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# 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 favored treatment of choice of young individuals nowadays who are motivated by a desire to improve appearance.1 Fixed orthodontic treatment usually takes around 1½ to 3 years for its completion and during this duration many dietary restrictions and modifications are advised.2 The changes in dietary patterns might result in an increase or decrease in weight. This present study is conducted to assess the amount of weight loss in patients undergoing fixed orthodontic treatment.*

**Methods:** *The height and weight of the study population was measured using stadiometer and digital weighing scale respectively. BMI of each individual was calculated. These measurements were taken three times in the duration of the study; first measurement collected pretreatment, second measurement in 1st follow up after starting of fixed orthodontic treatment and the third measurement will be collected in 2nd follow up i.e. after 2 months.*

*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 1st follow up statistically significant difference was observed. Similarly, the difference in pretreatment weight and weight at 3rd follow up was found statistically significant. 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.*

**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 for a long run along with the proper treatment outcome.*

**Keywords:** *Weight loss, BMI, Fixed orthodontic treatment.*

## 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 favored treatment of choice of young individuals nowadays as they are motivated by the desire to improve 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 at 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 for preventing pain and discomfort and not to eat crispy and sticky foods so that the brackets would not debond easily. Consequently, to minimize pain and discomfort patients usually tend to follow a soft food diet and decrease their dietary intake.[1,3]

Alteration in the diet habits affects the weight of an individual. Most patients preferred 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 for a long run along with the proper treatment outcome.

The aim of the present study is assess the amount of weight loss in patients undergoing fixed orthodontic treatment in KIST Dental Hospital.

## Methods

This was the hospital based prospective study conducted after getting an ethical approval from institutional review committee (KIST- IRC Ref. No. 2079/80/98). 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 height and weight of the study population were measured using same stadiometer and digital weighing scale respectively. BMI of each individual were calculated. These measurements were taken 3 times in the duration of the study; first measurement was collected pretreatment, second measurement 1st follow up after starting of fixed orthodontic treatment and the third measurement was collected in 2nd follow up i.e. after 2 months.

Body mass index is defined as the individual's body mass divided by the square of his or her height. The formula universally used in medicine produce a unit of measure of kg/m^{2}.

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

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.

The sample size was determined using the following formula:

$$Sample\ size\ (n) = (Z\alpha/2 + Z\beta)^2 \times (\sigma / \Delta)^2$$

Where:

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

$Z\beta$: the critical value for the desired power (usually 0.84 for 80% power)

$\sigma$: the standard deviation of the outcome measure (22 kg in this case)

$\Delta$: the expected effect size (2.5 kg weight loss) (Reference: Ajwa et al [2])

Substituting the values:

n = (1.96 + 0.84)² × (22 / 2.5)² n = 76.24

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

## Result

**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 |

The mean of the subjects was 23.11 years ranging from 18 to 43 years. All subjects were Nepalese origin. The mean patients height at pretreatment, 1$^{st}$ follow up and 2$^{nd}$ follow up was observed same as 1.6m. The mean patients weight at pretreatment, 1$^{st}$ follow up and 2$^{nd}$ follow up was 55.1 kg, 54.8kg and 55.4 kg respectively. The mean patients BMI at pretreatment, 1$^{st}$ follow up and 2$^{nd}$ follow up was 20.7, 20.5 and 20.7 respectively.
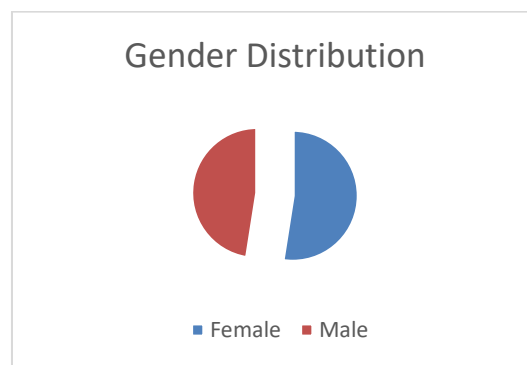
## Gender Distribution



**Figure 1:** Gender Distribution

In this study 47.1 % of the participants were male and52.9% of the participants were female

**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 |

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 3:** Comparison of weight of the participants between pretreatment, 1st follow up and 2nd 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 1st follow up | .35176 | .46742 | .05070 | .25095 | .45258 | 6.938 | 84 | .000 |
| Pre-weight – Weight at 2nd follow up | -.11529 | .57828 | .06272 | -.24003 | .00944 | -1.838 | 84 | .070 |
| Pre- Weight – Weight at 3rd follow up | -.25412 | .65548 | .07110 | -.39550 | -.11273 | -3.574 | 84 | .001 |

The mean pretreatment weight was 55.17± 9.4 and weight at 1st follow up was decreased to 54.8±9.3. When we compare the pretreatment weight and weight at 1st follow up statistically significant difference was observed with p value 0.00.

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)

**Table 4:** Comparison of BMI of participants between pretreatment, 1st follow up and 2nd 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 1st follow up | .15582 | .19004 | .02061 | .11483 | .19681 | 7.560 | 84 | .000 |
| Pre-BMI at 2nd follow up | .00232 | .22844 | .02478 | -.04696 | .05159 | .094 | 84 | .926 |
| Pre-BMI at 3rd follow up | -.03710 | .24744 | .02684 | -.09047 | .01627 | -1.382 | 84 | .170 |

The mean pretreatment BMI was 20.7± 3.12 and BMI at 1st follow up was decreased to 20.5±3.08 (Table 3). When we compare the pretreatment BMI and BMI at 1st follow up statistically significant difference was observed with p value 0.00 (Table 4). 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.

**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 your 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 foods 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.

In our study we measured the height and weight of the study population and also calculated BMI of each individual in three intervals; pretreatment, one month after bracket placement and two months after bracket placement. We recorded a certain weight changes among the participants. The mean age of the subjects was 23.11 years ranging from 18 to 43 years. All subjects were Nepalese origin. The mean patients height at pretreatment, 1st follow up and 2nd follow up was observed same as 1.6m. The mean patients weight at pretreatment, 1st follow up and 2nd follow up was 55.1 kg, 54.8kg 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. It was concluded 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 V et al in his study 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 compare the pretreatment weight and weight at 1st follow up statistically significant difference was observed with p value 0.00. 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 4). 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 compare the pretreatment BMI and BMI at 1st follow up statistically significant difference was observed with p value 0.00. The difference in pretreatment BMI and BMI at 2nd follow up was statistically not significant (Table 5). Similarly the difference in pretreatment BMI and BMI at 3rd follow up was also statistically not significant.

In consistency with our findings, Sandeep et al 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 similar line to our study which reported comparison between male and female weight changes. 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. The participants reported difficulty in chewing hard food and felt comfortable with soft food and liquids especially for the initial ten days after the orthodontic treatment also similar to this study.[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.

Patients require time for adaptation after being introduced to the new challenge of combating discomfort and pain. The patients showed a

positive trend in weight gain, reverting to their pre-treatment BMI scores.

Also a study conducted by Mary et al observed 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

## Conclusion

Orthodontic treatment affects the dietary pattern which may be due to the difficulty in mastication and as a result it may change the weights of fixed orthodontic treatment patients. Patients preferably opted for soft diet which was less discomforting during eating and chewing and also their eating frequency is decreased. In our study there was a weight loss in first week and 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. If the nutritional demand and the intake can be monitored during the treatment, proper health can also be maintained for a long run along with the proper treatment outcome.

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