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CHANGES IN WEIGHT AND BODY MASS INDEX OF PATIENTS UNDERGOING HYRAX EXPANDER THERAPY

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ABSTRACT

Objective: To determine the changes in weight and body mass index of patients with a Hyrax expander in one month and three months after cementation.

Methodology: A total of 130 patients from 10-14 years of age with an indication of Hyrax expander were included in this quasi-experimental study. Patients were enrolled through the convenience sampling technique. The study was carried out from November 2019 to January 2022 at the Department of Orthodontics, Khyber College of Dentistry, Peshawar. The Height and weight were measured at 3-time intervals; T0 (before initiation of treatment), T1 (1 month after appliance cementation), and T2 (3 months after appliance cementation). Data analysis was done using IBM SPSS 25.0. The body mass index at T0, T1, and T2, along with means, standard deviations, frequencies, and percentages, were calculated. A paired samples t-test was employed to check the mean differences in weight and body mass index at T0, T1, and T2. A p-value of ≤ 0.05 was considered significant.

Results: The mean age of 130 patients was 11.81 ± 1.31 years. The number of male patients were 54 out of 130 and female patients were 76 out of 130. The mean difference in weight loss at T0-T1 ($0.83 \text{ kg} \pm 2.69$) was statistically significant. ($p = 0.001$) So was the mean difference of body mass index ($0.43 \text{ kg/m}^2 \pm 0.81$) at T0-T1. The mean differences in both weight and body mass index were insignificant at T2.

Conclusion: A decrease in body mass index and weight loss is observed in patients undergoing hyrax expander therapy 1 month after initiation of treatment.

Keywords: Bodyweight Change; Diet; Eating Behavior; Maxillary Expansion.

INTRODUCTION

Diet and orthodontic treatment, being paradoxical, have a synergistic relation. Not only are the patients instructed by their orthodontists to avoid hard foods to prevent the risk of appliance damage, but the patients also themselves prefer soft food due to the associated pain.¹ The preference for certain types of food results in ignorance of the nutritional value resulting in weight loss.² Maxillary constriction can be treated orthodontically through rapid maxillary expansion (RME). One of the appliances that can achieve this is the fixed Hyrax expander which may be tooth or tissue borne.³ The effects of RME are not only skeletal; by increasing the width of the midpalatal suture, but also dental.⁴ Where RME does have benefits, it is not without its adverse effects.

Studies have indicated the potential risks that come from rapid maxillary expansion such as buccal tipping of the molars.⁵ There have been studies regarding the impact of fixed orthodontic treatment on quality of

life.^{6,7} However; the impact of hyrax expander on the body weight of Pakistani patients has not been explored thoroughly. With this in mind, this study aimed to investigate whether hyrax appliance had any influence on the body weight and the body mass index of Pakistani patients 1 month and 3 months after hyrax appliance cementation. The null hypothesis is that hyrax appliance does not affect the weight or body mass index during its course of treatment.

METHODOLOGY

This single group quasi-experimental study was conducted in the Orthodontics ward of Khyber College of Dentistry, Peshawar from November 2019 to January 2022. Approval was granted by the Ethical Review Board of Khyber College of Dentistry (letter number; 9 ADR/KCD/2019). A convenience sampling technique was employed, and the total sample size was 130 ($n=130$). Patients, both male and female, included in this study were medically fit with no history of trauma and congenital craniofacial deformities. The included patients had the dental stage in the mixed or perma-

dentition which is the optimum stage for expansion. These patients had unilateral or bilateral posterior crossbite with constricted maxilla requiring maxillary expansion with hyrax appliance. The age range was 10-14 years. The exclusion criteria were those patients with a history of chronic diseases such as diabetes mellitus, anemia, and hormonal disturbances, patients on chronic medication that could influence nutritional habits or body weight e.g. steroid therapy, and those with eating disorders such as anorexia nervosa, patients on diet plans and those with previous or ongoing orthodontic fixed treatment. Informed consent was verbally taken from all the participants.

A hyrax appliance was constructed for each patient (n=130) for palatal expansion of the constricted maxillary arches. The appliance consisted of a midline jackscrew, which was to be activated by the patients themselves or their guardians and was attached to the maxillary first permanent molars via bands.⁸ The appliance came with a key for activation of the jackscrew, which was to be turned every alternate day. One half turn expanded the arch by 0.5mm. Each patient and their guardian were properly instructed regarding the activation and care of the appliance. After the informed consent, the appliance was fitted in each patient's mouth by a single trained operator via GIC (glass ionomer cement). (Figure 1)

The height and weight of each participant were measured on 3 different instances in cm (which was later converted into meters) and kilograms (kg), respectively; T0= Before initiation of treatment, T1= After 1 month of cementation, T2= After 3 months of cementation

Height was measured via a stadiometer and the weight on a digital scale by a single trained operator. The height and weight were measured to calculate the Body Mass Index (BMI) for each patient. Body Mass Index is

defined as the individual's body mass divided by the square of his or her height (kg/m^2).⁹

Data were analyzed using IBM SPSS 25.0. Descriptive analysis was done i.e., frequencies, percentages, means, and standard deviations were calculated for gender, age (years), weight (kg), and BMI (kg/m^2). Paired samples t-test was employed to calculate the difference in means of weight and BMI at T0, T1, and T2 and to see whether the differences were significant or not. A p-value of ≤ 0.05 was considered significant.

RESULTS

Out of those 130 participants, 54 (41.5%) were males and 76 (58.5%) were females. The total number of participants at 10 years of age was 28 (21.5%), at 11 years 29 (22.3%), at 12 years 27 (20.8%), at 13 years 32 (24.6%) and at 14 years of age was 14 (10.8%). the mean age of 130 participants was $11.81 \text{ years} \pm 1.31$.

The mean weight and BMI at T0, T1, and T2 at 10-14 years of age are given in Table 1. The mean weight of participants initially at T0 was $39.85 \text{ kg} \pm 5.94$. At T1, the mean weight was $39.01 \text{ kg} \pm 6.17$. The mean difference in weight at T0-T1 was 0.83 kg which was significant ($p=0.001$). The mean weight at T2 ($39.96 \text{ kg} \pm 5.90$) was higher than at T0 but the mean difference was statistically insignificant ($p=0.29$). (Figure 2, Table 2)

The Body mass index showed a decrease from T0 to T1 ($0.43 \text{ kg}/\text{m}^2 \pm 0.81$) which was statistically significant ($p<.001$). Whereas the BMI was $18.17 \text{ kg}/\text{m}^2 \pm 1.08$ at T2 but this difference from T0 was statistically insignificant ($p=0.78$). (Figure 3, Table 2)

DISCUSSION

A total of 130 participants were included in this single group quasi-experimental study of which, 54 were males and 76 were females. Patients in the age range of 10-14



Figure 1: Banded Hyrax Expander Mean weight (kg) and BMI (kg/mg^2) according to Age of Participants T0=before cementation, T1=after 1 month, T2=after 3 months

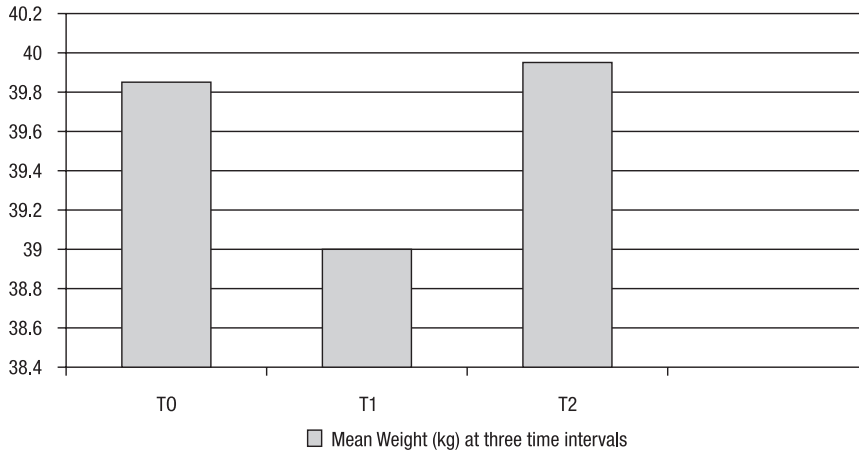


Figure 2: Frequency of isolated Enterobacteriaceae in %

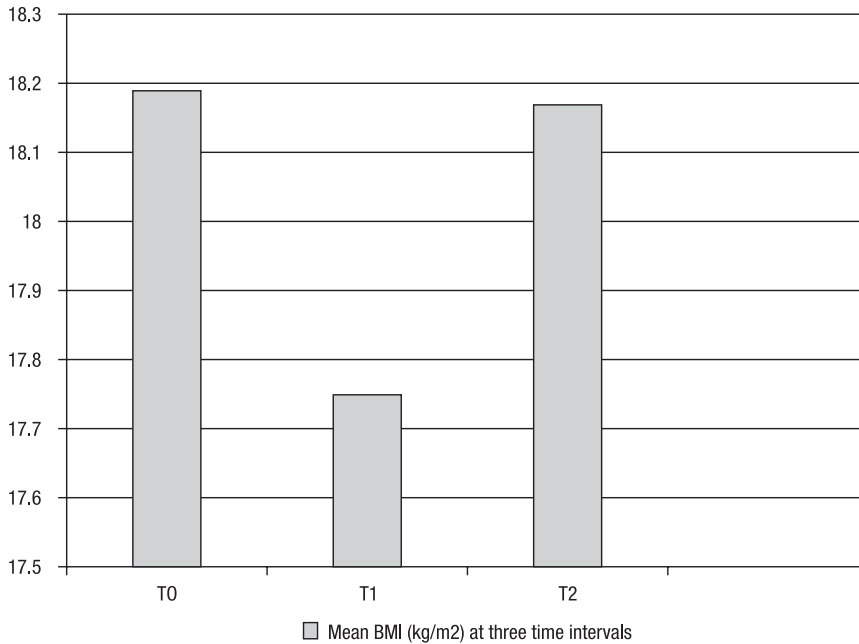


Figure 3: Mean Body Mass Index (BMI) kg/m2 of Participants

years were selected corresponding to the mixed dentition or permanent dentition stage as this is the optimum stage for maxillary expansion.^{10,11} The weight and subsequently the body mass index decreased from T0 to T1. However, at T2, the weight and BMI reverted to almost the original level. Data results from our study show that hyrax expander does cause a decrease in the weight of the participants initially. The weight decreased 1 month after cementation which was significant ($p=0.001$). This is similar to the results of a study by Sandeep et al. from India who showed a decrease in body weight 1 month after initiation of treatment.¹²

In our study, BMI also showed a decrease 1 month after cementation which was statistically significant ($p<0.005$). Johal et al. from UK also reported a similar decrease in BMI in which almost half of the patients reported eating less during than before treatment.¹³

BMI and weight increased to almost the original levels at T2 after a decrease initially in our study. This may be because pain and discomfort associated with the fixed appliance are more initially but diminishes later on as shown by Gecgelen et al. In their study, 47.5% of participants reported pain on the first day after activation of hyrax expander. This percentage reduced to 35% later on.¹⁴ Kilinc et al also showed in their study that the weight loss was significant after 1 month of

Table 1: Mean values of weight and BMI according to age of participants.

Participants Age Years	Mean and Standard deviation					
	T0		T1		T2	
Amoxicillin / Clavulanic acid	Kg	Kg/m2	Kg	Kg/m2	Kg	Kg/m2
10	33.06 ± 1.57	17.60 ± .80	31.89±1.41	16.99± .87	33.31±1.57	17.60 ± .64
11	35.73 ± 1.43	17.23 ± .84	36.28±5.17	17.23±1.61	36.28±1.61	17.19 ± .94
12	40.29 ± 1.89	18.30 ± .61	39.19±2.12	17.85± .75	40.49±2.33	18.42 ± .78
13	44.78 ± 3.32	19.02 ± .71	43.39±3.57	18.42± .76	45.09±3.31	19.11 ± .71
14	49.81 ± 1.85	19.21 ± .72	48.52±2.63	18.71± .99	49.28±2.02	18.72 ± .94

T0=before cementation, T1=after 1 month, T2=after 3 months

Table 2: Paired samples t test for weight and body mass index at T0, T1 and T2

Paired Description	Paired Differences			t value	P value
	Mean (Kg/m ²)	SD	SE		
Weight at T0-T1	0.83	2.69	0.23	3.54	0.001*
Weight at T0-T2	-0.11	1.25	0.11	-1.04	0.29
BMI at T0-T1	0.43	0.81	0.07	6.12	<0.005*
BMI at T0-T2	0.01	0.61	0.05	0.27	0.78

*=statistically significant, SD= Standard Deviation, SE= Standard Error

fixed treatment, however, the patients started to regain that lost weight after 1 month.¹⁵ Sandeep et al. also reported that at the end of the third month, significant weight gain was observed in both males and females, although not as same as the initial weight noted before the orthodontic therapy.¹² Our study reflected that there was insignificant weight gain after the end of the third month. (p=0.29).

The BMI increased 3 months after the cementation of hyrax expander which was again insignificant (p=0.78). Nanci et al. from Chicago reported in their study that 90.2 % of patients experienced masticatory difficulty initially but these were not significant after 1 week as the patients had adapted to the appliance.¹⁶ However in our study, the weight loss was significant after 1 month of appliance cementation. This may have been due to the preference for soft foods due to the associated tenderness.²

CONCLUSION

Hyrax appliance results in weight loss and a decrease in BMI 1 month after appliance cementation. Therefore, patients and their attendants should be informed that weight loss one month into treatment should be expected and is not a cause of worry, as weight is improved three months into treatment. Whereas, weight loss at one month, followed by no recovery at three months should be investigated. The limitation of this study is that the role of gender or age was not explored which may or may not affect the outcome.

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Author's Contribution

AMS conceived the idea and collected the data. FA performed the data analysis. SS, KK, MS, SY contributed in data collection and write up of the manuscript. Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of Interest

Authors declared no conflict of interest

Grant Support and Financial Disclosure

None

Data Sharing Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.