Assessment of Factors Associated with Patient’s Compliance in Orthodontic Treatment

V.S.N. Vithanaarachchi, S.P.N.P. Nagarathne, Chantha Jayawardena and L.S. Nawarathna

Abstract

Objective: To assess the factors associated with the compliance of patients undergoing orthodontic treatment with removable and fixed appliances.

Materials and methods: Sample of 60 orthodontic patients with removable and fixed appliances (32 females and 28 males) between 10 and 22 years of age (average age 14.5 ± 2.794 years) were selected with clinical compliance evaluation method and were evaluated using a questionnaire.

Results: There were statistically significant correlations between the age of the patient (p-value = 0.006), father’s education level (p-value = 0.049 and τ= 0.038), difficulties in practice oral hygiene measures (p-value = 0.007, τ= 0.54) and contribution from the supportive clinical staff (p-value<0.05,τ= 0.32) towards the compliance of orthodontic patients wearing fixed appliances. Further, feeling discomfort in public due to oral embarrassment (p-value <0.05,τ= 0.173) was statistically significant among patients with better compliance than who were treated with both removable and fixed appliances. No statistically significant relations were found between the sex, patient’s perceptions of their malocclusion, patient’s awareness of the malocclusions and patient’s relationship with orthodontist.

Conclusions: The results of the current study highlight the correlation between age, oral health awareness, personal oral embarrassment due to irregularities of the teeth and contribution from the supportive staff are important indetermining the compliance to treatment.

Key Words: Compliance, Co-operation, Orthodontic Patient

Introduction

The successful outcome of the orthodontic treatment depends not only upon the knowledge and clinical competence of the orthodontist concerned, but also the co–operation of the patient. The issue of patient compliance is a complex, multifactorial and wide ranging in nature. Compliance can be perceived by factors such as the perceived need of orthodontic treatment by both the patient and parent, the timing of treatment, personality characteristics of both patient and parent, duration and the type of treatment.

Compliance can be assessed either by direct or indirect means. Direct measurement of objective compliance in orthodontics was assessed in a very few studies using timing devices built into the removable appliances. Indirect measures mainly comprise judgment of compliance by the patient or his/her guardians. Personality tests have been used by a few investigators with the goal of being able to predict patient cooperation by identifying particular personality types. The reported data by Gabriel, Clemmer and Hayes, Sahm have given
evidence of considerable discrepancies among the various methods of compliance assessment. The co-operative orthodontic patient has been described in many studies that identifies the patient by demographic and personal characteristics, such as age, sex, social class, personality type and relationship to the orthodontic team. According to some reviewed research studies, age is consistently and significantly associated with patient co-operation. These studies revealed that patients of 12 years of age or slightly younger are more co-operative than older children. The gender of the patient is one of the easiest attributable variable to assess compliance. Three studies reported that girls were more co-operative than boys, whereas five studies found no difference between the two sexes. The socioeconomic status of a patient is also found to be related to orthodontic patient’s co-operation. Two studies reported that patients in the lower middle or lower social classes are more co-operative than children in the upper social class. The successful practice of orthodontics significantly depends on the interaction between the orthodontist and the patient. Relationship between the clinician and the patient in orthodontic practice can positively influence the treatment outcome by encouraging the patient to co-operate with the following prescribed instructions with regard to the appliance wear and maintenance of oral hygiene. Family support for the patient to follow the given instructions is also needed for successful outcome of treatment. Further, continuous encouragement and feedback from the orthodontic supportive staff is helpful to create supportive and friendly environment to the patient. These factors may further enhance the compliance of the patient towards orthodontic treatment.

As compliance of a patient is a major contributory factor for the successful outcome of orthodontic treatment, this study was designed to evaluate the factors associated with patient compliance in orthodontic treatment.

Aims and objectives
This study was designed to determine following factors associated with the compliance of patients undergoing orthodontic treatment with removable and fixed appliances.

1. Age and sex
2. Socioeconomic factors of patient
3. Perception of malocclusion
4. Awareness of the malocclusion
5. Relationship with the team of orthodontists

Materials and methods
A descriptive, prospective and comparative study was conducted at the Division of Orthodontics, Faculty of Dental Sciences, University of Peradeniya, Sri Lanka. The final study sample consisted of 60 orthodontic patients, which included 28 boys and 32 girls aged 10 to 22 years. The mean age of the sample was 14.5 years (SD = 2.794 years). Patients with cleft lip and palate, syndromic conditions and other serious disabilities were excluded from this study.

Initial assessment was done with 200 patients at the beginning of treatment with upper simple removable appliances (110 patients) and full fixed appliances (90 patients) by a single orthodontist. Clinical compliance assessment was performed four times for each appointment in monthly intervals by the principal investigator. Informed consent was obtained from the patients, and both patients and parents for those below the age of eighteen years. The two compliance groups were evaluated using the clinical compliance evaluation method which was designed to make a quantitative and objective appraisal of patient compliance. It examines three areas of co-operation, oral hygiene, appliance wear and appliance maintenance.

Compliance of the patients wearing removable appliance were assessed using a modified version of simplified oral hygiene index and 9-point scale.
Assessment of Factors Associated with Patient’s Compliance in Orthodontic Treatment

of appliance wear\textsuperscript{19}. In the modified version of simplified oral hygiene index, the facial surfaces of both maxillary permanent 1st molars, the maxillary right permanent central incisor, mandibular left permanent central incisor and lingual surfaces of both mandibular permanent first molars were used for assessment.

<table>
<thead>
<tr>
<th>Right 1st molar</th>
<th>Right permanent central incisor</th>
<th>Left permanent central incisor</th>
<th>Left 1st molar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buccal</td>
<td>Lingual</td>
<td>Labial</td>
<td>Buccal</td>
</tr>
<tr>
<td>Upper</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Lower</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Table 1: Assessment surfaces of modified version of simplified oral hygiene index

| 4 points | No debris or stain present |
| 3 points | Soft debris not covering more than 1/3 of the tooth surface or gingival to the bracket |
| 2 points | Soft debris covering more than 1/3 of the tooth surface, including the bracket, but not more than 2/3 |
| 0 point  | Soft debris covering more than 2/3 of the tooth surface, both gingival and incisal to the bracket |

Table 2: Modified version of simplified oral hygiene index

Appliance wear was measured on a 9-point scale\textsuperscript{19} for removable appliance patients. The point values were based on the percentage of the prescribed time duration that the patient wore the appliance. The nine point scale for the assessment of removable appliance wear is included by following parameters. The assessment was based on the patient’s response and the judgment of the clinician.

| 25 points | 90% - 100% of the prescribed time |
| 21 points | 80% - 90% of the prescribed time |
| 18 points | 70% - 80% of the prescribed time |
Compliance of the fixed appliance wearing patients were assessed using modified version of simplified oral hygiene index as mentioned above (Table 1 and 2) and 4-point scale of fixed appliance maintenance which included following parameters.

### Table 3: The nine-point scale for the assessment of removable appliance wear

<table>
<thead>
<tr>
<th>Points</th>
<th>Percentage of the prescribed time</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>60%-70%</td>
</tr>
<tr>
<td>12</td>
<td>50%-60%</td>
</tr>
<tr>
<td>9</td>
<td>40%-50%</td>
</tr>
<tr>
<td>6</td>
<td>30%-40%</td>
</tr>
<tr>
<td>3</td>
<td>20%-30%</td>
</tr>
<tr>
<td>0</td>
<td>10%-20%</td>
</tr>
</tbody>
</table>

### Table 4: 4-point scale of fixed appliance maintenance

<table>
<thead>
<tr>
<th>Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>No broken brackets or bands and no bends in the arch wire</td>
</tr>
<tr>
<td>15</td>
<td>No breakages or mild bends in the arch wire</td>
</tr>
<tr>
<td>5</td>
<td>Moderate bends in the arch wire or loose bands</td>
</tr>
<tr>
<td>0</td>
<td>Broken brackets, loose bands</td>
</tr>
</tbody>
</table>

The total highest score was given for the patient either with removable appliance or fixed appliance was 29 points. Patients who were above (≥ 50%) and below (<50%) the average of each assessment were considered as below average compliance (better compliers) and below average compliance (poor compliers) respectively. Finally, 60 patients were selected for the final study sample including equal number of patients in each category as in the following distribution (Fig. 1). Half of these patients (30 patients) received treatment with simple removable appliances (RA) and the other half (30 patients) received fixed appliance (FA) treatment. Each group consisted of fifteen patients with below average compliance and fifteen patients with above average compliance according to the scoring given by the clinical compliance evaluation method.
Assessment of Factors Associated with Patient’s Compliance in Orthodontic Treatment

Parent sample
(200 subjects)

 Patients with RA
(110 patients)
Patients with FA
(90 patients)

Assessment of compliance

Assessment of compliance

Modified version of simplified oral hygiene index + 9-point scale for assessment of appliance wear

Modified version of simplified oral hygiene index + 4-point scale of fixed appliance maintenance

Drop outs

Drop outs

Above average
Compliers
(15 patients)

Below average
Compliers
(15 patients)

Above average
Compliers
(15 patients)

Below average
Compliers
(15 patients)

Fig 1: Flow chart of sample selection

The patients who were enrolled in the research project were asked to complete paper – pencil questioners. Initially a pilot questioner was conducted to seven subjects to determine the appropriateness, to identify ambiguous questions and to measure the time for completion. The questionnaire was designed to include 27 items to obtain basic demographic information, five items to assess socio-economic factors of the patient and ten items to assess patient’s percep-
tions of the malocclusion. Further four questions were added to assess the patient’s awareness of the malocclusion and six items were included to assess the level of relationship of the patient with the orthodontic team. The patients were informed about the confidentiality of data collection and were not made available for any other patients identity was concealed throughout the process.

Results
The scores obtained from each questioner were entered and analyzed using the statistical software R²¹. Data were analyzed using correlation tests and stepwise multiple regression analysis. Fisher’s exact test was indicated to assess the association between variables as the sample size is small. If the association between the variables are significant, the Kendall rank Correlation Coefficient test (τ) was applied to measure the ordinal association between the two variables. There was a positive correlation between the age of the patient and the compliance among subjects who were wearing fixed appliances (p-value = 0.006). Its positive correlation was confirmed with the Kendall rank Correlation Coefficient test (τ = 0.078). However, there was no relation-

ship between the gender and the compliance of the patients towards the orthodontic treatment (p-value = 0.43). A statistically significant positive correlation was observed with regard to the father’s education level and the compliance of the subjects who were wearing fixed appliances (p-value = 0.049 and τ = 0.038). There was no significant association between the perception of their malocclusion and compliance towards orthodontic treatment (p-value >0.05). Significant correlation was observed with regard to the difficulty in practicing oral hygiene measures due to irregularity of teeth and the compliance of patients wearing both removable and fixed appliances (p-value = 0.007, τ = 0.54). This study didn’t show any significant association between patient’s knowledge of the irregularities of the teeth and their co-operation (p-value = 0.75). With the present study, a positive correlation was observed with removable and fixed appliance patients with regard to the feeling of discomfort in public and the cooperation towards the treatment (p-value <0.05, τ = 0.173). Moderately positive association was observed between the supportive clinical staff and the compliance of the patients (p-value<0.05, τ = 0.32)

<table>
<thead>
<tr>
<th>No</th>
<th>Variable</th>
<th>Removable Appliances</th>
<th>Fixed Appliances</th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Age</td>
<td>0.129</td>
<td>0.006*</td>
<td>0.178</td>
</tr>
<tr>
<td>2</td>
<td>Sex</td>
<td>1.000</td>
<td>0.462</td>
<td>0.438</td>
</tr>
<tr>
<td>3</td>
<td>Father’s Educational level</td>
<td>0.792</td>
<td>0.049*</td>
<td>0.125</td>
</tr>
<tr>
<td>4</td>
<td>Mother’s Educational level</td>
<td>0.605</td>
<td>0.888</td>
<td>0.779</td>
</tr>
<tr>
<td>5</td>
<td>Patient’s perceptions of their malocclusion</td>
<td>0.256</td>
<td>0.465</td>
<td>0.076**</td>
</tr>
<tr>
<td>6</td>
<td>Feeling discomfort in public</td>
<td>0.224</td>
<td>0.483</td>
<td>0.089**</td>
</tr>
<tr>
<td>7</td>
<td>Difficulties in practice oral hygiene measures</td>
<td>1.000</td>
<td>0.007*</td>
<td>0.018*</td>
</tr>
<tr>
<td>8</td>
<td>Patient’s awareness of the malocclusions</td>
<td>0.545</td>
<td>0.859</td>
<td>0.758</td>
</tr>
</tbody>
</table>
Assessment of Factors Associated with Patient’s Compliance in Orthodontic Treatment

<table>
<thead>
<tr>
<th></th>
<th>Patient’s relationship with orthodontist</th>
<th>0.163</th>
<th>-0.029</th>
<th>0.674</th>
<th>-0.074</th>
<th>0.191</th>
<th>-0.046</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Patient’s relationship with the supportive staff</td>
<td>0.857</td>
<td>0.0779</td>
<td>0.080**</td>
<td>0.327</td>
<td>0.183</td>
<td>0.230</td>
</tr>
</tbody>
</table>

*Significant at 95% and **significant at 90% Table 06; Summary of the data analysis

Fig 02; Correlogram shows the correlation among the variables of the patients treated with removable appliances

Fig 03; Correlogram shows the correlation among the variables of the patients treated with fixed appliances
Discussion

In the assessment of compliance of orthodontic patients, it is important to evaluate their demographic characteristics. Some studies showed no correlation between the age and the level of compliance of orthodontic patients. However, some studies have reported that patients have more cooperation towards orthodontic treatment below the age of 12 years than adolescents. In one study, the age was found to be the best predictor of compliance towards the orthodontic treatment. In agreement with latter studies, our study also showed a positive correlation between the age and co-operation towards orthodontic treatment with fixed appliances.

Some studies have claimed that patient’s gender might help to predict the compliance of patients towards orthodontic treatment. Girls were more co-operative than boys were the conclusions of a few studies. However, some other studies highlighted that there is no significant correlation between gender difference and compliance of the patient to orthodontic. Present study also showed no significant correlation between the gender and compliance of orthodontic patients who had treatment with removable and fixed appliances. It is considered that the parent educational level has a positive impact on their children’s cooperation towards the orthodontic treatment. In present study father’s educational level had positive effect on patient's better compliance. Therefore, it shows that educated parents are able to provide positive motivation to children for compliance with long term orthodontic treatment.

Oral health awareness, specific dental knowledge and personal oral embarrassment are considered as positive motives associated with compliance of a patient. Siddowda and Rani found moderate level of knowledge and awareness of irregular teeth with co-operative patients. In the present study, patients who were wearing fixed appliances had significant correlation to compliance and the difficulty in practicing oral hygiene measures due to their irregularities. Fixed appliances are indicated for the management of complex orthodontic problems when compared to the indications for simple removable appliances. Therefore, the above correlation might be due to the complexity of the malocclusion. Some individuals may experience personal oral embarrassment due to the unaesthetic appearance of irregularly arranged teeth. Therefore, sometimes they refuse to perform activities in public. In the present study, it was shown that patients with better compliance had the feeling of discomfort in public especially who were indicated for fixed appliances. This also in directly showed that the severity of malocclusion has a positive correlation with compliance. Specific dental knowledge of the patients also considered as one of the positive motives for their co-operation. However, there was no such positive relationship in this study.

Relationship between clinician and supportive staff is an important factor in the compliance of the patient towards the treatment. Orthodontist’s behavior like listing, empathy and explanation of treatment to the patient are important in improving compliance of orthodontic patient. The patient’s satisfaction and co-operation are influenced by politeness and verbal communication between patient and whom may help to
alleviate anxiety of the patient. In this study the moderately positive correlation was observed with the supportive staff and the compliance of the orthodontic patients (r= 0.032). However, there was no significant correlation between the relationship of the patient with the clinician and compliance.

Conclusion
In conclusion, the results of the present study on the assessment of factors associated with patient’s compliance in orthodontic treatment highlights correlation between age, oral health awareness, personal oral embarrassment due to irregularities of the teeth and contribution from the supportive staff of orthodontic team. Although a larger sample is required, this study provides a baseline for a comprehensive study in the future. In a future study, it is important to objectively assess the severity of malocclusion as a factor that correlates to the compliance with orthodontic treatment.

Acknowledgments
We would like to thank all the orthodontic patients who participated in the study.

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