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RESEARCH ARTICLE

TO EVALUATE THE IMPORTANCE OF EDUCATION AND MOTIVATION IN PATIENTS UNDERGOING ORTHODONTIC TREATMENT-A PROSPECTIVE STUDY

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ABSTRACT

The present study has been undertaken to determine the most appropriate oral hygiene motivation method (OHMM) for maintaining good oral hygiene during fixed appliance orthodontic treatment. **Material and Methods-** The study group was divided into four groups in accordance to their OHMM such as- GROUP I. Only verbal information (V). GROUP II. Only written information (W). GROUP III. Demonstration on model (M). GROUP IV. Audio Visual Aids and Self application by the patients (AV). Proper hygiene instructions were then provided and clinical examination was performed (baseline,1st ,3rd ,and 6th month). The examination included recording of Plaque Index (PI) for each sample at each examination. **Results:** At 1st, 3rd , 6 th months group V had the highest mean PI score while the lowest mean PI score was observed in Group AV and the difference between the groups was significant. **Conclusion:** The preventive, educational and motivational actions undertaken in this study proved statistically effective in improving the oral health of orthodontic patients. The most effective method is demonstration by audiovisual aids.

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INTRODUCTION

Orthodontic treatment with fixed appliances alters the oral environment, increases plaque amount (Pender, 1986), changes the composition of the flora (Lundstro¨m, 1987), and complicates the cleaning for the patient (Olympio et al., 2006). Gingivitis and enamel decalcification (Arends, 1986; O'Reilly, 1987) around fixed appliances are frequent side effects when the preventive programs have not been implemented (Zachrisson, 1977). Plaque build-up during orthodontic treatment may lead to chronic hyperplastic gingivitis with increased pocket depths (Alexander, 1991) (Alexander, 1991) and slight, but significant loss of periodontal support (Alexander, 1991; Alstad, 1979; Hamp, 1982) (Alstad & Zachrisson, 1979; Hamp *et al*., 1982, Alexander, 1991). However, long-term studies have not suggested that orthodontic treatment affects subsequent susceptibility to periodontal disease (Sadowsky, 1981) (Sadowski &BeGole, 1981). In literature, numerous studies investigated the most appropriate plaque elimination method for orthodontic patients. However, they largely differ with respect to content, design, and duration. Some of these studies compared the effectiveness of manual or electric toothbrushes on plaque elimination (Huber, 1972; Hickman, 2002). Others evaluated the efficiency of toothpastes and mouthwashes with different ingredients (Olympio, 2006; Ogaard et al., 2006; Ramaglia, 1999), and oral irrigators (Burch, 1994; Attarzadeh, 1990) on gingival health and plaque elimination.

Oral hygiene motivation methods (OHMM) are generally classified as verbal (Huber, 1972; Yeung et al., 1989; Boyd, 1983), written (McGlynn, 1987), or visual based (Lees, 2000) (Audio Visual Aids). The three main methods of patient instruction used in medicine and dentistry are verbal, printed materials, and videotapes. Written instructions appear to be the least effective (Self, 1981) (Self *et al*., 1983). The advantages of video presentation have been described as convenience and clarity of demonstration of relevant material, with the opportunity for self-learning in privacy and comfort. Boyd (Boyd, 1983) evaluated the effectiveness of the self-monitoring plaque control. Yeung, (Yeung, 1989) conducted an oral hygiene program consisting of four weekly sessions of oral health education, instruction of plaque control techniques, and reviews in the plaque removal performance. They have found significantly lower bleeding on probing (BOP), gingival index (GI), and plaque index (PI) scores in the experimental group.

It is therefore crucial to establish preventive motivation and guidance methods to ensure mechanical control of dental plaque. Purpose of this study is to determine the most appropriate oral hygiene motivation method (OHMM) for maintaining good oral hygiene during fixed appliance orthodontic treatment.

MATERIALS AND METHODS

Source of data: This study was conducted in the Department of Orthodontics & Dentofacial Orthopedics, Darshan Dental College and Hospital, Loyara, Udaipur, Rajasthan. A total of 240 orthodontic patients (120 males, 120 females) undergoing orthodontic treatment were included in the study following the inclusion and exclusion criteria.

Inclusion Criteria:

- Being under fixed orthodontic treatment planned to last at least six months beyond the beginning of the study.
- Permanent dentition.
- Good general health condition.

Exclusion Criteria

- Taken systemic antibiotics within three months before the beginning of research.
- Pregnant woman.
- Smoker and exhibiting minor gingivitis.
- Previous orthodontic treatment.
- Edentulous spaces.
- History of trauma.
- Significant cuspal wear.
- Extensive restorations or prosthetics.

The study group was then divided into four groups in accordance to their OHMM as follows:

Group I: Only verbal information (V). Only verbal oral hygiene instructions were given.

GROUP II: Only written information (W). Only verbal and written oral hygiene instructions were given.

GROUP III: Demonstration on model (M). Oral hygiene instructions were demonstrated on model

GROUP IV: Audio Visual Aids and Self application by the patients (AV).

Oral hygiene instructions were given through videos run in digital projectors.

Clinical examination: All patients received professional prophylaxis after baseline examination and were further examined at intervals of 1st, 3rd and 6th month. During this examination a new professional prophylaxis was performed. OHMM designed on correct oral hygiene and the importance of tooth brushing and proper flossing were provided after baseline examination and after 1st, 3rd and 6th month to all the four Groups I-IV. Clinician addressed all the four Groups individually and one patient at a time pertaining to the prevention of diseases such as dental caries and periodontal diseases, the fact that the orthodontic appliance required special individual efforts to maintain oral hygiene, and the understanding that plaque accumulates around the brackets, which requires additional care and the proper use of dental floss and a floss threader. To this end, when dental plaque became apparent, patients were shown in mirrors the regions of greater plaque accumulation and the clinical characteristics of gingival tissue in the inflamed areas. Proper hygiene instructions were then provided and clinical examination was performed (baseline,1st ,3rd ,and 6th month). The clinician performed the examination under artificial light and with compressed air, explorer and flat clinical mirrors. Two percent fuchsin was applied in order to disclose supragingival dental plaque.

The test was as follows:

Plaque Index (Pl) … which was introduced by Silness and Loe in 1964.

- Used on all teeth (28, so wisdom teeth are excluded) or selected teeth (6).
- The six index teeth are 16, 12, 24, 36, 32, 44.
- No substitution for any missing tooth.
- Used on all four surfaces: Distofacial , Facial, Mesio-facial and lingual surface of tooth .
- This index measures the thickness of plaque on the gingival one third.

Score Criteria

- 0 No plaque
- 1 A film of plaque adhering to the free gingival margin and
- adjacent area of the tooth, which can not be seen with the naked eye. But only by using disclosing solution or by using probe.
- 2 Moderate accumulation of deposits within the gingival pocket, on the gingival margin and/ or adjacent tooth surface, which can be seen with the naked eye.
- 3 Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin.

Calculation

Individual

PI = TOTAL SCORE / NO. OF SURFACE EXAMINED

Population

PI= TOTAL SCORE / NO. OF SUBJECTS EXAMINED

Data Processing & Statistical Analysis: After collection of data, the obtained data was checked, verified and edited. The data was then entered in a personal computer using the IBM SPSS (Statistical Package for Social Sciences), where it was cleaned, edited and appropriate statistical tests were done depending on the distribution of data. To statistically compare the mean sores of PI at different time intervals among different groups along with three different age-groups and two genders, one-way ANOVA (Analysis of variance) and Tukey's Post Hoc was used. For inter-group comparison of missed appointments and breakages, chi-square test is employed. Statistical differences were determined at the 95% confidence level (p, .05).

RESULTS

- The present study was designed to determine the most appropriate oral hygiene motivation method (OHMM) for maintaining good oral hygiene during fixed appliance orthodontic treatment.
- The total sample under study (n = 240) was divided into four groups, viz Group I - Only verbal information (V) (n = 60), Group II - Only written information (W) (n = 60), Group III - Demonstration on model (M) (n = 60), Group IV - Audio Visual Aids and Self application by the patients (AV) (n = 60). For Age-wise and Gender- wise comparison in each of these groups, the 60 samples were further sub-divided into 20 Pre-adolescents (Male and Female – 10 each), 20 Adolescents (Male and Female – 10 each) and 20 Adults (Male and Female – 10 each) (Table -1).
- All patients received professional prophylaxis after baseline examination and were further examined at intervals of 1st, 3rd and 6th month. The examination included recording of Plaque Index (PI) for each sample at each examination. To statistically compare the mean sores of PI at different time intervals among different groups along with three different age-groups and two genders, one-way ANOVA (Analysis of variance) and Tukey's Post Hoc was used.
- On Baseline examination, the mean PI score between different groups has been compared, (Table 2).
- Group W had the highest mean PI score (1.93) while the lowest mean PI score was observed in Group VA (1.79), but the difference between the groups was Non – significant (p = 0.06), (Table 2).
- Furthermore, on age-wise comparison of the mean PI score of different groups at baseline, the highest score observed was of Group W Adolescents (1.99) and the lowest score was shared by Pre-adolescent and adults of Group AV (1.77). However the age-wise difference was Non-significant in all the groups, viz. V (p = 0.59), W (p = 1.24), M (p = 2.59) and AV (p = 0.98), (Table 3).
- During Gender-wise comparison of the mean PI score of different groups at baseline, within the groups V, W and M, the females had a non-significantly higher values than males, (p = 0.07), (p = 1.65) and (p = 1.49) respectively, however males had a non-significantly higher mean in group AV (p = 1.24), (Table 4).
- All these parameters were further compared at an interval of 1 month. Comparison of the mean PI scores between different groups during the 1st month examination is as below, (Table 5).
- Group V had the highest mean PI score (1.93) while the lowest mean PI score was observed in Group AV (1.42), and the difference between the groups was significant (p = 0.04)*, (Table 5).
- Furthermore, on age-wise comparison of the mean PI score of different groups at 1st month, Pre-adolescents had the lowest mean score in all the groups, viz. V, W, M and AV, with significant differences between age-groups in groups V, W and AV, (p = 0.04)*, (p = 0.00)* and (p = 0.05)*, respectively, whereas the differences between age groups in group M is non-significant (p = 0.09)*, (Table 6).
- During Gender-wise comparison of the mean PI score of different groups at 1st month, within the groups V, W and AV, the males had non-significantly lower values than females, (p = 0.79), (p = 1.46) and (p = 1.49) respectively, however females had a non-significantly lower mean in group M (p = 1.26), (Table 7).
- All these parameters were further compared at an interval of 3 months. Comparison of the mean PI scores between different groups during the 3rd month examination is as below, (Table 8).
- Group V had the highest mean PI score (1.86) while the lowest mean PI score was observed in Group AV (1.31), and the difference between the groups was significant (p = 0.00)*, (Table 8).
- Furthermore, on age-wise comparison of the mean PI score of different groups at 3rd month, Adolescents had significantly lowest mean score in the groups V (p = 0.02)*, W (p = 0.01)* and M (p = 0.00)*, whereas the differences between age groups in group AV is non-significant (p = 0.09), (Table 9).
- During Gender-wise comparison of the mean PI score of different groups at 3rd month, both the sexes stood very close in their mean PI scores resulting in non – significant differences in all four groups, viz. V (p = 0.13), W (p = 2.13), M (p = 1.49) and AV (p = 0.49), (Table 10).
- All these parameters were further compared at an interval of 6 months. Comparison of the mean PI scores between different groups during the 6th month examination is as below, (Table 11).
- Group V had the highest mean PI score (2.10) while the lowest mean PI score was observed in Group AV (1.15), and the difference between the groups was significant (p = 0.00)*, (Table 11).
- Furthermore, on age-wise comparison of the mean PI score of different groups at 6th month, Adolescents had significantly lowest mean score in the groups V (p = 0.00)* and W (p = 0.04)*, whereas the differences between age groups in groups M (p = 2.49) and AV (p = 0.49) is non-significant, (Table 12).
- During Gender-wise comparison of the mean PI score of different groups at 6th month, the mean PI scores for both the sexes were the same resulting in non – significant differences in all four groups, viz. V (p = 2.13), W (p = 1.49), M (p = 0.49) and AV (p = 1.49), (Table 13).

Table 1. Age-wise and Gender-wise Distribution of Sample into Four Study Groups

Groups	Pre Adolescent		Adolescent		Adult		Total
	Male	Female	Male	Female	Male	Female	
V	10	10	10	10	10	10	60
W	10	10	10	10	10	10	60
M	10	10	10	10	10	10	60
VA	10	10	10	10	10	10	60
Total	80		80		80		240

Table 2. Comparison of values of PI scores of all four groups at Baseline

	MEAN (± SD)				
	V	W	M	VA	*p* VALUE
PI	1.9 ± 0.21	1.93 ± 0.25	1.86 ± 0.20	1.79 ± 0.25	0.06

Table 3. Mean PI score comparison of different age groups at Baseline

	PRE ADOLESCENT	ADOLESCENT	ADULT	*p* VALUE
V	1.85	1.83	1.94	0.59
W	1.92	1.99	1.89	1.24
M	1.88	1.8	1.89	2.59
AV	1.77	1.83	1.77	0.98

Table 4. Mean PI score comparison of different sexes at Baseline

	MALE	FEMALE	*p* VALUE
V	1.86	1.94	0.07
W	1.93	1.94	1.65
M	1.83	1.88	1.49
AV	1.81	1.77	1.24

Table 5. Comparison of values of PI scores of all four groups at 1 Month

	MEAN (± SD)				
	V	W	M	VA	*p* VALUE
PI	1.93 ± 0.29	1.67 ± 0.26	1.55 ± 0.15	1.42 ± 0.23	0.04*

Table 6. Mean PI score comparison of different age groups at 1 Month

	PRE ADOLESCENT	ADOLESCENT	ADULT	*p* VALUE
V	1.66	1.89	2.24	**0.04***
W	1.47	1.62	2	**0.00***
M	1.39	1.55	1.71	0.09
AV	1.2	1.37	1.69	**0.05***

Table 7. Mean PI score comparison of different sexes at 1 Month

	MALE	FEMALE	*p* VALUE
V	1.92	1.94	0.79
W	1.66	1.68	1.46
M	1.56	1.54	1.26
AV	1.41	1.42	1.49

Table 8. Comparison of values of PI scores of all four groups at 3 Months

	MEAN (± SD)				
	V	W	M	VA	*p* VALUE
PI	1.86 ± 0.19	1.71 ± 0.21	1.44 ± 0.16	1.31 ± 0.13	0.00*

Table 9. Mean PI score comparison of different age groups at 3 Months

	PRE ADOLESCENT	ADOLESCENT	ADULT	*p* VALUE
V	1.96	1.62	1.99	0.02*
W	1.64	1.52	1.98	0.01*
M	1.33	1.33	1.66	0.00*
AV	1.2	1.36	1.38	0.09

DISCUSSION

- Orthodontic treatment with fixed appliances alters the oral environment, increases plaque amount (Pender, 1986), changes the composition of the flora (Lundstro¨m, 1987), and complicates the cleaning for the patient (Olympio, 2006).
- In literature, numerous studies investigated the most appropriate plaque elimination method for orthodontic patients. Some of these studies compared the

effectiveness of manual or electric toothbrushes on plaque elimination (Huber, 1972; Hickman et al., 2002). Others evaluated the efficiency of toothpastes and mouthwashes with different ingredients (Olympio, 2006; Ogaard et al., 2006; Ramaglia, 1999), and oral irrigators (Burch, 1994; Attarzadeh, 1990) on gingival health and plaque elimination.

- Few studies in the literature evaluated the oral hygiene motivation methods (OHMM) in orthodontic patients using various methods. These methods are generally classified as verbal (Huber, 1972; Yeung, 1989; Boyd, 1983), written (McGlynn, 1987), or visual based (Lees, 2000) (Audio Visual Aids). The three main methods of patient instruction used in medicine and dentistry are verbal, printed materials, and videotapes. Written instructions appear to be the least effective (Self et al., 1981) (Self *et al*., 1983). The advantages of video presentation have been described as convenience and clarity of demonstration of relevant material, with the opportunity for self-learning in privacy and comfort. A review of 33 medical studies supported the use of video material for increasing patient knowledge and skills, and for changing behaviour (Nielsen, 1988) (Nielsen & Sheppard, 1988).
- Yeung (Yeung, 1989) conducted an oral hygiene program consisting of four weekly sessions of oral health education, instruction of plaque control techniques, and reviews in the plaque removal performance. They have found significantly lower bleeding on probing (BOP), gingival index (GI), and plaque index (PI) scores in the experimental group. Mcglynn (McGlynn, 1987) studied the effectiveness of an oral hygiene booklet and repeated lectures with professional prophylaxis. No significant differences between the booklet and lecture groups were found. On the other hand, Lees et al (Lees, 2000) compared written, verbal, and videotape oral hygiene instruction methods for the patients with fixed appliances.
- Adele Lees And W. P. Rock , (2000) compared the effectiveness of written, videotape, and one-to-one instruction upon the knowledge, oral hygiene standard, and gingival health of subjects undergoing orthodontic treatment with a lower fixed appliance. Zuhal Yetkin Aya *et al.* (2007) conducted a study to determine the most appropriate oral hygiene motivation method (OHMM) for orthodontic patients with fixed appliances. A total of 150 orthodontic patients were divided into five groups (n = 30) according to the verbal OHMM and instructed as follows: only verbal information (V), verbal information with demonstration on model (M), verbal information with demonstration on model and self application by the patient (M+A), verbal information using the illustration catalog (I), and verbal information using the illustration catalog and self application by the patient (I+A). The periodontal parameters (plaque index [PI], gingival index [GI], and bleeding on probing [BOP]) were recorded at the baseline (before the instructions of the OHMM), 1 week later, and 4 weeks after the OHMM.
- In the present study, the study group was divided into four groups in accordance to their OHMM as follows: GROUP I: Only verbal information (V) - Only verbal oral hygiene instructions were given, GROUP II: Only written information (W) - Only verbal and written oral hygiene instructions were given, GROUP III: Demonstration on model (M) - Oral hygiene instructions were demonstrated on model, GROUP IV: Audio Visual Aids and Self application by the patients (AV) - Oral hygiene instructions were given through videos run in digital projectors. The periodontal parameters (plaque index [PI], gingival index [GI], and bleeding index [BI]) were recorded at the baseline (before the instructions of the OHMM), 1 month, 3 months and 6 months after bonding of upper and lower arches.
- On Baseline examination, the mean PI score between different groups has been compared. Group W had the highest mean PI score (1.93) while the lowest mean PI score was observed in Group VA (1.79), but the difference between the groups was Non – significant (p = 0.06). Pender *et al. (1986)* found a mean PI score of (1.19) at baseline examination of his 22 orthodontic patients sample. A mean PI score of (1.53) was recorded on examination of permanent second molars, by Stanley Alexander (Alexander, 1991) in a study sample of 23 patients, at a baseline examination. Alstad and Zachrisson[8] recorded a baseline mean PI score of (0.92) in a 38 orthodontic patient sample. Sadowsky and BeGole (Sadowsky, 1981) found a mean PI score of (1.05) in a group of 103 adults who had malocclusions but were not orthodontically treated. A study by S. C. H. Yeung *et al.* (1989) reported a mean baseline PI score of (1.14) in their study sample. A mean PI score of (1.4) was recorded at baseline examination of 31 patients in a study by McGlynn *et al.* (1987).
- In a similar study by Adele Lees *et al.*, (2000) at baseline examination, the highest mean PI score was observed in a group receiving video education (2.35) whereas the lowest was seen in a group receiving written education (2.03). Another similar study by Zuhal Yetkin *et al. (2007)* recorded the highest mean PI score (1.7) in a group receiving verbal information using the illustration catalog while the lowest mean PI score (1.5) in a group receiving only verbal information.
- Priscila *et al.(2011)* showed a mean PI score of (2.5) at baseline examination of 27 patients. A mean PI score of (1.98) was recorded in 30 orthodontic patients in a study by Patricia *et.al.*[26] In a study conducted on 80 adolescent patients by Fancesca Zotti *et al*, (2016) a mean PI score of (1.35) was recorded at a baseline examination. A study constituting 44 patients by Omar Alkadhi *et al. (2017)* reported mean PI score of (0.85) at baseline.
- All these parameters were further compared at an interval of 1 month, 3 months and 6 months. During these follow up appointments, PI had a similar recording. The lowest mean PI scores at every interval was found by Group AV and the decrease in mean score as compared to other groups was significant (p = 0.00). Similar study results were found in a study by Zuhal Yetkin *et. al. (2006)* wherein the lowest mean scores were found in a group receiving verbal information using illustration catalog and self application by the patient ($p < 0.05$). Whereas the results found in a study by Adele Lees *et al. (2000)* contrasted our study results as their study revealed no significant differences between the mean Plaque scores between different groups receiving oral hygiene motivation through different techniques.

Conclusion

- The preventive, educational and motivational actions undertaken in this study proved statistically effective in improving the oral health of orthodontic patients. The

current health paradigm requires that patients be regarded as one single whole.

- Still there exists a vast scope for further studies in this aspect of Orthodontics. Orthodontists can compare and evaluate other different types of oral hygiene motivational techniques that could result in improved patient compliance in maintenance of oral hygiene. Also long term studies can be carried out in respect to maintenance of oral hygiene within different motivational technique groups that could be monitored till the end of the treatment and also during the post treatment follow-up appointments.

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