favoured treatment of choice for young individuals as they are motivated

by the desire to improve their appearance.¹ Orthodontic treatment has a potential impact on patients' daily life and may alter their dietary habits since chewing and swallowing hard foods can be difficult for patients, and also their masticatory ability is reduced in the first 24 hours after insertion of the fixed appliance.²

During orthodontic treatment, patients are often advised by orthodontists to follow certain dietary restrictions, such as to eat soft food during the initial stages of treatment to prevent pain, discomfort, bracket debonding and not to eat crispy and sticky foods. Consequently, to minimize pain and discomfort, patients usually tend to follow a soft food diet and decrease their dietary intake.^{1,3}

Alteration in dietary habits affects the weight of an individual. Most patients preferred a soft diet and experienced difficulty and discomfort during eating and chewing.³ Along with this change, orthodontic treatment by itself is physically, physiologically and emotionally stressful to the patient, which raises the nutritional requirements of the person.⁴ If the nutritional demand and the intake can be monitored during the treatment, proper health can also be maintained in the long run, along with the proper treatment outcome. The aim of the present study was to assess the amount of weight loss in patients undergoing fixed orthodontic treatment in KIST Dental Hospital.

MATERIALS AND METHODS

This was a hospital-based prospective study conducted after getting ethical approval from the institutional review committee (KIST- IRC Ref. No. 2079/80/98). The study duration was from January 2023 to September 2023. Patients 18-40 years of age who planned to undergo orthodontic treatment in KIST dental hospital to correct malocclusion were included in the study. Patients with a history of previous orthodontic treatment, patients with any systemic disease, physical disability, or stress, patients taking any long-term medications for obesity, patients receiving steroid therapy, athletes and patients enrolled in a gym or following a diet for weight reduction were excluded from the study.

The sample size was determined using the following formula:

$$\text{Sample size (n)} = (Z_{\alpha/2} + Z_{\beta})^2 \times (\sigma / \Delta)^2$$

Where:

$Z_{\alpha/2}$: the critical value for the level of significance (usually 1.96 for a 95% confidence interval)

Z_{β} : the critical value for the desired power (usually 0.84 for 80% power)

σ : the standard deviation of the outcome measure (22 kg in this case)

Δ : the expected effect size (2.5 kg weight loss) (Reference: Ajwa et al²)

Substituting the values:

$$n = (1.96 + 0.84)^2 \times (22 / 2.5)^2 n = 76.24$$

Rounding up, we got a required sample size of 77 participants.

The height and weight of the study population were measured using same stadiometer and digital weighing scale respectively (Figure 1).



Figure 1: Stadiometer and digital weighing scale

The Body mass index (BMI) of each individual was calculated. BMI is defined as the individual's body mass divided by the square of his or her height. The formula universally used in medicine produces a unit of measure of kg/m².

$$\text{BMI} = \text{Weight (kg)} / [\text{height (m)}]^2$$

These measurements were taken four times in the duration of the study; the first measurement was collected pretreatment, the second measurement at 1st follow-up of fixed orthodontic treatment, the third measurement was collected at 2nd follow-up i.e. after 2 months and the fourth measurement was collected at 3rd follow-up which was done after 3 months of starting of treatment.

The results were tabulated and analyzed with the Statistical Package for the Social Sciences software (SPSS - Version 16). The mean changes between different parameters in three visits were compared.

RESULTS

The mean age of the subjects was 23.11 years ranging from 18 to 43 years. All subjects were of Nepali origin. The patients' mean height at pretreatment, 1st follow-up and 2nd follow-up was observed same as 1.6m. The patients' mean weight at pretreatment, 1st follow-up and 2nd follow-up was 55.1 kg, 54.8 kg and 55.4 kg respectively. The mean patients BMI at pretreatment, 1st follow-up and 2nd follow-up was 20.7, 20.5 and 20.7 respectively (Table 1).

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	85	18	43	23.11	4.96
Height – Pre treatment	85	1.44	2.03	1.63	0.09
Weight – Pre treatment	85	38	81	55.17	9.470
BMI– Pre treatment	85	12.86	29.22	20.74	3.12151
Height – 1 st follow-up	85	1.44	2.03	1.63	0.09
Weight – 1 st follow-up	85	37.50	80.60	54.81	9.37
BMI – 1 st follow-up	85	12.86	28.94	20.58	3.08
Height – 2 nd follow-up	85	1.44	2.03	1.63	0.09
Weight – 2 nd follow-up	85	38.10	80.90	55.28	9.40
BMI – 2 nd follow-up	85	12.85	29.17	20.74	3.07
Height – 3 rd follow-up	85	1.44	2.03	1.63	0.09
Weight – 3 rd follow-up	85	38.00	80.90	55.42	9.47
BMI – 3 rd follow-up	85	12.90	29.22	20.78	3.09

In this study, 47.1 % of the participants were male and 52.9% of the participants were female (Fig. 2)

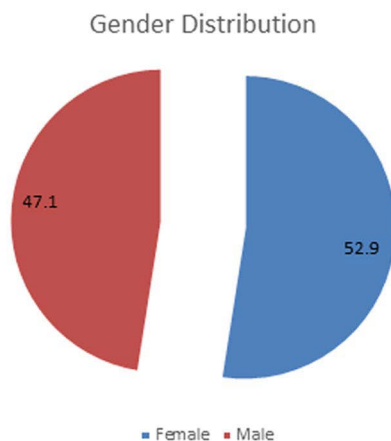


Figure 2: Gender Distribution

Regarding the age distribution, majority of the participants (75%) were between the age group 18 -24. 14% were in between 20 -29 years. Only 2.4% of participants were above 35 years (Table 2).

Table 2: Distribution of participants according to age group

Age Group	Frequency	Percent
18-24	64	75%
25-29	12	14%
30-35	7	8.2%
35+	2	2.4%
Total	85	100.0

The mean pretreatment weight was 55.17 ± 9.4 kg and weight at 1st follow-up was decreased to 54.8 ± 9.3 kg. The difference between the pretreatment weight and weight at 1st follow-up was statistically significant (p value <0.001). The mean weight at 3rd follow-up was again increased to 55.42 ± 9.4 kg. The difference in pretreatment weight and weight at 3rd follow-up was found to be statistically significant (Table 3).

The mean pretreatment BMI was 20.7 ± 3.12 , and the BMI at 1st follow-up was decreased to 20.5 ± 3.08 and the difference was statistically significant (p value <0.001). The difference in pretreatment BMI and BMI at 2nd follow-up was statistically not significant. Similarly, the difference in pretreatment BMI and BMI at 3rd follow-up was also statistically not significant (Table 4).

Table 3: Comparison of weight of the participants between pretreatment, 1st follow-up, 2nd follow-up and 3rd follow-up

Comparison between:	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre- weight – Weight at 1 st follow-up	.35176	.46742	.05070	.25095	.45258	6.938	84	<.001
Pre-weight – Weight at 2 nd follow-up	-.11529	.57828	.06272	-.24003	.00944	-1.838	84	.070
Pre- Weight – Weight at 3 rd follow-up	-.25412	.65548	.07110	-.39550	-.11273	-3.574	84	.001

Table 4: Comparison of BMI of participants between pretreatment, 1st follow-up, 2nd follow-up and 3rd follow-up

Comparison between:	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pre-BMI - BMI at 1 st follow-up	.15582	.19004	.02061	.11483	.19681	7.560	84	<.001
Pre-BMI - BMI at 2 nd follow-up	.00232	.22844	.02478	-.04696	.05159	.094	84	.926
Pre-BMI - BMI at 3 rd follow-up	-.03710	.24744	.02684	-.09047	.01627	-1.382	84	.170

DISCUSSION

The discomfort experienced by patients during orthodontic treatment can have a serious impact on their quality of life. Orthodontic treatment can make it difficult to brush teeth, make it difficult to chew or chew chewy food and chew against resistance. Various studies have reported that eating hard, raw fruits such as carrots and apples became difficult, thus making patients change their dietary habits. For this reason, during the first month of treatment, the orthodontic patient tends to follow a soft diet and reduce food intake, leading to weight loss and a decrease in their body mass index.⁵

Orthodontic treatment is a dynamic treatment. Usual procedures during orthodontic treatment like placement of separators, placement of initial arch wires, adjustments, and activation of orthodontic appliances can be the major cause for discomfort and pain for 2-3 days, which affects patients' eating patterns. Patients may avoid hard food and restrict food intake because of the conditioned and nociceptive reflexes elicited by arch wire activation.⁶

Also, the interference with arch wires may result in reduced intake of food and a loss of pleasure in eating. In general, the change in dietary patterns in turn affects the body metabolism, body weight and therapy having a direct effect on the BMI of the individual and results in an increase or decrease in weight.⁷

BMI is the method most typically used to quantify body weight of a person in relation to their body surface. It is a numerical index used to classify a person's weight in relation to "normal," and is typically defined as the weight in kilograms divided by the square of height in meters. The change in the weight may reflect the changes in BMI.

It was concluded from our study that after the start of orthodontic treatment, significant weight loss was found from pretreatment to 1st follow-up and small gain from 1st follow-up to 2nd follow-up. This was in comparison to study done by Gnanasambandam et al. who concluded that BMI decreased in the first 3 months and gradually recovered by the end of the first year of treatment.⁶

The difference in weight and BMI between each follow-up was compared. The mean pretreatment weight was 55.17 ± 9.4 and weight at 1st follow-up was decreased to 54.8 ± 9.3 . When we compared the pretreatment weight and weight at 1st follow-up statistically significant difference was observed. The mean weight at 3rd follow-up was again increased to 55.42 ± 9.4 . The difference in pretreatment weight and weight at 3rd follow-up was found statistically significant (Table 3). The mean pretreatment BMI was 20.7 ± 3.12 and BMI at 1st follow-up was decreased to 20.5 ± 3.08 (Table 1). When we compared the pretreatment BMI and BMI at 1st follow-up statistically significant difference was observed. The difference in pretreatment BMI and BMI at 2nd follow-up was statistically not significant (Table 4). Similarly, the difference in pretreatment BMI and BMI at 3rd follow-up was also statistically not significant.

In agreement with our findings, Sandeep et al.⁸ reported that patients had a significant weight loss at the end of the first month, followed by weight gain, but at the end of the third month, they still could not regain their initial weight. We found that the patients recovered some of the weight they lost at the third month of treatment and the difference between the mean initial weight values and the average weight values at the third month was not statistically significant. That could be because of getting used to the appliances and having learned how to eat and what to eat with the appliances by the time which could result in a more comfortable nutrition.⁸ Another study by Soni et al.⁹ in 2013 was in a similar line to our study where the weight loss among the male participants was found to be relatively higher than the female participants measures in between a month interval from the orthodontic treatment.^{9,10,11}

Ajwa et al.² have arrived at a similar conclusion regarding a change in BMI between the first and second treatment visits. Additionally, they have claimed that their results can be used as guidance for structured diet planning.

Also, a study conducted by Mary et al.⁷ observed a marked reduction in weight in patients undergoing orthodontic treatment. Their study confirmed the loss of weight and discomfort among patients who undergo orthodontic treatments, for which the restricted diet pattern and difficulty in mastication were considered the main factors.⁷

This study was limited by its short follow-up duration of only two months, which may not reflect long-term

trends. It was conducted in a single center without a control group, limiting generalizability. Dietary intake was not directly measured, and psychological factors influencing weight were not assessed.

CONCLUSION

The dietary pattern is affected by orthodontic treatment which may be due to the difficulty in mastication and in result it may change the weights of fixed orthodontic treatment patients. Soft diet was chosen by patients, which was less discomforting while eating and chewing and also their eating frequency was decreased. In our study there was a weight loss in first month of treatment but patients started to gain their lost weights back after the second month of treatment. This study confirms the reduction in weight seen in patients undergoing orthodontic treatment in the first month after initiation of treatment. The findings of this study are of importance among the orthodontic practitioners to compulsorily highlight the importance of proper and structured diet plan and advice after commencement of treatment. Proper health can also be maintained for a long run along with the proper treatment outcome, if the nutritional demand and the intake can be monitored during the treatment.

Conflict of Interest:

There is no conflict of interest.

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